Does intellectual capital have any influence on stock price crash risk?

Agung Nur Probohudono and Adelia Dyaning Pratiwi
Economic and Business, Fakultas Ekonomi, Universitas Sebelas Maret, Surakarta, Indonesia, and
Mahameru Rosy Rochmatullah
Economic and Business, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

Received 18 September 2020
Revised 5 January 2021
1 April 2021
Accepted 10 May 2021

Abstract

Purpose – This paper explores the influence between intellectual capital (IC) and the risk of stock price crashes by using company performance as an intervening variable.
Design/methodology/approach – This study empirically analyzes the impact of the efficiency of IC on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange (IDX) during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.
Findings – This study's findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated influence on stock price crash risk so that the aspects of IC are obscured.
Originality/value – This research provides new information that IC disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Keywords Intellectual capital, Stock price crash risk, Firm performance, Disclosure, Social capital, Corporate governance convergence

Paper type Research paper

1. Introduction

Companies nowadays are being replaced with a knowledge-based, fast-changing and technology-intensive economy, including in Indonesia. Most companies use technology to enhance the efficiency of company activities and depress expenses incurred. In this modern economy, for many firms, the most important and essential asset is intellectual capital (IC), in sharp contrast to times when physical capital was the power of companies. Previous studies have shown that company value and capability are often based on the intangible IC that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress, such as increasing brand equity and social networking. In addition, IC provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati *et al.*, 2015) and cost efficiency (Martinez *et al.*, 2020). In this study, we propose that the application of IC in the company is expected to reduce the risk on stock price crashes.

The purpose of this study is to find out the relationship between efficiency of IC and stock price crash risk in the future by using firm performance as the mediating variable. Clarke *et al.* (2011) stated that IC has a positive influence on firm performance, which is characterized by three components of IC efficiency (ICE): human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). These factors could be a good indicator for company shareholders because a company with good ICE indicates that they have been using their resources efficiently. Several studies have proven that IC reflects good

Journal of Intellectual Capital
Vol. 23 No. 6, 2022
pp. 1161-1174

1469-1930
DOI 10.1108/JIC-09-2020-0306

competence, skills and knowledge, which can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, the company can disclose information in accordance with the needs of the shareholders.

Based on a Taiwanese study by Chen *et al.* (2005), this study uses the quantitative measure, value-added intellectual coefficient (VAIC), developed by Pulic (1998) as a measure of ICE. Data are collected for firms listed on the Indonesia Stock Exchange (IDX) in 2018. We used path analysis to determine whether there is any relation between IC, firm performance and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no research on the relationship between IC and stock price crash risk. This study contributes to the literature by bridging this gap in the knowledge, that is, the relationship between IC and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discusses the findings. Section 6 concludes the paper.

2. Literature review and hypothesis

2.1 Strengths and weaknesses of measuring intellectual capital

Basically, IC is measured by various elements such as human capital, physical capital, structural capital, social capital and relational capital. However, previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) measured IC with three components, namely human capital, physical capital and structural capital; however, only human capital is positively related to all the three efficiencies (technical, allocative and cost). Castillo *et al.* (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes and relationships with customers. On the issue of environmental protection, Yong *et al.* (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff *et al.* (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although IC possesses weaknesses, its advantages, demonstrated in previous studies, outweigh them. Barrena-Martínez *et al.* (2020) proved that the three components of IC (relational capital, human capital and structural capital) positively affect open innovation performance. Salvi *et al.* (2020) suggested a significantly positive relationship between all three components of IC and firm value, generating multiple implications for reporting entities, investors, regulators and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing the IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza *et al.* (2020) indicated the contribution of green IC to be an intangible resource for organizations in achieving sustainable performance, providing a competitive advantage for future researchers. Dubic *et al.* (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership, meaning that human capital has an important role in business innovation. This study will explore the efficiency of IC using three measures (human capital, structural capital and capital employed).

2.2 The determinant of information efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also

shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu *et al.* (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in corporate share repurchase decisions, while the enactment of the regulations has a significant effect on firms undertaking share repurchase programs (Moin *et al.*, 2020). In China, regulations that promote the efficiency of share prices also play an important role in controlling stock prices (He and Fang, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility, macroeconomic events, financial transparency and government regulations, play a greater role in controlling the risk of stock price crashes, while IC does not play an important role in controlling stock prices.

Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen *et al.* (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee *et al.* (2020) revealed that a supplier firm with a concentrated customer base experiences a higher crash risk, which is attenuated by lower switching costs and accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment also affects stock price volatility (Li, 2019). Likewise, Ma *et al.* (2020) suggest that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies indicate that economic policy, investor sentiment and audit quality have a significant effect on the risk of stock price crashes.

2.3 Intellectual capital efficiency

IC represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts *et al.*, 2001). Several studies have revealed that ICE can improve the performance of companies (see, e.g. Clarke *et al.*, 2011; Gogan *et al.*, 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell *et al.*, 2018; Sardo *et al.*, 2018; Huang and Huang, 2020). Investors are quite interested in buying shares when the company has implemented ICE. Lin *et al.* (2015) and Ozkan *et al.* (2017) show that the greater the ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which, if invested efficiently, can strengthen the company's position, helping it gain competitive advantage. This means that HCE represents a selection of superior IC to be employed in the company's business. Meanwhile, Asiaei *et al.* (2018) have proven that there is a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac *et al.* (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, companies that have a higher HCE are more likely to have a higher return on equity (ROE), a higher return on asset (ROA), a higher return on invested capital (ROIC) and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize the overall business performance. IC plays a central role in determining the structural capital model used in companies. Gogan *et al.* (2015) posit that determining the right model in structural capital is essential to obtain a competitive advantage in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian *et al.* (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes; it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson *et al.* (2006) revealed that shareholder demand is a higher return on capital employed, meaning that CEE represents IC, which can perform accurate calculations in capital investment in order to obtain optimal returns. Mørch *et al.* (2017) explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and the financial performance of investments. Thus, ICE plays an important role in investment decisions.

2.4 Intellectual capital efficiency measurement model on stock price risk

Basically, the efficiency of ICE plays a role in the application of HCE, SCE and CEE. This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in the knowledge economy developed by Pulic (1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by Chen *et al.* (2017). ICE is calculated using three components, namely value-added human capital efficiency (VAHU), value-added structural capital (STVA) and value-added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the methods section.

Several studies have used this model, which shows mixed results as well. Hejazi *et al.* (2016) found that increasing IC should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital and structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati *et al.*, 2010). The four studies indicate that innovation and creation play a dominant role in describing the latent constructs of IC. Based on the discussion above, hypothesis (H1) is as follows:

H1a. HCE is positively related to firm performance.

H1b. SCE is positively related to firm performance.

H1c. CEE is positively related to firm performance.

Chen *et al.* (2005) have confirmed that investors place higher value on companies with better ICE. Furthermore, Song (2015) has shown that the management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of IC. Dong and Zhang (2016) have also shown that environmental control, information and communication and monitoring components significantly reduce the risk of accidents, while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare is also a factor that contributes to the risk of stock price crashes. Further analysis shows that a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and that there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose *et al.* (2017) showed a positive relationship between IC as a whole and the market capitalization value of a company. Some of these studies imply that IC can reduce the risk of stock investment. Based on the above discussion, hypothesis (H2) is as follows:

H2a. HCE is negatively related to stock price crash risk.

H2b. SCE is negatively related to stock price crash risk.

H2c. CEE is negatively related to stock price crash risk.

Bennett *et al.* (2020) explained that the management, directly or indirectly, learns from its firm's stock price so that more informative stock prices should make the firm more

productive. This means that the informativeness of stock prices indicates that the company's performance is better. Martani *et al.* (2009) mentioned that a company's financial performance is shown by the profitability ratio, and the market value ratio significantly influences returns in the company. Based on this, the following hypothesis (H3) can be formulated as

H3. Firm performance is negatively related to stock price crash risk.

IC owned by the company is expected to create added value so that it can improve company performance. Good firm performance is an indicator that will be considered by investors in making investment decisions. Cenciarelli *et al.* (2018) show that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on the research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that develop IC require capital for R&D, so they are faced with financing constraints. This means that ICE supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao *et al.* (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. Companies in areas of high social trust tend to hide bad news. The management tends to disclose more related information to acquire investors. Thus, ICE is needed as a corporate strategy to increase information transparency and financial performance, which will result in increasing investor confidence. Based on the discussion above, we can hypothesize (H4) that

H4a. HCE is negatively related to stock price crash risk by using firm performance as an intervening variable.

H4b. SCE is negatively related to stock price crash risk by using firm performance as an intervening variable.

H4c. CEE is negatively related to stock price crash risk by using firm performance as an intervening variable.

3. Research design

3.1 Sample

This study uses companies from various sectors as research objects and sample for the research. The sample was collected from IDX's annual report data for 2018. We also obtained weekly stock data from Yahoo Finance. We then used the following selection criteria: First, similar to Khan and Watts (2009), we required that total assets and book values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

3.2 Measurement of independent variables

Chen *et al.* (2005) argue that VAIC and its three components, HCE, SCE and CEE, represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE and CEE. This can be expressed in Formula (1).

$$\text{VAIC} = \text{HCE} + \text{SCE} + \text{CEE} \qquad \text{Formula 1}$$

To measure VAIC, we need value added (VA) to be calculated. In its simplest form, VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs, which are

considered to be a value-creating entity (Tan *et al.*, 2008). This VA is also defined as the net value created by firms during the year (Chen *et al.*, 2005). VA can be calculated using Formula (2).

$$\mathrm{VA} = S - B = \mathrm{NI} + T + \mathrm{DP} + I + W \qquad \text{Formula 2}$$

S is sales; B is cost of goods sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense and W is employee wages and salaries.

3.2.1 Human capital efficiency. Human capital factors consist of skills, knowledge, productivity, competence and all aspects that pertain to an employee in the work place. HCE can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula VAHU. VAHU calculations can be seen in Formula (3).

$$\mathrm{VAHU} = \mathrm{VA}/\mathrm{HC} \qquad \text{Formula 3}$$

3.2.2 Structural capital efficiency. Structural capital is an element in IC and consists of organizational networks, patents, strategy and brand names. Based on Pulic (1998), we calculated SCE as in Formula (4). Meanwhile, SCE is calculated using STVA as in Formula (5).

$$\mathrm{SC} = \mathrm{VA} - \mathrm{HC} \qquad \text{Formula 4}$$

$$\mathrm{STVA} = \mathrm{SC}/\mathrm{VA} \qquad \text{Formula 5}$$

SCE is the dollar of SC within the firm, for every dollar of VA, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, a logical inconsistency would remain (Pulic, 1998).

3.2.3 Capital employed efficiency. CEE is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on CE. We could calculate CE as the total assets minus intangible assets and CEE is defined as VACA. VACA calculations can be seen in Formula (6).

$$\mathrm{VACA} = \mathrm{VA}/\mathrm{CE} \qquad \text{Formula 6}$$

3.3 Measurement of dependent variable

The risk of stock price crash is the risk of a significant stock price decline after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen *et al.* (2017), which can be seen in Formula (7).

$$\mathrm{NCSKEW} = \frac{-\left[\frac{n(n-1)^3}{2}\sum_{T=1}^{n}\left(w_{i,T,t} - \overline{w}_{i,t}\right)^3\right]}{\left[(n-1)(n-2)\left(\sum_{T=1}^{n}\left(w_{i,T,t} - \overline{w}_{i,t}\right)^2\right)^{3/2}\right]} \qquad \text{Formula 7}$$

$W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company's specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

3.4 Measurement of intervening variable

This study uses firm performance as the intervening variable. We use ROE to analyze firm performance. We calculate this ratio with Formula (8).

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \qquad \text{Formula 8}$$

3.5 Empirical models

This study uses path analysis that produce two model regressions to test our hypotheses.

$$\text{ROE} = \alpha + \beta 1\ \text{VAHU} + \beta 2\ \text{STVA} + \beta 3\ \text{VACA} + \beta 4\ \text{SIZE} - \mu \qquad \text{Model I}$$

$$\text{NCSKEW} = \alpha - \beta 1\ \text{STVA} - \beta 2\ \text{VACA} - \beta 3\ \text{AHU} + \beta 4\ \text{SIZE} - \beta 5\ \text{ROE} - \mu \qquad \text{Model II}$$

ROE is the ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy for stock price crash risk, VAHU is value-added human capital, STVA is value-added structural capital, VACA is value-added capital employed and SIZE is firm size as the control variable in this study.

4. Results

4.1 Normality test

Table 1 shows the significance value of Asymp. The Sig (two-tailed) is 0.200. The value is greater than 0.1. According to the basis of decision making in the Kolmogorov–Smirnov normality test above, it can be concluded that the data are normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for the data above.

4.2 Multicollinearity test

The basis for decision-making from the multicollinearity test is the value of tolerance (Tol) and variance inflating factor (VIF). Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While the VIF value for each variable is less than ten. Then, according to the basis for the multicollinearity test decision-making, we can conclude that there are no symptoms of multicollinearity in the regression model. Table 2 shows the results of the multicollinearity test.

One-sample Kolmogorov–Smirnov test

		Unstandardized residual
N		152
Normal Parameters[a,b]	Mean	0.000
	Std. deviation	0.924
Most extreme differences	Absolute	0.059
	Positive	0.037
	Negative	−0.059
Test statistic		0.059
Asymp. Sig. (two-tailed)		0.200[c,d]

Note(s): a. Test distribution is normal; b. Calculated from data; c. Lilliefors significance correction and d. This is a lower bound of the true significance

Table 1. Normal probability test result

4.3 Heteroskedasticity test

Based on Figure 1, we know that data dots spread above and below or around the number 0. We can then see that the dots are not just clustered above or below. The distribution of data points does not form a wavy pattern, widening then narrowing and then widening again. We can also see that the dots do not make a certain pattern. According to the analyses, we can conclude that there is no heteroscedasticity problem; so a good and ideal regression model can be fulfilled.

4.4 Path analysis

In Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0.000, respectively. While, based on Table 2, there is no significant relationship between VAHU and ROE at the 1% significance level; so we can conclude that H1(a) is rejected. Based on a beta test, VACA is the variable that most influences changes in ROE. The value of Sig. *F*-statistics shows that at a significance level of 1%, VAHU, VACA and STVA simultaneously influence

Model 1	Unstandardized coefficients *B*	Unstandardized coefficients Std. error	Standardized coefficients Beta	*t*	Sig.	Collinearity statistics Tolerance	Collinearity statistics VIF
(Constant)	−4.074	1.323		−3.079	0.002		
VAHU	−0.062	0.096	−0.103	−0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	−0.271	1.481	−0.021	−0.183	0.855	0.475	2.104

Note(s): Dependent variable (NCSKEW)

Table 2. Multicollinearity test results

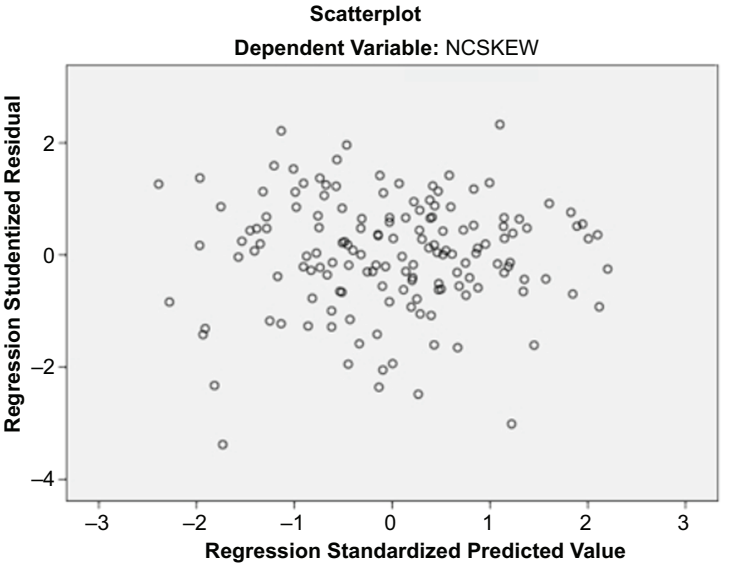


Figure 1. Heteroskedasticity test result

	Dependent variable: ROE		Dependent variable: NCSKEW	
	Predicted sign	Model 1	Predicted sign	Model 2
VAHU	+	0.001 (0.005)	–	−0.062 (0.096)
STVA	+	0.128** (0.052)	–	0.144 (0.952)
VACA	+	0.404* (0.037)	–	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	–	0.123 (0.043)
ROE (Intervening)			–	−0.271 (1.481)
Constant		−0.340 (0.068)		−4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. *F*-stat		0.000*		0.074***
N		152		152

Note(s): This table presents the correlation coefficient number (β), while the number within parentheses is the standard error. *, ** and *** indicate significance at the levels 1%, 5% and 10%, respectively

Table 3.
Results of the regression model

ROE. This result is a strong indicator that there is a relationship between IC and firm performance, thus supporting H1(b) and H1(c). That is, if a firm can use its IC more efficiently in one year, this can lead to a performance increase in the same year.

In Table 3, Model 2 shows that all of the components of IC do not have any significant relationship with stock price crash risk at the 1% significance level. From Table 2, we also know that ROE does not have any significant influence on stock price crash risk. Furthermore, we use Model 1 and Model 2 for path analysis. After acquiring the numbers from Table 2, we calculated the indirect effect by multiplying the effect of the IC component with ROE and then ROE with stock price crash risk. Based on Table 2 and the path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0.000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis, if the indirect effect is greater than the direct effect, then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA and VACA do not have any significant relationship with stock price crash risk either directly or indirectly through firm performance.

5. Discussion

Several studies show that IC plays an important role in improving sustainable company performance and business progress (see, e.g. Castillo *et al.*, 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo *et al.*, 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the IDX. In addition, other results show that the company's performance, as represented by ROE, also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang *et al.*, 2019). Information inefficiency is a global problem that always exists in the stock market, although more prevalent in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee *et al.* (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that a company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment toward stock prices seems to dominate influence on the operation of the stock market. The sentiment index built on social media has

been shown to greatly influence the volatility of stock prices (Liang *et al.*, 2020). The optimistic (pessimistic) sentiment of Internet search-based investors can also influence premium value in the United States stock market (Teti *et al.*, 2019; Klemola, 2020). Meanwhile, Ni *et al.* (2019) reveal that the fluctuation of stock prices is more sensitive to the intraday sentiment of individuals. Chau *et al.* (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various studies, we believe that investors' optimistic (pessimistic) sentiment toward stock price volatility dominates influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

6. Conclusions and implications

6.1 Conclusions

This study examines the effect of IC components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX and stock price data published by Yahoo Finance. IC variables are measured by the VAIC method written by Pulic (1998), and stock price crash risk variables are measured by NCSKEW developed by Chen *et al.* (2017). Data were processed using the path analysis method to determine the direct effect and indirect effect from each of the interrelated variables.

Simultaneously, the VAHU, STVA and VACA variables have a significant relationship to firm performance; however, partially, VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three IC variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. We conclude that investor sentiment has dominated influence on stock price crash risk so that the IC aspect has become obscured.

6.2 Implications

So far, research on IC has been discussed in 700 articles written by leading authors at various universities (Dubic *et al.*, 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that IC disclosure, which is proxied by the company's financial performance, becomes obscured, while investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In future research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Basically, the ability and knowledge for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce idiosyncratic volatility, which is the best predictor of stock returns and is proven to have a positive impact on investors' heterogeneous beliefs (Kongsilp and Mateus, 2017; He *et al.*, 2020). Zhan (2019) argues that there was a positive relationship between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical application, IC represents the knowledge and ability for preparing a stock portfolio that contains company-specific information, which is needed to minimize stock price crash risk.

References

Adesina, K.S. (2019), "Bank technical, allocative and cost efficiencies in Africa: the influence of intellectual capital", *North American Journal of Economics and Finance*, Vol. 48, pp. 419-433.

Al-Yahyaee, K.H., *et al.* (2020), "Why cryptocurrency markets are inefficient: the impact of liquidity and volatility", *The North American Journal of Economics and Finance*, Vol. 52, April 2020, 101168.

Andersson, T., *et al.* (2006), "Financialized accounts: restructuring and return on capital employed in the SandP 500", *Accounting Forum*, Vol. 30, pp. 21-41.

Anifowose, M., *et al.* (2017), "Intellectual capital disclosure and corporate market value: does board diversity matter?", *Journal of Accounting in Emerging Economies*, Vol. 7 No. 3, pp. 369-398.

Asiaei, K. and Jusoh, R. (2017), "Using a robust performance measurement system to illuminate intellectual capital", *International Journal of Accounting Information Systems*, Vol. 26, pp. 1-19.

Asiaei, K., *et al.* (2018), "Intellectual capital and performance measurement systems in Iran", *Journal of Intellectual Capital*, Vol. 19 No. 2, pp. 294-320.

Barrena-Martínez, J., *et al.* (2020), "Joint forces: towards an integration of intellectual capital theory and the open innovation paradigm", *Journal of Business Research*, Vol. 112, May 2020, pp. 261-270.

Bartram, S.M. and Grinblatt, . (2021), "Global market inefficiencies", *Journal of Financial Economics*, Vol. 139 No. 1, pp. 234-259.

Belcaid, K. and Ghini, A.E. (2019), "US European, Chinese economic policy uncertainty and Moroccan stock market volatility", *The Journal of Economic Asymmetries*, Vol. 20, e00128.

Ben-Nasr, H. and Ghouma, H. (2018), "Employee welfare and stock price crash risk", *Journal of Corporate Finance*, Vol. 48, pp. 700-725.

Bennett, B., *et al.* (2020), "Does the stock market make firms more productive?", *Economics*, Vol. 136 No. 2, pp. 281-306.

Berzkalne, I. and Zelgalve, E. (2014), "Intellectual capital and company value", *Procedia-Social and Behavioral Sciences*, Vol. 110, pp. 887-896.

Boya, C.M. (2019), "From efficient markets to adaptive markets: evidence from the French stock exchange", *Research in International Business and Finance*, Vol. 49, October 2019, pp. 156-165.

Cao, C., *et al.* (2016), "Social trust and stock price crash risk: evidence from China", *International Review of Economics and Finance*, Vol. 46, pp. 148-165.

Castillo, A.E., *et al.* (2019), "Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises", *Procedia Computer Science*, Vol. 160, pp. 567-572.

Cenciarelli, V.G., *et al.* (2018), "Does intellectual capital help predict bankruptcy?", *Journal of Intellectual Capital*, Vol. 19 No. 2, pp. 321-337.

Chance, D.M. and Yang, T.-H. (2007), "Black–scholes–merton, liquidity, and the valuation of executive stock options", in Hirschey, M., John, K. and Makhija, A.K. (Eds), *Issues in Corporate Governance and Finance (Advances in Financial Economics, 12)*, Emerald Group Publishing, Bingley, pp. 271-310.

Chau, F., *et al.* (2016), "Does investor sentiment really matter?", *International Review of Financial Analysis*, Vol. 48, December 2016, pp. 221-232.

Chen, M.C., *et al.* (2005), "An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance", *Journal of Intellectual Capital*, Vol. 6 No. 2, pp. 159-176.

Chen, C., *et al.* (2017), "Earnings smoothing: does it exacerbate or constrain stock price crash risk?", *Journal of Corporate Finance*, Vol. 42, pp. 36-54.

Ciprian, G.G., *et al.* (2012), "Elaboration of accounting financial report on structural capital", *Procedia - Social and Behavioral Sciences*, Vol. 62, pp. 706-710.

Clarke, M., *et al.* (2011), "Intellectual capital and firm performance in Australia", *Journal of Intellectual Capital*, Vol. 12 No. 4, pp. 505-530.

Dabić, M., *et al.* (2020), "Two decades of the journal of intellectual capital: a bibliometric overview and an agenda for future research", *Journal of Intellectual Capital*, Vols ahead-of-print.

Dubic, M., *et al.* (2021), "Intellectual agility and innovation in micro and small businesses: the mediating role of entrepreneurial leadership", *Journal of Business Research*, Vol. 123, February 2021, pp. 683-695.

Dženopoljac, V., *et al.* (2016), "Intellectual capital and financial performance in the Serbian ICT industry", *Journal of Intellectual Capital*, Vol. 17 No. 2, pp. 373-396.

Gogan, L.M., *et al.* (2015), "Structural capital - a proposed measurement model", *Procedia Economics and Finance*, Vol. 23, pp. 1139-1146.

Gogan, L.M., *et al.* (2016), "The impact of intellectual capital on organizational performance", *Procedia-Social and Behavioral Sciences*, Vol. 211, pp. 194-202.

Hayati, M., *et al.* (2015), "The effect of intellectual capital to value relevance of accounting information based on PSAK convergence of IFRS (manufacture firms in Indonesia)", *Procedia - Social and Behavioral Sciences*, Vol. 211, pp. 999-1007.

He, M., *et al.* (2020), "Heterogeneous beliefs and idiosyncratic volatility puzzle: evidence from China", *China Finance Review International*, Vol. 11 No. 1, pp. 124-141.

He, Q. and Fang, C. (2019), "Regulatory sanctions and stock pricing efficiency: evidence from the Chinese stock market", *Pacific-Basin Finance Journal*, Vol. 58, 101241.

Hejazi, R., *et al.* (2016), "Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q", *Knowledge and Process Management*, Vol. 23 No. 4, pp. 259-273.

Hu, j., *et al.* (2020), "Corporate board reforms around the world and stock price crash risk", *Journal of Corporate Finance*, Vol. 62 No. 2020, 101557.

Huang, C.C. and Huang, S.M. (2020), "External and internal capabilities and organizational performance: does intellectual capital matter?", *Asia Pacific Management Review*, Vol. 52 No. 2, pp. 111-120.

Huang, C.J. and Liu, C.J. (2005), "Exploration for the relationship between innovation, IT and performance", *Journal of Intellectual Capital*, Vol. 6 No. 2, pp. 237-252.

Jerzak, K. (2015), "The essence of human capital in a building company - selected aspects", *Procedia Engineering*, Vol. 122, pp. 95-103.

Kamukama, N. and Sulait, T. (2017), "Intellectual capital and competitive advantage in Uganda's microfinance industry", *African Journal of Economic and Management Studies*, Vol. 8 No. 4, pp. 498-514.

Khan, M. and Watts, R.L. (2009), "Estimation and empirical properties of a firm-year measure of accounting conservatism", *Journal of Accounting and Economics*, Vol. 48 Nos 2–3, pp. 132-150.

Kim, J.B. and Zhang, L. (2016), "Accounting conservatism and stock price crash risk: firm-level evidence", *Contemporary Accounting Research*, Vol. 33, pp. 412-441.

Kitts, B., *et al.* (2001), "Intellectual capital: from intangible assets to fitness landscapes", *Expert Systems with Applications*, Vol. 20, pp. 35-50.

Klemola, A. (2020), "Internet search-based investor sentiment and value premium", *Finance Research Letters*, Vol. 33, March 2020, 101224.

Kongsilp, W. and Mateus, C. (2017), "Volatility risk and stock return predictability on global financial crises", *China Finance Review International*, Vol. 7 No. 1, pp. 33-66.

Lee, C.C. and Lin, C.K. (2019), "The major determinants of influencing the operating performance from the perspective of intellectual capital: evidence on CPA industry", *Asia Pacific Management Review*, Vol. 24 No. 2, pp. 124-139.

Lee, S.M., *et al.* (2020), "Customer concentration and stock price crash risk", *Journal of Business Research*, Vol. 110 No. 2020, pp. 327-346.

Lentjushenkova, O. and Lapina, I. (2014), "The classification of the intellectual capital investments of an enterprise", *Procedia - Social and Behavioral Sciences*, Vol. 156, pp. 53-57.

Li, X. (2019), "Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test", *Finance Research Letters*, 101395.

Liang, C., *et al.* (2020), "Which sentiment index is more informative to forecast stock market volatility? Evidence from China", *International Review of Financial Analysis*, Vol. 71, October 2020, 101552.

Liao, Q. and Ouyang, B. (2017), "Organized labor, corporate governance, and stock price crash risk", *Review of Accounting and Finance*, Vol. 16 No. 4, pp. 424-443.

Lin, Y.M., *et al.* (2015), "The information content of unexpected stock returns: evidence from intellectual capital", *International Review of Economics and Finance*, Vol. 37, pp. 208-225.

Liu, C.H. and Jiang, J.F. (2020), "Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels", *Journal of Hospitality and Tourism Management*, Vol. 43, pp. 139-148.

Longo, M. and Mura, M. (2011), "The effect of intellectual capital on employees' satisfaction and retention", *Information and Management*, Vol. 48 No. 7, pp. 278-287.

Luo, Y. and Zang, C. (2020), "Economic policy uncertainty and stock price crash risk", *Research in International Business and Finance*, Vol. 51, January 2020, 101112.

Ma, X., *et al.* (2020), "Corporate customer concentration and stock price crash risk", *Journal of Banking and Finance*, Vol. 119, October 2020, 105903.

Mahmood, T. and Mubarik, M.S. (2020), "Balancing innovation and exploitation in the fourth industrial revolution: role of intellectual capital and technology absorptive capacity", *Technological Forecasting and Social Change*, Vol. 160, November 2020, 120248.

Martani, D., *et al.* (2009), "The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return", *Chinese Business Review*, Vol. 8 No. 6, pp. 44-55.

Martinez, J.B., *et al.* (2020), "Joint forces: towards an integration of intellectual capital theory and the open innovation paradigm", *Journal of Business Research*, Vol. 112, pp. 261-270.

McDowell, W.C., *et al.* (2018), "Building small firm performance through intellectual capital development: exploring innovation as the "black box", *Journal of Business Research*, Vol. 88, pp. 321-327.

Mørch, O., *et al.* (2017), "Maximizing the rate of return on the capital employed in shipping capacity renewal", *Omega*, Vol. 67, pp. 42-53.

Moin, A., *et al.* (2020), "In search of stock repurchases determinants in listed Indonesian firms during regulatory changes", *Journal of Economic Behavior and Organization*, Vol. 176, August 2020, pp. 145-165.

Mustapha, M. and Abdelheq, L. (2018), "The role of investment in intellectual capital in improving organizational performance considering knowledge management: the case study of wireless communication sector in Algeria", *Arab Economic and Business Journal*, Vol. 13 No. 1, pp. 73-91.

Ni, Y., *et al.* (2019), "A novel stock evaluation index based on public opinion analysis", *Procedia Computer Science*, Vol. 147 No. 2019, pp. 581-587.

Oppong, G.K. and Pattanayak, J.K. (2019), "Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India", *Borsa Istanbul Review*, Vol. 19 No. 3, pp. 219-227.

Örnek, A.S. and Ayas, S. (2015), "The relationship between intellectual capital, innovative work behavior and business performance reflection", *Procedia - Social and Behavioral Sciences*, Vol. 195, pp. 1387-1395.

Ozkan, N., *et al.* (2017), "Intellectual capital and financial performance: a study of the Turkish Banking Sector", *Borsa Istanbul Review*, Vol. 17 No. 3, pp. 190-198.

Pulic, A. (1998), *Measuring the Performance of Intellectual Potential in Knowledge Economy, Paper Presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential*, McMaster University, Hamilton.

Salvi, A., *et al.* (2020), "Intellectual capital disclosure in integrated reports: the effect on firm value", *Technological Forecasting and Social Change*, Vol. 160, November 2020, 120228.

Sardo, F., *et al.* (2018), "On the relationship between intellectual capital and financial performance: a panel data analysis on SME hotels", *International Journal of Hospitality Management*, Vol. 75, pp. 67-74.

Secundo, G., *et al.* (2020), "Sustainable development, intellectual capital and technology policies: a structured literature review and future research agenda", *Technological Forecasting and Social Change*, Vol. 153, 119917.

Sharabati, A.A.A., *et al.* (2010), "Intellectual capital and business performance in the pharmaceutical sector of Jordan", *Management Decision*, Vol. 48 No. 1, pp. 105-131.

Song, L. (2015), "Accounting disclosure, stock price synchronicity and stock crash risk: an emerging-market perspective", *International Journal of Accounting and Information Management*, Vol. 23 No. 4, pp. 349-363.

Tan, H.P., *et al.* (2008), "The evolving research on intellectual capital", *Journal of Intellectual Capital*, Vol. 9 No. 4, pp. 585-608.

Teti, E., *et al.* (2019), "The relationship between twitter and stock prices. Evidence from the US technology industry", *Technological Forecasting and Social Change*, Vol. 149, December 2019, 119747.

Wen, F., *et al.* (2019), "Retail investor attention and stock price crash risk: evidence from China", *International Review of Financial Analysis*, Vol. 65 No. 2019, 101376.

Yang, B., *et al.* (2019), "Is informational inefficiency priced in stock markets? A comparison between the US and Chinese cases", *Pacific-Basin Finance Journal*, Vol. 55, June 2019, pp. 222-238.

Yong, J.Y., *et al.* (2019), "Nexus between green intellectual capital and green human resource management", *Journal of Cleaner Production*, Vol. 215, April 2019, pp. 364-374.

Yusliza, M.Y., *et al.* (2020), "A structural model of the impact of green intellectual capital on sustainable performance", *Journal of Cleaner Production*, Vol. 249, March 2020, 119334.

Yusoff, Y.M., *et al.* (2019), "Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method", *Journal of Cleaner Production*, Vol. 234, October 2019, pp. 626-637.

Zhan, F. (2019), "Individualism, synchronized stock price movements, and stock market volatility", *International Journal of Managerial Finance*, Vol. 15 No. 3, pp. 371-403.

Zhou, Z. and Pan, D. (2018), "Can corporate innovation restrain the stock price crash risk?", *Journal of Financial Risk Management*, Vol. 7 No. 1, pp. 39-54.

Corresponding author
Agung Nur Probohudono can be contacted at: anprobohudono@staff.uns.ac.id

Does intellectual capital have any influence on stock price crash risk?

by Agung Nur Probohudono Adelia Dyaning Pratiwi, And Mahameru Rosy Rochmatu

Submission date: 08-Dec-2022 03:22PM (UTC+0700)
Submission ID: 1975163798
File name: 10-1108_JIC-09-2020-0306-1-10.pdf (329.25K)
Word count: 5269
Character count: 27720

The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/1469-1930.htm

Does intellectual capital have any influence on stock price crash risk?

Agung Nur Probohudono and Adelia Dyaning Pratiwi
Economic and Business, Fakultas Ekonomi, Universitas Sebelas Maret, Surakarta, Indonesia, and
Mahameru Rosy Rochmatullah
Economic and Business, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

Received 18 September 2020
Revised 5 January 2021
1 April 2021
Accepted 10 May 2021

Abstract

Purpose – This paper explores the influence between intellectual capital (IC) and the risk of stock price crashes by using company performance as an intervening variable.

Design/methodology/approach – This study empirically analyzes the impact of the efficiency of IC on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange (IDX) during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.

Findings – This study's findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated influence on stock price crash risk so that the aspects of IC are obscured.

Originality/value – This research provides new information that IC disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Keywords Intellectual capital, Stock price crash risk, Firm performance, Disclosure, Social capital, Corporate governance convergence

Paper type Research paper

1. Introduction

Companies nowadays are being replaced with a knowledge-based, fast-changing and technology-intensive economy, including in Indonesia. Most companies use technology to enhance the efficiency of company activities and depress expenses incurred. In this modern economy, for many firms, the most important and essential asset is intellectual capital (IC), in sharp contrast to times when physical capital was the power of companies. Previous studies have shown that company value and capability are often based on the intangible IC that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress, such as increasing brand equity and social networking. In addition, IC provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati *et al.*, 2015) and cost efficiency (Martinez *et al.*, 2020). In this study, we propose that the application of IC in the company is expected to reduce the risk on stock price crashes.

The purpose of this study is to find out the relationship between efficiency of IC and stock price crash risk in the future by using firm performance as the mediating variable. Clarke *et al.* (2011) stated that IC has a positive influence on firm performance, which is characterized by three components of IC efficiency (ICE): human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). These factors could be a good indicator for company shareholders because a company with good ICE indicates that they have been using their resources efficiently. Several studies have proven that IC reflects good

Journal of Intellectual Capital
Vol. 23 No. 6, 2022
pp. 1161-1174

1469-1930
DOI 10.1108/JIC-09-2020-0306

competence, skills and knowledge, which can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, the company can disclose information in accordance with the needs of the shareholders.

Based on a Taiwanese study by Chen *et al.* (2005), this study uses the quantitative measure, value-added intellectual coefficient (VAIC), developed by Pulic (1998) as a measure of ICE. Data are collected for firms listed on the Indonesia Stock Exchange (IDX) in 2018. We used path analysis to determine whether there is any relation between IC, firm performance and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no research on the relationship between IC and stock price crash risk. This study contributes to the literature by bridging this gap in the knowledge, that is, the relationship between IC and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discusses the findings. Section 6 concludes the paper.

2. Literature review and hypothesis

2.1 Strengths and weaknesses of measuring intellectual capital

Basically, IC is measured by various elements such as human capital, physical capital, structural capital, social capital and relational capital. However, previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) measured IC with three components, namely human capital, physical capital and structural capital; however, only human capital is positively related to all the three efficiencies (technical, allocative and cost). Castillo *et al.* (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes and relationships with customers. On the issue of environmental protection, Yong *et al.* (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff *et al.* (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although IC possesses weaknesses, its advantages, demonstrated in previous studies, outweigh them. Barrena-Martínez *et al.* (2020) proved that the three components of IC (relational capital, human capital and structural capital) positively affect open innovation performance. Salvi *et al.* (2020) suggested a significantly positive relationship between all three components of IC and firm value, generating multiple implications for reporting entities, investors, regulators and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing the IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza *et al.* (2020) indicated the contribution of green IC to be an intangible resource for organizations in achieving sustainable performance, providing a competitive advantage for future researchers. Dubic *et al.* (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership, meaning that human capital has an important role in business innovation. This study will explore the efficiency of IC using three measures (human capital, structural capital and capital employed).

2.2 The determinant of information efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also

shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu *et al.* (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in corporate share repurchase decisions, while the enactment of the regulations has a significant effect on firms undertaking share repurchase programs (Moin *et al.*, 2020). In China, regulations that promote the efficiency of share prices also play an important role in controlling stock prices (He and Fang, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility, macroeconomic events, financial transparency and government regulations, play a greater role in controlling the risk of stock price crashes, while IC does not play an important role in controlling stock prices.

Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen *et al.* (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee *et al.* (2020) revealed that a supplier firm with a concentrated customer base experiences a higher crash risk, which is attenuated by lower switching costs and accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment also affects stock price volatility (Li, 2019). Likewise, Ma *et al.* (2020) suggest that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies indicate that economic policy, investor sentiment and audit quality have a significant effect on the risk of stock price crashes.

2.3 Intellectual capital efficiency

IC represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts *et al.*, 2001). Several studies have revealed that ICE can improve the performance of companies (see, e.g. Clarke *et al.*, 2011; Gogan *et al.*, 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell *et al.*, 2018; Sardo *et al.*, 2018; Huang and Huang, 2020). Investors are quite interested in buying shares when the company has implemented ICE. Lin *et al.* (2015) and Ozkan *et al.* (2017) show that the greater the ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which, if invested efficiently, can strengthen the company's position, helping it gain competitive advantage. This means that HCE represents a selection of superior IC to be employed in the company's business. Meanwhile, Asiaei *et al.* (2018) have proven that there is a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac *et al.* (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, companies that have a higher HCE are more likely to have a higher return on equity (ROE), a higher return on asset (ROA), a higher return on invested capital (ROIC) and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize the overall business performance. IC plays a central role in determining the structural capital model used in companies. Gogan *et al.* (2015) posit that determining the right model in structural capital is essential to obtain a competitive advantage in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian *et al.* (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes; it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson *et al.* (2006) revealed that shareholder demand is a higher return on capital employed, meaning that CEE represents IC, which can perform accurate calculations in capital investment in order to obtain optimal returns. Mørch *et al.* (2017) explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and the financial performance of investments. Thus, ICE plays an important role in investment decisions.

2.4 Intellectual capital efficiency measurement model on stock price risk

Basically, the efficiency of ICE plays a role in the application of HCE, SCE and CEE. This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in the knowledge economy developed by Pulic (1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by Chen *et al.* (2017). ICE is calculated using three components, namely value-added human capital efficiency (VAHU), value-added structural capital (STVA) and value-added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the methods section.

Several studies have used this model, which shows mixed results as well. Hejazi *et al.* (2016) found that increasing IC should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital and structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati *et al.*, 2010). The four studies indicate that innovation and creation play a dominant role in describing the latent constructs of IC. Based on the discussion above, hypothesis (H1) is as follows:

H1a. HCE is positively related to firm performance.

H1b. SCE is positively related to firm performance.

H1c. CEE is positively related to firm performance.

Chen *et al.* (2005) have confirmed that investors place higher value on companies with better ICE. Furthermore, Song (2015) has shown that the management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of IC. Dong and Zhang (2016) have also shown that environmental control, information and communication and monitoring components significantly reduce the risk of accidents, while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare is also a factor that contributes to the risk of stock price crashes. Further analysis shows that a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and that there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose *et al.* (2017) showed a positive relationship between IC as a whole and the market capitalization value of a company. Some of these studies imply that IC can reduce the risk of stock investment. Based on the above discussion, hypothesis (H2) is as follows:

H2a. HCE is negatively related to stock price crash risk.

H2b. SCE is negatively related to stock price crash risk.

H2c. CEE is negatively related to stock price crash risk.

Bennett *et al.* (2020) explained that the management, directly or indirectly, learns from its firm's stock price so that more informative stock prices should make the firm more

productive. This means that the informativeness of stock prices indicates that the company's performance is better. Martani *et al.* (2009) mentioned that a company's financial performance is shown by the profitability ratio, and the market value ratio significantly influences returns in the company. Based on this, the following hypothesis (H3) can be formulated as

H3. Firm performance is negatively related to stock price crash risk.

IC owned by the company is expected to create added value so that it can improve company performance. Good firm performance is an indicator that will be considered by investors in making investment decisions. Cenciarelli *et al.* (2018) show that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on the research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that develop IC require capital for R&D, so they are faced with financing constraints. This means that ICE supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao *et al.* (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. Companies in areas of high social trust tend to hide bad news. The management tends to disclose more related information to acquire investors. Thus, ICE is needed as a corporate strategy to increase information transparency and financial performance, which will result in increasing investor confidence. Based on the discussion above, we can hypothesize (H4) that

H4a. HCE is negatively related to stock price crash risk by using firm performance as an intervening variable.

H4b. SCE is negatively related to stock price crash risk by using firm performance as an intervening variable.

H4c. CEE is negatively related to stock price crash risk by using firm performance as an intervening variable.

3. Research design

3.1 Sample

This study uses companies from various sectors as research objects and sample for the research. The sample was collected from IDX's annual report data for 2018. We also obtained weekly stock data from Yahoo Finance. We then used the following selection criteria: First, similar to Khan and Watts (2009), we required that total assets and book values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

3.2 Measurement of independent variables

Chen *et al.* (2005) argue that VAIC and its three components, HCE, SCE and CEE, represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE and CEE. This can be expressed in Formula (1).

$$\text{VAIC} = \text{HCE} + \text{SCE} + \text{CEE} \qquad \text{Formula 1}$$

To measure VAIC, we need value added (VA) to be calculated. In its simplest form, VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs, which are

considered to be a value-creating entity (Tan *et al.*, 2008). This VA is also defined as the net value created by firms during the year (Chen *et al.*, 2005). VA can be calculated using Formula (2).

$$\mathrm{VA} = S - B = \mathrm{NI} + T + \mathrm{DP} + I + W \qquad \text{Formula 2}$$

S is sales; B is cost of goods sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense and W is employee wages and salaries.

3.2.1 Human capital efficiency. Human capital factors consist of skills, knowledge, productivity, competence and all aspects that pertain to an employee in the work place. HCE can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula VAHU. VAHU calculations can be seen in Formula (3).

$$\mathrm{VAHU} = \mathrm{VA}/\mathrm{HC} \qquad \text{Formula 3}$$

3.2.2 Structural capital efficiency. Structural capital is an element in IC and consists of organizational networks, patents, strategy and brand names. Based on Pulic (1998), we calculated SCE as in Formula (4). Meanwhile, SCE is calculated using STVA as in Formula (5).

$$\mathrm{SC} = \mathrm{VA} - \mathrm{HC} \qquad \text{Formula 4}$$

$$\mathrm{STVA} = \mathrm{SC}/\mathrm{VA} \qquad \text{Formula 5}$$

SCE is the dollar of SC within the firm, for every dollar of VA, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, a logical inconsistency would remain (Pulic, 1998).

3.2.3 Capital employed efficiency. CEE is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on CE. We could calculate CE as the total assets minus intangible assets and CEE is defined as VACA. VACA calculations can be seen in Formula (6).

$$\mathrm{VACA} = \mathrm{VA}/\mathrm{CE} \qquad \text{Formula 6}$$

3.3 Measurement of dependent variable

The risk of stock price crash is the risk of a significant stock price decline after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen *et al.* (2017), which can be seen in Formula (7).

$$\mathrm{NCSKEW} = \frac{-\left[\frac{n(n-1)^3}{2}\sum_{T=1}^{n}\left(w_{i,T,t} - \overline{w}_{i,t}\right)^3\right]}{\left[(n-1)(n-2)\left(\sum_{T=1}^{n}\left(w_{i,T,t} - \overline{w}_{i,t}\right)^2\right)^{3/2}\right]} \qquad \text{Formula 7}$$

$W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company's specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

3.4 Measurement of intervening variable

This study uses firm performance as the intervening variable. We use ROE to analyze firm performance. We calculate this ratio with Formula (8).

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \qquad \text{Formula 8}$$

3.5 Empirical models

This study uses path analysis that produce two model regressions to test our hypotheses.

$$\text{ROE} = \alpha + \beta 1\ \text{VAHU} + \beta 2\ \text{STVA} + \beta 3\ \text{VACA} + \beta 4\ \text{SIZE} - \mu \qquad \text{Model I}$$

$$\text{NCSKEW} = \alpha - \beta 1\ \text{STVA} - \beta 2\ \text{VACA} - \beta 3\ \text{AHU} + \beta 4\ \text{SIZE} - \beta 5\ \text{ROE} - \mu \qquad \text{Model II}$$

ROE is the ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy for stock price crash risk, VAHU is value-added human capital, STVA is value-added structural capital, VACA is value-added capital employed and SIZE is firm size as the control variable in this study.

4. Results

4.1 Normality test

Table 1 shows the significance value of Asymp. The Sig (two-tailed) is 0.200. The value is greater than 0.1. According to the basis of decision making in the Kolmogorov–Smirnov normality test above, it can be concluded that the data are normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for the data above.

4.2 Multicollinearity test

The basis for decision-making from the multicollinearity test is the value of tolerance (Tol) and variance inflating factor (VIF). Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While the VIF value for each variable is less than ten. Then, according to the basis for the multicollinearity test decision-making, we can conclude that there are no symptoms of multicollinearity in the regression model. Table 2 shows the results of the multicollinearity test.

One-sample Kolmogorov–Smirnov test

		Unstandardized residual
N		152
Normal Parameters[a,b]	Mean	0.000
	Std. deviation	0.924
Most extreme differences	Absolute	0.059
	Positive	0.037
	Negative	−0.059
Test statistic		0.059
Asymp. Sig. (two-tailed)		0.200[c,d]

Note(s): a. Test distribution is normal; b. Calculated from data; c. Lilliefors significance correction and d. This is a lower bound of the true significance

Table 1. Normal probability test result

4.3 Heteroskedasticity test

Based on Figure 1, we know that data dots spread above and below or around the number 0. We can then see that the dots are not just clustered above or below. The distribution of data points does not form a wavy pattern, widening then narrowing and then widening again. We can also see that the dots do not make a certain pattern. According to the analyses, we can conclude that there is no heteroscedasticity problem; so a good and ideal regression model can be fulfilled.

4.4 Path analysis

In Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0.000, respectively. While, based on Table 2, there is no significant relationship between VAHU and ROE at the 1% significance level; so we can conclude that H1(a) is rejected. Based on a beta test, VACA is the variable that most influences changes in ROE. The value of Sig. *F*-statistics shows that at a significance level of 1%, VAHU, VACA and STVA simultaneously influence

Model 1	Unstandardized coefficients *B*	Unstandardized coefficients Std. error	Standardized coefficients Beta	*t*	Sig.	Collinearity statistics Tolerance	Collinearity statistics VIF
(Constant)	−4.074	1.323		−3.079	0.002		
VAHU	−0.062	0.096	−0.103	−0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	−0.271	1.481	−0.021	−0.183	0.855	0.475	2.104

Note(s): Dependent variable (NCSKEW)

Table 2. Multicollinearity test results

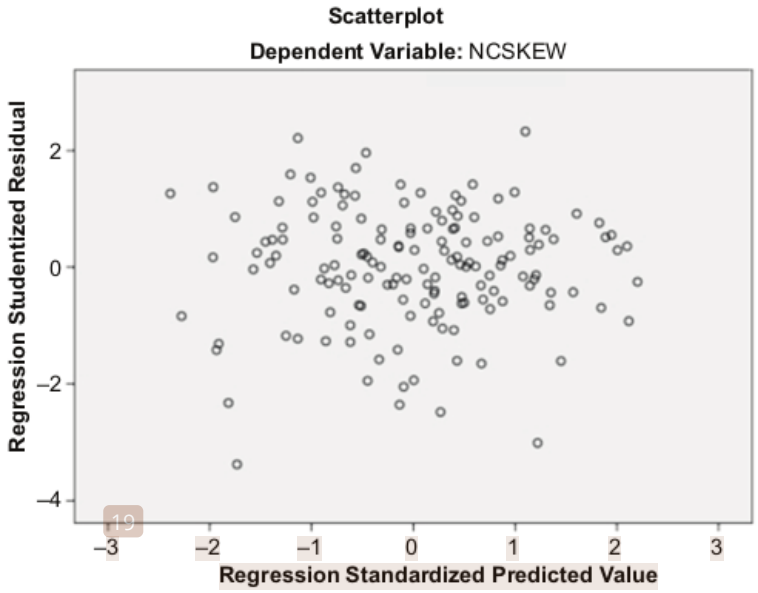


Figure 1. Heteroskedasticity test result

	Dependent variable: ROE		Dependent variable: NCSKEW	
	Predicted sign	Model 1	Predicted sign	Model 2
VAHU	+	0.001 (0.005)	−	−0.062 (0.096)
STVA	+	0.128** (0.052)	−	0.144 (0.952)
VACA	+	0.404* (0.037)	−	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	−	0.123 (0.043)
ROE (Intervening)			−	−0.271 (1.481)
Constant		−0.340 (0.068)		−4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. *F*-stat		0.000*		0.074***
N		152		152

Note(s): This table presents the correlation coefficient number (β), while the number within parentheses is the standard error. *, ** and *** indicate significance at the levels 1%, 5% and 10%, respectively

Table 3.
Results of the regression model

ROE. This result is a strong indicator that there is a relationship between IC and firm performance, thus supporting H1(b) and H1(c). That is, if a firm can use its IC more efficiently in one year, this can lead to a performance increase in the same year.

In Table 3, Model 2 shows that all of the components of IC do not have any significant relationship with stock price crash risk at the 1% significance level. From Table 2, we also know that ROE does not have any significant influence on stock price crash risk. Furthermore, we use Model 1 and Model 2 for path analysis. After acquiring the numbers from Table 2, we calculated the indirect effect by multiplying the effect of the IC component with ROE and then ROE with stock price crash risk. Based on Table 2 and the path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0.000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis, if the indirect effect is greater than the direct effect, then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA and VACA do not have any significant relationship with stock price crash risk either directly or indirectly through firm performance.

5. Discussion

Several studies show that IC plays an important role in improving sustainable company performance and business progress (see, e.g. Castillo *et al.*, 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo *et al.*, 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the IDX. In addition, other results show that the company's performance, as represented by ROE, also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang *et al.*, 2019). Information inefficiency is a global problem that always exists in the stock market, although more prevalent in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee *et al.* (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that a company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment toward stock prices seems to dominate influence on the operation of the stock market. The sentiment index built on social media has

been shown to greatly influence the volatility of stock prices (Liang *et al.*, 2020). The optimistic (pessimistic) sentiment of Internet search-based investors can also influence premium value in the United States stock market (Teti *et al.*, 2019; Klemola, 2020). Meanwhile, Ni *et al.* (2019) reveal that the fluctuation of stock prices is more sensitive to the intraday sentiment of individuals. Chau *et al.* (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various studies, we believe that investors' optimistic (pessimistic) sentiment toward stock price volatility dominates influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

6. Conclusions and implications

6.1 Conclusions

This study examines the effect of IC components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX and stock price data published by Yahoo Finance. IC variables are measured by the VAIC method written by Pulic (1998), and stock price crash risk variables are measured by NCSKEW developed by Chen *et al.* (2017). Data were processed using the path analysis method to determine the direct effect and indirect effect from each of the interrelated variables.

Simultaneously, the VAHU, STVA and VACA variables have a significant relationship to firm performance; however, partially, VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three IC variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. We conclude that investor sentiment has dominated influence on stock price crash risk so that the IC aspect has become obscured.

6.2 Implications

So far, research on IC has been discussed in 700 articles written by leading authors at various universities (Dubic *et al.*, 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that IC disclosure, which is proxied by the company's financial performance, becomes obscured, while investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In future research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Basically, the ability and knowledge for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce idiosyncratic volatility, which is the best predictor of stock returns and is proven to have a positive impact on investors' heterogeneous beliefs (Kongsilp and Mateus, 2017; He *et al.*, 2020). Zhan (2019) argues that there was a positive relationship between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical application, IC represents the knowledge and ability for preparing a stock portfolio that contains company-specific information, which is needed to minimize stock price crash risk.

Does intellectual capital have any influence on stock price crash risk?

ORIGINALITY REPORT

7%	4%	2%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	1library.net Internet Source	<1%
2	9pdf.net Internet Source	<1%
3	Jitao Hu, Longying Hu, Mingzhu Hu, Antony Dnes. "Entrepreneurial human capital, equity concentration and firm performance: Evidence from companies listed on China's Growth Enterprise Market", Managerial and Decision Economics, 2022 Publication	<1%
4	Submitted to West Coast University Student Paper	<1%
5	jp.feb.unsoed.ac.id Internet Source	<1%
6	qrm.abhariau.ac.ir Internet Source	<1%
7	Vladimir Dzenopoljac. "Intellectual capital: Importance, measurement, and impact on corporate performance", Ekonomika preduzeca, 2014	<1%

	Publication	
8	ccsenet.org Internet Source	<1 %
9	es.scribd.com Internet Source	<1 %
10	typeset.io Internet Source	<1 %
11	Submitted to Central Queensland University Student Paper	<1 %
12	Emmanuel Joel Aikins Abakah, Guglielmo Maria Caporale, Luis Alberiko Gil-Alana. "Economic policy uncertainty: Persistence and cross-country linkages", Research in International Business and Finance, 2021 Publication	<1 %
13	gondo-mx.gilead.org.il Internet Source	<1 %
14	anzdoc.com Internet Source	<1 %
15	Submitted to Lampasas High School Student Paper	<1 %
16	eprints.soas.ac.uk Internet Source	<1 %
17	Submitted to University of Aberdeen Student Paper	<1 %
18	Submitted to University of Reading Student Paper	<1 %

19	vdocuments.site Internet Source	<1 %
20	publikationen.ub.uni-frankfurt.de Internet Source	<1 %
21	repository.ntu.edu.sg Internet Source	<1 %
22	www.ejournal.pelitaindonesia.ac.id Internet Source	<1 %
23	Shui-ying Jin. "An empirical investigation of the relationship between intellectual capital and firms' development ability", 2008 International Conference on Management Science and Engineering 15th Annual Conference Proceedings, 09/2008 Publication	<1 %
24	Submitted to Universitas Merdeka Malang Student Paper	<1 %
25	aisel.aisnet.org Internet Source	<1 %
26	docplayer.hu Internet Source	<1 %
27	Jeong-Bon Kim, Byron Y. Song. "Auditor Quality and Loan Syndicate Structure", AUDITING: A Journal of Practice & Theory, 2011 Publication	<1 %

28	Luzi Hail, Christian Leuz, Peter Wysocki. "Global Accounting Convergence and the Potential Adoption of IFRS by the U.S. (Part I): Conceptual Underpinnings and Economic Analysis", Accounting Horizons, 2010 Publication	<1 %
29	sipeg.unj.ac.id Internet Source	<1 %
30	Qasim Ali Nisar, Shahbaz Haider, Faizan Ali, Samia Jamshed, Kisang Ryu, Sonaina Saif Gill. "Green Human Resource Management Practices and Environmental Performance in Malaysian Green Hotels: The role of Green Intellectual Capital and Pro-Environmental Behavior", Journal of Cleaner Production, 2021 Publication	<1 %
31	Rohana Ngah, Abdul Razak Ibrahim. "The Influence of Intellectual Capital on Knowledge Sharing: Small and Medium Enterprises' Perspective", Communications of the IBIMA, 2011 Publication	<1 %

Exclude quotes	On	Exclude matches	Off
Exclude bibliography	On		

Does intellectual capital have any influence on stock price crash risk?

GRADEMARK REPORT

FINAL GRADE

/0

GENERAL COMMENTS

Instructor

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

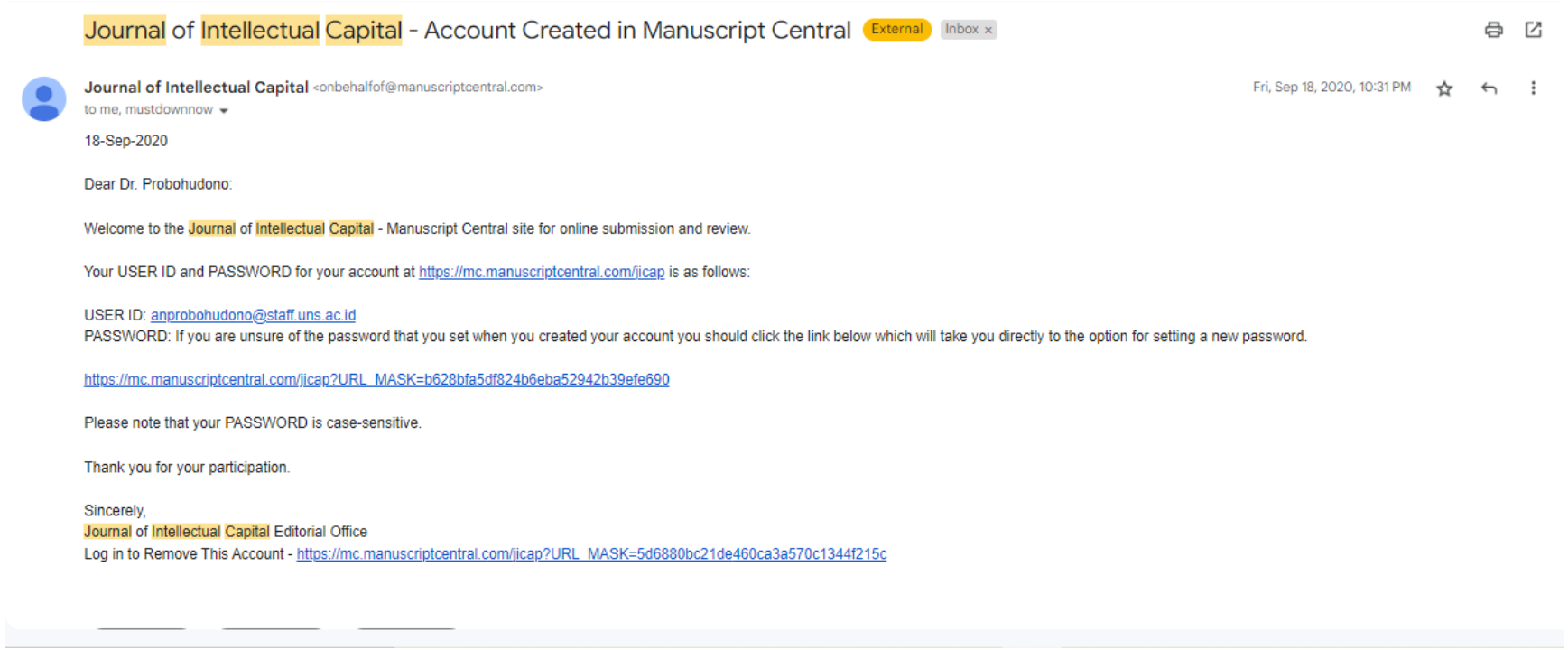
PAGE 8

PAGE 9

PAGE 10

Journal of Intellectual Capital - Account Created in Manuscript Central

Email Date: Fri, Sep 18, 2020, 10:31 PM



Journal of Intellectual Capital - Account Created in Manuscript Central External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Fri, Sep 18, 2020, 10:31 PM

to me, mustdownnow

18-Sep-2020

Dear Dr. Probohudono:

Welcome to the Journal of Intellectual Capital - Manuscript Central site for online submission and review.

Your USER ID and PASSWORD for your account at https://mc.manuscriptcentral.com/jicap is as follows:

USER ID: anprobohudono@staff.uns.ac.id
PASSWORD: If you are unsure of the password that you set when you created your account you should click the link below which will take you directly to the option for setting a new password.

https://mc.manuscriptcentral.com/jicap?URL_MASK=b628bfa5df824b6eba52942b39efe690

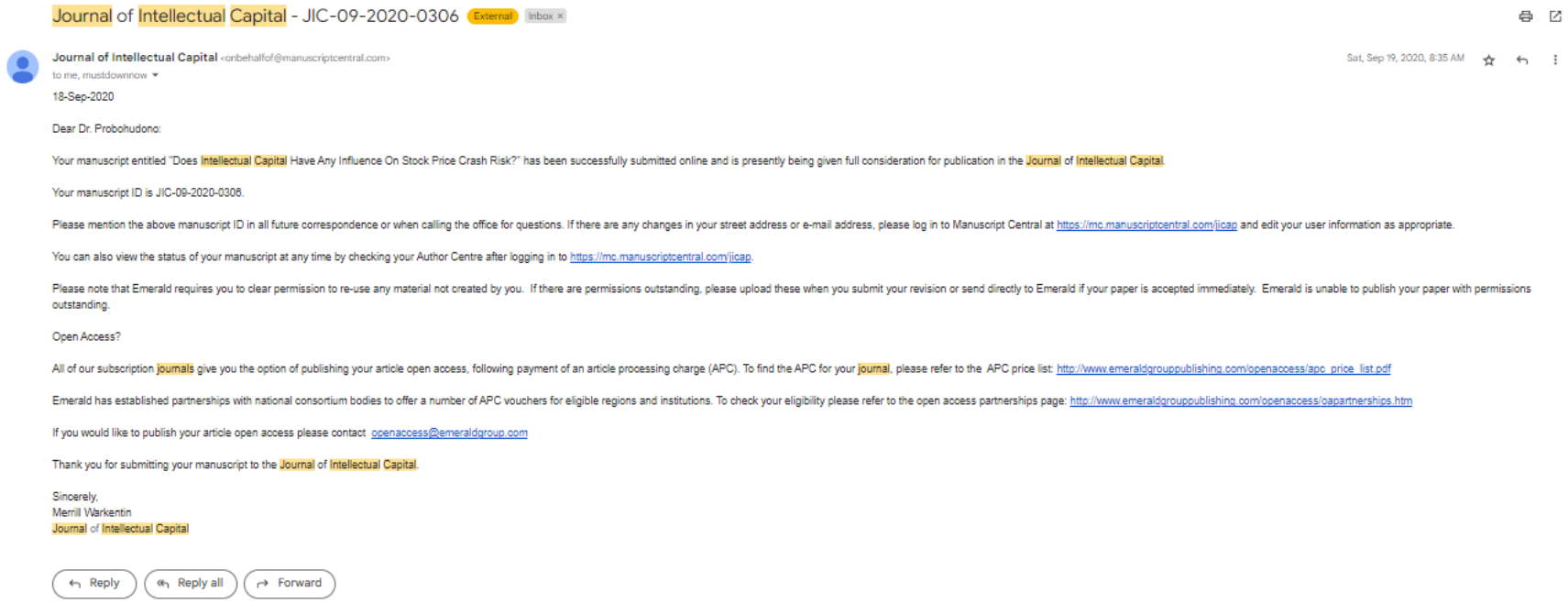
Please note that your PASSWORD is case-sensitive.

Thank you for your participation.

Sincerely,
Journal of Intellectual Capital Editorial Office
Log in to Remove This Account - https://mc.manuscriptcentral.com/jicap?URL_MASK=5d6880bc21de460ca3a570c1344f215c

Journal of Intellectual Capital - JIC-09-2020-0306

Email Date: Sat, Sep 19, 2020, 8:35 AM



Journal of Intellectual Capital - JIC-09-2020-0306 External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to me, mustdownnow

Sat, Sep 19, 2020, 8:35 AM

18-Sep-2020

Dear Dr. Probohudono:

Your manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" has been successfully submitted online and is presently being given full consideration for publication in the Journal of Intellectual Capital.

Your manuscript ID is JIC-09-2020-0306.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to Manuscript Central at https://mc.manuscriptcentral.com/jicap and edit your user information as appropriate.

You can also view the status of your manuscript at any time by checking your Author Centre after logging in to https://mc.manuscriptcentral.com/jicap.

Please note that Emerald requires you to clear permission to re-use any material not created by you. If there are permissions outstanding, please upload these when you submit your revision or send directly to Emerald if your paper is accepted immediately. Emerald is unable to publish your paper with permissions outstanding.

Open Access?

All of our subscription journals give you the option of publishing your article open access, following payment of an article processing charge (APC). To find the APC for your journal, please refer to the APC price list: http://www.emeraldgrouppublishing.com/openaccess/apc_price_list.pdf

Emerald has established partnerships with national consortium bodies to offer a number of APC vouchers for eligible regions and institutions. To check your eligibility please refer to the open access partnerships page: http://www.emeraldgrouppublishing.com/openaccess/oapartnerships.htm

If you would like to publish your article open access please contact openaccess@emeraldgroup.com

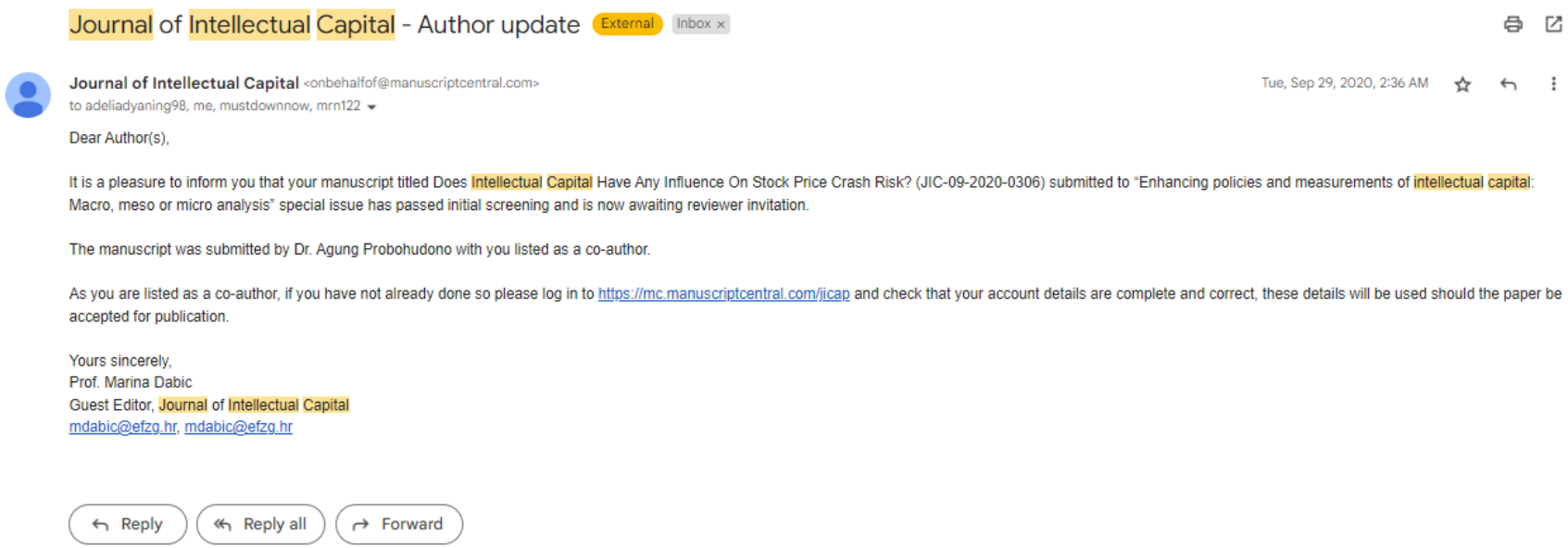
Thank you for submitting your manuscript to the Journal of Intellectual Capital.

Sincerely,
Merrill Warkentin
Journal of Intellectual Capital

Reply Reply all Forward

Journal of Intellectual Capital - Author update

Email Date: Tue, Sep 29, 2020, 2:36 AM



Journal of Intellectual Capital - Author update External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to adeliadyaning98, me, mustdownnow, mrn122

Tue, Sep 29, 2020, 2:36 AM

Dear Author(s),

It is a pleasure to inform you that your manuscript titled Does Intellectual Capital Have Any Influence On Stock Price Crash Risk? (JIC-09-2020-0306) submitted to "Enhancing policies and measurements of intellectual capital: Macro, meso or micro analysis" special issue has passed initial screening and is now awaiting reviewer invitation.

The manuscript was submitted by Dr. Agung Probohudono with you listed as a co-author.

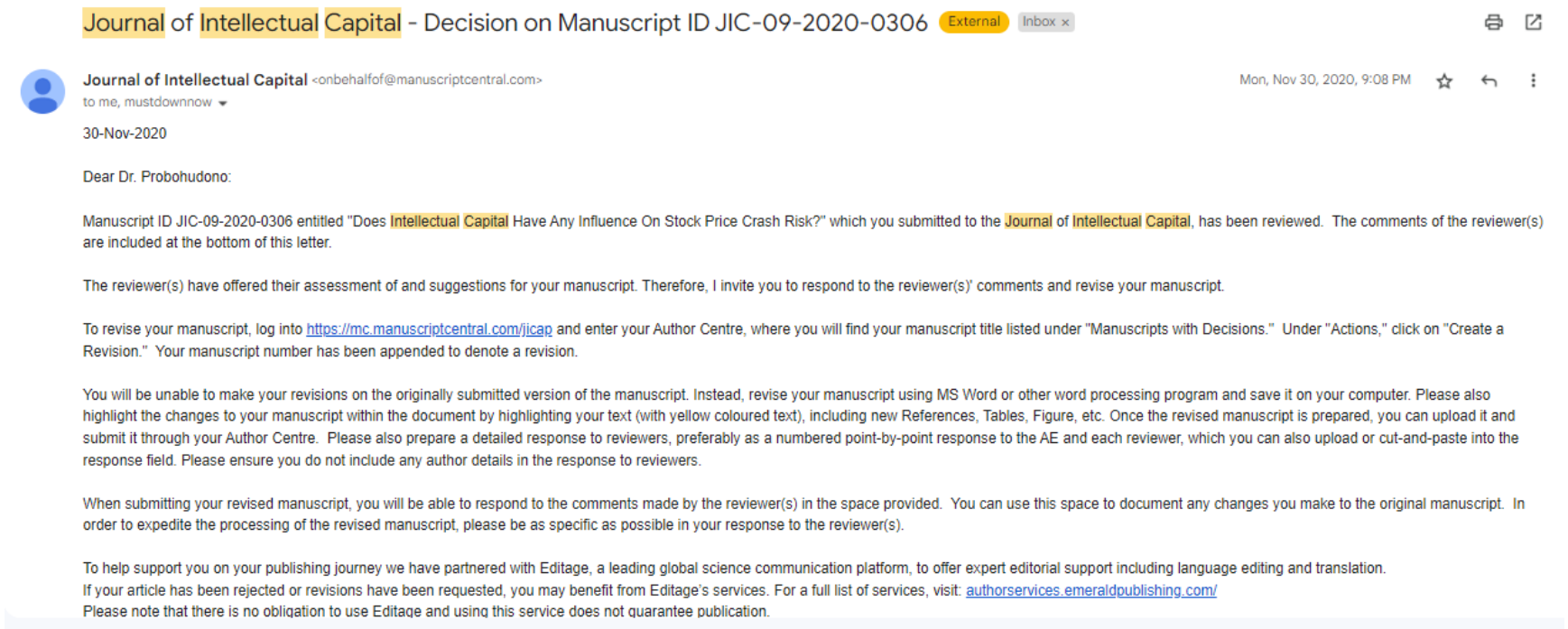
As you are listed as a co-author, if you have not already done so please log in to https://mc.manuscriptcentral.com/jicap and check that your account details are complete and correct, these details will be used should the paper be accepted for publication.

Yours sincerely,
Prof. Marina Dabic
Guest Editor, Journal of Intellectual Capital
mdabic@efzg.hr, mdabic@efzg.hr

Reply Reply all Forward

Journal of Intellectual Capital - Decision on Manuscript ID JIC-09-2020-0306

Email Date: Nov 30, 2020, 9:08 PM



Journal of Intellectual Capital - Decision on Manuscript ID JIC-09-2020-0306 External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Mon, Nov 30, 2020, 9:08 PM

to me, mustdownnow

30-Nov-2020

Dear Dr. Probohudono:

Manuscript ID JIC-09-2020-0306 entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" which you submitted to the Journal of Intellectual Capital, has been reviewed. The comments of the reviewer(s) are included at the bottom of this letter.

The reviewer(s) have offered their assessment of and suggestions for your manuscript. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript.

To revise your manuscript, log into https://mc.manuscriptcentral.com/jicap and enter your Author Centre, where you will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision.

You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using MS Word or other word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by highlighting your text (with yellow coloured text), including new References, Tables, Figure, etc. Once the revised manuscript is prepared, you can upload it and submit it through your Author Centre. Please also prepare a detailed response to reviewers, preferably as a numbered point-by-point response to the AE and each reviewer, which you can also upload or cut-and-paste into the response field. Please ensure you do not include any author details in the response to reviewers.

When submitting your revised manuscript, you will be able to respond to the comments made by the reviewer(s) in the space provided. You can use this space to document any changes you make to the original manuscript. In order to expedite the processing of the revised manuscript, please be as specific as possible in your response to the reviewer(s).

To help support you on your publishing journey we have partnered with Editage, a leading global science communication platform, to offer expert editorial support including language editing and translation.
If your article has been rejected or revisions have been requested, you may benefit from Editage's services. For a full list of services, visit: authorservices.emeraldpublishing.com/
Please note that there is no obligation to use Editage and using this service does not guarantee publication.

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to the Journal of Intellectual Capital, your revised manuscript should be uploaded as soon as possible. If it is not possible for you to submit your revision in a reasonable amount of time, we may have to consider your paper as a new submission.

Once again, thank you for submitting your manuscript to the Journal of Intellectual Capital and I look forward to receiving your revision.

Sincerely,
Prof. Marina Dabic
Guest Editor, Journal of Intellectual Capital
mdabic@efzg.hr, marina.dabic@ntu.ac.uk
Reviewer(s)' Comments to Author:
Reviewer: 1

Recommendation: Major Revision

Comments:
The article needs to be strongly improved.
The paper contribution is not clear; please explain the gap you aim to cover

Additional Questions:
1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper contribution is not clear; I suggest specifying the gap that this article aims at facing to.

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: The literature review should be strengthened including some other relevant and recent studies abot intellectual capital disclosure and value relevance

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Yes

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Results are not always clear, I suggest improving the explanation of them and the discussion section

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: Research implications are missing

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The paper needs to be language edited and proofread

Reviewer: 2

Recommendation: Major Revision

Comments:
Dear Author/s,

Many thanks for submitting your manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" to Journal of Intellectual Capital.
The paper is more original and well written, offering a significant perspective in the analysis of relation between Intellectual Capital (IC) and firm performance with a specific focus on stock price crash risk. However, it is necessary to implement the suggestions that have been given in detail, for the quality to be in line with the standards of the Journal. From my point of view with some revision of the text in order to respect this requirement, the work can be considered for the publication of the journal.
Best Regards and Good Luck.

Additional Questions:
1. Originality: Does the paper contain new and significant information adequate to justify publication?: The paper is original offering a significant perspective in the analysis of relation between Intellectual Capital (IC) and firm performance with a specific focus on stock price crash risk.

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: Literature is well-structured but it is necessary to update the section with more recent papers: in fact, in the last year there have been many relevant studies published on the subject. Below, I propose just a few to integrate into the research framework:

- F Wen, L Xu, G Ouyang, G Kou, Retail investor attention and stock price crash risk: Evidence from China, International Review of Financial Analysis, 2019
- Y Luo, C Zhang, Economic policy uncertainty and stock price crash risk, Research in International Business and Finance, 2020
- J Hu, S Li, AG Taboada, F Zhang, Corporate board reforms around the world and stock price crash risk, Journal of Corporate Finance, 2020
- X Ma, W Wang, J Wu, W Zhang, Corporate customer concentration and stock price crash risk, Journal of Banking & Finance, 2020
- SM Lee, P Jiraporn, H Song, Customer concentration and stock price crash risk, Journal of Business Research, 2020

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Methodology is coherent with the research design and well-presented in relation to the investigated research hypothesis.

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: The results and their discussion are well presented, but it is necessary that the section of the discussion is improved, proposing a reading of the results with respect to the hypotheses formulated and the previous evidence of the existing literature.

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: From my point of view, the conclusions need to be revised by inserting the practical, managerial and academic implications, as well as by inserting future lines of research.
Alternatively, a special section can be added about the implications and future prospects of research.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The written style is clear and it is simple for the readability, but a professional proof-editing is recommended in order to further improve the quality of the paper in line with the journal requirements.

Journal of Intellectual Capital - JIC-09-2020-0306.R1

Email Date: Tue, Jan 5, 2021, 7:18 PM

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to me, mustdownnow

Tue, Jan 5, 2021, 7:18 PM

05-Jan-2021

Dear Dr. Probohudono:

Your revised manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" has been successfully submitted online and is presently being given full consideration for publication in the Journal of Intellectual Capital.

Your manuscript ID is JIC-09-2020-0306.R1.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to Manuscript Central at https://mc.manuscriptcentral.com/jicap and edit your user information as appropriate.

You can also view the status of your manuscript at any time by checking your Author Centre after logging in to https://mc.manuscriptcentral.com/jicap

Please note that Emerald requires you to clear permission to re-use any material not created by you. If there are permissions outstanding, please upload these when you submit your revision or send directly to Emerald if your paper is accepted immediately. Emerald is unable to publish your paper with permissions outstanding.

Open Access?

All of our subscription journals give you the option of publishing your article open access, following payment of an article processing charge (APC). To find the APC for your journal, please refer to the APC price list: http://www.emeraldgrouppublishing.com/openaccess/apc_price_list.pdf

Emerald has established partnerships with national consortium bodies to offer a number of APC vouchers for eligible regions and institutions. To check your eligibility please refer to the open access partnerships page: http://www.emeraldgrouppublishing.com/openaccess/oapartnerships.htm

If you would like to publish your article open access please contact openaccess@emeraldgroup.com

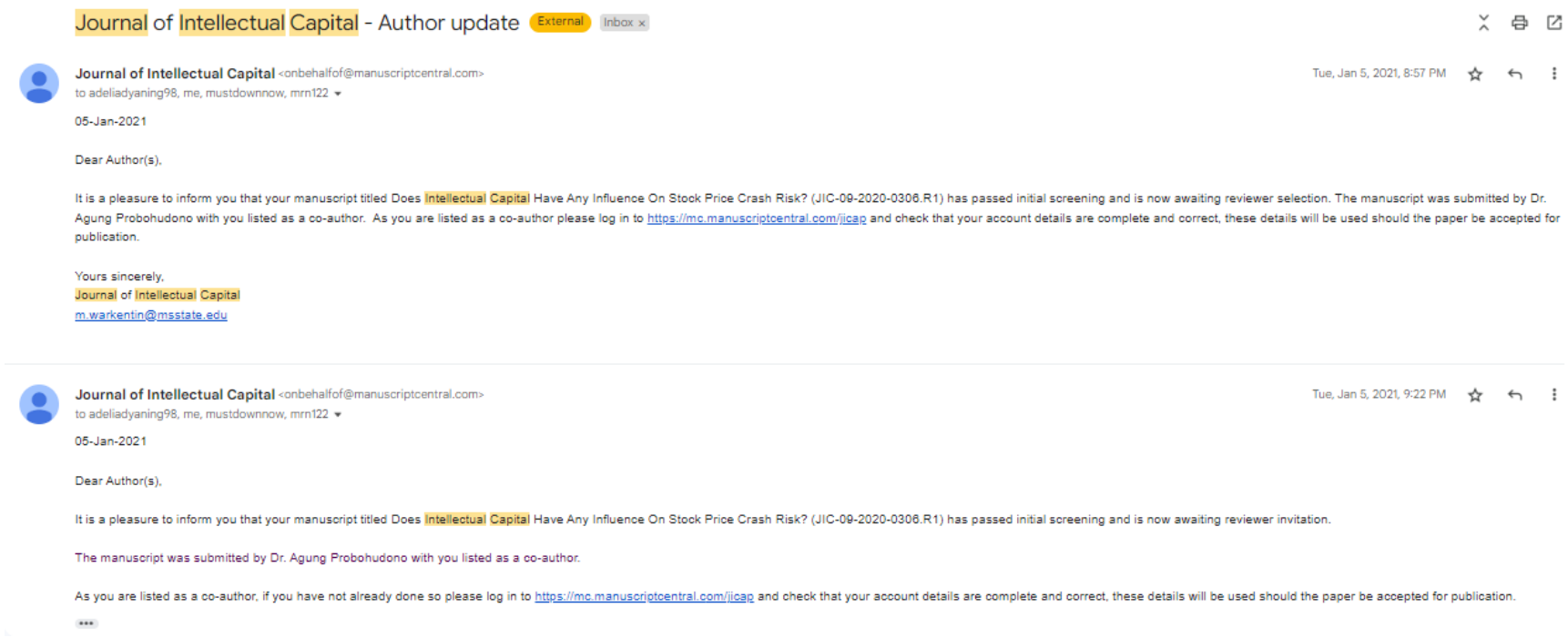
Thank you for submitting your manuscript to the Journal of Intellectual Capital.

Sincerely,
Merrill Warkentin
Journal of Intellectual Capital

Reply | Reply all | Forward

Journal of Intellectual Capital - Author update

Date Email: Tue, Jan 5, 2021, 8:57 PM



Journal of Intellectual Capital - Author update External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to adeliadyaning98, me, mustdownnow, mrn122

Tue, Jan 5, 2021, 8:57 PM

05-Jan-2021

Dear Author(s),

It is a pleasure to inform you that your manuscript titled Does Intellectual Capital Have Any Influence On Stock Price Crash Risk? (JIC-09-2020-0306.R1) has passed initial screening and is now awaiting reviewer selection. The manuscript was submitted by Dr. Agung Probohudono with you listed as a co-author. As you are listed as a co-author please log in to https://mc.manuscriptcentral.com/jicap and check that your account details are complete and correct, these details will be used should the paper be accepted for publication.

Yours sincerely,
Journal of Intellectual Capital
m.warkentin@msstate.edu

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to adeliadyaning98, me, mustdownnow, mrn122

Tue, Jan 5, 2021, 9:22 PM

05-Jan-2021

Dear Author(s),

It is a pleasure to inform you that your manuscript titled Does Intellectual Capital Have Any Influence On Stock Price Crash Risk? (JIC-09-2020-0306.R1) has passed initial screening and is now awaiting reviewer invitation.

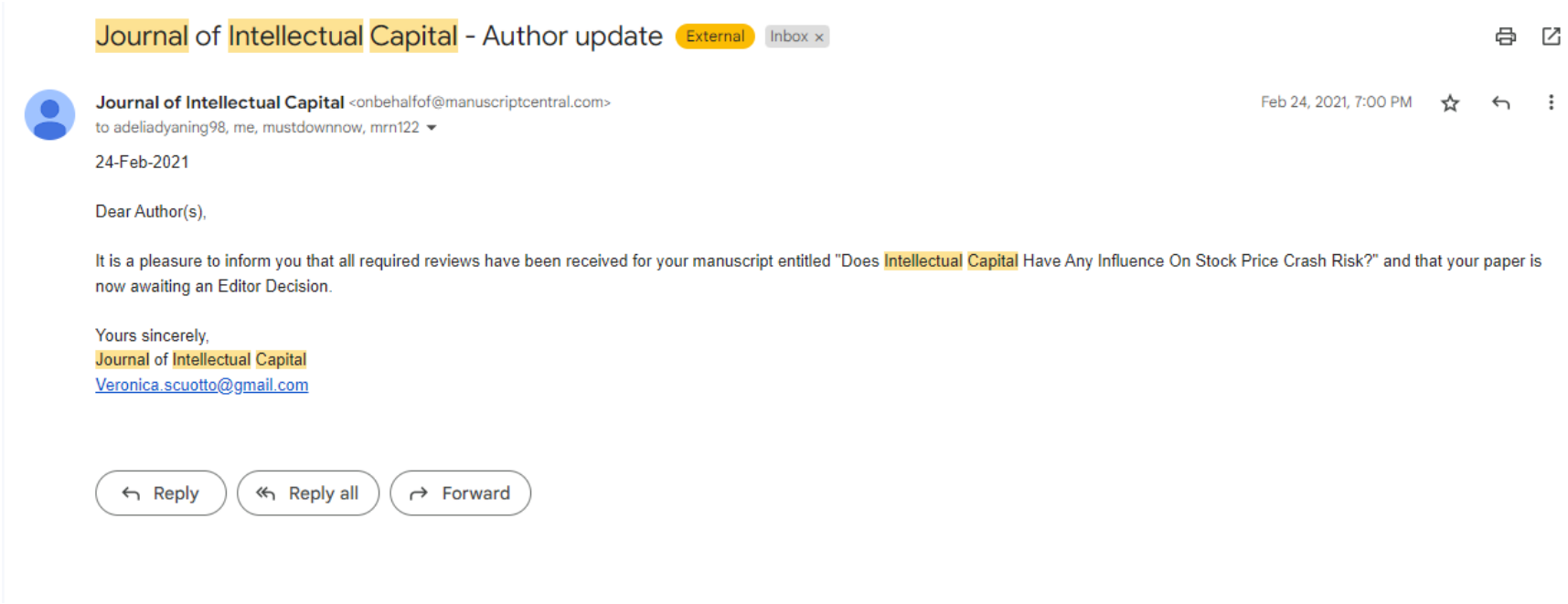
The manuscript was submitted by Dr. Agung Probohudono with you listed as a co-author.

As you are listed as a co-author, if you have not already done so please log in to https://mc.manuscriptcentral.com/jicap and check that your account details are complete and correct, these details will be used should the paper be accepted for publication.

•••

Journal of Intellectual Capital - Author update

Date Email: Feb 24, 2021, 7:00 PM



Journal of Intellectual Capital - Author update External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Feb 24, 2021, 7:00 PM

to adeliadyaning98, me, mustdownnow, mrn122

24-Feb-2021

Dear Author(s),

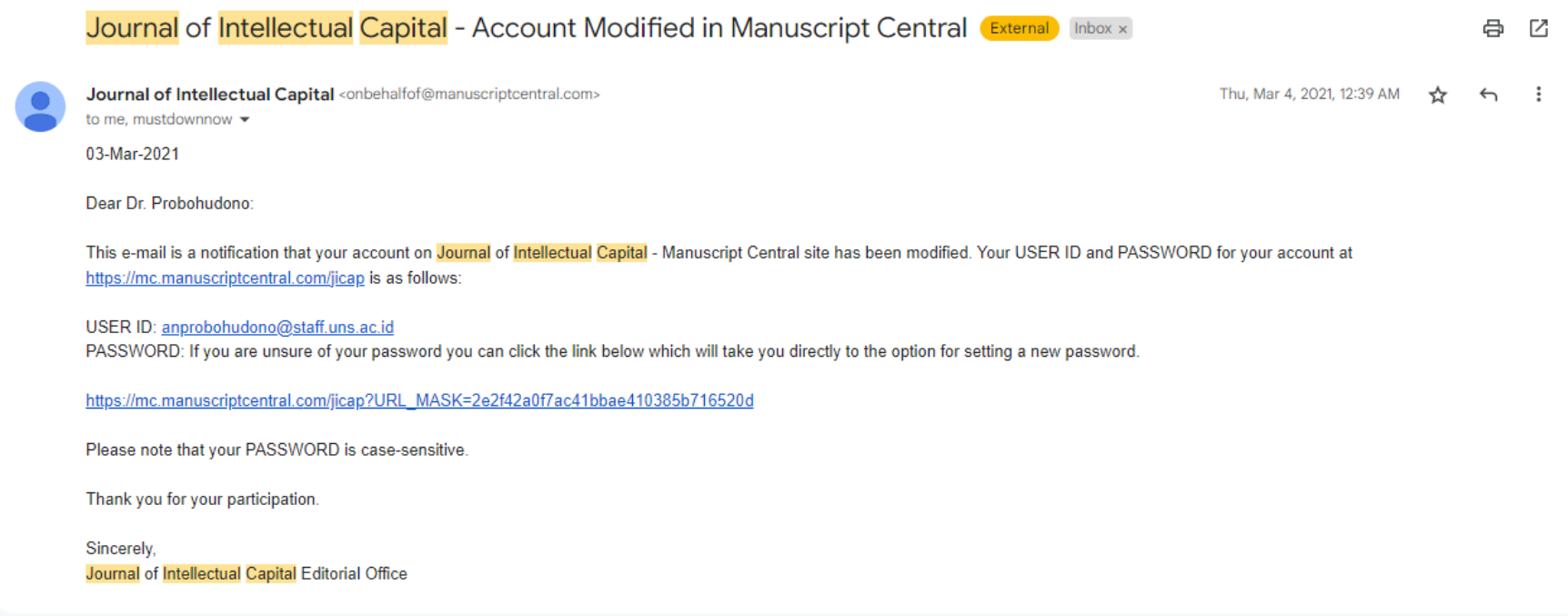
It is a pleasure to inform you that all required reviews have been received for your manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" and that your paper is now awaiting an Editor Decision.

Yours sincerely,
Journal of Intellectual Capital
Veronica.scuotto@gmail.com

Reply Reply all Forward

Journal of Intellectual Capital - Account Modified in Manuscript Central

Email Date: Thu, Mar 4, 2021, 12:39 AM



Journal of Intellectual Capital - Account Modified in Manuscript Central External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Thu, Mar 4, 2021, 12:39 AM

to me, mustdownnow

03-Mar-2021

Dear Dr. Probohudono:

This e-mail is a notification that your account on Journal of Intellectual Capital - Manuscript Central site has been modified. Your USER ID and PASSWORD for your account at https://mc.manuscriptcentral.com/jicap is as follows:

USER ID: anprobohudono@staff.uns.ac.id
PASSWORD: If you are unsure of your password you can click the link below which will take you directly to the option for setting a new password.

https://mc.manuscriptcentral.com/jicap?URL_MASK=2e2f42a0f7ac41bbae410385b716520d

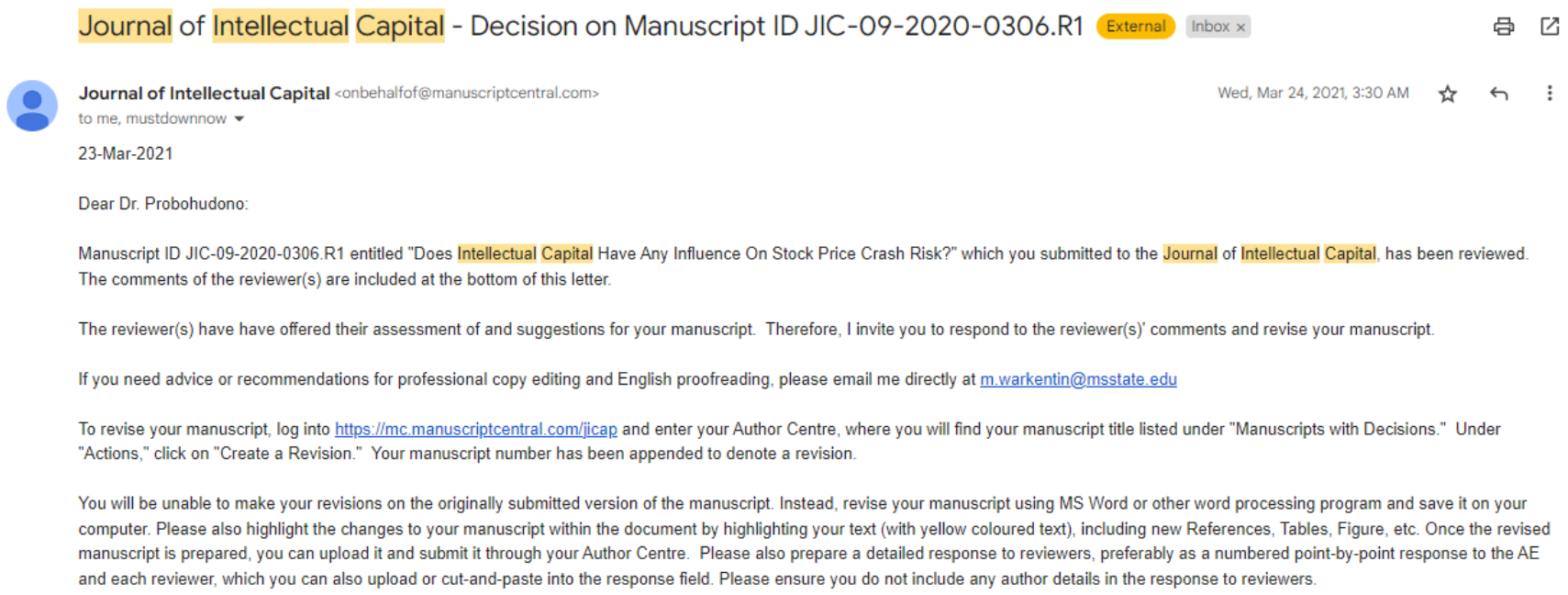
Please note that your PASSWORD is case-sensitive.

Thank you for your participation.

Sincerely,
Journal of Intellectual Capital Editorial Office

Journal of Intellectual Capital - Decision on Manuscript ID JIC-09-2020-0306.R1

Email Date: Wed, Mar 24, 2021, 3:30 AM



Journal of Intellectual Capital - Decision on Manuscript ID JIC-09-2020-0306.R1 External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Wed, Mar 24, 2021, 3:30 AM

to me, mustdownnow

23-Mar-2021

Dear Dr. Probohudono:

Manuscript ID JIC-09-2020-0306.R1 entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" which you submitted to the Journal of Intellectual Capital, has been reviewed. The comments of the reviewer(s) are included at the bottom of this letter.

The reviewer(s) have have offered their assessment of and suggestions for your manuscript. Therefore, I invite you to respond to the reviewer(s)' comments and revise your manuscript.

If you need advice or recommendations for professional copy editing and English proofreading, please email me directly at m.warkentin@msstate.edu

To revise your manuscript, log into https://mc.manuscriptcentral.com/jicap and enter your Author Centre, where you will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision.

You will be unable to make your revisions on the originally submitted version of the manuscript. Instead, revise your manuscript using MS Word or other word processing program and save it on your computer. Please also highlight the changes to your manuscript within the document by highlighting your text (with yellow coloured text), including new References, Tables, Figure, etc. Once the revised manuscript is prepared, you can upload it and submit it through your Author Centre. Please also prepare a detailed response to reviewers, preferably as a numbered point-by-point response to the AE and each reviewer, which you can also upload or cut-and-paste into the response field. Please ensure you do not include any author details in the response to reviewers.

Once the revised manuscript is prepared, you can upload it and submit it through your Author Centre.

When submitting your revised manuscript, you will be able to respond to the comments made by the reviewer(s) in the space provided. You can use this space to document any changes you make to the original manuscript. In order to expedite the processing of the revised manuscript, please be as specific as possible in your response to the reviewer(s).

To help support you on your publishing journey we have partnered with Editage, a leading global science communication platform, to offer expert editorial support including language editing and translation.
If your article has been rejected or revisions have been requested, you may benefit from Editage's services. For a full list of services, visit: authorservices.emeraldpublishing.com/
Please note that there is no obligation to use Editage and using this service does not guarantee publication.

IMPORTANT: Your original files are available to you when you upload your revised manuscript. Please delete any redundant files before completing the submission.

Because we are trying to facilitate timely publication of manuscripts submitted to the Journal of Intellectual Capital, your revised manuscript should be uploaded as soon as possible. If it is not possible for you to submit your revision in a reasonable amount of time, we may have to consider your paper as a new submission.

Once again, thank you for submitting your manuscript to the Journal of Intellectual Capital and I look forward to receiving your revision.

Sincerely,
Dr. Merrill Warkentin
Editor-in-Chief, Journal of Intellectual Capital
m.warkentin@msstate.edu

Associate Editor Comments:
Associate Editor
Comments to Author::

Comments to Author::
thank you for your revision. however reviewers recommend to improve the implactions for research, practice, society and undertake proofreadind

Reviewer(s)' Comments to Author:
Reviewer: 1

Recommendation: Minor Revision

Comments:
The paper has been improved but some minor revisions are still required

Additional Questions:
1. Originality: Does the paper contain new and significant information adequate to justify publication?: Yes

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: Literature has been improved

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: yes

4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: yes

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: Implications' improvement is strongly recommended.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: Proofreading is still recommended

Reviewer: 2

Recommendation: Accept

Comments:
Dear Author/s,

Many thanks for resubmitting your manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" to Journal of Intellectual Capital.
The paper is more original and well written, offering a significant perspective in the analysis of relation between Intellectual Capital (IC) and firm performance with a specific focus on stock price crash risk.
I think that this paper is now adequate to the publication in this prestigious Journal, given the excellent review work done.
Congratulations!
Best Regards.

Additional Questions:
1. Originality: Does the paper contain new and significant information adequate to justify publication?: I think that this paper is original offering a significant perspective in the analysis of relation between Intellectual Capital (IC) and firm performance with a specific focus on stock price crash risk.

2. Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: In this version of paper, the literature has been improved and updated with more recent papers in relationship to the received suggestions.

3. Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Methodology is coherent with the research design and well-presented in relation to the investigated research hypothesis.

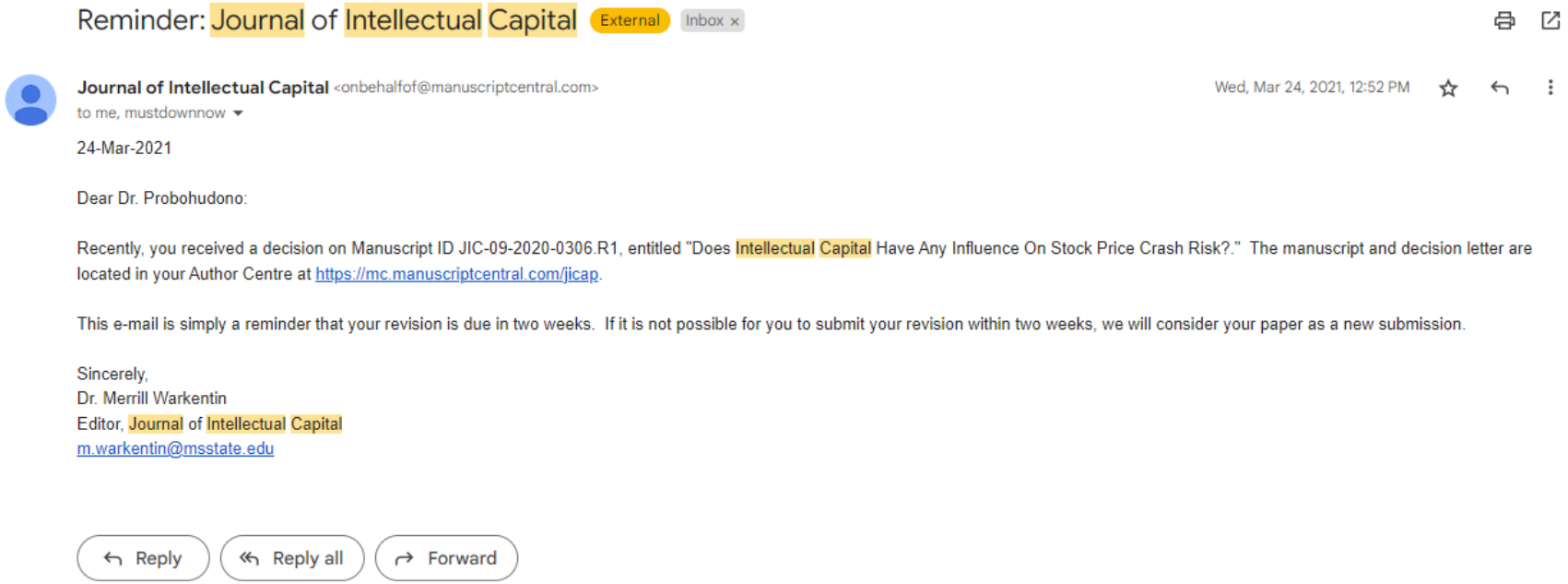
4. Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Results are well presented and are rewritten in relationship to the received suggestions.

5. Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The sections of discussion and conclusions have been well revised by inserting the practical, managerial and academic implications, as well as by inserting future lines of research.

6. Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The Author(s) accepted the suggestion to carry out a professional proof-editing in order to further improve the quality of the paper in line with the journal requirements.

Reminder: Journal of Intellectual Capital

Date Email: Wed, Mar 24, 2021, 12:52 PM



Reminder: Journal of Intellectual Capital External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Wed, Mar 24, 2021, 12:52 PM

to me, mustdownnow

24-Mar-2021

Dear Dr. Probohudono:

Recently, you received a decision on Manuscript ID JIC-09-2020-0306.R1, entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?." The manuscript and decision letter are located in your Author Centre at https://mc.manuscriptcentral.com/jicap.

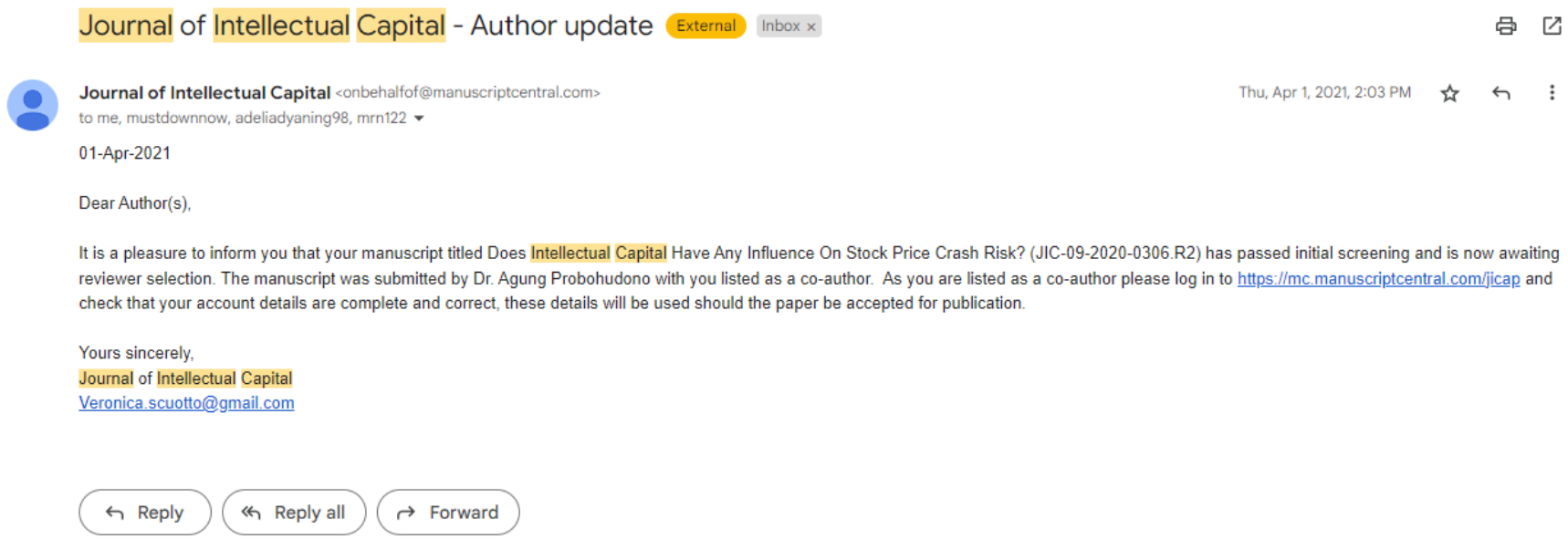
This e-mail is simply a reminder that your revision is due in two weeks. If it is not possible for you to submit your revision within two weeks, we will consider your paper as a new submission.

Sincerely,
Dr. Merrill Warkentin
Editor, Journal of Intellectual Capital
m.warkentin@msstate.edu

Reply Reply all Forward

Journal of Intellectual Capital - Author update

Date email: Thu, Apr 1, 2021, 2:03 PM



Journal of Intellectual Capital - JIC-09-2020-0306.R2

Date email: Thu, Apr 1, 2021, 2:03 PM

Journal of Intellectual Capital - JIC-09-2020-0306.R2 External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Thu, Apr 1, 2021, 2:03 PM

to me, mustdownnow

01-Apr-2021

Dear Dr. Probohudono:

Your revised manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" has been successfully submitted online and is presently being given full consideration for publication in the Journal of Intellectual Capital.

Your manuscript ID is JIC-09-2020-0306.R2.

Please mention the above manuscript ID in all future correspondence or when calling the office for questions. If there are any changes in your street address or e-mail address, please log in to Manuscript Central at https://mc.manuscriptcentral.com/jicap and edit your user information as appropriate.

You can also view the status of your manuscript at any time by checking your Author Centre after logging in to https://mc.manuscriptcentral.com/jicap

Please note that Emerald requires you to clear permission to re-use any material not created by you. If there are permissions outstanding, please upload these when you submit your revision or send directly to Emerald if your paper is accepted immediately. Emerald is unable to publish your paper with permissions outstanding.

Open Access?

All of our subscription journals give you the option of publishing your article open access, following payment of an article processing charge (APC). To find the APC for your journal, please refer to the APC price list: http://www.emeraldgrouppublishing.com/openaccess/apc_price_list.pdf

Emerald has established partnerships with national consortium bodies to offer a number of APC vouchers for eligible regions and institutions. To check your eligibility please refer to the open access partnerships page: http://www.emeraldgrouppublishing.com/openaccess/oapartnerships.htm

If you would like to publish your article open access please contact openaccess@emeraldgroup.com

Thank you for submitting your manuscript to the Journal of Intellectual Capital.

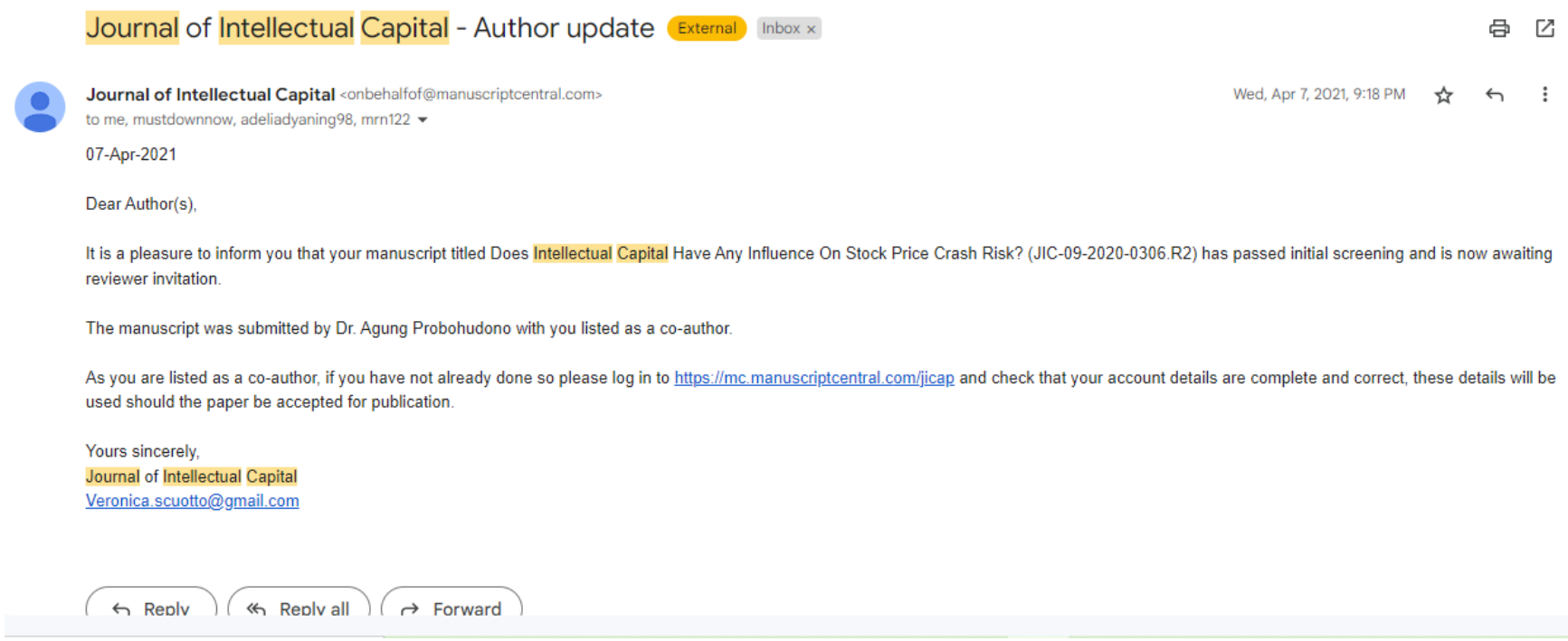
Sincerely,
Associate Professor Veronica Scuotto
Journal of Intellectual Capital

https://orcid.org/0000-0003-2359-3569

Reply Reply all Forward

Journal of Intellectual Capital - Author update

Date email: Wed, Apr 7, 2021, 9:18 PM



Journal of Intellectual Capital - Author update External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to me, mustdownnow, adeliadyaning98, mrn122

Wed, Apr 7, 2021, 9:18 PM

07-Apr-2021

Dear Author(s),

It is a pleasure to inform you that your manuscript titled Does Intellectual Capital Have Any Influence On Stock Price Crash Risk? (JIC-09-2020-0306.R2) has passed initial screening and is now awaiting reviewer invitation.

The manuscript was submitted by Dr. Agung Probohudono with you listed as a co-author.

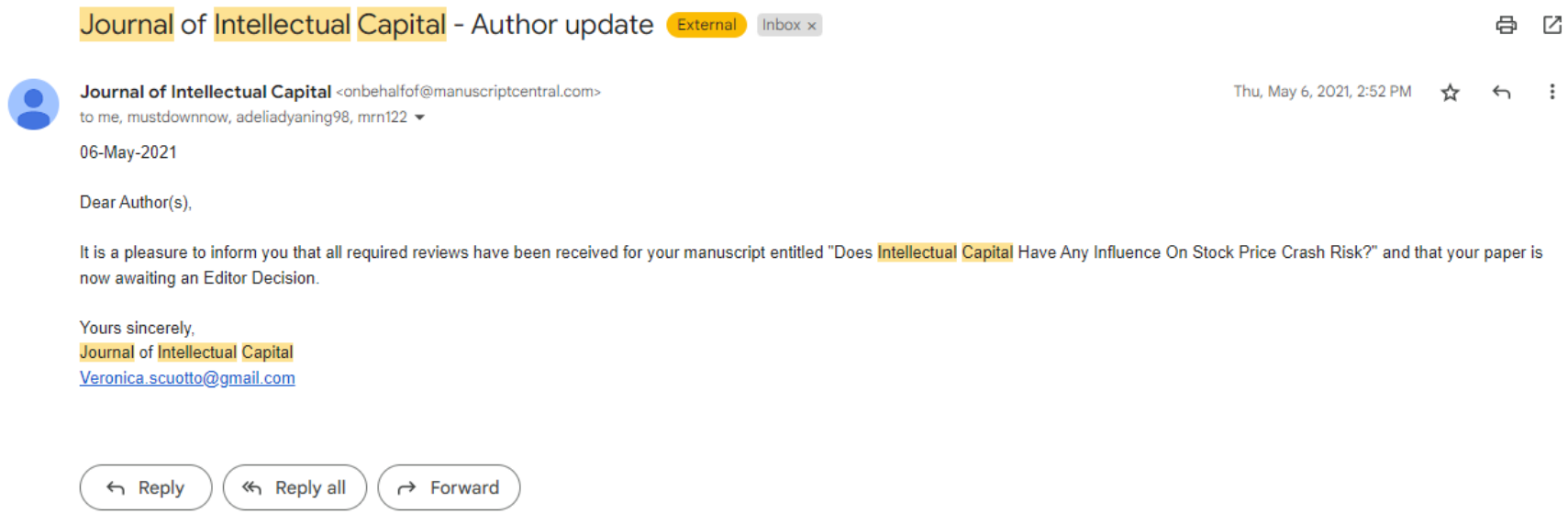
As you are listed as a co-author, if you have not already done so please log in to https://mc.manuscriptcentral.com/jicap and check that your account details are complete and correct, these details will be used should the paper be accepted for publication.

Yours sincerely,
Journal of Intellectual Capital
Veronica.scuotto@gmail.com

Reply Reply all Forward

Journal of Intellectual Capital - Author update

Email date: Thu, May 6, 2021, 2:52 PM



Journal of Intellectual Capital - Author update External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Thu, May 6, 2021, 2:52 PM

to me, mustdownnow, adeliadyaning98, mrn122

06-May-2021

Dear Author(s),

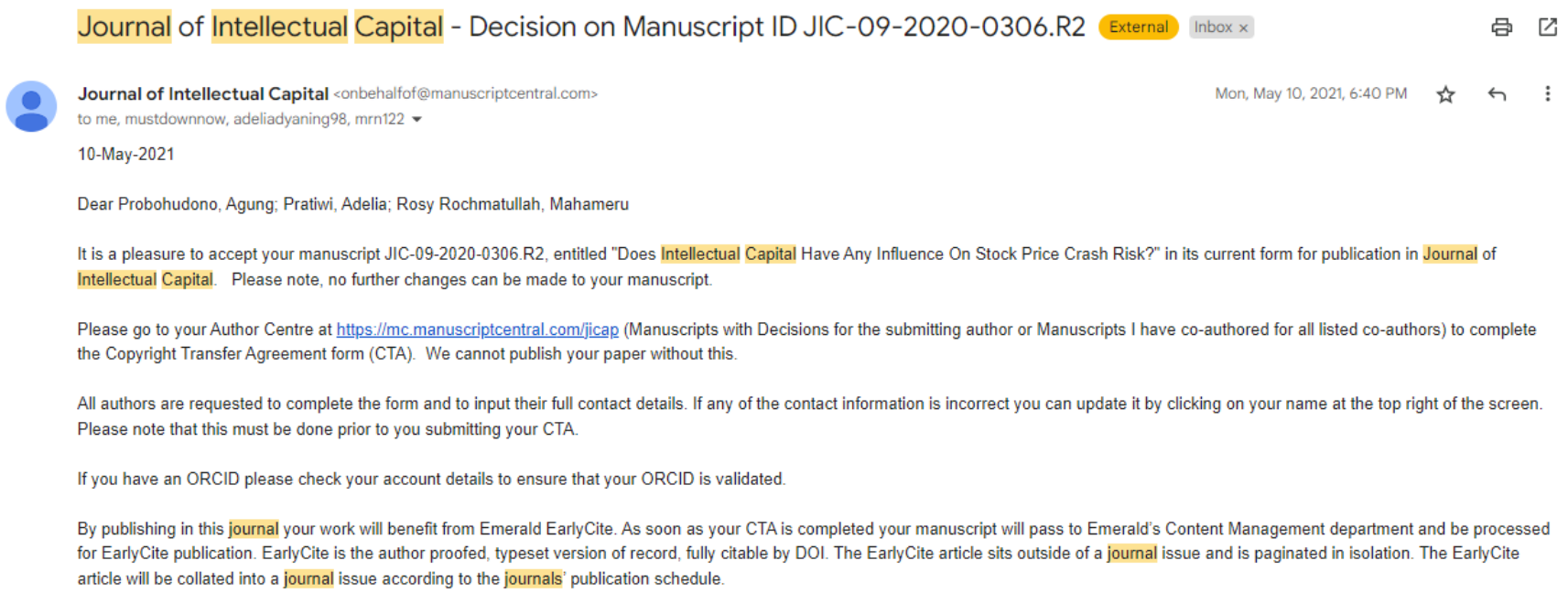
It is a pleasure to inform you that all required reviews have been received for your manuscript entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" and that your paper is now awaiting an Editor Decision.

Yours sincerely,
Journal of Intellectual Capital
Veronica.scuotto@gmail.com

Reply Reply all Forward

Journal of Intellectual Capital - Decision on Manuscript ID JIC-09-2020-0306.R2

Date email: Mon, May 10, 2021, 6:40 PM



Journal of Intellectual Capital - Decision on Manuscript ID JIC-09-2020-0306.R2 External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com> Mon, May 10, 2021, 6:40 PM

to me, mustdownnow, adeliadyaning98, mrn122

10-May-2021

Dear Probohudono, Agung; Pratiwi, Adelia; Rosy Rochmatullah, Mahameru

It is a pleasure to accept your manuscript JIC-09-2020-0306.R2, entitled "Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?" in its current form for publication in Journal of Intellectual Capital. Please note, no further changes can be made to your manuscript.

Please go to your Author Centre at https://mc.manuscriptcentral.com/jicap (Manuscripts with Decisions for the submitting author or Manuscripts I have co-authored for all listed co-authors) to complete the Copyright Transfer Agreement form (CTA). We cannot publish your paper without this.

All authors are requested to complete the form and to input their full contact details. If any of the contact information is incorrect you can update it by clicking on your name at the top right of the screen. Please note that this must be done prior to you submitting your CTA.

If you have an ORCID please check your account details to ensure that your ORCID is validated.

By publishing in this journal your work will benefit from Emerald EarlyCite. As soon as your CTA is completed your manuscript will pass to Emerald's Content Management department and be processed for EarlyCite publication. EarlyCite is the author proofed, typeset version of record, fully citable by DOI. The EarlyCite article sits outside of a journal issue and is paginated in isolation. The EarlyCite article will be collated into a journal issue according to the journals' publication schedule.

NOTE: In a month or so after your paper has been processed, begin to look for it on the journal's "EarlyCite" page so you can download the PDF for your paper to share (by email, etc.) with friends, colleagues, co-authors, students, former students, and others who may want to read your work, but certain restrictions are imposed by Emerald Publishing regarding publicly posting the paper to public websites. Remember also that you can boost your citation count (at Google Scholar, etc.) by citing your publications (including your JIC publication) in your current and future papers as well (and encouraging your friends and students to do the same).

https://www.emerald.com/insight/publication/issn/1469-1930#earlycite

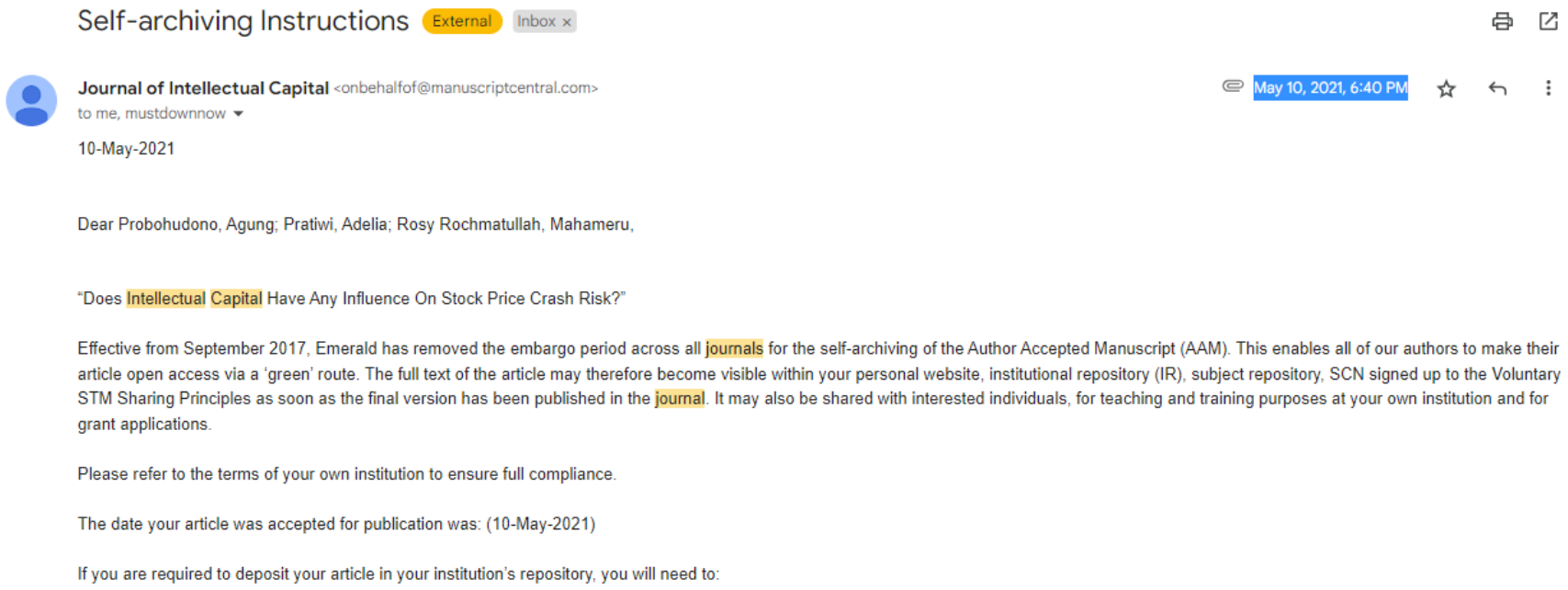
FOR OPEN ACCESS AUTHORS: Please note if you have indicated that you would like to publish your article as Open Access via Emerald's Gold Open Access route, you are required to complete a Creative Commons Attribution Licence - CCBY 4.0 (in place of the standard copyright assignment form referenced above). You will receive a follow up email within the next 30 days with a link to the CCBY licence and information regarding payment of the Article Processing Charge. If you have indicated that you might be eligible for a prepaid APC voucher, you will also be informed at this point if a voucher is available to you (for more information on APC vouchers please see http://www.emeraldpublishing.com/oapartnerships

Thank you for your contribution. On behalf of the Editors of Journal of Intellectual Capital, we look forward to your continued contributions to the Journal.

Sincerely,
Dr. Merrill Warkentin
Editor-in-Chief, Journal of Intellectual Capital
m.warkentin@msstate.edu

Self-archiving Instructions

Date email: May 10, 2021, 6:40 PM



Self-archiving Instructions External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to me, mustdownnow

May 10, 2021, 6:40 PM

10-May-2021

Dear Probohudono, Agung; Pratiwi, Adelia; Rosy Rochmatullah, Mahameru,

"Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?"

Effective from September 2017, Emerald has removed the embargo period across all journals for the self-archiving of the Author Accepted Manuscript (AAM). This enables all of our authors to make their article open access via a 'green' route. The full text of the article may therefore become visible within your personal website, institutional repository (IR), subject repository, SCN signed up to the Voluntary STM Sharing Principles as soon as the final version has been published in the journal. It may also be shared with interested individuals, for teaching and training purposes at your own institution and for grant applications.

Please refer to the terms of your own institution to ensure full compliance.

The date your article was accepted for publication was: (10-May-2021)

If you are required to deposit your article in your institution's repository, you will need to:

- Either, manually deposit the accepted manuscript attached to this email or a version from your own records (it must be the version accepted for publication by the journal's Editor) into your repository
- Or if applicable, forward your accepted manuscript to your institution's Repository Manager.
- If you are unsure which option is applicable to you, please refer to your institutional or departmental publication policy;

To deposit your AAM, you will need to adhere to the following conditions:

- You must include the DOI (10.1108/JIC-09-2020-0306) back to the official published version of your article within www.emeraldinsight.com;
- Include all of the relevant metadata (article title, journal name, volume, issue no. etc.).
- The AAM must clearly indicate where the article was published, or where it is forthcoming;
- Include a clear licensing statement (see below).

Deposit licences

Emerald allows authors to deposit their AAM under the Creative Commons Attribution Non-commercial International Licence 4.0 (CC BY-NC 4.0). To do this, the deposit must clearly state that the AAM is deposited under this licence and that any reuse is allowed in accordance with the terms outlined by the licence. To reuse the AAM for commercial purposes, permission should be sought by contacting permissions@emeraldinsight.com.

For the sake of clarity, commercial usage would be considered as, but not limited to:

- Copying or downloading AAMs for further distribution for a fee;
- Any use of the AAM in conjunction with advertising;
- Any use of the AAM by for promotional purposes by for-profit organisations;
- Any use that would confer monetary reward, commercial gain or commercial exploitation.

Emerald appreciates that some authors may not wish to use the CC BY-NC licence; in this case, you should deposit the AAM and include the copyright line of the published article. Should you have any questions about our licensing policies, please contact permissions@emeraldinsight.com.

- Include the article abstract (see below).

This paper explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.
This study empirically analyzes the impact of the efficiency of intellectual capital on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.
Our findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated influence on stock price crash risk so that the aspects of intellectual capital are obscured.
This research provides new information that intellectual capital disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Please note that the full text of the AAM must only appear in the IR once the final version of the article has been published in the journal.

If you have any questions about Emerald's repository policy, please contact permissions@emeraldinsight.com

Thank you for choosing to publish with Emerald.

Kind Regards,
Laura Wilson
Head of Rights, Emerald Publishing

One attachment • Scanned by Gmail

PDF_Proof.PDF

Reply | Reply all | Forward

Copyright Form Reminder: Journal of Intellectual Capital

Date Email: Wed, May 12, 2021, 7:10 PM

Copyright Form Reminder: Journal of Intellectual Capital External Inbox ×

Journal of Intellectual Capital <onbehalfof@manuscriptcentral.com>
to me, mustdownnow

Wed, May 12, 2021, 7:10 PM

12-May-2021

Dear Dr. Probohudono:

Recently, your manuscript entitled 'Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?' (JIC-09-2020-0306.R2) was accepted for publication in Journal of Intellectual Capital. This e-mail is a reminder that you have not yet completed a copyright form. We are unable to publish your paper without it.

When completing this form please take the opportunity to check that your contact details are correct. If your details need to be updated, please access your account details by clicking on your name at the top right of the screen. Please note that this must be done prior to you submitting your copyright form.

You can access the form by clicking on the following link:

https://mc.manuscriptcentral.com/jicap?URL_MASK=aa1d7af365b34e71ae6a7d75d80feb05

If you have any questions, please let me know.

Sincerely,
Associate Professor Veronica Scuotto
Journal of Intellectual Capital, Editorial Office
Veronica.scuotto@gmail.com

Manuscript Awal

Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

ABSTRACT

Purpose
This paper aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach
This study empirically analyzes the impact of efficiency of intellectual capital on stock price crash risk using 152 sample of companies listed on Indonesia Stock Exchange (IDX) in the period of 2018. To test the research hypotheses, regression analysis and path analysis are applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.

Findings
~~The results show that intellectual capital positively effects on firm performance but does not give any effect on stock price crash risk. The findings show that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future. More detailed explanation can be seen in the discussion section.~~ Our findings indicate that intellectual capital (IC) disclosure needs to involve convergence of corporate governance (CG) to reveal management quality of listed companies. CG convergence will encourage the efficiency of information on the stock market and minimize the risk of stock price crashes. It means, CG convergence is a new indicator that we propose to measure IC of listed companies. More detailed explanation is presented in the discussion section.

Originality / value
This paper deepens the understanding that the output of intellectual capital in the stock market are company performance quality and information efficiency in order to minimize negative sentiment from investors. Therefore, this paper proposes a new discourse on IC disclosure by involving corporate governance convergence.~~This empirical paper deepens the understanding that the output of intellectual capital in business is an increase in company performance, but efficient disclosure of information about performance improvements is also needed in order to minimize negative sentiment from investors.Thus, the ultimate goal of intellectual capital is the efficiency of the company's performance information on the stock market.~~

Key word: Intellectual capital, stock price crash risk, firm performance, disclosure, corporate governance convergence.

1. Introduction

Companies in modern era nowadays are being replaced with a knowledge–based, fast–changing and technologically intensive economy, including in Indonesia. Most of companies use technology to enhance the efficiency on companies activity and depress expense incurred. In this modern economy, for many firms, the most important asset must be had for each company is intellectual capital. It has been different from previous era that physical capital was the power of the companies. Previous studies have shown that company value and capability are often based on the intangible intellectual capital (IC) that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress such as increasing brand equity and social networking. In addition, IC also provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we would intuitively expect that the application of intellectual capital in the company is able to reduce risk on stock price crashes.

The purpose of this study is to find out relationship between efficiency of intellectual capital and stock price crash risk in the future by using firm performance as mediating variable. Clarke et al. (2011) stated that Intellectual capital (IC) has a positive influence on firm performance which is characterized by three components of IC efficiency, such as: HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). It could be a good signal for companies's shareholder, because a company with good efficiency on IC means that they have been using the resource for its best. Several studies have proven that IC reflects good competence, skills and knowledge that can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, IC represents good competency, skills and knowledge so that the company is able to disclose information in accordance with the needs of shareholders.

Based on a Taiwanese study by Chen et al. (2005) this study uses the quantitative measure, value added intellectual coefficient (VAIC) developed by Pulic (1998) as a measure of IC efficiency. Data is collected for Indonesia Stock Exchange (IDX) listed firms in 2018. We analyze using path analysis for knowing whether there are any relation between intellectual capital, firm performance, and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no investigate about relationship between

IC and Stock Price Crash Risk. Finally, this study contributes to the literature on the relation between Intellectual Capital and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discussions. Section 6 concludes the paper.

2. Literature Review and Hypothesis

a. Intellectual Capital Efficiency (ICE)

Intellectual Capital (IC) represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that Intellectual Capital efficiency (ICE) can improve the performance of companies (see e.g. Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are very interested in buying shares when the company has implemented ICE. As Lin et al. (2015); Ozkan et al. (2017) shows that the greater of ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which if invested efficiently in can be strengthen the company's position and gains a competitive advantage. It means, the efficiency of human capital (HCE) represents the selection of superior intellectual capital (IC) to be employed in the company's business. Meanwhile, Asiaei et al. (2018) has proven that there was a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, Companies that have a higher HCE are more likely to have a higher ROE, a higher ROA, a higher ROIC and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize overall business performance. Intellectual capital (IC) has a central role in determining the structural capital model used in companies. Gogan et al. (2015) revealed that determining the right model in structural capital needs to be done in order to obtain competitive advantages in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes, it is necessary to

complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital Employed (ROCE). It means, capital employed efficiency (CEE) represents intellectual capital (IC) which is able to perform accurate calculations in capital investment in order to obtain optimal returns. As Mørch et al. (2017) have explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and financial performance of investments. Thus, Intellectual Capital efficiency (ICE) has an important role in investment decisions.

b. Intellectual Capital Efficiency (ICE) Measurement Model on Stock Price Risk

Basically, the efficiency of intellectual capital (ICE) plays a role in the application of HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in knowledge economy developed by (Pulic, 1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by (Chen et al., 2017). ICE is calculated using three components, namely value added human capital efficiency (VAHU), value added structural capital (STVA), and value added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the method section.

Several studies have used this model which shows mixed results as well. Hejazi et al. (2016) found that increasing intellectual capital (IC) should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The three studies indicate that Innovation and creation play a dominant role in describing the latent constructs of IC. Based on discussion above, hypothesis (H1) is given

H1a : Human capital efficiency is positively related to firm performance

H1b : Structural capital efficiency is positively related to firm performance

H1c : Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better intellectual capital efficiency. Furthermore, Song (2015) has shown that management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of intellectual capital. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare also factors that contribute to the risk of stock price crashes. Further analysis shows a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between the intellectual capital as a whole and the market capitalization value of the company. Some of these studies imply that IC can reduce the risk of stock investment. Based on discussion above, hypothesis (H2) is given.

H2a : Human capital efficiency is negatively related to stock price crash risk

H2b : Structural capital efficiency is negatively related to stock price crash risk

H2c : Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) has explained that management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. It means, informativeness of stock prices indicates that the company's performance is better. As Martani et al. (2009) mentioned in their research that the company's financial performance is shown by the profitability ratio and the market value ratio significantly influences returns in the company. Based on this research, the following hypothesis (H3) can be formulated as

H3 : firm performance is negatively related to stock price crash risk

Intellectual capital (IC) owned by the company is expected to create added value so that it can improve company performance. Good firm performance is one of the signals that will be considered by investors in making investment decisions. Cenciarelli et al. (2018) in her

research showed that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that will develop Intellectual capital require capital for R&D so they are faced with financing constraints. It means, IC efficiency supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. There is a fact that companies in areas of high social trust tend to hide bad news. Management tends to disclose more related information to get investor. Thus, intellectual capital efficiency is needed as a corporate strategy to increase information transparency and financial performance which will manifest towards increasing investor confidence. Based on discussion above, we can hypothesize (H4) that

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

3. Research Design

a. Sample

This study uses companies from various sectors as research objects as the sample for the research. The sample collected from Indonesia Stock Exchange (IDX) annual report data in 2018. We also obtain weekly stock data from Yahoo Finance. We then use the following selection criteria: First, similar to Khan and Watts (2009), we require that total assets and book, values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent variables

Chen et al. (2005) argue that value added intellectual coefficient (VAIC) and its three components, HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency) represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. It can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC we need value added to be calculated. In its simplest form VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs which are considered to be a value creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005), VA could be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is Cost of Goods Sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is wages and salaries for employee.

i. Human Capital Efficiency (HCE)

Human capital (HC) factors consist of skills, knowledge, productivity, competence, and all the things that fit with employee in the work place. Human capital efficiency (HCE) can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula value added human capital efficiency (VAHU). VAHU calculations can be seen in Formula 3.

VAHU = VA/HC .....Formula 3

ii. Structural Capital Efficiency (SCE)

Structural Capital (SC) is one of elements in intellectual capital, it consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SC as in Formula 4. Meanwhile, structural capital efficiency (SCE) is calculated using value added structural capital (STVA) as in Formula 5.

SC = VA – HC .....Formula 4

STVA = SC / VA .....Formula 5

Structural capital efficiency (SCE) is the dollar of SC within the firm, for every dollar of value added, and as HCE increases, SCE increases. If the efficiency

measures for both HCE and SCE were calculated with VA as the numerator, the logical inconsistency would remain (Pulic, 1998).

iii. Capital Employed Efficiency (CEE)

Capital Employed Efficiency (CEE) is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on capital employed (CE). We could calculate CE as the total assets minus intangible assets and CEE is defined as value added capital employed (VACA). VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent variable

The risk of stock price crash is the risk of a stock price decline in a significant range after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017) which can be seen in Formula 7.

$$\text{NCSKEW} = \frac{-[n(n-1)3/2\ \sum_{T=1}^{n}(w_{i,T,t-}\ \bar{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t-}\ \bar{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\bar{w}$, t is the average weekly return of the company's specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening variable

This paper uses firm performance as intervening variable. We use ROE to analyze the firm performance. We calculate this ratio with formula 8.

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \quad \text{..... Formula 8}$$

e. Empirical Models

This study uses path analysis that produce two model regression to test our hypotheses.

Model I

$ROE = \alpha + \beta 1\ VAHU + \beta 2\ STVA + \beta 3\ VACA + \beta 4\ SIZE - \mu$

Model II

$\text{NCSKEW} = \alpha - \beta 1\ STVA - \beta 2\ VACA - \beta 3\ AHU + \beta 4\ SIZE - \beta 5\ ROE - \mu$

Notes: ROE is ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy of stock price crash risk, VAHU is value added human capital, STVA is structural capital value added, VACA is value added capital employed, and SIZE is firm size as control variable in this study.

4. Results

a. Normality Test

Table 1 show that the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. Then according to the basis of decision making in the Kolmogorov-Smirnov normality test above, the result can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924
Most Extreme Differences	Absolute	0.059
	Positive	0.037
	Negative	-0.059
Test Statistic		0.059
Asymp. Sig. (2-tailed)		0.200[c,d]

Notes:
a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

b. Multicollinearity Test

The basis for decision making from the multicolinearity test is done by looking at the value of Tolerance and VIF. Based on the output table, it is known that the tolerance value of

each variable is greater than 0.1. While for the VIF value for each variable is less than 10. Then according to the basis for multicoliniearity test decision making, we can conclude that there are no symptoms of multicoliniearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

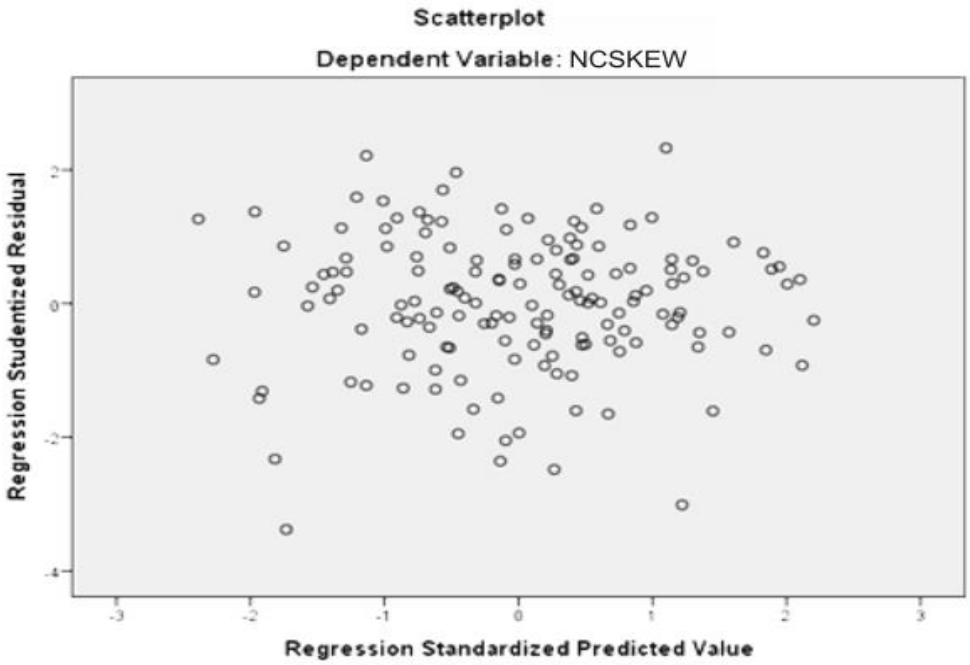
c. Heteroskedasticity Test

Based on Figure 1, we know that data dots spread above and below or around the number of 0. Then we can see that dots are not clustered just on above or below. The distribution of data points does not form a wavy pattern widened then narrowed and widened again. We also can see that the dots do not make any certain pattern. According from the analyses, we can conclude that there is no heteroscedasticity problem so that a good and ideal regression model can be fulfilled.

d. Path Analysis

In the Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0,000, respectively. While based on the table given that there is no significant relationship between VAHU and ROE at the 1% significance level, so we can conclude that H1(a) is rejected. Based on a beta test, VACA is variable that have the most influences changes in ROE. The value of Sig. F-statistics show that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence on ROE. This result is a strong indicator that there is a relationship between intellectual capital and firm performance, thus supporting H1(b) and H1(c). That is, if a firm is able to use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In the Table 3, Model 2 shows that all of the components of intellectual capital do not have any significance relationship with stock price crash risk at 1% significance level. From table above we also know that ROE does not have any significance influence on stock price crash risk. Furthermore, we use model 1 and model 2 to do analysis path. After getting the numbers from the table, we calculate the indirect effect by multiplying the effect of the IC component with ROE and ROE with stock price crash risk. Based on the table and path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0,000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis that if the indirect effect is greater than the direct effect then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship to stock price crash risk either directly or indirectly through firm performance.

Table 3. The Results of Regression Model

	Dependent Variable: ROE	Dependent Variable: NCSKEW

	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number between parentheses is the standard error. The *, **, and *** signs indicate significance at the levels of 1%, 5%, and 10%.

We have explored several previous studies in order to strengthen the results of this test. Our exploration showed that the results of this test are synchronous with previous studies. Exploration results have presented in the discussion section.

5. Discussion

Several studies show that intellectual capital (IC) has an important role in improving sustainable company performance and business progress (see e.g. Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the Indonesia Stock Exchange (IDX). In addition, other results show that the company's performance as represented by return on equity (ROE) also has no effect on stock price crash risk. This means, IC only plays a role in controlling company performance and does not play a role in controlling share prices. We believe that the potential endogeneity in these results. Lee at al. (2020) also experienced edogeneity on the results of their analysis that shows the government customer concentration is negatively associated with

stock price crash risk. Further, they found that the likelihood that a supplier firm with a concentrated customer base experiences higher crash risk is attenuated by lower switching costs and is accentuated when the degree of information asymmetry is high. Therefore, we will present the exploration results of several previous studies in order to reveal the risk of stock price crashes in this discussion section.

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in the corporate share repurchases decisions, while the enactment of the regulations has a significant effect on firms' undertaking share repurchases programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility,macroeconomic events, financial transparency, and Government regulations play a greater role in controlling the risk of stock price crashes, while IC does not have an important role in controlling stock prices.

~~Studies in China show that regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019)~~. Luo & Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Another study shows that Chinese investor sentiment (CIS) also affects stock price volatility (Li, 2019). Likewise Ma et al. (2020) suggests that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The four studies indicate that economic policy, investor sentiment, and audit quality have a significant effect on the risk of stock price crashes.~~These two studies imply that companies have more interest in stock investment so that anomalies of information have the potential to be carried out by companies in order to increase company capital. This resulted in negative sentiment by investors towards the company. Thus, investor sentiment and government regulations that encourage an efficient market on the stock~~

~~exchange also play a role in stock price volatility. In our opinion, intellectual capital (IC) does not play a role in controlling the risk of falling share prices, while external factors such as macroeconomic events, investor sentiment, and regulations that promote efficient markets have a strong influence on the risk of falling share prices.~~

The results of previous research explorations indicate that intellectual capital (IC) does not function as an added value to the company and does not guarantee management quality to stakeholders. Meanwhile, the risk of share prices crashes is determined by information asymmetry about the performance of the listed companies. Practically, the opportunistic behavior of listed companies leads to inefficiency of information on the stock market. Government regulation is a tool used to minimize investor sentiment. The most anticipatory action possible is additional information that ensures the quality of company management. Quality assurance of company management can be interpreted by corporate governance (CG) convergence which includes five important aspects such as Culture, Leadership, Alignment, Systems, and Structure (Drew et al., 2020). Esqueda & O'Connor (2020) stated that CG quality is positively correlated with the company's life cycle. Correa-Garcia et al. (2020) also proven that CG has implications for the quality of sustainability reporting in Latin American business groups. In the end, we believe that IC affects the risk of stock price crashes when IC disclosure involves company management quality assurance indicated by CG convergence. It can be measured by adopting a corporate governance index of listed companies that focuses on four important aspects, including: 1. CEO duality, 2. Size of the board of directors, 3. Managements 'holdings and 4. Block shareholders' holding (Chen et al., 2007).

~~BAB I~~6. Conclusions and implications

a. Conclusions

This study examines the effect of intellectual capital components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX (Indonesia Stock Exchange) and stock price data published by Yahoo Finance. Intellectual capital variables are measured by the Value added Intellectual capital (VAIC) method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data is

processed using the path analysis method to determine the direct effect and indirectly from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance but partially the VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The findings state that the three intellectual capital variables do not have a significant direct or indirect relationship with stock price crash risk. This finding supports our exploration results which indicate that IC disclosure needs to consider the convergence of corporate governance in order to reveal the quality of company management.~~The findings show that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future.~~

~~Based on the discussion section, it shows that intellectual capital (IC) does not play a role in controlling of stock price crash risk. Meanwhile, the results of previous research explorations indicate that the occurrence of macroeconomic events, investor sentiment and regulations that promote efficient markets are determining factor for stock price volatility which is connected to the stock price crash risk. In the end, we concluded that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future.~~

b. Implications

This study provides a new knowledge that Intellectual Capital (IC) disclosure in the stock market needs to consider corporate governance (CG) convergence as an additional measure. Future studies can implement the CG index developed by Chen et al. (2007) to measure IC in listed companies. Thus, IC will promote the efficiency of information on the stock market which is very helpful for investors in purchasing decisions.

REFERENCES

Adesina, K. S. (2019). Bank technical, allocative and cost efficiencies in Africa: The influence of intellectual capital. *North American Journal of Economics and Finance*. 48, 419-433.

Andersson, T. et al., (2006). Financialized accounts: Restructuring and return on capital employed in the S&P 500. *Accounting Forum*. 30, 21-41.

Asiaei, K. and Jusoh, R. (2017). Using a robust performance measurement system to illuminate intellectual capital. *International Journal of Accounting Information Systems*. 26, 1-19.

Asiaei, K. et al., (2018). Intellectual capital and performance measurement systems in Iran. *Journal of Intellectual Capital*, 19(2), 294-320.

Anifowose, M. et al., (2017). Intellectual capital disclosure and corporate market value: does board diversity matter?. *Journal of Accounting in Emerging Economies*, 7 (3), 369-398.

Belcaid, K. and Ghini, A. E. (2019). U.S., European, Chinese economic policy uncertainty and Moroccan stock market volatility. *The Journal of Economic Asymmetries*. 20, e00128.

Bennett, B. et al., (2020). Does the stock market make firms more productive?. *Economics*, 136 (2), 281-306.

Ben-Nasr, H. and Ghouma, H. (2018). Employee welfare and stock price crash risk. *Journal of Corporate Finance*, 48, 700-725.

Berzkalne, I. and Zelgalve, E. (2014). Intellectual capital and company value. *Procedia - Social and Behavioral Sciences*, 110, 887-896.

Boya, C. M. (2019). From efficient markets to adaptive markets: Evidence from the French stock exchange. *Research in International Business and Finance*, 49, 156-165.

Cao, C. et al., (2016). Social trust and stock price crash risk: Evidence from China. *International Review of Economics & Finance*, 46, 148-165.

Castillo, A. E. et al., (2019). Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises. *Procedia Computer Science*, 160, 567-572.

Cenciarelli, V. G. et al., (2018). Does intellectual capital help predict bankruptcy?. *Journal of* Intellectual Capital, 19(2), 321-337.

Chen, M.C. et al., (2005). An Empirical Investigation of the Relationship between Intellectual Capital and Firms' Market Value and Financial Performance. *Journal of Intellectual Capital*, 6(2), 159-176.

Chen, C. et al., (2017). Earnings smoothing: Does it exacerbate or constrain stock price crash risk?. *Journal of Corporate Finance*. 42, 36-54.

Ciprian, G. G. et al., (2012). Elaboration of accounting financial report on structural capital. *Procedia - Social and Behavioral Sciences*, 62, 706-710.

Clarke, M. et al., (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12(4), 505-530.

Dženopoljac, V. et al., (2016). Intellectual capital and financial performance in the Serbian ICT industry. *Journal of Intellectual Capital*, 17(2), 373-396.

Gogan, L. M. et al., (2015). Structural capital - A proposed measurement model. *Procedia Economics and Finance*. 23, 1139 – 1146.

Gogan, L. M. et al., (2016). The Impact of Intellectual Capital on Organizational Performance. *Procedia - Social and Behavioral Sciences*. 211, 194-202.

Hayati, M. et al., (2015). The Effect of Intellectual Capital to Value Relevance of Accounting Information Based on PSAK Convergence of IFRS (Manufacture Firms in Indonesia). *Procedia - Social and Behavioral Sciences*. 211, 999 – 1007.

He, Q. and Fang, C. (2019). Regulatory sanctions and stock pricing efficiency: Evidence from the Chinese stock market. *Pacific-Basin Finance Journal*. 58, 101241.

Hejazi, R. et al., (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management*, 23(4), 259 273.

Huang, C. J. and Liu, C. J. (2005). Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*. 6 (2), 237-252.

Huang, C. C. and Huang, S. M. (2020). External and internal capabilities and organizational performance: Does intellectual capital matter?. *Asia Pacific Management Review*. 52 (2), 111-120.

Jerzak, K. (2015). The essence of human capital in a building company - selected aspects. *Procedia Engineering*. 122, 95-103.

Kamukama, N. and Sulait, T. (2017). Intellectual capital and competitive advantage in Uganda's microfinance industry. *African Journal of Economic and Management Studies*, 8(4), 498-514.

Khan, M. and R. L. Watts. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics*, 48 (2–3), 132–150.

Kim, J.B. and Zhang, L. (2016). Accounting Conservatism and Stock Price Crash Risk: Firm-Level Evidence. *Contemporary Accounting Research*, 33, 412-441.

Kitts, B. et al., (2001). Intellectual capital: from intangible assets to fitness landscapes. *Expert Systems with Applications*. 20, 35-50.

Lee, C. C. and Lin, C. K. (2019). The major determinants of influencing the operating performance from the perspective of intellectual capital: Evidence on CPA industry. *Asia Pacific Management Review*, 24 (2), 124-139.

Lentjushenkova, O. and Lapina, I. (2014). The classification of the intellectual capital investments of an enterprise. *Procedia - Social and Behavioral Sciences*. 156, 53-57.

Li, X. (2019). Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test. *Finance Research Letters*, 101395

Liao, Q. and Ouyang, B. (2017). Organized labor, corporate governance, and stock price crash risk. *Review of Accounting and Finance*, 16 (4), 424-443

Lin, Y. M. et al., (2015). The information content of unexpected stock returns: Evidence from intellectual capital. *International Review of Economics & Finance*. 37, 208-225.

Liu, C. H. and Jiang, J. F. (2020). Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels. *Journal of Hospitality and Tourism Management*. 43, 139 – 148.

Longo, M. and Mura, M. (2011). The effect of intellectual capital on employees' satisfaction and retention. *Information & Management*. 48 (7), 278-287.

Martani, D. et al., (2009). The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return. *Chinese Business Review*, 8(6), 44-55.

Martinez, J. B. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*. 112, 261-270.

McDowell, W. C. et al., (2018). Building small firm performance through intellectual capital development: Exploring innovation as the "black box". *Journal of Business Research*. 88, 321-327.

Mørch, O. et al., (2017). Maximizing the rate of return on the capital employed in shipping capacity renewal. *Omega*. 67, 42-53.

Mustapha, M. and Abdelheq, L. (2018). The Role of Investment in Intellectual Capital in improving organizational performance considering knowledge management: The case study of wireless communication sector in Algeria. *Arab Economic and Business Journal*. 13 (1), 73-91.

Oppong, G. K. and Pattanayak, J. K. (2019). Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India. *Borsa Istanbul Review*, 19 (3), 219-227.

Örnek, A. S. and Ayas, S. (2015). The Relationship between Intellectual Capital, Innovative Work Behavior and Business Performance Reflection. *Procedia - Social and Behavioral Sciences*, 195, 1387-1395.

Ozkan, N. et al., (2017). Intellectual capital and financial performance: A study of the Turkish Banking Sector. *Borsa Istanbul Review*. 17 (3), 190-198.

Pulic, A. (1998). Measuring the Performance of Intellectual Potential in Knowledge Economy, paper presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential, McMaster University, Hamilton.

Sardo, F. et al., (2018). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management*. 75, 67-74.

Secundo, G. et al., (2020). Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. *Technological Forecasting & Social Change*, 153, 119917.

Sharabati, A. A. A. et al., (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Management Decision*, 48(1), 105-131.

Song, L. (2015). Accounting disclosure, stock price synchronicity and stock crash risk: An emerging-market perspective. *International Journal of Accounting and Information Management*, 23(4), 349-363.

Tan, H. P. et al., (2008). The evolving research on intellectual capital. *Journal of Intellectual Capital*, 9(4), 585-608.

Zhou, Z. and Pan, D. (2018). Can Corporate Innovation Restrain the Stock Price Crash Risk?. *Journal of Financial Risk Management*, 7(1), 39 - 54.

Order #774763 - Manuscript proofread_TRACKED_REVISED

Does Intellectual Capital Have Any Influence on Stock Price Crash Risk?

ABSTRACT

Purpose
This study[.1] aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach
This study empirically analyzes the impact of the efficiency of intellectual capital on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange [.2]during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study. [.3]

Findings
Our findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated its[.4] influence on stock price crash risk so that the aspects of intellectual capital are obscured.

Originality / value
This research provides new information that intellectual capital disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Key word: Intellectual capital, stock price crash risk, firm performance, disclosure, social capital, corporate governance convergence

~~6.~~7. Introduction

Companies nowadays are being replaced with a knowledge-based, fast-changing, and technology-intensive economy, including in Indonesia. Most companies use technology to enhance the efficiency of company activities and depress expenses incurred. In this modern economy, for many firms, the most important and essential asset is intellectual capital (IC), in sharp contrast to times when physical capital was the power of companies. Previous studies have shown that company value and capability are often based on the intangible IC that it possesses

(Berzkalne and Zelgalve, 2014; Huang and Huang, 2020[.5]). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress, such as increasing brand equity and social networking. In addition, IC provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we propose that the application of IC in the company is expected to reduce risk on stock price crashes.[.6]

The purpose of this study is to find out the relationship between efficiency of IC and stock price crash risk in the future by using firm performance as the mediating variable. Clarke et al. (2011) stated that IC has a positive influence on firm performance, which is characterized by three components of IC efficiency (ICE): human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE). These factors could be a good indicator for company shareholders because a company with good ICE indicates that they have been using their resources efficiently. Several studies have proven that IC reflects good competence, skills, and knowledge, which can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, the company can disclose information in accordance with the needs of the shareholders.

Based on a Taiwanese study by Chen et al. (2005), this study uses the quantitative measure, value added intellectual coefficient (VAIC), developed by Pulic (1998) as a measure of ICE. Data is collected for firms listed on the Indonesia Stock Exchange (IDX) in 2018. We used path analysis to determine whether there is any relation between IC, firm performance, and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no research on the relationship between IC and stock price crash risk. This study contributes to the literature by bridging this gap in the knowledge, that is, the relationship between IC and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discusses the findings. Section 6 concludes the paper.

~~7.~~8. Literature Review and Hypothesis

a. Strengths and Weaknesses of Measuring Intellectual Capital

Basically, IC is measured by various elements such as human capital, physical capital, structural capital, social capital, and relational capital. However, previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) measured IC with three components, namely human capital, physical capital, and structural capital; however, only human capital is positively related to all the three efficiencies (technical, allocative, and cost). Castillo et al. (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes and relationships with customers. On the issue of environmental protection, Yong et al. (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff et al. (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although IC possesses weaknesses, its advantages have been demonstrated in several previous studies[.7]. Barrena-Martínez et al. (2020) proved that the three components of IC (relational capital, human capital, and structural capital) positively affect open innovation performance. Salvi et al. (2020) suggested a significantly positive relationship between all three components of IC [.8]and firm value, generating multiple implications for reporting entities, investors, regulators, and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing the IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza et al. (2020) indicated the contribution of green IC to be an intangible resource for organizations in achieving sustainable performance, providing a competitive advantage for future researchers[.9]. Dubic et al. (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership, meaning that human capital has an important role in business innovation. This study will explore the efficiency of IC using three measures (human capital, structural capital, and capital employed).

b. The Determinant of Information Efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the

uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in corporate share repurchase decisions, while the enactment of the regulations has a significant effect on firms undertaking share repurchase programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also play an important role in controlling stock prices (He and Fang, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility, macroeconomic events, financial transparency, and government regulations, play a greater role in controlling the risk of stock price crashes, while IC does not play an important role in controlling stock prices.

Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences a higher crash risk, which is attenuated by lower switching costs and accentuated when the degree of information asymmetry is high.[.10] Another study shows that Chinese investor sentiment also affects stock price volatility (Li, 2019). Likewise, Ma et al. (2020) suggest that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies indicate that economic policy, investor sentiment, and audit quality have a significant effect on the risk of stock price crashes.

c. Intellectual Capital Efficiency

IC represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that ICE can improve the performance of companies (see e.g., Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are quite interested in buying shares when the company has

implemented ICE. Lin et al. (2015) and Ozkan et al. (2017) show that the greater the ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which, if invested efficiently, can strengthen the company's position, helping it gain competitive advantage. This means that HCE represents a selection of superior IC to be employed in the company's business. Meanwhile, Asiaei et al. (2018) have proven that there is a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, companies that have a higher HCE are more likely to have a higher return on equity (ROE), a higher ROA, a higher ROIC[.11], and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize the overall business performance. IC plays a central role in determining the structural capital model used in companies. Gogan et al. (2015) posit that determining the right model in structural capital is essential to obtain a competitive advantage in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes; it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital employed, meaning that CEE represents IC, which can perform accurate calculations in capital investment in order to obtain optimal returns. Mørch et al. (2017) explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and the financial performance of investments. Thus, ICE plays an important role in investment decisions.

d. Intellectual Capital Efficiency Measurement Model on Stock Price Risk

Basically, the efficiency of ICE plays a role in the application of HCE, SCE, and CEE. This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in the knowledge

economy developed by Pulic (1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by Chen et al. (2017). ICE is calculated using three components, namely value-added human capital efficiency (VAHU), value-added structural capital (STVA), and value-added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the methods section.

Several studies have used this model, which shows mixed results as well. Hejazi et al. (2016) found that increasing IC should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, and structural capital on competitive advantage. Another study [.12]shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The three[.13] studies indicate that innovation and creation play a dominant role in describing the latent constructs of IC. Based on the discussion above, hypothesis (H1) is:

H1a: Human capital efficiency is positively related to firm performance

H1b: Structural capital efficiency is positively related to firm performance

H1c: Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better ICE. Furthermore, Song (2015) has shown that the management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of IC. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents, while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare is also a factor that contributes to the risk of stock price crashes. Further analysis shows that a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and that there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between IC as a whole and the market capitalization value of a company. Some of these studies imply that IC can

reduce the risk of stock investment. Based on the above discussion, hypothesis (H2) is as follows:

H2a: Human capital efficiency is negatively related to stock price crash risk

H2b: Structural capital efficiency is negatively related to stock price crash risk

H2c: Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) explained that the management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. This means that the informativeness of stock prices indicates that the company's performance is better. Martani et al. (2009) mentioned that a company's financial performance is shown by the profitability ratio, and the market value ratio significantly influences returns in the company. Based on this, the following hypothesis (H3) can be formulated as:

H3: Firm performance is negatively related to stock price crash risk

IC owned by the company is expected to create added value so that it can improve company performance. Good firm performance is an indicator that will be considered by investors in making investment decisions. Cenciarelli et al. (2018) show that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on the research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that develop IC require capital for R&D, so they are faced with financing constraints. This means that ICE supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. Companies in areas of high social trust tend to hide bad news. The management tends to disclose more related information to acquire investors. Thus, ICE is needed as a corporate strategy to increase information transparency and financial performance, which will result in increasing investor confidence. Based on the discussion above, we can hypothesize (H4) that:

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

~~8.~~9. Research Design

a. Sample

This study uses companies from various sectors as research objects and sample for the research. The sample was collected from IDX's [.14]annual report data for 2018. We also obtained weekly stock data from Yahoo Finance. We then used the following selection criteria: First, similar to Khan and Watts (2009), we required that total assets and book values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent Variables

Chen et al. (2005) argue that VAIC and its three components, HCE, SCE, and CEE, represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. This can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC, we need value added (VA) to be calculated. In its simplest form, VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs, which are considered to be a value-creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005). VA can be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is cost of goods sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is employee wages and salaries.

iv. Human Capital Efficiency

Human capital factors consist of skills, knowledge, productivity, competence, and all aspects that pertain to an employee in the work place. HCE can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula VAHU. VAHU calculations can be seen in Formula 3.

VAHU = VA/HC .....Formula 3

v. Structural Capital Efficiency

Structural capital is an element in IC and consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SCE as in Formula 4. Meanwhile, SCE is calculated using STVA as in Formula 5.

SC = VA – HC .....Formula 4

STVA = SC / VA .....Formula 5

SCE is the dollar of SC within the firm, for every dollar of VA, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, a logical inconsistency would remain (Pulic, 1998).

vi. Capital Employed Efficiency

CEE is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on CE. We could calculate CE as the total assets minus intangible assets and CEE is defined as VACA. VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent Variable

The risk of stock price crash is the risk of a significant stock price decline after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017), which can be seen in Formula 7.

$$\text{NCSKEW} = \frac{-[n(n-1)3/2\ \sum_{T=1}^{n}(w_{i,T,t-}\bar{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t-}\bar{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\bar{w}_{i,t}$ is the average weekly return of the company's specific stock for year t and n is the number

of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening Variable

This study uses firm performance as the intervening variable. We use ROE to analyze firm performance. We calculate this ratio with Formula 8.

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \quad \text{..... Formula 8}$$

e. Empirical Models

This study uses path analysis that produce two model regressions to test our hypotheses.

Model I

$$ROE = \alpha + \beta 1\, VAHU + \beta 2\, STVA + \beta 3\, VACA + \beta 4\, SIZE - \mu$$

Model II

$$\text{NCSKEW} = \alpha - \beta 1\, STVA - \beta 2\, VACA - \beta 3\, AHU + \beta 4\, SIZE - \beta 5\, ROE - \mu$$

Notes: ROE is the ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy for stock price crash risk, VAHU is value-added human capital, STVA is value-added structural capital, VACA is value-added capital employed, and SIZE is firm size as the control variable in this study.

~~9.~~10. Results

a. Normality Test

Table 1 shows the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. According to the basis of decision making in the Kolmogorov-Smirnov normality[.15] test above, it can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for the data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924

	Absolute	0.059
Most Extreme Differences	Positive	0.037
	Negative	-0.059
Test Statistic		0.059
Asymp. Sig. (2-tailed)		0.200[c,d]

Notes:
a. Test distribution is Normal
b. Calculated from data
c. Lilliefors Significance Correction
d. This is a lower bound of the true significance

b. Multicollinearity Test

The basis for decision making from the multicollinearity test is the value of tolerance and VIF[.16]. Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While the VIF value for each variable is less than 10. Then, according to the basis for the multicollinearity test decision making, we can conclude that there are no symptoms of multicollinearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

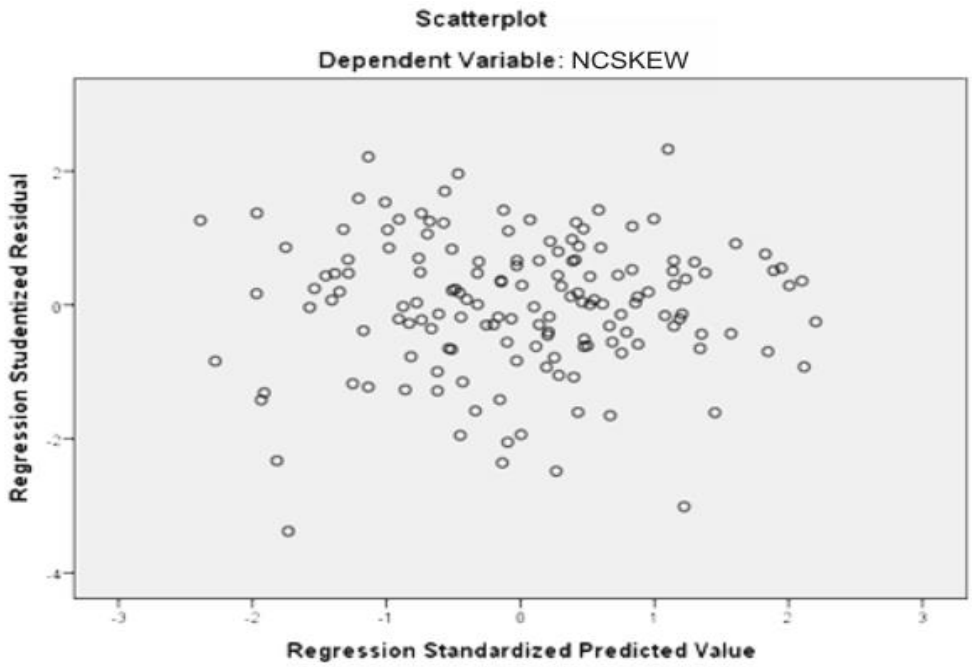
c. Heteroskedasticity Test

Based on Figure 1, we know that data dots spread above and below or around the number 0. We can then see that the dots are not just clustered above or below. The distribution of data points does not form a wavy pattern, widening then narrowing and then widening again. We can also see that the dots do not make a certain pattern. According to the analyses, we can conclude that there is no heteroscedasticity problem; so a good and ideal regression model can be fulfilled.

d. Path Analysis

In Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0.000, respectively. While, based on Table 2, there is no significant relationship between VAHU and ROE at the 1% significance level; so we can conclude that H1(a) is rejected. Based on a beta test, VACA is the variable that most influences changes in ROE. The value of Sig. F-statistics shows that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence ROE. This result is a strong indicator that there is a relationship between IC and firm performance, thus supporting H1(b) and H1(c). That is, if a firm can use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In Table 3, Model 2 shows that all of the components of IC do not have any significant relationship with stock price crash risk at the 1% significance level. From Table 2[.17] we also know that ROE does not have any significant influence on stock price crash risk. Furthermore, we use Model 1 and Model 2 for path analysis. After acquiring the numbers from Table 2, we calculated the indirect effect by multiplying the effect of the IC component with ROE and then ROE with stock price crash risk. Based on Table 2 and the path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0.000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis, if the indirect effect is greater than the direct effect, then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship with stock price crash risk either directly or indirectly through firm performance.

Table 3. Results of the Regression Model

	Dependent Variable: ROE		Dependent Variable: NCSKEW	
	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number within parentheses is the standard error. *, **, and *** indicate significance at the levels 1%, 5%, and 10%, respectively.

~~10.~~11. Discussion

Several studies show that IC plays an important role in improving sustainable company performance and business progress (see e.g., Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the IDX. In addition, other results show that the company's performance, as represented by ROE, also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, although more prevalent in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that a company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment toward stock prices seems to dominate its [.18]influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors can also influence premium value in the United States stock market (Teti el al., 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) reveal that the fluctuation of stock prices is more sensitive to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various studies, we believe that investors' optimistic (pessimistic) sentiment toward stock price volatility dominates its [.19]influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

~~11.~~12. Conclusions and Implications

a. Conclusions

This study examines the effect of IC components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX and stock price data published by Yahoo Finance. IC variables are measured by the VAIC method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data was processed using the path analysis method to determine the direct effect and indirect effect from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance; however, partially, VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three IC variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. We conclude that investor sentiment has dominated its[.20] influence on stock price crash risk so that the IC aspect has become obscured.

b. Implications

So far, research on IC has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that IC disclosure, which is proxied by the company's financial performance, becomes obscured, while investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In future research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Basically, the ability and knowledge for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce idiosyncratic volatility, which is the best predictor of stock returns and is proven to have a positive impact on investors' heterogeneous beliefs (Kongsilp and Mateus, 2017; He et al., 2020). Zhan (2019) argues that there was a positive relationship between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical application, IC represents the knowledge and ability for preparing a stock portfolio that contains company-specific information, which is needed to minimize stock price crash risk.

Order #774763 - Manuscript proofread_CLEAN_REVISED

Does Intellectual Capital Have Any Influence on Stock Price Crash Risk?

ABSTRACT

Purpose
This study[.21] aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach
This study empirically analyzes the impact of the efficiency of intellectual capital on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange [.22]during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study. [.23]

Findings
Our findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated its[.24] influence on stock price crash risk so that the aspects of intellectual capital are obscured.

Originality / value
This research provides new information that intellectual capital disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Key word: Intellectual capital, stock price crash risk, firm performance, disclosure, social capital, corporate governance convergence

1. Introduction

Companies nowadays are being replaced with a knowledge-based, fast-changing, and technology-intensive economy, including in Indonesia. Most companies use technology to enhance the efficiency of company activities and depress expenses incurred. In this modern economy, for many firms, the most important and essential asset is intellectual capital (IC), in sharp contrast to times when physical capital was the power of companies. Previous studies have shown that company value and capability are often based on the intangible IC that it possesses

(Berzkalne and Zelgalve, 2014; Huang and Huang, 2020[.25]). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress, such as increasing brand equity and social networking. In addition, IC provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we propose that the application of IC in the company is expected to reduce risk on stock price crashes.[.26]

The purpose of this study is to find out the relationship between efficiency of IC and stock price crash risk in the future by using firm performance as the mediating variable. Clarke et al. (2011) stated that IC has a positive influence on firm performance, which is characterized by three components of IC efficiency (ICE): human capital efficiency (HCE), structural capital efficiency (SCE), and capital employed efficiency (CEE). These factors could be a good indicator for company shareholders because a company with good ICE indicates that they have been using their resources efficiently. Several studies have proven that IC reflects good competence, skills, and knowledge, which can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, the company can disclose information in accordance with the needs of the shareholders.

Based on a Taiwanese study by Chen et al. (2005), this study uses the quantitative measure, value added intellectual coefficient (VAIC), developed by Pulic (1998) as a measure of ICE. Data is collected for firms listed on the Indonesia Stock Exchange (IDX) in 2018. We used path analysis to determine whether there is any relation between IC, firm performance, and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no research on the relationship between IC and stock price crash risk. This study contributes to the literature by bridging this gap in the knowledge, that is, the relationship between IC and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discusses the findings. Section 6 concludes the paper.

2. Literature Review and Hypothesis

a. Strengths and Weaknesses of Measuring Intellectual Capital

Basically, IC is measured by various elements such as human capital, physical capital, structural capital, social capital, and relational capital. However, previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) measured IC with three components, namely human capital, physical capital, and structural capital; however, only human capital is positively related to all the three efficiencies (technical, allocative, and cost). Castillo et al. (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes and relationships with customers. On the issue of environmental protection, Yong et al. (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff et al. (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although IC possesses weaknesses, its advantages have been demonstrated in several previous studies[.27]. Barrena-Martínez et al. (2020) proved that the three components of IC (relational capital, human capital, and structural capital) positively affect open innovation performance. Salvi et al. (2020) suggested a significantly positive relationship between all three components of IC [.28]and firm value, generating multiple implications for reporting entities, investors, regulators, and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing the IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza et al. (2020) indicated the contribution of green IC to be an intangible resource for organizations in achieving sustainable performance, providing a competitive advantage for future researchers[.29]. Dubic et al. (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership, meaning that human capital has an important role in business innovation. This study will explore the efficiency of IC using three measures (human capital, structural capital, and capital employed).

b. The Determinant of Information Efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the

uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in corporate share repurchase decisions, while the enactment of the regulations has a significant effect on firms undertaking share repurchase programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also play an important role in controlling stock prices (He and Fang, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility, macroeconomic events, financial transparency, and government regulations, play a greater role in controlling the risk of stock price crashes, while IC does not play an important role in controlling stock prices.

Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences a higher crash risk, which is attenuated by lower switching costs and accentuated when the degree of information asymmetry is high.[.30] Another study shows that Chinese investor sentiment also affects stock price volatility (Li, 2019). Likewise, Ma et al. (2020) suggest that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies indicate that economic policy, investor sentiment, and audit quality have a significant effect on the risk of stock price crashes.

c. Intellectual Capital Efficiency

IC represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that ICE can improve the performance of companies (see e.g., Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are quite interested in buying shares when the company has

implemented ICE. Lin et al. (2015) and Ozkan et al. (2017) show that the greater the ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which, if invested efficiently, can strengthen the company's position, helping it gain competitive advantage. This means that HCE represents a selection of superior IC to be employed in the company's business. Meanwhile, Asiaei et al. (2018) have proven that there is a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, companies that have a higher HCE are more likely to have a higher return on equity (ROE), a higher ROA, a higher ROIC[.31], and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize the overall business performance. IC plays a central role in determining the structural capital model used in companies. Gogan et al. (2015) posit that determining the right model in structural capital is essential to obtain a competitive advantage in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes; it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital employed, meaning that CEE represents IC, which can perform accurate calculations in capital investment in order to obtain optimal returns. Mørch et al. (2017) explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and the financial performance of investments. Thus, ICE plays an important role in investment decisions.

d. Intellectual Capital Efficiency Measurement Model on Stock Price Risk

Basically, the efficiency of ICE plays a role in the application of HCE, SCE, and CEE. This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in the knowledge

economy developed by Pulic (1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by Chen et al. (2017). ICE is calculated using three components, namely value-added human capital efficiency (VAHU), value-added structural capital (STVA), and value-added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the methods section.

Several studies have used this model, which shows mixed results as well. Hejazi et al. (2016) found that increasing IC should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, and structural capital on competitive advantage. Another study [.32]shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The three[.33] studies indicate that innovation and creation play a dominant role in describing the latent constructs of IC. Based on the discussion above, hypothesis (H1) is:

H1a: Human capital efficiency is positively related to firm performance

H1b: Structural capital efficiency is positively related to firm performance

H1c: Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better ICE. Furthermore, Song (2015) has shown that the management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of IC. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents, while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare is also a factor that contributes to the risk of stock price crashes. Further analysis shows that a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and that there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between IC as a whole and the market capitalization value of a company. Some of these studies imply that IC can

reduce the risk of stock investment. Based on the above discussion, hypothesis (H2) is as follows:

H2a: Human capital efficiency is negatively related to stock price crash risk

H2b: Structural capital efficiency is negatively related to stock price crash risk

H2c: Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) explained that the management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. This means that the informativeness of stock prices indicates that the company's performance is better. Martani et al. (2009) mentioned that a company's financial performance is shown by the profitability ratio, and the market value ratio significantly influences returns in the company. Based on this, the following hypothesis (H3) can be formulated as:

H3: Firm performance is negatively related to stock price crash risk

IC owned by the company is expected to create added value so that it can improve company performance. Good firm performance is an indicator that will be considered by investors in making investment decisions. Cenciarelli et al. (2018) show that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on the research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that develop IC require capital for R&D, so they are faced with financing constraints. This means that ICE supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. Companies in areas of high social trust tend to hide bad news. The management tends to disclose more related information to acquire investors. Thus, ICE is needed as a corporate strategy to increase information transparency and financial performance, which will result in increasing investor confidence. Based on the discussion above, we can hypothesize (H4) that:

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

3. Research Design

a. Sample

This study uses companies from various sectors as research objects and sample for the research. The sample was collected from IDX's [.34]annual report data for 2018. We also obtained weekly stock data from Yahoo Finance. We then used the following selection criteria: First, similar to Khan and Watts (2009), we required that total assets and book values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent Variables

Chen et al. (2005) argue that VAIC and its three components, HCE, SCE, and CEE, represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. This can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC, we need value added (VA) to be calculated. In its simplest form, VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs, which are considered to be a value-creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005). VA can be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is cost of goods sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is employee wages and salaries.

i. Human Capital Efficiency

Human capital factors consist of skills, knowledge, productivity, competence, and all aspects that pertain to an employee in the work place. HCE can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula VAHU. VAHU calculations can be seen in Formula 3.

VAHU = VA/HC .....Formula 3

ii. Structural Capital Efficiency

Structural capital is an element in IC and consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SCE as in Formula 4. Meanwhile, SCE is calculated using STVA as in Formula 5.

SC = VA – HC .....Formula 4

STVA = SC / VA .....Formula 5

SCE is the dollar of SC within the firm, for every dollar of VA, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, a logical inconsistency would remain (Pulic, 1998).

iii. Capital Employed Efficiency

CEE is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on CE. We could calculate CE as the total assets minus intangible assets and CEE is defined as VACA. VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent Variable

The risk of stock price crash is the risk of a significant stock price decline after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017), which can be seen in Formula 7.

$$\text{NCSKEW} = \frac{-[n(n-1)3/2\ \sum_{T=1}^{n}(w_{i,T,t-}\bar{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t-}\bar{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\bar{w}$, t is the average weekly return of the company's specific stock for year t and n is the number

of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening Variable

This study uses firm performance as the intervening variable. We use ROE to analyze firm performance. We calculate this ratio with Formula 8.

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \quad \text{..... Formula 8}$$

e. Empirical Models

This study uses path analysis that produce two model regressions to test our hypotheses.

Model I

$$ROE = \alpha + \beta 1\, VAHU + \beta 2\, STVA + \beta 3\, VACA + \beta 4\, SIZE - \mu$$

Model II

$$\text{NCSKEW} = \alpha - \beta 1\, STVA - \beta 2\, VACA - \beta 3\, AHU + \beta 4\, SIZE - \beta 5\, ROE - \mu$$

Notes: ROE is the ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy for stock price crash risk, VAHU is value-added human capital, STVA is value-added structural capital, VACA is value-added capital employed, and SIZE is firm size as the control variable in this study.

4. Results

a. Normality Test

Table 1 shows the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. According to the basis of decision making in the Kolmogorov-Smirnov normality[.35] test above, it can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for the data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924

	Absolute	0.059
Most Extreme Differences	Positive	0.037
	Negative	-0.059
Test Statistic		0.059
Asymp. Sig. (2-tailed)		0.200[c,d]

Notes:
a. Test distribution is Normal
b. Calculated from data
c. Lilliefors Significance Correction
d. This is a lower bound of the true significance

b. Multicollinearity Test

The basis for decision making from the multicollinearity test is the value of tolerance and VIF[.36]. Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While the VIF value for each variable is less than 10. Then, according to the basis for the multicollinearity test decision making, we can conclude that there are no symptoms of multicollinearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

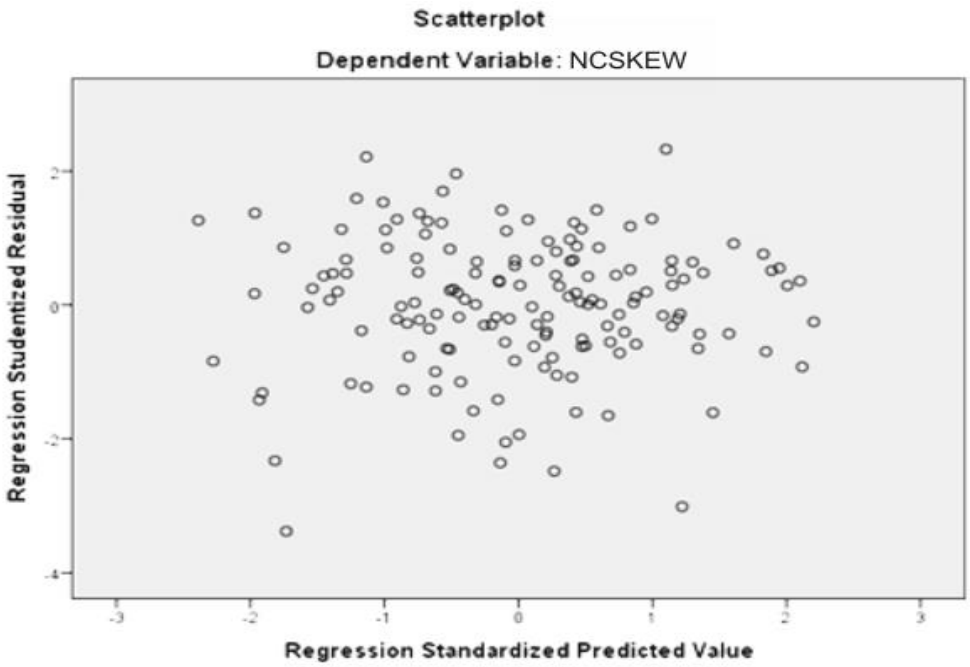
c. Heteroskedasticity Test

Based on Figure 1, we know that data dots spread above and below or around the number 0. We can then see that the dots are not just clustered above or below. The distribution of data points does not form a wavy pattern, widening then narrowing and then widening again. We can also see that the dots do not make a certain pattern. According to the analyses, we can conclude that there is no heteroscedasticity problem; so a good and ideal regression model can be fulfilled.

d. Path Analysis

In Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0.000, respectively. While, based on Table 2, there is no significant relationship between VAHU and ROE at the 1% significance level; so we can conclude that H1(a) is rejected. Based on a beta test, VACA is the variable that most influences changes in ROE. The value of Sig. F-statistics shows that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence ROE. This result is a strong indicator that there is a relationship between IC and firm performance, thus supporting H1(b) and H1(c). That is, if a firm can use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In Table 3, Model 2 shows that all of the components of IC do not have any significant relationship with stock price crash risk at the 1% significance level. From Table 2[.37] we also know that ROE does not have any significant influence on stock price crash risk. Furthermore, we use Model 1 and Model 2 for path analysis. After acquiring the numbers from Table 2, we calculated the indirect effect by multiplying the effect of the IC component with ROE and then ROE with stock price crash risk. Based on Table 2 and the path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0.000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis, if the indirect effect is greater than the direct effect, then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship with stock price crash risk either directly or indirectly through firm performance.

Table 3. Results of the Regression Model

	Dependent Variable: ROE		Dependent Variable: NCSKEW	
	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number within parentheses is the standard error. *, **, and *** indicate significance at the levels 1%, 5%, and 10%, respectively.

5. Discussion

Several studies show that IC plays an important role in improving sustainable company performance and business progress (see e.g., Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the IDX. In addition, other results show that the company's performance, as represented by ROE, also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, although more prevalent in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that a company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment toward stock prices seems to dominate its [.38]influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors can also influence premium value in the United States stock market (Teti el al., 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) reveal that the fluctuation of stock prices is more sensitive to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various studies, we believe that investors' optimistic (pessimistic) sentiment toward stock price volatility dominates its [.39]influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

6. Conclusions and Implications

a. Conclusions

This study examines the effect of IC components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX and stock price data published by Yahoo Finance. IC variables are measured by the VAIC method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data was processed using the path analysis method to determine the direct effect and indirect effect from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance; however, partially, VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three IC variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. We conclude that investor sentiment has dominated its[.40] influence on stock price crash risk so that the IC aspect has become obscured.

b. Implications

So far, research on IC has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that IC disclosure, which is proxied by the company's financial performance, becomes obscured, while investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In future research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Basically, the ability and knowledge for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce idiosyncratic volatility, which is the best predictor of stock returns and is proven to have a positive impact on investors' heterogeneous beliefs (Kongsilp and Mateus, 2017; He et al., 2020). Zhan (2019) argues that there was a positive relationship between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical application, IC represents the knowledge and ability for preparing a stock portfolio that contains company-specific information, which is needed to minimize stock price crash risk.

Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

Journal:	*Journal of Intellectual Capital*
Manuscript ID	JIC-09-2020-0306.R1
Manuscript Type:	Research Paper
Keywords:	Intellectual capital, stock price crash risk, firm performance, Disclosure, investor sentiment, volatility
Abstract:	

MANUSCRIPT DETAILS

: Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

:paper aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.study empirically analyzes the impact of efficiency of intellectual capital on stock price crash risk using 152 sample of companies listed on Indonesia Stock Exchange (IDX) in the period of 2018. To test the research hypotheses, regression analysis and path analysis are applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated its influence on stock price crash risk, so that the aspects of intellectual capital are obscured._RESEARCH_LIMITATIONS/IMPLICATIONS__(LIMIT_100_WORDS) :No data available._PRACTICAL_IMPLICATIONS__(LIMIT_100_WORDS) :No data available.research provides new information that intellectual capital disclosure in the stock market needs to involve a knowledge of the volatility of stock prices in order to reveal stock price crash risk.

A. RESPONSE TO REVIEWER COMMENTS

Manuscript ID : ID JIC-09-2020-0306

Manuscript Title : Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

Reviewer 1, the first comment

1. The paper contribution is not clear; I suggest specifying the gap that this article aims at facing to.

Responses:

1. We have added an explanation in some parts of the text:
   a. In **Abstract, Originality/Value,** The explanation in this part is as follows:
   "This research provides new information that intellectual capital disclosure in the stock market needs to involve a knowledge of the volatility of stock prices in order to reveal stock price crash risk".
   b. In **part 6, b.Implications,** the explanation in this part is as follows:
   "So far, research on intellectual capital (IC) has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that intellectual capital disclosure, which is proxied by the company's financial performance becomes obscured, while Investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In further research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility".
   Additional scientific sources:
   Dabić, M. et al., (2020). Two decades of the Journal of Intellectual Capital: a bibliometric overview and an agenda for future research. *Journal of Intellectual Capital*, ahead-of-print.

Reviewer 1, the second comment

2. The literature review should be strengthened including some other relevant and recent studies about intellectual capital disclosure and value relevance.

Responses:

1. We have added an explanation in the section 2. Literature Review and Hypothesis, a. Strengths and Weaknesses of Measuring Intellectual Capital, Additions to this section are as follows:

   a. The first paragraph:

   "Basically, intellectual capital (IC) is measured by various elements such as human capital, physical capital, structural capital, social capital, and relational capital. However, several previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) has measured IC with three components, namely human capital, physical capital and structural capital, however only human capital is positively related to all the three efficiency (technical, allocative, and cost). Castillo et al. (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes, and the relationships with customers. On the issue of environmental protection, Yong et al. (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff et al. (2019) also revealed that green human capital does not have a positive relationship with business sustainability".

   b. The second paragraph:

   "Although there are various weaknesses of intellectual capital (IC), its advantages have been demonstrated in several previous studies. Barrena-Martínez et al. (2020) proved that the three components of IC (relational capital, human capital, and structural capital) positively affect open innovation (OI) performance. Salvi et al. (2020) suggested a significantly positive relationship between all three components of IC (structural, human, social and relationship) and firm value, generating multiple implications for reporting entities, investors, regulators, and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza et al. (2020) revealed that the contribution of green intellectual capital as an intangible resource for organizations in achieving sustainable performance and a competitive advantage for future researchers. Dubic et al. (2021) revealed that the intellectual agility

of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership. It means that human capital has an important role in business innovation. This study will explore the efficiency of intellectual capital using three measures (Human capital, Structural capital and Capital employed)".

2. We have added an explanation in the section 2. Literature Review and Hypothesis, b.The Determinant of Information Efficiency, Additions to this section are as follows:
   a. The first paragraph

   "Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in the corporate share repurchases decisions, while the enactment of the regulations has a significant effect on firms' undertaking share repurchases programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility,macroeconomic events, financial transparency, and Government regulations are determinants of information efficiency in the stock market".

   b. The second paragraph

   "Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences higher crash risk is attenuated by lower switching costs and is accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment (CIS) also

affects stock price volatility (Li, 2019). Likewise Ma et al. (2020) suggests that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies show that economic policy, investor sentiment, and audit quality are determinants of the efficiency of information in the stock market".

Additional scientific sources:

Yong, J. Y. et al., (2019). Nexus between green intellectual capital and green human resource management. *Journal of Cleaner Production*, 215 (April 2019), 364-374.

Yusoff, Y. M. et al., (2019). Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method. *Journal of Cleaner Production*, 234 (October 2019), 626-637.

Barrena-Martínez, J. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*, 112 (May 2020), 261-270.

Salvi, A. et al., (2020). Intellectual capital disclosure in integrated reports: The effect on firm value. *Technological Forecasting and Social Change*, 160 (November 2020), 120228.

Mahmood, T. and Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160 (November 2020), 120248.

Yusliza, M. Y. et al. (2020). A structural model of the impact of green intellectual capital on sustainable performance. *Journal of Cleaner Production*, 249 (March 2020), 119334.

Dubic, M. et al. (2021). Intellectual agility and innovation in micro and small businesses: The mediating role of entrepreneurial leadership. *Journal of Business Research*, 123 (February 2021), 683-695.

Hu, j. et al., (2020). Corporate board reforms around the world and stock price crash risk. *Journal of Corporate Finance*, 62(2020), 101557.

Moin, A. et al.,(2020). In search of stock repurchases determinants in listed Indonesian firms during regulatory changes. *Journal of Economic Behavior and Organization*, 176 (August 2020), 145-165.

Lee, S. M. et al., (2020). Customer concentration and stock price crash risk. *Journal of Business Research*, 110 (2020), 327–346

Wen, F. et al., (2019). Retail investor attention and stock price crash risk: Evidence from China. *International Review of Financial Analysis*, 65 (2019), 101376.

Luo, Y. and Zang, C. (2020). Economic policy uncertainty and stock price crash risk. *Research in International Business and Finance*, 51 (January 2020), 101112.

Ma, X. et al.,(2020). Corporate customer concentration and stock price crash risk. *Journal of Banking & Finance*, 119 (October 2020), 105903.

Reviewer 1, the third comment

3. Are the methods employed appropriate?: Yes

Responses:

Done.

Reviewer 1, the fourth comment

4. Results are not always clear, I suggest improving the explanation of them and the discussion section

Responses:

We have deleted the 2nd and 3rd paragraphs, while we also provided an additional explanation to replace the two deleted paragraphs.In **part 5, Discussion,** the explanation in this part is as follows:

a. The first paragraph, line 6-13:

"We find that information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, even though it is more present in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that

the company's financial performance appears to be no longer considered in the share purchase decision".

b. The Second paragraph:

"Investors' optimistic (pessimistic) sentiment towards stock prices seems to dominate its influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors is also able to influence the premium value in the United States stock market (Teti el al. 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) revealed that the fluctuation of stock prices is more sensitively to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various previous studies, we believe that investors' optimistic (pessimistic) sentiment towards stock price volatility dominates its influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market".

Additional scientific sources:

Yang, B. et al., (2019). Is informational inefficiency priced in stock markets? A comparison between the U.S. and Chinese cases. *Pacific-Basin Finance Journal*, 55 (June 2019), 222-238.

Bartram, S. M. and. Grinblatt. (2021). Global market inefficiencies. *Journal of Financial Economics,* 139 (1), 234-259.

Al-Yahyaee, K. H. et al., (2020). Why cryptocurrency markets are inefficient: The impact of liquidity and volatility. *The North American Journal of Economics and Finance*, 52 (April 2020), 101168.

Liang, C. et al., (2020). Which sentiment index is more informative to forecast stock market volatility? Evidence from China. *International Review of Financial Analysis*, 71 (October 2020), 101552.

Teti, E. et al., (2019). The relationship between twitter and stock prices. Evidence from the US technology industry. *Technological Forecasting and Social Change*, 149 (December 2019), 119747.

Klemola, A. (2020). Internet search-based investor sentiment and value premium. *Finance Research Letters*, 33 (March 2020), 101224.

Ni, Y. et al., (2019). A novel stock evaluation index based on public opinion analysis. *Procedia Computer Science*, 147 (2019), 581-587.

Chau, F. et al., (2016). Does investor sentiment really matter?. *International Review of Financial Analysis*, 48 (December 2016), 221-232.

Reviewer 1, the fifth comment

5. Research implications are missing

Responses:

We've added an implication section in the text.

a. In **part 6, b. Implications,** the explanation in this part is as follows:

So far, research on intellectual capital (IC) has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that intellectual capital disclosure, which is proxied by the company's financial performance becomes obscured, while Investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In further research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Additional scientific sources:

Dabić, M. et al., (2020). Two decades of the Journal of Intellectual Capital: a bibliometric overview and an agenda for future research. *Journal of Intellectual Capital*, ahead-of-print.

Reviewer 1, the sixth comment

6. The paper needs to be language edited and proofre

Responses:

Done

Reviewer 2, the first comment

1. **The paper is original offering a significant perspective in the analysis of relation between Intellectual Capital (IC) and firm performance with a specific focus on stock price crash risk.**

Responses:

Done

Reviewer 2, the second comment

2. **Literature is well-structured but it is necessary to update the section with more recent papers: in fact, in the last year there have been many relevant studies published on the subject. Below, I propose just a few to integrate into the research framework:**
    - F Wen, L Xu, G Ouyang, G Kou, Retail investor attention and stock price crash risk: Evidence from China, International Review of Financial Analysis, 2019
    - Y Luo, C Zhang, Economic policy uncertainty and stock price crash risk, Research in International Business and Finance, 2020
    - J Hu, S Li, AG Taboada, F Zhang, Corporate board reforms around the world and stock price crash risk, Journal of Corporate Finance, 2020
    - X Ma, W Wang, J Wu, W Zhang, Corporate customer concentration and stock price crash risk, Journal of Banking & Finance, 2020
    - SM Lee, P Jiraporn, H Song, Customer concentration and stock price crash risk, Journal of Business Research, 2020

Responses:

We have added an explanation in the section 2. Literature Review and Hypothesis, b.The Determinant of Information Efficiency, Additions to this section are as follows:

a. The first paragraph

"Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the

uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in the corporate share repurchases decisions, while the enactment of the regulations has a significant effect on firms' undertaking share repurchases programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility,macroeconomic events, financial transparency, and Government regulations are determinants of information efficiency in the stock market".

b. The second paragraph

"Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences higher crash risk is attenuated by lower switching costs and is accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment (CIS) also affects stock price volatility (Li, 2019). Likewise Ma et al. (2020) suggests that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies show that economic policy, investor sentiment, and audit quality are determinants of the efficiency of information in the stock market".

Additional scientific sources:

Yong, J. Y. et al., (2019). Nexus between green intellectual capital and green human resource management. *Journal of Cleaner Production*, 215 (April 2019), 364-374.

Yusoff, Y. M. et al., (2019). Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method. *Journal of Cleaner Production*, 234 (October 2019), 626-637.

Barrena-Martínez, J. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*, 112 (May 2020), 261-270.

Salvi, A. et al., (2020). Intellectual capital disclosure in integrated reports: The effect on firm value. *Technological Forecasting and Social Change*, 160 (November 2020), 120228.

Mahmood, T. and Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160 (November 2020), 120248.

Yusliza, M. Y. et al. (2020). A structural model of the impact of green intellectual capital on sustainable performance. *Journal of Cleaner Production*, 249 (March 2020), 119334.

Dubic, M. et al. (2021). Intellectual agility and innovation in micro and small businesses: The mediating role of entrepreneurial leadership. *Journal of Business Research*, 123 (February 2021), 683-695.

Hu, j. et al., (2020). Corporate board reforms around the world and stock price crash risk. *Journal of Corporate Finance*, 62(2020), 101557.

Moin, A. et al.,(2020). In search of stock repurchases determinants in listed Indonesian firms during regulatory changes. *Journal of Economic Behavior and Organization*, 176 (August 2020), 145-165.

Lee, S. M. et al., (2020). Customer concentration and stock price crash risk. *Journal of Business Research*, 110 (2020), 327–346

Wen, F. et al., (2019). Retail investor attention and stock price crash risk: Evidence from China. *International Review of Financial Analysis*, 65 (2019), 101376.

Luo, Y. and Zang, C. (2020). Economic policy uncertainty and stock price crash risk. *Research in International Business and Finance*, 51 (January 2020), 101112.

Ma, X. et al.,(2020). Corporate customer concentration and stock price crash risk. *Journal of Banking & Finance*, 119 (October 2020), 105903.

Reviewer 2, the third comment

3. **Methodology is coherent with the research design and well-presented in relation to the investigated research hypothesis.**

Responses:

Done

Reviewer 2, the fourth comment

4. **The results and their discussion are well presented, but it is necessary that the section of the discussion is improved, proposing a reading of the results with respect to the hypotheses formulated and the previous evidence of the existing literature.**

Responses:

We have deleted the 2nd and 3rd paragraphs, while we also provided an additional explanation to replace the two deleted paragraphs.In **part 5, Discussion,** the explanation in this part is as follows:

a. The first paragraph, line 6-13:

"Several studies show that intellectual capital (IC) has an important role in improving sustainable company performance and business progress (see e.g. Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the Indonesia Stock Exchange (IDX). In addition, other results show that the company's performance as represented by return on equity (ROE) also has no effect on stock price crash risk. This means, IC only plays a role in controlling company performance and does not play a role in controlling share prices. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, even though it is more present in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is

not balanced with low volatility will weaken information efficiency in the stock market. This indicates that the company's financial performance appears to be no longer considered in the share purchase decision".

b. The Second paragraph:

"Investors' optimistic (pessimistic) sentiment towards stock prices seems to dominate its influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors is also able to influence the premium value in the United States stock market (Teti el al. 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) revealed that the fluctuation of stock prices is more sensitively to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various previous studies, we believe that investors' optimistic (pessimistic) sentiment towards stock price volatility dominates its influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market".

Additional scientific sources:

Yang, B. et al., (2019). Is informational inefficiency priced in stock markets? A comparison between the U.S. and Chinese cases. *Pacific-Basin Finance Journal*, 55 (June 2019), 222-238.

Bartram, S. M. and. Grinblatt. (2021). Global market inefficiencies. *Journal of Financial Economics,* 139 (1), 234-259.

Al-Yahyaee, K. H. et al., (2020). Why cryptocurrency markets are inefficient: The impact of liquidity and volatility. *The North American Journal of Economics and Finance*, 52 (April 2020), 101168.

Liang, C. et al., (2020). Which sentiment index is more informative to forecast stock market volatility? Evidence from China. *International Review of Financial Analysis*, 71 (October 2020), 101552.

Teti, E. et al., (2019). The relationship between twitter and stock prices. Evidence from the US technology industry. Technological Forecasting and Social Change, 149 (December 2019), 119747.

Klemola, A. (2020). Internet search-based investor sentiment and value premium. Finance Research Letters, 33 (March 2020), 101224.

Ni, Y. et al., (2019). A novel stock evaluation index based on public opinion analysis. Procedia Computer Science, 147 (2019), 581-587.

Chau, F. et al., (2016). Does investor sentiment really matter?. International Review of Financial Analysis, 48 (December 2016), 221-232.

Reviewer 2, the fifth comment

5. **The results and their discussion are well presented, but it is necessary that the section of the discussion is improved, proposing a reading of the results with respect to the hypotheses formulated and the previous evidence of the existing literature.**

Responses:

1. We have revised the conclusion section
   a. In **part 6, a. Conclusions, second paragraph,** the explanation in this part is as follows:

"Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance but partially the VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three intellectual capital variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. Finally, we conclude that investor sentiment has dominated its influence on stock price crash risk, so that the IC aspect has become obscured".

2. We've added an implication section in the text.
   a. In **part 6, b. Implications,** the explanation in this part is as follows:

"So far, research on intellectual capital (IC) has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that intellectual capital disclosure, which is proxied by the company's financial performance becomes obscured, while Investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In further research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility".

Additional scientific sources:

Dabić, M. et al., (2020). Two decades of the Journal of Intellectual Capital: a bibliometric overview and an agenda for future research. *Journal of Intellectual Capital*, ahead-of-print.

Revised manuscript:

Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

ABSTRACT

Purpose

This paper aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach

This study empirically analyzes the impact of efficiency of intellectual capital on stock price crash risk using 152 sample of companies listed on Indonesia Stock Exchange (IDX) in the period of 2018. To test the research hypotheses, regression analysis and path analysis are applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.

Findings

~~The results show that intellectual capital positively effects on firm performance but does not give any effect on stock price crash risk. The findings show that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future. More detailed explanation can be seen in the discussion section.~~Our findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated its influence on stock price crash risk, so that the aspects of intellectual capital are obscured.

Originality / value

This research provides new information that intellectual capital disclosure in the stock market needs to involve a knowledge of the volatility of stock prices in order to reveal stock price crash risk.~~This empirical paper deepens the understanding that the output of intellectual capital in business is an increase in company performance, but efficient disclosure of information about performance improvements is also needed in order to minimize negative sentiment from investors.Thus, the ultimate goal of intellectual capital is the efficiency of the company's performance information on the stock market.~~

Key word: Intellectual capital, stock price crash risk, firm performance, disclosure, investor sentiment, volatility

1. Introduction

Companies in modern era nowadays are being replaced with a knowledge–based, fast–changing and technologically intensive economy, including in Indonesia. Most of companies use technology to enhance the efficiency on companies activity and depress expense incurred. In this modern economy, for many firms, the most important asset must be had for each company is intellectual capital. It has been different from previous era that physical capital was the power of the companies. Previous studies have shown that company value and capability are often based on the intangible intellectual capital (IC) that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress such as increasing brand equity and social networking. In addition, IC also provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we would intuitively expect that the application of intellectual capital in the company is able to reduce risk on stock price crashes.

The purpose of this study is to find out relationship between efficiency of intellectual capital and stock price crash risk in the future by using firm performance as mediating variable. Clarke et al. (2011) stated that Intellectual capital (IC) has a positive influence on firm performance which is characterized by three components of IC efficiency, such as: HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). It could be a good signal for companies's shareholder, because a company with good efficiency on IC means that they have been using the resource for its best. Several studies have proven that IC reflects good competence, skills and knowledge that can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, IC represents good competency, skills and knowledge so that the company is able to disclose information in accordance with the needs of shareholders.

Based on a Taiwanese study by Chen et al. (2005) this study uses the quantitative measure, value added intellectual coefficient (VAIC) developed by Pulic (1998) as a measure of IC efficiency. Data is collected for Indonesia Stock Exchange (IDX) listed firms in 2018. We analyze using path analysis for knowing whether there are any relation between intellectual capital, firm performance, and stock price crash risk. Prior VAIC studies have investigated the

direct relationship between IC and performance, but there is no investigate about relationship between IC and Stock Price Crash Risk. Finally, this study contributes to the literature on the relation between Intellectual Capital and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discussions. Section 6 concludes the paper.

2. Literature Review and Hypothesis

a. Strengths and Weaknesses of Measuring Intellectual Capital

Basically, intellectual capital (IC) is measured by various elements such as human capital, physical capital, structural capital, social capital, and relational capital. However, several previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) has measured IC with three components, namely human capital, physical capital and structural capital, however only human capital is positively related to all the three efficiency (technical, allocative, and cost). Castillo et al. (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes, and the relationships with customers. On the issue of environmental protection, Yong et al. (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff et al. (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although there are various weaknesses of intellectual capital (IC), its advantages have been demonstrated in several previous studies. Barrena-Martínez et al. (2020) proved that the three components of IC (relational capital, human capital, and structural capital) positively affect open innovation (OI) performance. Salvi et al. (2020) suggested a significantly positive relationship between all three components of IC (structural, human, social and relationship) and firm value, generating multiple implications for reporting entities, investors, regulators, and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza et al. (2020) revealed that the contribution of green intellectual capital as an intangible resource

for organizations in achieving sustainable performance and a competitive advantage for future researchers. Dubic et al. (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership. It means that human capital has an important role in business innovation. This study will explore the efficiency of intellectual capital using three measures (Human capital, Structural capital and Capital employed).

b. The determinant of Information Efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in the corporate share repurchases decisions, while the enactment of the regulations has a significant effect on firms' undertaking share repurchases programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility,macroeconomic events, financial transparency, and Government regulations play a greater role in controlling the risk of stock price crashes, while IC does not have an important role in controlling stock prices.

. Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences higher crash risk is attenuated by lower switching costs and is accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment (CIS) also affects stock price volatility (Li, 2019). Likewise Ma et al. (2020) suggests that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The fifth studies indicate

that economic policy, investor sentiment, and audit quality have a significant effect on the risk of stock price crashes.

~~a.~~c. Intellectual Capital Efficiency (ICE)

Intellectual Capital (IC) represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that Intellectual Capital efficiency (ICE) can improve the performance of companies (see e.g. Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are very interested in buying shares when the company has implemented ICE. As Lin et al. (2015); Ozkan et al. (2017) shows that the greater of ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which if invested efficiently in can be strengthen the company's position and gains a competitive advantage. It means, the efficiency of human capital (HCE) represents the selection of superior intellectual capital (IC) to be employed in the company's business. Meanwhile, Asiaei et al. (2018) has proven that there was a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, Companies that have a higher HCE are more likely to have a higher ROE, a higher ROA, a higher ROIC and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize overall business performance. Intellectual capital (IC) has a central role in determining the structural capital model used in companies. Gogan et al. (2015) revealed that determining the right model in structural capital needs to be done in order to obtain competitive advantages in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes, it is necessary to

complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital Employed (ROCE). It means, capital employed efficiency (CEE) represents intellectual capital (IC) which is able to perform accurate calculations in capital investment in order to obtain optimal returns. As Mørch et al. (2017) have explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and financial performance of investments. Thus, Intellectual Capital efficiency (ICE) has an important role in investment decisions.

~~b.~~d. Intellectual Capital Efficiency (ICE) Measurement Model on Stock Price Risk

Basically, the efficiency of intellectual capital (ICE) plays a role in the application of HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in knowledge economy developed by (Pulic, 1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by (Chen et al., 2017). ICE is calculated using three components, namely value added human capital efficiency (VAHU), value added structural capital (STVA), and value added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the method section.

Several studies have used this model which shows mixed results as well. Hejazi et al. (2016) found that increasing intellectual capital (IC) should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The three studies indicate that Innovation and creation play a dominant role in describing the latent constructs of IC. Based on discussion above, hypothesis (H1) is given

H1a : Human capital efficiency is positively related to firm performance

H1b : Structural capital efficiency is positively related to firm performance

H1c : Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better intellectual capital efficiency. Furthermore, Song (2015) has shown that management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of intellectual capital. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare also factors that contribute to the risk of stock price crashes. Further analysis shows a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between the intellectual capital as a whole and the market capitalization value of the company. Some of these studies imply that IC can reduce the risk of stock investment. Based on discussion above, hypothesis (H2) is given.

H2a : Human capital efficiency is negatively related to stock price crash risk

H2b : Structural capital efficiency is negatively related to stock price crash risk

H2c : Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) has explained that management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. It means, informativeness of stock prices indicates that the company's performance is better. As Martani et al. (2009) mentioned in their research that the company's financial performance is shown by the profitability ratio and the market value ratio significantly influences returns in the company. Based on this research, the following hypothesis (H3) can be formulated as

H3 : firm performance is negatively related to stock price crash risk

Intellectual capital (IC) owned by the company is expected to create added value so that it can improve company performance. Good firm performance is one of the signals that will

be considered by investors in making investment decisions. Cenciarelli et al. (2018) in her research showed that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on research and development (RandD) conducted by the company. Zhou and Pan (2018) explained that companies that will develop Intellectual capital require capital for RandD so they are faced with financing constraints. It means, IC efficiency supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. There is a fact that companies in areas of high social trust tend to hide bad news. Management tends to disclose more related information to get investor. Thus, intellectual capital efficiency is needed as a corporate strategy to increase information transparency and financial performance which will manifest towards increasing investor confidence. Based on discussion above, we can hypothesize (H4) that

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

3. Research Design

a. Sample

This study uses companies from various sectors as research objects as the sample for the research. The sample collected from Indonesia Stock Exchange (IDX) annual report data in 2018. We also obtain weekly stock data from Yahoo Finance. We then use the following selection criteria: First, similar to Khan and Watts (2009), we require that total assets and book, values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded

incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent variables

Chen et al. (2005) argue that value added intellectual coefficient (VAIC) and its three components, HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency) represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. It can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC we need value added to be calculated. In its simplest form VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs which are considered to be a value creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005), VA could be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is Cost of Goods Sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is wages and salaries for employee.

i. Human Capital Efficiency (HCE)

Human capital (HC) factors consist of skills, knowledge, productivity, competence, and all the things that fit with employee in the work place. Human capital efficiency (HCE) can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula value added human capital efficiency (VAHU). VAHU calculations can be seen in Formula 3.

VAHU = VA/HC .....Formula 3

ii. Structural Capital Efficiency (SCE)

Structural Capital (SC) is one of elements in intellectual capital, it consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SC as in Formula 4. Meanwhile, structural capital efficiency (SCE) is calculated using value added structural capital (STVA) as in Formula 5.

SC = VA – HC .....Formula 4

STVA = SC / VA .....Formula 5

Structural capital efficiency (SCE) is the dollar of SC within the firm, for every dollar of value added, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, the logical inconsistency would remain (Pulic, 1998).

iii. Capital Employed Efficiency (CEE)

Capital Employed Efficiency (CEE) is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on capital employed (CE). We could calculate CE as the total assets minus intangible assets and CEE is defined as value added capital employed (VACA). VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent variable

The risk of stock price crash is the risk of a stock price decline in a significant range after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017) which can be seen in Formula 7.

$$\text{NCSKEW} = \frac{-[n(n-1)3/2\sum_{T=1}^{n}(w_{i,T,t-}\overline{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t-}\overline{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company's specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening variable

This paper uses firm performance as intervening variable. We use ROE to analyze the firm performance. We calculate this ratio with formula 8.

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}}$$ ..... Formula 8

e. Empirical Models

This study uses path analysis that produce two model regression to test our hypotheses.

Model I

$$ROE = \alpha + \beta 1\ VAHU + \beta 2\ STVA + \beta 3\ VACA + \beta 4\ SIZE - \mu$$

Model II

$$\text{NCSKEW} = \alpha - \beta 1\ STVA\ - \beta 2\ VACA - \beta 3\ AHU + \beta 4\ SIZE - \beta 5\ ROE\ - \mu$$

Notes: ROE is ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy of stock price crash risk, VAHU is value added human capital, STVA is structural capital value added, VACA is value added capital employed, and SIZE is firm size as control variable in this study.

4. Results

a. Normality Test

Table 1 show that the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. Then according to the basis of decision making in the Kolmogorov-Smirnov normality test above, the result can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924
Most Extreme Differences	Absolute	0.059
	Positive	0.037
	Negative	-0.059
Test Statistic		0.059
Asymp. Sig. (2-tailed)		0.200[c,d]

Notes:
a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

b. Multicollinearity Test

The basis for decision making from the multicolinearity test is done by looking at the value of Tolerance and VIF. Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While for the VIF value for each variable is less than 10. Then according to the basis for multicoliniearity test decision making, we can conclude that there are no symptoms of multicoliniearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

c. Heteroskedasticity Test

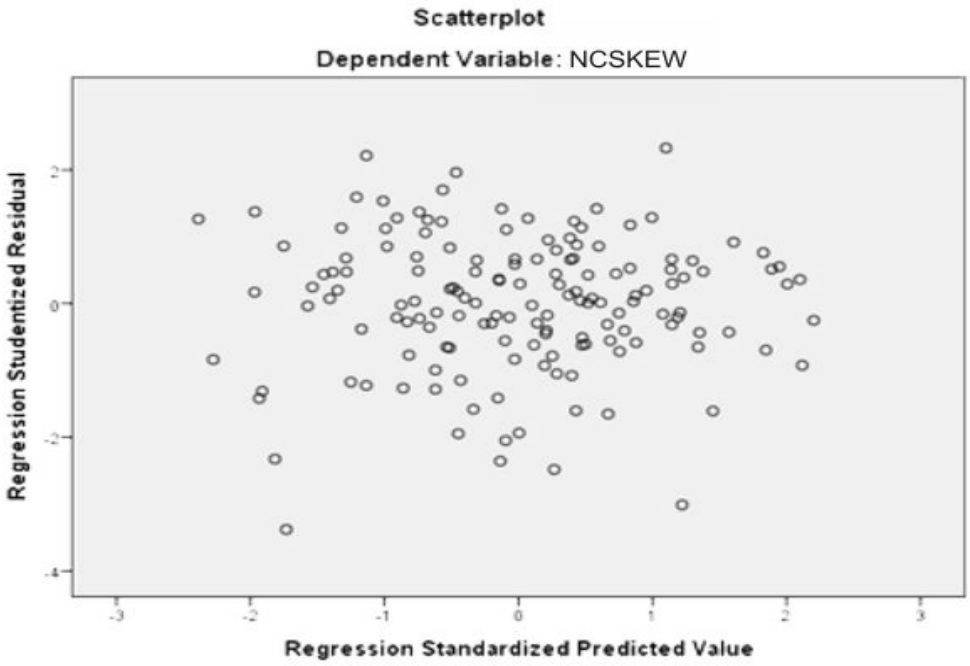
Based on Figure 1, we know that data dots spread above and below or around the number of 0. Then we can see that dots are not clustered just on above or below. The distribution of data points does not form a wavy pattern widened then narrowed and widened again. We also can see that the dots do not make any certain pattern. According from the analyses, we can conclude that there is no heteroscedasticity problem so that a good and ideal regression model can be fulfilled.

d. Path Analysis

In the Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0,000, respectively. While based on the table given that there is no significant relationship between VAHU and ROE at the 1% significance level, so we can conclude that H1(a) is rejected. Based on a beta test, VACA is variable that have the most influences changes in

ROE. The value of Sig. F-statistics show that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence on ROE. This result is a strong indicator that there is a relationship between intellectual capital and firm performance, thus supporting H1(b) and H1(c). That is, if a firm is able to use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In the Table 3, Model 2 shows that all of the components of intellectual capital do not have any significance relationship with stock price crash risk at 1% significance level. From table above we also know that ROE does not have any significance influence on stock price crash risk. Furthermore, we use model 1 and model 2 to do analysis path. After getting the numbers from the table, we calculate the indirect effect by multiplying the effect of the IC component with ROE and ROE with stock price crash risk. Based on the table and path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0,000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis that if the indirect effect is greater than the direct

effect then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship to stock price crash risk either directly or indirectly through firm performance.

Table 3. The Results of Regression Model

	Dependent Variable: ROE		Dependent Variable: NCSKEW	
	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number between parentheses is the standard error. The *, **, and *** signs indicate significance at the levels of 1%, 5%, and 10%.

5. Discussion

Several studies show that intellectual capital (IC) has an important role in improving sustainable company performance and business progress (see e.g. Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the Indonesia Stock Exchange (IDX). In addition, other results show that the company's performance as represented by return on equity (ROE) also has no effect on stock price crash risk. ~~This means, IC only plays a role in controlling company performance and does not play a role in controlling share prices.~~ We find that

information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, even though it is more present in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that the company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment towards stock prices seems to dominate its influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors is also able to influence the premium value in the United States stock market (Teti el al. 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) revealed that the fluctuation of stock prices is more sensitively to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various previous studies, we believe that investors' optimistic (pessimistic) sentiment towards stock price volatility dominates its influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

~~Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). In addition, a study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatilityand macroeconomic events, play a greater role in controlling the risk of falling share prices, while IC does not have an important role in controlling stock prices.~~

~~Studies in China show that regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). andAnother study shows that Chinese investor sentiment (CIS) also affects stock price volatility (Li, 2019). These two studies imply that companies have more interest in stock investment so that anomalies of information~~

~~have the potential to be carried out by companies in order to increase company capital. This resulted in negative sentiment by investors towards the company. Thus, investor sentiment and government regulations that encourage an efficient market on the stock exchange also play a role in stock price volatility. In our opinion, intellectual capital (IC) does not play a role in controlling the risk of falling share prices, while external factors such as macroeconomic events, investor sentiment, and regulations that promote efficient markets have a strong influence on the risk of falling share prices.~~

6. Conclusions and Iimplications

a. Conclusions

This study examines the effect of intellectual capital components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX (Indonesia Stock Exchange) and stock price data published by Yahoo Finance. Intellectual capital variables are measured by the Value added Intellectual capital (VAIC) method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data is processed using the path analysis method to determine the direct effect and indirectly from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance but partially the VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results~~findings~~ state that the three intellectual capital variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. Finally, we conclude that investor sentiment has dominated its influence on stock price crash risk, so that the IC aspect has become obscured.~~The findings show that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future.~~

~~Based on the discussion section, it shows that intellectual capital (IC) does not play a role in controlling of stock price crash risk. Meanwhile, the results of previous research~~

explorations indicate that the occurrence of macroeconomic events, investor sentiment and regulations that promote efficient markets are determining factor for stock price volatility which is connected to the stock price crash risk. In the end, we concluded that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future.

b. Implications

So far, research on intellectual capital (IC) has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that intellectual capital disclosure, which is proxied by the company's financial performance becomes obscured, while Investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In further research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

REFERENCES

Adesina, K. S. (2019). Bank technical, allocative and cost efficiencies in Africa: The influence of intellectual capital. *North American Journal of Economics and Finance*. 48, 419-433.

Andersson, T. et al., (2006). Financialized accounts: Restructuring and return on capital employed in the SandP 500. *Accounting Forum*. 30, 21-41.

Al-Yahyaee, K. H. et al., (2020). Why cryptocurrency markets are inefficient: The impact of liquidity and volatility. *The North American Journal of Economics and Finance*, 52 (April 2020), 101168.

Asiaei, K. and Jusoh, R. (2017). Using a robust performance measurement system to illuminate intellectual capital. *International Journal of Accounting Information Systems*. 26, 1-19.

Asiaei, K. et al., (2018). Intellectual capital and performance measurement systems in Iran. *Journal of Intellectual Capital*, 19(2), 294-320.

Anifowose, M. et al., (2017). Intellectual capital disclosure and corporate market value: does board diversity matter?. *Journal of Accounting in Emerging Economies*, 7 (3), 369-398.

Barrena-Martínez, J. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*, 112 (May 2020), 261-270.

Bartram, S. M. and. Grinblatt. (2021). Global market inefficiencies. *Journal of Financial Economics,* 139 (1), 234-259.

Belcaid, K. and Ghini, A. E. (2019). U.S., European, Chinese economic policy uncertainty and Moroccan stock market volatility. *The Journal of Economic Asymmetries*. 20, e00128.

Bennett, B. et al., (2020). Does the stock market make firms more productive?. *Economics*, 136 (2), 281-306.

Ben-Nasr, H. and Ghouma, H. (2018). Employee welfare and stock price crash risk. *Journal of Corporate Finance*, 48, 700-725.

Berzkalne, I. and Zelgalve, E. (2014). Intellectual capital and company value. *Procedia - Social and Behavioral Sciences*, 110, 887-896.

Boya, C. M. (2019). From efficient markets to adaptive markets: Evidence from the French stock exchange. Research in International Business and Finance, 49 (October 2019), 156-165.

Cao, C. et al., (2016). Social trust and stock price crash risk: Evidence from China. *International Review of Economics and Finance*, 46, 148-165.

Castillo, A. E. et al., (2019). Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises. *Procedia Computer Science*, 160, 567-572.

Cenciarelli, V. G. et al., (2018). Does intellectual capital help predict bankruptcy?. *Journal of* Intellectual Capital, 19(2), 321-337.

Chau, F. et al., (2016). Does investor sentiment really matter?. *International Review of Financial Analysis,* 48 (December 2016), 221-232.

Chen, M.C. et al., (2005). An Empirical Investigation of the Relationship between Intellectual Capital and Firms' Market Value and Financial Performance. *Journal of Intellectual Capital*, 6(2), 159-176.

Chen, C. et al., (2017). Earnings smoothing: Does it exacerbate or constrain stock price crash risk?. *Journal of Corporate Finance*. 42, 36-54.

Ciprian, G. G. et al., (2012). Elaboration of accounting financial report on structural capital. *Procedia - Social and Behavioral Sciences*, 62, 706-710.

Clarke, M. et al., (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12(4), 505-530.

Dabić, M. et al., (2020). Two decades of the Journal of Intellectual Capital: a bibliometric overview and an agenda for future research. *Journal of Intellectual Capital*, ahead-of-print.

Dubic, M. et al. (2021). Intellectual agility and innovation in micro and small businesses: The mediating role of entrepreneurial leadership. *Journal of Business Research*, 123 (February 2021), 683-695.

Dženopoljac, V. et al., (2016). Intellectual capital and financial performance in the Serbian ICT industry. *Journal of Intellectual Capital*, 17(2), 373-396.

Gogan, L. M. et al., (2015). Structural capital - A proposed measurement model. *Procedia Economics and Finance*. 23, 1139 – 1146.

Gogan, L. M. et al., (2016). The Impact of Intellectual Capital on Organizational Performance. *Procedia - Social and Behavioral Sciences*. 211, 194-202.

Hayati, M. et al., (2015). The Effect of Intellectual Capital to Value Relevance of Accounting Information Based on PSAK Convergence of IFRS (Manufacture Firms in Indonesia). *Procedia - Social and Behavioral Sciences*. 211, 999 – 1007.

He, Q. and Fang, C. (2019). Regulatory sanctions and stock pricing efficiency: Evidence from the Chinese stock market. *Pacific-Basin Finance Journal*. 58, 101241.

Hejazi, R. et al., (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management*, 23(4), 259 273.

Hu, j. et al., (2020). Corporate board reforms around the world and stock price crash risk. *Journal of Corporate Finance*, 62(2020), 101557.

Huang, C. J. and Liu, C. J. (2005). Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*. 6 (2), 237-252.

Huang, C. C. and Huang, S. M. (2020). External and internal capabilities and organizational performance: Does intellectual capital matter?. *Asia Pacific Management Review*. 52 (2), 111-120.

Jerzak, K. (2015). The essence of human capital in a building company - selected aspects. *Procedia Engineering*. 122, 95-103.

Kamukama, N. and Sulait, T. (2017). Intellectual capital and competitive advantage in Uganda's

microfinance industry. *African Journal of Economic and Management Studies*, 8(4), 498-514.

Khan, M. and R. L. Watts. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics*, 48 (2–3), 132–150.

Kim, J.B. and Zhang, L. (2016). Accounting Conservatism and Stock Price Crash Risk: Firm-Level Evidence. *Contemporary Accounting Research*, 33, 412-441.

Kitts, B. et al., (2001). Intellectual capital: from intangible assets to fitness landscapes. *Expert Systems with Applications*. 20, 35-50.

Klemola, A. (2020). Internet search-based investor sentiment and value premium. *Finance Research Letters*, 33 (March 2020), 101224.

Lee, S. M. et al., (2020). Customer concentration and stock price crash risk. *Journal of Business Research*, 110 (2020), 327–346.

Lee, C. C. and Lin, C. K. (2019). The major determinants of influencing the operating performance from the perspective of intellectual capital: Evidence on CPA industry. *Asia Pacific Management Review*, 24 (2), 124-139.

Lentjushenkova, O. and Lapina, I. (2014). The classification of the intellectual capital investments of an enterprise. *Procedia - Social and Behavioral Sciences*. 156, 53-57.

Li, X. (2019). Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test. *Finance Research Letters*, 101395

Liao, Q. and Ouyang, B. (2017). Organized labor, corporate governance, and stock price crash risk. *Review of Accounting and Finance*, 16 (4), 424-443

Liang, C. et al., (2020). Which sentiment index is more informative to forecast stock market volatility? Evidence from China. *International Review of Financial Analysis*, 71 (October 2020), 101552.

Lin, Y. M. et al., (2015). The information content of unexpected stock returns: Evidence from intellectual capital. *International Review of Economics and Finance*. 37, 208-225.

Liu, C. H. and Jiang, J. F. (2020). Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels. *Journal of Hospitality and Tourism Management*. 43, 139 – 148.

Longo, M. and Mura, M. (2011). The effect of intellectual capital on employees' satisfaction and retention. *Information and Management*. 48 (7), 278-287.

Luo, Y. and Zang, C. (2020). Economic policy uncertainty and stock price crash risk. *Research in International Business and Finance*, 51 (January 2020), 101112.

Ma, X. et al.,(2020). Corporate customer concentration and stock price crash risk. *Journal of Banking & Finance*, 119 (October 2020), 105903.

Mahmood, T. and Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160 (November 2020), 120248.

Martani, D. et al., (2009). The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return. *Chinese Business Review*, 8(6), 44-55.

Martinez, J. B. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*. 112, 261-270.

McDowell, W. C. et al., (2018). Building small firm performance through intellectual capital development: Exploring innovation as the "black box". *Journal of Business Research*. 88, 321-327.

Moin, A. et al.,(2020). In search of stock repurchases determinants in listed Indonesian firms during regulatory changes. *Journal of Economic Behavior and Organization*, 176 (August 2020), 145-165.

Mørch, O. et al., (2017). Maximizing the rate of return on the capital employed in shipping capacity renewal. *Omega*. 67, 42-53.

Mustapha, M. and Abdelheq, L. (2018). The Role of Investment in Intellectual Capital in improving organizational performance considering knowledge management: The case study of wireless communication sector in Algeria. *Arab Economic and Business Journal*. 13 (1), 73-91.

Ni, Y. et al., (2019). *A novel stock evaluation index based on public opinion analysis*. Procedia Computer Science, 147 (2019), 581-587.

Oppong, G. K. and Pattanayak, J. K. (2019). Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India. *Borsa Istanbul Review*, 19 (3), 219-227.

Örnek, A. S. and Ayas, S. (2015). The Relationship between Intellectual Capital, Innovative Work Behavior and Business Performance Reflection. *Procedia - Social and Behavioral Sciences*, 195, 1387-1395.

Ozkan, N. et al., (2017). Intellectual capital and financial performance: A study of the Turkish Banking Sector. *Borsa Istanbul Review*. 17 (3), 190-198.

Pulic, A. (1998). Measuring the Performance of Intellectual Potential in Knowledge Economy, paper presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential, McMaster University, Hamilton.

Salvi, A. et al., (2020). Intellectual capital disclosure in integrated reports: The effect on firm value. *Technological Forecasting and Social Change*, 160 (November 2020), 120228.

Sardo, F. et al., (2018). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management*. 75, 67-74.

Secundo, G. et al., (2020). Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. *Technological Forecasting and Social Change*, 153, 119917.

Sharabati, A. A. A. et al., (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Management Decision*, 48(1), 105-131.

Song, L. (2015). Accounting disclosure, stock price synchronicity and stock crash risk: An emerging-market perspective. *International Journal of Accounting and Information Management*, 23(4), 349-363.

Tan, H. P. et al., (2008). The evolving research on intellectual capital. *Journal of Intellectual Capital*, 9(4), 585-608.

Teti, E. et al., (2019). The relationship between twitter and stock prices. Evidence from the US technology industry. *Technological Forecasting and Social Change*, 149 (December 2019), 119747.

Wen, F. et al., (2019). Retail investor attention and stock price crash risk: Evidence from China. *International Review of Financial Analysis*, 65 (2019), 101376.

Yang, B. et al., (2019). Is informational inefficiency priced in stock markets? A comparison between the U.S. and Chinese cases. *Pacific-Basin Finance Journal*, 55 (June 2019), 222-238.

Yong, J. Y. et al., (2019). Nexus between green intellectual capital and green human resource management. *Journal of Cleaner Production*, 215 (April 2019), 364-374.

Yusliza, M. Y. et al. (2020). A structural model of the impact of green intellectual capital on sustainable performance. *Journal of Cleaner Production*, 249 (March 2020), 119334.

Yusoff, Y. M. et al., (2019). Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method. *Journal of Cleaner Production*, 234 (October 2019), 626-637.

Zhou, Z. and Pan, D. (2018). Can Corporate Innovation Restrain the Stock Price Crash Risk?. *Journal of Financial Risk Management*, 7(1), 39 - 54.

Manuscript Before Revision:

Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

ABSTRACT

Purpose
This paper aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach
This study empirically analyzes the impact of efficiency of intellectual capital on stock price crash risk using 152 sample of companies listed on Indonesia Stock Exchange (IDX) in the period of 2018. To test the research hypotheses, regression analysis and path analysis are applied.

Findings
The results show that intellectual capital positively effects on firm performance but does not give any effect on stock price crash risk. The findings show that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future. More detailed explanation can be seen in the discussion section

Originality / value
This empirical paper deepens the understanding that the output of intellectual capital in business is an increase in company performance, but efficient disclosure of information about performance improvements is also needed in order to minimize negative sentiment from investors. Thus, the ultimate goal of intellectual capital is the efficiency of the company's performance information on the stock market.

Key word: Intellectual capital, stock price crash risk, firm performance

1. Introduction

Companies in modern era nowadays are being replaced with a knowledge–based, fast–changing and technologically intensive economy, including in Indonesia. Most of companies use technology to enhance the efficiency on companies activity and depress expense incurred. In this modern economy, for many firms, the most important asset must be had for each company is

intellectual capital. It has been different from previous era that physical capital was the power of the companies. Previous studies have shown that company value and capability are often based on the intangible intellectual capital (IC) that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress such as increasing brand equity and social networking. In addition, IC also provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we would intuitively expect that the application of intellectual capital in the company is able to reduce risk on stock price crashes.

The purpose of this study is to find out relationship between efficiency of intellectual capital and stock price crash risk in the future by using firm performance as mediating variable. Clarke et al. (2011) stated that Intellectual capital (IC) has a positive influence on firm performance which is characterized by three components of IC efficiency, such as: HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). It could be a good signal for companies's shareholder, because a company with good efficiency on IC means that they have been using the resource for its best. Several studies have proven that IC reflects good competence, skills and knowledge that can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, IC represents good competency, skills and knowledge so that the company is able to disclose information in accordance with the needs of shareholders.

Based on a Taiwanese study by Chen et al. (2005) this study uses the quantitative measure, value added intellectual coefficient (VAIC) developed by Pulic (1998) as a measure of IC efficiency. Data is collected for Indonesia Stock Exchange (IDX) listed firms in 2018. We analyze using path analysis for knowing whether there are any relation between intellectual capital, firm performance, and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no investigate about relationship between IC and Stock Price Crash Risk. Finally, this study contributes to the literature on the relation between Intellectual Capital and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discussions. Section 6 concludes the paper.

2. Literature Review and Hypothesis

a. Intellectual Capital Efficiency (ICE)

Intellectual Capital (IC) represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that Intellectual Capital efficiency (ICE) can improve the performance of companies (see e.g. Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are very interested in buying shares when the company has implemented ICE. As Lin et al. (2015); Ozkan et al. (2017) shows that the greater of ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which if invested efficiently in can be strengthen the company's position and gains a competitive advantage. It means, the efficiency of human capital (HCE) represents the selection of superior intellectual capital (IC) to be employed in the company's business. Meanwhile, Asiaei et al. (2018) has proven that there was a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, Companies that have a higher HCE are more likely to have a higher ROE, a higher ROA, a higher ROIC and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize overall business performance. Intellectual capital (IC) has a central role in determining the structural capital model used in companies. Gogan et al. (2015) revealed that determining the right model in structural capital needs to be done in order to obtain competitive advantages in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes, it is necessary to

complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital Employed (ROCE). It means, capital employed efficiency (CEE) represents intellectual capital (IC) which is able to perform accurate calculations in capital investment in order to obtain optimal returns. As Mørch et al. (2017) have explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and financial performance of investments. Thus, Intellectual Capital efficiency (ICE) has an important role in investment decisions.

b. Intellectual Capital Efficiency (ICE) Measurement Model on Stock Price Risk

Basically, the efficiency of intellectual capital (ICE) plays a role in the application of HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in knowledge economy developed by (Pulic, 1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by (Chen et al., 2017). ICE is calculated using three components, namely value added human capital efficiency (VAHU), value added structural capital (STVA), and value added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the method section.

Several studies have used this model which shows mixed results as well. Hejazi et al. (2016) found that increasing intellectual capital (IC) should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The three studies indicate that Innovation and creation play a dominant role in describing the latent constructs of IC. Based on discussion above, hypothesis (H1) is given

H1a : Human capital efficiency is positively related to firm performance

H1b : Structural capital efficiency is positively related to firm performance

H1c : Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better intellectual capital efficiency. Furthermore, Song (2015) has shown that management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of intellectual capital. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare also factors that contribute to the risk of stock price crashes. Further analysis shows a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between the intellectual capital as a whole and the market capitalization value of the company. Some of these studies imply that IC can reduce the risk of stock investment. Based on discussion above, hypothesis (H2) is given.

H2a : Human capital efficiency is negatively related to stock price crash risk

H2b : Structural capital efficiency is negatively related to stock price crash risk

H2c : Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) has explained that management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. It means, informativeness of stock prices indicates that the company's performance is better. As Martani et al. (2009) mentioned in their research that the company's financial performance is shown by the profitability ratio and the market value ratio significantly influences returns in the company. Based on this research, the following hypothesis (H3) can be formulated as

H3 : firm performance is negatively related to stock price crash risk

Intellectual capital (IC) owned by the company is expected to create added value so that it can improve company performance. Good firm performance is one of the signals that will

be considered by investors in making investment decisions. Cenciarelli et al. (2018) in her research showed that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that will develop Intellectual capital require capital for R&D so they are faced with financing constraints. It means, IC efficiency supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. There is a fact that companies in areas of high social trust tend to hide bad news. Management tends to disclose more related information to get investor. Thus, intellectual capital efficiency is needed as a corporate strategy to increase information transparency and financial performance which will manifest towards increasing investor confidence. Based on discussion above, we can hypothesize (H4) that

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

3. Research Design

a. Sample

This study uses companies from various sectors as research objects as the sample for the research. The sample collected from Indonesia Stock Exchange (IDX) annual report data in 2018. We also obtain weekly stock data from Yahoo Finance. We then use the following selection criteria: First, similar to Khan and Watts (2009), we require that total assets and book, values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent variables

Chen et al. (2005) argue that value added intellectual coefficient (VAIC) and its three components, HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency) represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. It can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC we need value added to be calculated. In its simplest form VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs which are considered to be a value creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005), VA could be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is Cost of Goods Sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is wages and salaries for employee.

iv. Human Capital Efficiency (HCE)

Human capital (HC) factors consist of skills, knowledge, productivity, competence, and all the things that fit with employee in the work place. Human capital efficiency (HCE) can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula value added human capital efficiency (VAHU). VAHU calculations can be seen in Formula 3.

VAHU = VA/HC .....Formula 3

v. Structural Capital Efficiency (SCE)

Structural Capital (SC) is one of elements in intellectual capital, it consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SC as in Formula 4. Meanwhile, structural capital efficiency (SCE) is calculated using value added structural capital (STVA) as in Formula 5.

SC = VA – HC .....Formula 4

STVA = SC / VA .....Formula 5

Structural capital efficiency (SCE) is the dollar of SC within the firm, for every dollar of value added, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, the logical inconsistency would remain (Pulic, 1998).

vi. Capital Employed Efficiency (CEE)

Capital Employed Efficiency (CEE) is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on capital employed (CE). We could calculate CE as the total assets minus intangible assets and CEE is defined as value added capital employed (VACA). VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent variable

The risk of stock price crash is the risk of a stock price decline in a significant range after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017) which can be seen in Formula 7.

$$\text{NCSKEW} = \frac{-[n(n-1)3/2\sum_{T=1}^{n}(w_{i,T,t}-\overline{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t}-\overline{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company's specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening variable

This paper uses firm performance as intervening variable. We use ROE to analyze the firm performance. We calculate this ratio with formula 8.

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \quad \text{..... Formula 8}$$

e. Empirical Models

This study uses path analysis that produce two model regression to test our hypotheses.

Model I

$$ROE = \alpha + \beta 1\ VAHU + \beta 2\ STVA + \beta 3\ VACA + \beta 4\ SIZE - \mu$$

Model II

$$\text{NCSKEW} = \alpha - \beta 1\ STVA\ - \beta 2\ VACA - \beta 3\ AHU + \beta 4\ SIZE - \beta 5\ ROE\ - \mu$$

Notes: ROE is ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy of stock price crash risk, VAHU is value added human capital, STVA is structural capital value added, VACA is value added capital employed, and SIZE is firm size as control variable in this study.

4. Results

a. Normality Test

Table 1 show that the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. Then according to the basis of decision making in the Kolmogorov-Smirnov normality test above, the result can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924
Most Extreme Differences	Absolute	0.059
	Positive	0.037
	Negative	-0.059
Test Statistic		0.059
Asymp. Sig. (2-tailed)		0.200[c,d]

Notes:
a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

b. Multicollinearity Test

The basis for decision making from the multicolinearity test is done by looking at the value of Tolerance and VIF. Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While for the VIF value for each variable is less than 10. Then according to the basis for multicoliniearity test decision making, we can conclude that there are no symptoms of multicoliniearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

c. Heteroskedasticity Test

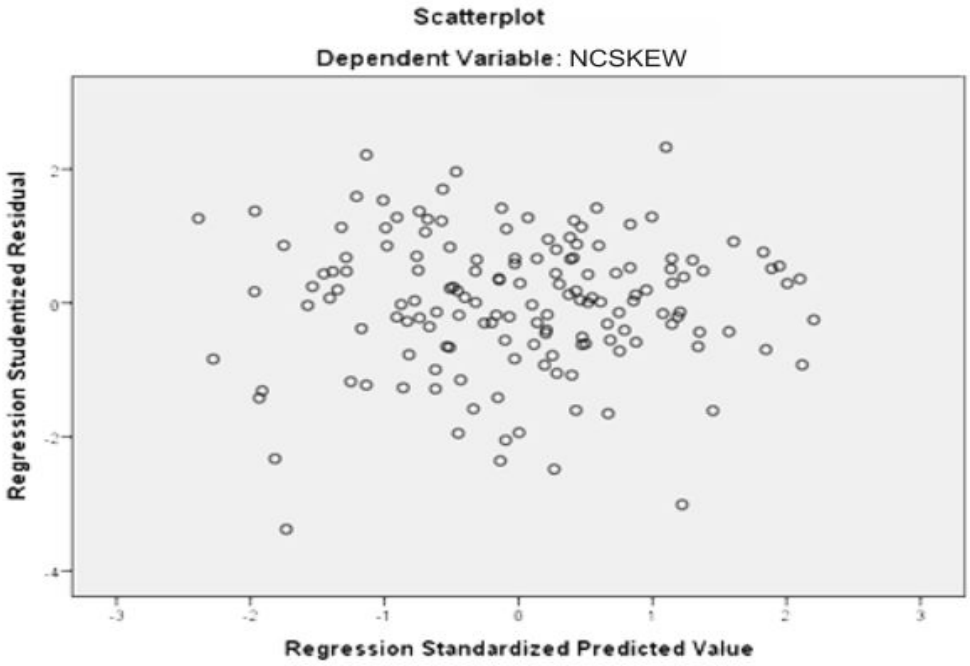
Based on Figure 1, we know that data dots spread above and below or around the number of 0. Then we can see that dots are not clustered just on above or below. The distribution of data points does not form a wavy pattern widened then narrowed and widened again. We also can see that the dots do not make any certain pattern. According from the analyses, we can conclude that there is no heteroscedasticity problem so that a good and ideal regression model can be fulfilled.

d. Path Analysis

In the Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0,000, respectively. While based on the table given that there is no significant relationship between VAHU and ROE at the 1% significance level, so we can conclude that H1(a) is rejected. Based on a beta test, VACA is variable that have the most influences changes in ROE. The value of Sig. F-statistics show that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence on ROE. This result is a strong indicator that there is a relationship between intellectual capital and firm performance, thus supporting H1(b) and

H1(c). That is, if a firm is able to use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In the Table 3, Model 2 shows that all of the components of intellectual capital do not have any significance relationship with stock price crash risk at 1% significance level. From table above we also know that ROE does not have any significance influence on stock price crash risk. Furthermore, we use model 1 and model 2 to do analysis path. After getting the numbers from the table, we calculate the indirect effect by multiplying the effect of the IC component with ROE and ROE with stock price crash risk. Based on the table and path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0,000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis that if the indirect effect is greater than the direct effect then it means there is a significant relationship in the indirect relationship between

variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship to stock price crash risk either directly or indirectly through firm performance.

Table 3. The Results of Regression Model

	Dependent Variable: ROE		Dependent Variable: NCSKEW	
	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number between parentheses is the standard error. The *, **, and *** signs indicate significance at the levels of 1%, 5%, and 10%.

5. Discussion

Several studies show that intellectual capital (IC) has an important role in improving sustainable company performance and business progress (see e.g. Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the Indonesia Stock Exchange (IDX). In addition, other results show that the company's performance as represented by return on equity (ROE) also has no effect on stock price crash risk. This means, IC only plays a role in controlling company performance and does not play a role in controlling share prices.

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). In addition, a study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatilityand macroeconomic events, play a greater role in controlling the risk of falling share prices, while IC does not have an important role in controlling stock prices.

Studies in China show that regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). Another study shows that Chinese investor sentiment (CIS) also affects stock price volatility (Li, 2019). These two studies imply that companies have more interest in stock investment so that anomalies of information have the potential to be carried out by companies in order to increase company capital. This resulted in negative sentiment by investors towards the company. Thus, investor sentiment and government regulations that encourage an efficient market on the stock exchange also play a role in stock price volatility. In our opinion, intellectual capital (IC) does not play a role in controlling the risk of falling share prices, while external factors such as macroeconomic events, investor sentiment, and regulations that promote efficient markets have a strong influence on the risk of falling share prices.

6. Conclusion

This study examines the effect of intellectual capital components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX (Indonesia Stock Exchange) and stock price data published by Yahoo Finance. Intellectual capital variables are measured by the Value added Intellectual capital (VAIC) method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data is processed using the path analysis method to determine the direct effect and indirectly from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance but partially the VAHU does not have a significant effect like STVA and

VACA. Capital employed has the biggest influence on firm performance. The findings state that the three intellectual capital variables do not have a significant direct or indirect relationship with stock price crash risk. The findings show that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future.

Based on the discussion section, it shows that intellectual capital (IC) does not play a role in controlling of stock price crash risk. Meanwhile, the results of previous research explorations indicate that the occurrence of macroeconomic events, investor sentiment and regulations that promote efficient markets are determining factor for stock price volatility which is connected to the stock price crash risk. In the end, we concluded that enhancing intellectual capital is an important thing to do to improve firm performance but having good performance does not mean can reduce stock price crash risk in the future.

REFERENCES

Adesina, K. S. (2019). Bank technical, allocative and cost efficiencies in Africa: The influence of intellectual capital. *North American Journal of Economics and Finance*. 48, 419-433.

Andersson, T. et al., (2006). Financialized accounts: Restructuring and return on capital employed in the S&P 500. *Accounting Forum*. 30, 21-41.

Asiaei, K. and Jusoh, R. (2017). Using a robust performance measurement system to illuminate intellectual capital. *International Journal of Accounting Information Systems*. 26, 1-19.

Asiaei, K. et al., (2018). Intellectual capital and performance measurement systems in Iran. *Journal of Intellectual Capital*, 19(2), 294-320.

Anifowose, M. et al., (2017). Intellectual capital disclosure and corporate market value: does board diversity matter?. *Journal of Accounting in Emerging Economies*, 7 (3), 369-398.

Belcaid, K. and Ghini, A. E. (2019). U.S., European, Chinese economic policy uncertainty and Moroccan stock market volatility. *The Journal of Economic Asymmetries*. 20, e00128.

Bennett, B. et al., (2020). Does the stock market make firms more productive?. *Economics*, 136 (2), 281-306.

Ben-Nasr, H. and Ghouma, H. (2018). Employee welfare and stock price crash risk. *Journal of Corporate Finance*, 48, 700-725.

Berzkalne, I. and Zelgalve, E. (2014). Intellectual capital and company value. *Procedia - Social and Behavioral Sciences*, 110, 887-896.

Boya, C. M. (2019). From efficient markets to adaptive markets: Evidence from the French stock exchange. *Research in International Business and Finance*, 49, 156-165.

Cao, C. et al., (2016). Social trust and stock price crash risk: Evidence from China. *International Review of Economics & Finance*, 46, 148-165.

Castillo, A. E. et al., (2019). Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises. *Procedia Computer Science*, 160, 567-572.

Cenciarelli, V. G. et al., (2018). Does intellectual capital help predict bankruptcy?. *Journal of* Intellectual Capital, 19(2), 321-337.

Chen, M.C. et al., (2005). An Empirical Investigation of the Relationship between Intellectual Capital and Firms' Market Value and Financial Performance. *Journal of Intellectual Capital*, 6(2), 159-176.

Chen, C. et al., (2017). Earnings smoothing: Does it exacerbate or constrain stock price crash risk?. *Journal of Corporate Finance*. 42, 36-54.

Ciprian, G. G. et al., (2012). Elaboration of accounting financial report on structural capital. *Procedia - Social and Behavioral Sciences*, 62, 706-710.

Clarke, M. et al., (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12(4), 505-530.

Dženopoljac, V. et al., (2016). Intellectual capital and financial performance in the Serbian ICT industry. *Journal of Intellectual Capital*, 17(2), 373-396.

Gogan, L. M. et al., (2015). Structural capital - A proposed measurement model. *Procedia Economics and Finance*. 23, 1139 – 1146.

Gogan, L. M. et al., (2016). The Impact of Intellectual Capital on Organizational Performance. *Procedia - Social and Behavioral Sciences*. 211, 194-202.

Hayati, M. et al., (2015). The Effect of Intellectual Capital to Value Relevance of Accounting Information Based on PSAK Convergence of IFRS (Manufacture Firms in Indonesia). *Procedia - Social and Behavioral Sciences*. 211, 999 – 1007.

He, Q. and Fang, C. (2019). Regulatory sanctions and stock pricing efficiency: Evidence from the Chinese stock market. *Pacific-Basin Finance Journal*. 58, 101241.

Hejazi, R. et al., (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management*, 23(4), 259 273.

Huang, C. J. and Liu, C. J. (2005). Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*. 6 (2), 237-252.

Huang, C. C. and Huang, S. M. (2020). External and internal capabilities and organizational performance: Does intellectual capital matter?. *Asia Pacific Management Review*. 52 (2), 111-120.

Jerzak, K. (2015). The essence of human capital in a building company - selected aspects. *Procedia Engineering*. 122, 95-103.

Kamukama, N. and Sulait, T. (2017). Intellectual capital and competitive advantage in Uganda's microfinance industry. *African Journal of Economic and Management Studies*, 8(4), 498-514.

Khan, M. and R. L. Watts. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics*, 48 (2–3), 132–150.

Kim, J.B. and Zhang, L. (2016). Accounting Conservatism and Stock Price Crash Risk: Firm-Level Evidence. *Contemporary Accounting Research*, 33, 412-441.

Kitts, B. et al., (2001). Intellectual capital: from intangible assets to fitness landscapes. *Expert Systems with Applications*. 20, 35-50.

Lee, C. C. and Lin, C. K. (2019). The major determinants of influencing the operating performance from the perspective of intellectual capital: Evidence on CPA industry. *Asia Pacific Management Review*, 24 (2), 124-139.

Lentjushenkova, O. and Lapina, I. (2014). The classification of the intellectual capital investments of an enterprise. *Procedia - Social and Behavioral Sciences*. 156, 53-57.

Li, X. (2019). Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test. *Finance Research Letters*, 101395

Liao, Q. and Ouyang, B. (2017). Organized labor, corporate governance, and stock price crash risk. *Review of Accounting and Finance*, 16 (4), 424-443

Lin, Y. M. et al., (2015). The information content of unexpected stock returns: Evidence from intellectual capital. *International Review of Economics & Finance*. 37, 208-225.

Liu, C. H. and Jiang, J. F. (2020). Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels. *Journal of Hospitality and Tourism Management*. 43, 139 – 148.

Longo, M. and Mura, M. (2011). The effect of intellectual capital on employees' satisfaction and retention. *Information & Management*. 48 (7), 278-287.

Martani, D. et al., (2009). The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return. *Chinese Business Review*, 8(6), 44-55.

Martinez, J. B. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*. 112, 261-270.

McDowell, W. C. et al., (2018). Building small firm performance through intellectual capital development: Exploring innovation as the "black box". *Journal of Business Research*. 88, 321-327.

Mørch, O. et al., (2017). Maximizing the rate of return on the capital employed in shipping capacity renewal. *Omega*. 67, 42-53.

Mustapha, M. and Abdelheq, L. (2018). The Role of Investment in Intellectual Capital in improving organizational performance considering knowledge management: The case study of wireless communication sector in Algeria. *Arab Economic and Business Journal*. 13 (1), 73-91.

Oppong, G. K. and Pattanayak, J. K. (2019). Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India. *Borsa Istanbul Review*, 19 (3), 219-227.

Örnek, A. S. and Ayas, S. (2015). The Relationship between Intellectual Capital, Innovative Work Behavior and Business Performance Reflection. *Procedia - Social and Behavioral Sciences*, 195, 1387-1395.

Ozkan, N. et al., (2017). Intellectual capital and financial performance: A study of the Turkish Banking Sector. *Borsa Istanbul Review*. 17 (3), 190-198.

Pulic, A. (1998). Measuring the Performance of Intellectual Potential in Knowledge Economy, paper presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential, McMaster University, Hamilton.

Sardo, F. et al., (2018). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management*. 75, 67-74.

Secundo, G. et al., (2020). Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. *Technological Forecasting & Social Change*, 153, 119917.

Sharabati, A. A. A. et al., (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Management Decision*, 48(1), 105-131.

Song, L. (2015). Accounting disclosure, stock price synchronicity and stock crash risk: An emerging-market perspective. *International Journal of Accounting and Information Management*, 23(4), 349-363.

Tan, H. P. et al., (2008). The evolving research on intellectual capital. *Journal of Intellectual Capital*, 9(4), 585-608.

Zhou, Z. and Pan, D. (2018). Can Corporate Innovation Restrain the Stock Price Crash Risk?. *Journal of Financial Risk Management*, 7(1), 39 - 54.

Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

Journal:	*Journal of Intellectual Capital*
Manuscript ID	JIC-09-2020-0306.R2
Manuscript Type:	Research Paper
Keywords:	Intellectual capital, stock price crash risk, firm performance, Disclosure, investor sentiment, volatility
Abstract:	

MANUSCRIPT DETAILS

: Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

:paper explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.study empirically analyzes the impact of the efficiency of intellectual capital on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated influence on stock price crash risk so that the aspects of intellectual capital are obscured._RESEARCH_LIMITATIONS/IMPLICATIONS__(LIMIT_100_WORDS) :No data available._PRACTICAL_IMPLICATIONS__(LIMIT_100_WORDS) :No data available.research provides new information that intellectual capital disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

A. 00RESPONSE TO REVIEWER COMMENTS

Manuscript ID : ID JIC-09-2020-0306

Manuscript Title : Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

Reviewer 1, the first comment

1. **Originality: Does the paper contain new and significant information adequate to justify publication?: Yes**

Responses:

Done

Reviewer 1, the second comment

2. **Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: Literature has been improved**

Responses:

Done

Reviewer 1, the third comment

3. **Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: yes**

Responses:

Done.

Reviewer 1, the fourth comment

4. **Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: yes**

Responses:

Done

Reviewer 1, the fifth comment

5. **Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap**

between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: Implications' improvement is strongly recommended.

Responses:

We've added an implication section in the text.

a. In **part 6, b. Implications,** the explanation in this part is as follows:

The second paragraph

Basically, the ability and knowledge for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce idiosyncratic volatility, which is the best predictor of stock returns and is proven to have a positive impact on investors' heterogeneous beliefs (Kongsilp and Mateus, 2017; He et al., 2020). Zhan (2019) argues that there was a positive relationship between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical application, IC represents the knowledge and ability for preparing a stock portfolio that contains company-specific information, which is needed to minimize stock price crash risk.

Additional scientific sources:

Chance, D. M. and Yang, T. -H. (2007). Black–Scholes–Merton, Liquidity, and the Valuation of Executive Stock Options, *Hirschey, M., John, K. and Makhija, A.K. (Ed.) Issues in Corporate Governance and Finance (Advances in Financial Economics, 12)*, Emerald Group Publishing Limited, Bingley, 271-310.

He, M., et al. (2020). Heterogeneous beliefs and idiosyncratic volatility puzzle: evidence from China, *China Finance Review International*, 11(1), 124-141.

Kongsilp, W. and Mateus, C. (2017). Volatility risk and stock return predictability on global financial crises. *China Finance Review International*, 7(1), 33-66.

Zhan, F. (2019). Individualism, synchronized stock price movements, and stock market volatility. *International Journal of Managerial Finance*, 15(3), 371-403.

Reviewer 1, the sixth comment

6. **Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: Proofreading is still recommended**

Responses:

We have used proofreading services recommended by the journal: www.scribendi.com in a whole document.

Reviewer 2, the first comment

1. **Originality: Does the paper contain new and significant information adequate to justify publication?: I think that this paper is original offering a significant perspective in the analysis of relation between Intellectual Capital (IC) and firm performance with a specific focus on stock price crash risk.**

Responses:

Done

Reviewer 2, the second comment

2. **Relationship to Literature: Does the paper demonstrate an adequate understanding of the relevant literature in the field and cite an appropriate range of literature sources? Is any significant work ignored?: In this version of paper, the literature has been improved and updated with more recent papers in relationship to the received suggestions.**

Responses:

Done

Reviewer 2, the third comment

3. **Methodology: Is the paper's argument built on an appropriate base of theory, concepts, or other ideas? Has the research or equivalent intellectual work on which the paper is based been well designed? Are the methods employed appropriate?: Methodology is coherent with the research design and well-presented in relation to the investigated research hypothesis.**

Responses:

Done

Reviewer 2, the fourth comment

4. **Results: Are results presented clearly and analysed appropriately? Do the conclusions adequately tie together the other elements of the paper?: Results are well presented and are rewritten in relationship to the received suggestions.**

Responses:

Done

Reviewer 2, the fifth comment

5. **Implications for research, practice and/or society: Does the paper identify clearly any implications for research, practice and/or society? Does the paper bridge the gap between theory and practice? How can the research be used in practice (economic and commercial impact), in teaching, to influence public policy, in research (contributing to the body of knowledge)? What is the impact upon society (influencing public attitudes, affecting quality of life)? Are these implications consistent with the findings and conclusions of the paper?: The sections of discussion and conclusions have been well revised by inserting the practical, managerial and academic implications, as well as by inserting future lines of research.**

Responses:

Done

Reviewer 2, the sixth comment

6. **Quality of Communication: Does the paper clearly express its case, measured against the technical language of the field and the expected knowledge of the journal's readership? Has attention been paid to the clarity of expression and readability, such as sentence structure, jargon use, acronyms, etc.: The Author(s) accepted the suggestion to carry out a professional proof-editing in order to further improve the quality of the paper in line with the journal requirements.**

Responses:

We have used proofreading services recommended by the journal: www.scribendi.com in a whole document.

Revised manuscript:

Does Intellectual Capital Have Any Influence on Stock Price Crash Risk?

ABSTRACT

Purpose

This ~~paper~~ study paper~~aims to~~ explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach

This study empirically analyzes the impact of the efficiency of intellectual capital on stock price crash risk using a sample size of 152 ~~sample of~~ companies listed on the Indonesia Stock Exchange ~~(IDX) in the period of~~during 2018. To test the research hypotheses, regression analysis and path analysis ~~are~~were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.

Findings

Our findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated ~~its~~ influence on stock price crash risk~~,~~ so that the aspects of intellectual capital are obscured.

Originality / value

This research provides new information that intellectual capital disclosure in the stock market needs to ~~involve~~ include ~~a~~ knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Key word: Intellectual capital, stock price crash risk, firm performance, disclosure, social capital, corporate governance convergence~~.~~

1. Introduction

Companies ~~in modern era~~ nowadays are being replaced with a knowledge~~-~~-based, fast~~-~~-changing, and technolog~~ically~~y~~-~~-intensive economy, including in Indonesia. Most ~~of~~ companies use technology to enhance the efficiency o~~f~~n compan~~y~~ies~~'~~ activities~~y~~ and depress expenses incurred. In this modern economy, for many firms, the most important and essential asset ~~asset must be had for each company~~ is intellectual capital (IC)~~.~~ ~~It has been different from previous era~~in sharp contrast to times when ~~that~~ physical capital was the power of ~~the~~ companies. Previous studies have shown that company value and capability are often based on the intangible ~~intellectual capital (~~IC~~)~~ that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress, such as increasing brand equity and social networking. In addition, IC ~~also~~ provides various positive benefits for companies such as employees~~'~~' job satisfaction and retention

(Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we ~~would intuitively expect~~propose that the application of ~~intellectual capital~~IC in the company is ~~able~~ expected to reduce risk on stock price crashes.

The purpose of this study is to find out the relationship between efficiency of ~~intellectual capital~~IC and stock price crash risk in the future by using firm performance as the mediating variable. ~~-~~Clarke et al. (2011) stated that ~~Intellectual capital (~~IC~~)~~ has a positive influence on firm performance, which is characterized by three components of IC efficiency (ICE)~~, such as~~: ~~HCE (H~~human ~~C~~capital ~~E~~efficiency (HCE), ~~SCE (S~~structural capital ~~E~~efficiency (SCE), and ~~CEE (C~~capital ~~E~~employed ~~E~~efficiency (CEE). ~~It~~ These factors could be a good indicator~~good signal~~ for ~~companies'~~company shareholders~~,~~ because a company with good ICE~~efficiency on IC means~~ indicates that they have been using their resources ~~for its best~~efficiently. Several studies have proven that IC reflects good competence, skills, and knowledge, ~~that~~ which can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, ~~IC represents good competency, skills and knowledge so that~~ the company ~~is able to~~can disclose information in accordance with the needs of the shareholders.

Based on a Taiwanese study by Chen et al. (2005), this study uses the quantitative measure, value added intellectual coefficient (VAIC), developed by Pulic (1998) as a measure of IC ~~efficiency~~E. Data is collected for firms listed on the Indonesia Stock Exchange (IDX) ~~listed firms~~ in 2018. We ~~analyze using~~used path analysis ~~for knowing~~to determine whether there is any relation between ~~intellectual capital~~IC, firm performance, and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no ~~investigate~~ research ~~about~~ on the relationship between IC and ~~S~~stock ~~P~~price ~~C~~crash ~~R~~risk. ~~Finally, t~~This study contributes to the literature by bridging this gap in the knowledge, that is, ~~on~~ the relationship between ~~Intellectual Capital~~IC and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discusses~~ions~~ the findings. Section 6 concludes the paper.

2. Literature Review and Hypothesis

a. Strengths and Weaknesses of Measuring Intellectual Capital

Basically, ~~intellectual capital (~~IC~~)~~ is measured by various elements such as human capital, physical capital, structural capital, social capital, and relational capital. However,

~~several~~ previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) ~~has~~ measured IC with three components, namely human capital, physical capital, and structural capital~~;~~ however, only human capital is positively related to all the three efficiencies~~y~~ (technical, allocative, and cost). Castillo et al. (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes~~,~~ and ~~the~~ relationships with customers. On the issue of environmental protection, Yong et al. (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff et al. (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although IC possesses ~~there are various~~ weaknesses ~~of intellectual capital (IC)~~, its advantages, ~~have been~~ demonstrated in ~~several~~ previous studies, outweigh them. Barrena-Martínez et al. (2020) proved that the three components of IC (relational capital, human capital, and structural capital) positively affect open innovation ~~(OI)~~ performance. Salvi et al. (2020) suggested a significantly positive relationship between all three components of IC ~~(structural, human, social and relationship)~~ and firm value, generating multiple implications for reporting entities, investors, regulators, and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing the IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza et al. (2020) ~~revealed that~~indicated the contribution of green ~~intellectual capital~~IC ~~as~~to be an intangible resource for organizations in achieving sustainable performance, ~~and~~providing a competitive advantage for future researchers. Dubic et al. (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership~~.~~ ~~It~~ meanings that human capital has an important role in business innovation. This study will explore the efficiency of ~~intellectual capital~~IC using three measures (~~H~~human capital, ~~S~~structural capital, and ~~C~~capital employed).

b. The ~~D~~determinant of Information Efficiency

Internationally, the efficiency of share price information is influenced by investors'~~'~~ understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). ~~-~~A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). ~~-~~Hu et al. (2020) revealed

that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in ~~the~~ corporate share repurchase~~s~~ decisions, while the enactment of the regulations has a significant effect on firms~~'~~ undertaking share repurchase~~s~~ programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also ~~have~~ play an important role in controlling stock prices (He and Fang, 2019). ~~-~~Thus, external factors, namely the ability of investors to analyze stock price volatility, macroeconomic events, financial transparency, and ~~G~~government regulations, play a greater role in controlling the risk of stock price crashes, while IC does not ~~have~~ play an important role in controlling stock prices.

~~.~~Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms~~'~~ future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences a higher crash risk, which is attenuated by lower switching costs and ~~is~~ accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment ~~(CIS)~~ also affects stock price volatility (Li, 2019). Likewise, Ma et al. (2020) suggest~~s~~ that exposure to an undiversified corporate customer base can have a negative bearing on a firm~~'~~s crash risk. The ~~fifth~~ five studies indicate that economic policy, investor sentiment, and audit quality have a significant effect on the risk of stock price crashes.

c. Intellectual Capital Efficiency ~~(ICE)~~

~~Intellectual Capital (~~IC~~)~~ represents a company~~'~~s intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that ~~Intellectual Capital efficiency (~~ICE~~)~~ can improve the performance of companies (see e.g., Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are ~~very~~ quite interested in buying shares when the company has implemented ICE. ~~As~~ Lin et al. (2015)~~;~~ and Ozkan et al. (2017) show~~s~~ that the greater ~~of~~ the ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which, if invested efficiently, ~~in~~ can ~~be~~ strengthen the company~~'~~s position, helping it~~and~~ gain~~s~~ ~~a~~ competitive advantage. ~~It~~ This means~~,~~ that ~~the efficiency of human capital (~~HCE~~)~~ represents ~~the~~ a selection of superior ~~intellectual capital (~~IC~~)~~ to be employed in the

company's business. Meanwhile, Asiaei et al. (2018) haves proven that there was is a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, Ccompanies that have a higher HCE are more likely to have a higher return on equity (ROE), a higher return on asset (ROA), a higher return on invested capital (ROIC), and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize the overall business performance. Intellectual capital (IC) hasplays a central role in determining the structural capital model used in companies. Gogan et al. (2015) revealed posit that determining the right model in structural capital is essentialneeds to be done in order to obtain a competitive advantages in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes;, it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital Eemployed (ROCE),. Itm meanings, that capital employed efficiency (CEE) represents intellectual capital (IC,) which is able tocan perform accurate calculations in capital investment in order to obtain optimal returns. As Mørch et al. (2017) have explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and the financial performance of investments. Thus, Intellectual Capital efficiency (ICE) has plays an important role in investment decisions.

d. Intellectual Capital Efficiency (ICE) Measurement Model on Stock Price Risk

Basically, the efficiency of intellectual capital (ICE) plays a role in the application of HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in the knowledge economy developed by (Pulic, (1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by (Chen et al., (2017). ICE is calculated using three components, namely value-added human capital efficiency (VAHU), value--added structural capital (STVA), and value-added capital

employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the methods section.

Several studies have used this model, which shows mixed results as well. Hejazi et al. (2016) found that increasing ~~intellectual capital (~~IC~~)~~ should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, and structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The ~~three~~ four studies indicate that ~~I~~innovation and creation play a dominant role in describing the latent constructs of IC. Based on the discussion above, hypothesis (H1) is~~: given~~

H1a: Human capital efficiency is positively related to firm performance

H1b: Structural capital efficiency is positively related to firm performance

H1c: Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better ~~intellectual capital efficiency~~ICE. Furthermore, Song (2015) has shown that the management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of ~~intellectual capital~~IC. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents, while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare is also a factor~~s~~ that contribute~~s~~ to the risk of stock price crashes. Further analysis shows that a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and that there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between ~~the intellectual capital~~IC as a whole and the market capitalization value of ~~the~~a company. Some of these studies imply that IC can reduce the risk of stock investment. Based on the above discussion ~~above~~, hypothesis (H2) is ~~given~~as follows:~~.~~

H2a: Human capital efficiency is negatively related to stock price crash risk

H2b: Structural capital efficiency is negatively related to stock price crash risk

H2c: Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) ~~has~~ explained that the management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. ~~It means,~~This means that the informativeness of stock prices indicates that the company's performance is better. ~~As~~ Martani et al. (2009) mentioned ~~in their research~~ that ~~the~~ a company's financial performance is shown by the profitability ratio, and the market value ratio significantly influences returns in the company. Based on this ~~research~~, the following hypothesis (H3) can be formulated as:

H3: ~~f~~Firm performance is negatively related to stock price crash risk

~~Intellectual capital (~~IC~~)~~ owned by the company is expected to create added value so that it can improve company performance. Good firm performance is ~~one of the signals~~an indicator that will be considered by investors in making investment decisions. Cenciarelli et al. (2018) ~~in her research~~ show~~ed~~ that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on the research and development (~~RandD~~R&D) conducted by the company. ~~—~~Zhou and Pan (2018) explained that companies that ~~will~~ develop ~~Intellectual capital~~IC require capital for ~~RandD~~ R&D, so they are faced with financing constraints. ~~It~~ This means~~,~~ that IC ~~efficiency~~E supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. ~~There is a fact that c~~Companies in areas of high social trust tend to hide bad news. The ~~M~~management tends to disclose more related information to ~~get~~ acquire investors. Thus, ~~intellectual capital efficiency~~ICE is needed as a corporate strategy to increase information transparency and financial performance, which will ~~manifest towards~~result in increasing investor confidence. Based on the discussion above, we can hypothesize (H4) that:

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as an intervening variable

3. Research Design

a. Sample

This study uses companies from various sectors as research objects ~~as the~~and sample for the research. The sample was collected from ~~Indonesia Stock Exchange (~~IDX'~~s)~~ annual report data ~~in~~for 2018. We also obtain~~ed~~ weekly stock data from Yahoo Finance. We then use~~d~~ the following selection criteria: First, similar to Khan and Watts (2009), we require~~d~~ that total assets and book~~,~~ values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent V~~v~~ariables

Chen et al. (2005) argue that ~~value added intellectual coefficient (~~VAIC~~)~~ and its three components, HCE ~~(Human Capital Efficiency)~~, SCE ~~(Structural capital Efficiency)~~, and CEE~~, (Capital Employed Efficiency)~~ represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. ~~It~~This can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC~~,~~ we need value added (VA) to be calculated. In its simplest form~~,~~ VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs~~,~~ which are considered to be a value~~-~~-creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005)~~.,~~ VA ~~could~~ can be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is ~~C~~cost of ~~G~~goods ~~S~~sold; ~~–~~NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is employee wages and salaries ~~for employee~~.

i. Human Capital Efficiency ~~(HCE)~~

Human capital ~~(HC)~~ factors consist of skills, knowledge, productivity, competence, and all ~~the things~~aspects that ~~fit with~~pertain to an employee in the work place. ~~Human capital efficiency (~~HCE~~)~~ can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the

formula ~~value added human capital efficiency (~~VAHU~~)~~. VAHU calculations can be seen in Formula 3.

VAHU = VA/HC .....Formula 3

ii. Structural Capital Efficiency ~~(SCE)~~

Structural ~~C~~capital ~~(SC)~~ is ~~one of~~an element~~s~~ in ~~intellectual capital~~IC and~~,~~ ~~it~~ consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SCE as in Formula 4. Meanwhile, ~~structural capital efficiency (~~SCE~~)~~ is calculated using ~~value added structural capital (~~STVA~~)~~ as in Formula 5.

SC = VA – HC .....Formula 4

STVA = SC / VA .....Formula 5

~~Structural capital efficiency (~~SCE~~)~~ is the dollar of SC within the firm, for every dollar of ~~value added~~VA, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, ~~the~~a logical inconsistency would remain (Pulic, 1998).

iii. Capital Employed Efficiency ~~(CEE)~~

~~Capital Employed Efficiency (~~CEE~~)~~ is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on ~~capital employed (~~CE~~)~~. We could calculate CE as the total assets minus intangible assets and CEE is defined as ~~value added capital employed (~~VACA~~)~~. VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent V~~v~~ariable

The risk of stock price crash is the risk of a significant stock price decline ~~in a significant range~~ after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017), which can be seen in Formula 7.

$$NCSKEW = \frac{-[n(n-1)3/2\sum_{T=1}^{n}(w_{i,T,t} - \overline{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t} - \overline{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company ''s weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company ''s specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening Vvariable

This paper study uses firm performance as the intervening variable. We use ROE to analyze the firm performance. We calculate this ratio with fFormula 8.

$$ROE = \frac{\text{Earning after tax}}{\text{Equity}} \quad \text{..... Formula 8}$$

e. Empirical Models

This study uses path analysis that produce two model regressions to test our hypotheses.

Model I

$$ROE = \alpha + \beta 1\, VAHU + \beta 2\, STVA + \beta 3\, VACA + \beta 4\, SIZE - \mu$$

Model II

$$NCSKEW = \alpha - \beta 1\, STVA - \beta 2\, VACA - \beta 3\, AHU + \beta 4\, SIZE - \beta 5\, ROE - \mu$$

Notes: ROE is the ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy offor stock price crash risk, VAHU is value--added human capital, STVA is value-added structural capital value added, VACA is value--added capital employed, and SIZE is firm size as the control variable in this study.

4. Results

a. Normality Test

Table 1 shows that the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. Then aAccording to the basis of decision making in the Kolmogorov-Smirnov normality test above, the resultit can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for the data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test		
		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924
Most Extreme Differences	Absolute	0.059
	Positive	0.037
	Negative	-0.059
Test Statistic		0.059
Asymp. Sig. (2-tailed)		0.200[c,d]

Notes:
a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

b. Multicollinearity Test

The basis for decision making from the multicollinearity test is ~~done by looking at~~ the value of ~~T~~tolerance (Tol) and variance inflating factor (VIF). Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While ~~for~~ the VIF value for each variable is less than 10. Then, according to the basis for the multicollinearity test decision making, we can conclude that there are no symptoms of multicollinearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

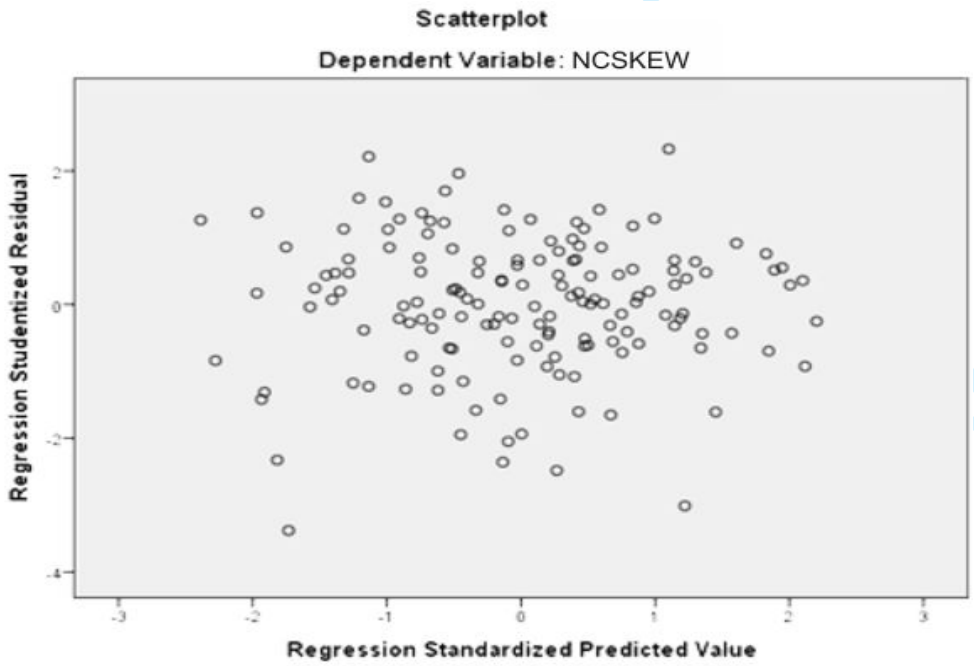
c. Heteroskedasticity Test

Based on Figure 1, we know that data dots spread above and below or around the number ~~of~~ 0. ~~Then w~~We can then see that the dots are not just clustered ~~just on~~ above or below. The distribution of data points does not form a wavy pattern, widen~~inged~~ then narrow~~inged~~ and then widen~~inged~~ again. We can also ~~can~~ see that the dots do not make a~~ny~~ certain pattern. According ~~from~~ to the analyses, we can conclude that there is no heteroscedasticity problem; so ~~that~~ a good and ideal regression model can be fulfilled.

d. Path Analysis

In ~~the~~ Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0.000, respectively. While, based on ~~the t~~Table 2, ~~given that~~ there is no significant relationship between VAHU and ROE at the 1% significance level; so we can conclude that H1(a) is rejected. Based on a beta test, VACA is the variable that ~~have the~~ most influences changes in ROE. The value of Sig. F-statistics shows that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence ~~on~~ ROE. This result is a strong indicator that there is a relationship between ~~intellectual capital~~IC and firm performance, thus supporting H1(b) and H1(c). That is, if a firm ~~is able to~~can use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In ~~the~~ Table 3, Model 2 shows that all of the components of ~~intellectual capital~~IC do not have any significant~~tee~~ relationship with stock price crash risk at the 1% significance level. From ~~table above~~Table 2 we also know that ROE does not have any significant~~tee~~ influence on stock price crash risk. Furthermore, we use ~~m~~Model 1 and ~~m~~Model 2 ~~to do~~for path analysis ~~path~~. After ~~getting~~ acquiring the numbers from ~~the table~~Table 2, we calculated the indirect effect by multiplying the effect of the IC component with ROE and then ROE with stock price crash risk. Based on ~~the t~~Table 2 and the path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0.,000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis, ~~that~~ if the indirect effect is greater than the direct effect, then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship ~~to~~with stock price crash risk either directly or indirectly through firm performance.

Table 3. ~~The~~ Results of the Regression Model

	Dependent Variable: ROE		Dependent Variable: NCSKEW	
	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number ~~between~~ within parentheses is the standard error. ~~The~~ *, **, and *** ~~signs~~ indicate significance at the levels ~~of~~ 1%, 5%, and 10%, respectively.

5. Discussion

Several studies show that ~~intellectual capital (~~IC~~)~~ ~~has~~ plays an important role in improving sustainable company performance and business progress (see e.g., Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the ~~Indonesia Stock Exchange (~~IDX~~)~~. In addition, other results show that the company's performance, as represented by ~~return on equity (~~ROE~~,)~~ also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, ~~even~~ although ~~it is~~ more ~~present~~ prevalent in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that ~~the~~ a company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment towards stock prices seems to dominate ~~its~~ influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors ~~is also able to~~can also influence ~~the~~ premium value in the United States stock market (Teti el al., 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) reveal~~ed~~ that the fluctuation of stock prices is more sensitive~~ly~~ to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various ~~previous~~ studies, we believe that investors' optimistic (pessimistic) sentiment towards stock price volatility dominates ~~its~~ influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

6. Conclusions and Implications

a. Conclusions

This study examines the effect of ~~intellectual capital~~IC components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX ~~(Indonesia Stock Exchange)~~ and stock price data published by Yahoo Finance. ~~Intellectual capital~~IC variables are measured by the ~~Value-added Intellectual capital (~~VAIC~~)~~ method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data ~~is~~was processed using the path analysis method to determine the direct effect and indirect~~ly~~ effect from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance~~;~~ ~~but~~ however, partially~~,~~ ~~the~~ VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three ~~intellectual capital~~IC variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. ~~Finally, w~~We conclude that investor sentiment has dominated ~~its~~ influence on stock price crash risk~~,~~ so that the IC aspect has become obscured.

b. Implications

So far, research on ~~intellectual capital (~~IC~~)~~ has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that ~~intellectual capital~~IC disclosure, which is proxied by the company~~'~~'s financial performance~~,~~ becomes obscured, while ~~i~~investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In ~~further~~ future research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Basically, the ability and knowledge ~~in~~for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders~~'~~' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce ~~the~~ idiosyncratic volatility~~,~~ which is the best predictor of stock returns and ~~it~~ is proven to have a positive impact on investors~~'~~' heterogeneous beliefs (Kongsilp and Mateus, 2017; He et al., 2020). ~~-~~Zhan (2019) argues that there ~~is~~was a positive relationship

between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical ~~implications~~application, ~~intellectual capital~~IC represents the knowledge and ability ~~in the~~for prepar~~ingation~~ a ~~of a~~ stock portfolio ~~which~~ that contains company-specific information, which is needed ~~in order~~ to minimize stock price crash risk.

REFERENCES

Adesina, K. S. (2019). Bank technical, allocative and cost efficiencies in Africa: The influence of intellectual capital. *North American Journal of Economics and Finance*. 48, 419-433.

Andersson, T. et al., (2006). Financialized accounts: Restructuring and return on capital employed in the SandP 500. *Accounting Forum*. 30, 21-41.

Al-Yahyaee, K. H. et al., (2020). Why cryptocurrency markets are inefficient: The impact of liquidity and volatility. *The North American Journal of Economics and Finance*, 52 (April 2020), 101168.Asiaei, K. and Jusoh, R. (2017). Using a robust performance measurement system to illuminate intellectual capital. *International Journal of Accounting Information Systems*. 26, 1-19.

Asiaei, K. et al., (2018). Intellectual capital and performance measurement systems in Iran. *Journal of Intellectual Capital*, 19(2), 294-320.

Anifowose, M. et al., (2017). Intellectual capital disclosure and corporate market value: does board diversity matter?. *Journal of Accounting in Emerging Economies*, 7 (3), 369-398.

Barrena-Martínez, J. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*, 112 (May 2020), 261-270.

Bartram, S. M. and. Grinblatt. (2021). Global market inefficiencies. *Journal of Financial Economics,* 139 (1), 234-259.

Belcaid, K. and Ghini, A. E. (2019). U.S., European, Chinese economic policy uncertainty and Moroccan stock market volatility. *The Journal of Economic Asymmetries*. 20, e00128.

Bennett, B. et al., (2020). Does the stock market make firms more productive?. *Economics*, 136 (2), 281-306.

Ben-Nasr, H. and Ghouma, H. (2018). Employee welfare and stock price crash risk. *Journal of Corporate Finance*, 48, 700-725.

Berzkalne, I. and Zelgalve, E. (2014). Intellectual capital and company value. *Procedia - Social and Behavioral Sciences*, 110, 887-896.

Boya, C. M. (2019). From efficient markets to adaptive markets: Evidence from the French stock exchange. Research in International Business and Finance, 49 (October 2019), 156-165.

Cao, C. et al., (2016). Social trust and stock price crash risk: Evidence from China. *International Review of Economics and Finance*, 46, 148-165.

Castillo, A. E. et al., (2019). Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises. *Procedia Computer Science*, 160, 567-572.

Cenciarelli, V. G. et al., (2018). Does intellectual capital help predict bankruptcy?. *Journal of* Intellectual Capital, 19(2), 321-337.

Chance, D. M. and Yang, T. -H. (2007). Black–Scholes–Merton, Liquidity, and the Valuation of Executive Stock Options, Hirschey, M., John, K. and Makhija, A.K. (Ed.) *Issues in Corporate Governance and Finance (Advances in Financial Economics, 12)*, Emerald Group Publishing Limited, Bingley, 271-310.

Chau, F. et al., (2016). Does investor sentiment really matter?. *International Review of Financial Analysis,* 48 (December 2016), 221-232.

Chen, M.C. et al., (2005). An Empirical Investigation of the Relationship between Intellectual Capital and Firms' Market Value and Financial Performance. *Journal of Intellectual Capital*, 6(2), 159-176.

Chen, C. et al., (2017). Earnings smoothing: Does it exacerbate or constrain stock price crash risk?. *Journal of Corporate Finance*. 42, 36-54.

Ciprian, G. G. et al., (2012). Elaboration of accounting financial report on structural capital. *Procedia - Social and Behavioral Sciences*, 62, 706-710.

Clarke, M. et al., (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12(4), 505-530.

Dabić, M. et al., (2020). Two decades of the Journal of Intellectual Capital: a bibliometric overview and an agenda for future research. *Journal of Intellectual Capital*, ahead-of-print.

Dubic, M. et al. (2021). Intellectual agility and innovation in micro and small businesses: The mediating role of entrepreneurial leadership. *Journal of Business Research*, 123 (February 2021), 683-695.

Dženopoljac, V. et al., (2016). Intellectual capital and financial performance in the Serbian ICT industry. *Journal of Intellectual Capital*, 17(2), 373-396.

Gogan, L. M. et al., (2015). Structural capital - A proposed measurement model. *Procedia Economics and Finance*. 23, 1139 – 1146.

Gogan, L. M. et al., (2016). The Impact of Intellectual Capital on Organizational Performance. *Procedia - Social and Behavioral Sciences*. 211, 194-202.

Hayati, M. et al., (2015). The Effect of Intellectual Capital to Value Relevance of Accounting Information Based on PSAK Convergence of IFRS (Manufacture Firms in Indonesia). *Procedia - Social and Behavioral Sciences*. 211, 999 – 1007.

He, M., et al. (2020). Heterogeneous beliefs and idiosyncratic volatility puzzle: evidence from China, *China Finance Review International*, 11(1), 124-141.

He, Q. and Fang, C. (2019). Regulatory sanctions and stock pricing efficiency: Evidence from the Chinese stock market. *Pacific-Basin Finance Journal*. 58, 101241.

Hejazi, R. et al., (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management*, 23(4), 259 273.

Hu, j. et al., (2020). Corporate board reforms around the world and stock price crash risk. *Journal of Corporate Finance*, 62(2020), 101557.

Huang, C. J. and Liu, C. J. (2005). Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*. 6 (2), 237-252.

Huang, C. C. and Huang, S. M. (2020). External and internal capabilities and organizational performance: Does intellectual capital matter?. *Asia Pacific Management Review*. 52 (2), 111-120.

Jerzak, K. (2015). The essence of human capital in a building company - selected aspects. *Procedia Engineering*. 122, 95-103.

Kamukama, N. and Sulait, T. (2017). Intellectual capital and competitive advantage in Uganda's microfinance industry. *African Journal of Economic and Management Studies*, 8(4), 498-514.

Khan, M. and R. L. Watts. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics*, 48 (2–3), 132–150.

Kim, J.B. and Zhang, L. (2016). Accounting Conservatism and Stock Price Crash Risk: Firm-Level Evidence. *Contemporary Accounting Research*, 33, 412-441.

Kitts, B. et al., (2001). Intellectual capital: from intangible assets to fitness landscapes. *Expert Systems with Applications*. 20, 35-50.

Klemola, A. (2020). Internet search-based investor sentiment and value premium. *Finance Research Letters*, 33 (March 2020), 101224.

Kongsilp, W. and Mateus, C. (2017), Volatility risk and stock return predictability on global financial crises, China Finance Review International, Vol. 7 No. 1, pp. 33-66.

Lee, S. M. et al., (2020). Customer concentration and stock price crash risk. *Journal of Business Research*, 110 (2020), 327–346.

Lee, C. C. and Lin, C. K. (2019). The major determinants of influencing the operating performance from the perspective of intellectual capital: Evidence on CPA industry. *Asia Pacific Management Review*, 24 (2), 124-139.

Lentjushenkova, O. and Lapina, I. (2014). The classification of the intellectual capital investments of an enterprise. *Procedia - Social and Behavioral Sciences*. 156, 53-57.

Li, X. (2019). Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test. *Finance Research Letters*, 101395

Liao, Q. and Ouyang, B. (2017). Organized labor, corporate governance, and stock price crash risk. *Review of Accounting and Finance*, 16 (4), 424-443

Liang, C. et al., (2020). Which sentiment index is more informative to forecast stock market volatility? Evidence from China. *International Review of Financial Analysis*, 71 (October 2020), 101552.

Lin, Y. M. et al., (2015). The information content of unexpected stock returns: Evidence from intellectual capital. *International Review of Economics and Finance*. 37, 208-225.

Liu, C. H. and Jiang, J. F. (2020). Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels. *Journal of Hospitality and Tourism Management*. 43, 139 – 148.

Longo, M. and Mura, M. (2011). The effect of intellectual capital on employees' satisfaction and retention. *Information and Management*. 48 (7), 278-287.

Luo, Y. and Zang, C. (2020). Economic policy uncertainty and stock price crash risk. *Research in International Business and Finance*, 51 (January 2020), 101112.

Ma, X. et al.,(2020). Corporate customer concentration and stock price crash risk. *Journal of Banking & Finance*, 119 (October 2020), 105903.

Mahmood, T. and Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160 (November 2020), 120248.

Martani, D. et al., (2009). The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return. *Chinese Business Review*, 8(6), 44-55.

Martinez, J. B. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*. 112, 261-270.

McDowell, W. C. et al., (2018). Building small firm performance through intellectual capital development: Exploring innovation as the "black box". *Journal of Business Research*. 88, 321-327.

Moin, A. et al.,(2020). In search of stock repurchases determinants in listed Indonesian firms during regulatory changes. *Journal of Economic Behavior and Organization*, 176 (August 2020), 145-165.

Mørch, O. et al., (2017). Maximizing the rate of return on the capital employed in shipping capacity renewal. *Omega*. 67, 42-53.

Mustapha, M. and Abdelheq, L. (2018). The Role of Investment in Intellectual Capital in improving organizational performance considering knowledge management: The case study of wireless communication sector in Algeria. *Arab Economic and Business Journal*. 13 (1), 73-91.

Ni, Y. et al., (2019). *A novel stock evaluation index based on public opinion analysis*. Procedia Computer Science, 147 (2019), 581-587.Oppong, G. K. and Pattanayak, J. K. (2019). Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India. *Borsa Istanbul Review*, 19 (3), 219-227.

Örnek, A. S. and Ayas, S. (2015). The Relationship between Intellectual Capital, Innovative Work Behavior and Business Performance Reflection. *Procedia - Social and Behavioral Sciences*, 195, 1387-1395.

Ozkan, N. et al., (2017). Intellectual capital and financial performance: A study of the Turkish Banking Sector. *Borsa Istanbul Review*. 17 (3), 190-198.

Pulic, A. (1998). Measuring the Performance of Intellectual Potential in Knowledge Economy, paper presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential, McMaster
University, Hamilton.

Salvi, A. et al., (2020). Intellectual capital disclosure in integrated reports: The effect on firm value. *Technological Forecasting and Social Change*, 160 (November 2020), 120228.

Sardo, F. et al., (2018). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management*. 75, 67-74.

Secundo, G. et al., (2020). Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. *Technological Forecasting and Social Change*, 153, 119917.

Sharabati, A. A. A. et al., (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Management Decision*, 48(1), 105-131.

Song, L. (2015). Accounting disclosure, stock price synchronicity and stock crash risk: An emerging-market perspective. *International Journal of Accounting and Information Management*, 23(4), 349-363.

Tan, H. P. et al., (2008). The evolving research on intellectual capital. *Journal of Intellectual Capital*, 9(4), 585-608.

Teti, E. et al., (2019). The relationship between twitter and stock prices. Evidence from the US technology industry. *Technological Forecasting and Social Change*, 149 (December 2019), 119747.

Wen, F. et al., (2019). Retail investor attention and stock price crash risk: Evidence from China. *International Review of Financial Analysis*, 65 (2019), 101376.

Yang, B. et al., (2019). Is informational inefficiency priced in stock markets? A comparison between the U.S. and Chinese cases. *Pacific-Basin Finance Journal*, 55 (June 2019), 222-238.

Yong, J. Y. et al., (2019). Nexus between green intellectual capital and green human resource management. *Journal of Cleaner Production*, 215 (April 2019), 364-374.

Yusliza, M. Y. et al. (2020). A structural model of the impact of green intellectual capital on sustainable performance. *Journal of Cleaner Production*, 249 (March 2020), 119334.

Yusoff, Y. M. et al., (2019). Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method. *Journal of Cleaner Production*, 234 (October 2019), 626-637.

Zhan, F. (2019). Individualism, synchronized stock price movements, and stock market volatility, *International Journal of Managerial Finance*, 15 (3), 371-403.

Zhou, Z. and Pan, D. (2018). Can Corporate Innovation Restrain the Stock Price Crash Risk?. *Journal of Financial Risk Management*, 7(1), 39 - 54.

Manuscript Before Revision:

Does Intellectual Capital Have Any Influence On Stock Price Crash Risk?

ABSTRACT

Purpose

This paper aims to explore the influence between intellectual capital and the risk of stock price crashes by using company performance as an intervening variable.

Design / methodology / approach

This study empirically analyzes the impact of efficiency of intellectual capital on stock price crash risk using 152 sample of companies listed on Indonesia Stock Exchange (IDX) in the period of 2018. To test the research hypotheses, regression analysis and path analysis are applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.

Findings

Our findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated its influence on stock price crash risk, so that the aspects of intellectual capital are obscured.

Originality / value

This research provides new information that intellectual capital disclosure in the stock market needs to involve a knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Key word: Intellectual capital, stock price crash risk, firm performance, disclosure, social capital, corporate governance convergence.

1. Introduction

Companies in modern era nowadays are being replaced with a knowledge–based, fast–changing and technologically intensive economy, including in Indonesia. Most of companies use technology to enhance the efficiency on companies activity and depress expense incurred. In this modern economy, for many firms, the most important asset must be had for each company is intellectual capital. It has been different from previous era that physical capital was

the power of the companies. Previous studies have shown that company value and capability are often based on the intangible intellectual capital (IC) that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress such as increasing brand equity and social networking. In addition, IC also provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati et al., 2015), and cost efficiency (Martinez et al., 2020). In this study, we would intuitively expect that the application of intellectual capital in the company is able to reduce risk on stock price crashes.

The purpose of this study is to find out relationship between efficiency of intellectual capital and stock price crash risk in the future by using firm performance as mediating variable. Clarke et al. (2011) stated that Intellectual capital (IC) has a positive influence on firm performance which is characterized by three components of IC efficiency, such as: HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). It could be a good signal for companies's shareholder, because a company with good efficiency on IC means that they have been using the resource for its best. Several studies have proven that IC reflects good competence, skills and knowledge that can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, IC represents good competency, skills and knowledge so that the company is able to disclose information in accordance with the needs of shareholders.

Based on a Taiwanese study by Chen et al. (2005) this study uses the quantitative measure, value added intellectual coefficient (VAIC) developed by Pulic (1998) as a measure of IC efficiency. Data is collected for Indonesia Stock Exchange (IDX) listed firms in 2018. We analyze using path analysis for knowing whether there are any relation between intellectual capital, firm performance, and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no investigate about relationship between IC and Stock Price Crash Risk. Finally, this study contributes to the literature on the relation between Intellectual Capital and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discussions. Section 6 concludes the paper.

2. Literature Review and Hypothesis

a. Strengths and Weaknesses of Measuring Intellectual Capital

Basically, intellectual capital (IC) is measured by various elements such as human capital, physical capital, structural capital, social capital, and relational capital. However, several previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) has measured IC with three components, namely human capital, physical capital and structural capital, however only human capital is positively related to all the three efficiency (technical, allocative, and cost). Castillo et al. (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes, and the relationships with customers. On the issue of environmental protection, Yong et al. (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff et al. (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although there are various weaknesses of intellectual capital (IC), its advantages have been demonstrated in several previous studies. Barrena-Martínez et al. (2020) proved that the three components of IC (relational capital, human capital, and structural capital) positively affect open innovation (OI) performance. Salvi et al. (2020) suggested a significantly positive relationship between all three components of IC (structural, human, social and relationship) and firm value, generating multiple implications for reporting entities, investors, regulators, and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza et al. (2020) revealed that the contribution of green intellectual capital as an intangible resource for organizations in achieving sustainable performance and a competitive advantage for future researchers. Dubic et al. (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership. It means that human capital has an important role in business innovation. This study will explore the efficiency of intellectual capital using three measures (Human capital, Structural capital and Capital employed).

b. The determinant of Information Efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the

uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu et al. (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in the corporate share repurchases decisions, while the enactment of the regulations has a significant effect on firms' undertaking share repurchases programs (Moin et al., 2020). In China, regulations that promote the efficiency of share prices also have an important role in controlling stock prices (He and Fang 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility,macroeconomic events, financial transparency, and Government regulations play a greater role in controlling the risk of stock price crashes, while IC does not have an important role in controlling stock prices.

Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen et al. (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee at al. (2020) revealed that a supplier firm with a concentrated customer base experiences higher crash risk is attenuated by lower switching costs and is accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment (CIS) also affects stock price volatility (Li, 2019). Likewise Ma et al. (2020) suggests that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The fifth studies indicate that economic policy, investor sentiment, and audit quality have a significant effect on the risk of stock price crashes.

c. Intellectual Capital Efficiency (ICE)

Intellectual Capital (IC) represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts et al., 2001). Several studies have revealed that Intellectual Capital efficiency (ICE) can improve the performance of companies (see e.g. Clarke et al., 2011; Gogan et al., 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell, 2018; Sardo et al., 2018; Huang and Huang, 2020). Investors are very interested in buying shares when the company has implemented ICE. As Lin et al. (2015); Ozkan et al. (2017) shows that the greater of ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which if invested efficiently in can be strengthen the company's position and gains a competitive advantage. It means, the efficiency of human capital (HCE) represents the selection of superior intellectual capital (IC) to be employed in the company's business. Meanwhile, Asiaei et al. (2018) has proven that there was a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac et al. (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, Companies that have a higher HCE are more likely to have a higher ROE, a higher ROA, a higher ROIC and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize overall business performance. Intellectual capital (IC) has a central role in determining the structural capital model used in companies. Gogan et al. (2015) revealed that determining the right model in structural capital needs to be done in order to obtain competitive advantages in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian et al. (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes, it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson et al. (2006) revealed that shareholder demand is a higher return on capital Employed (ROCE). It means, capital employed efficiency (CEE) represents intellectual capital (IC) which is able to perform accurate calculations in capital investment in order to obtain optimal returns. As Mørch et al. (2017) have explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and financial performance of investments. Thus, Intellectual Capital efficiency (ICE) has an important role in investment decisions.

d. Intellectual Capital Efficiency (ICE) Measurement Model on Stock Price Risk

Basically, the efficiency of intellectual capital (ICE) plays a role in the application of HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency). This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in knowledge economy developed by (Pulic, 1998) and the calculation of the

negative coefficient of firm-specific daily returns (NCSKEW) developed by (Chen et al., 2017). ICE is calculated using three components, namely value added human capital efficiency (VAHU), value added structural capital (STVA), and value added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the method section.

Several studies have used this model which shows mixed results as well. Hejazi et al. (2016) found that increasing intellectual capital (IC) should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital, structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati et al., 2010). The three studies indicate that Innovation and creation play a dominant role in describing the latent constructs of IC. Based on discussion above, hypothesis (H1) is given

H1a : Human capital efficiency is positively related to firm performance

H1b : Structural capital efficiency is positively related to firm performance

H1c : Capital employed efficiency is positively related to firm performance

Chen et al. (2005) have confirmed that investors place higher value on companies with better intellectual capital efficiency. Furthermore, Song (2015) has shown that management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of intellectual capital. Dong and Zhang (2016) have also shown that environmental control, information and communication, and monitoring components significantly reduce the risk of accidents while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare also factors that contribute to the risk of stock price crashes. Further analysis shows a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose et al. (2017) showed a positive relationship between the intellectual capital as a whole and the market capitalization value of the company. Some of these studies imply that IC can reduce the risk of stock investment. Based on discussion above, hypothesis (H2) is given.

H2a : Human capital efficiency is negatively related to stock price crash risk

H2b : Structural capital efficiency is negatively related to stock price crash risk

H2c : Capital employed efficiency is negatively related to stock price crash risk

Bennett et al. (2020) has explained that management, directly or indirectly, learns from its firm's stock price, so that more informative stock prices should make the firm more productive. It means, informativeness of stock prices indicates that the company's performance is better. As Martani et al. (2009) mentioned in their research that the company's financial performance is shown by the profitability ratio and the market value ratio significantly influences returns in the company. Based on this research, the following hypothesis (H3) can be formulated as

H3 : firm performance is negatively related to stock price crash risk

Intellectual capital (IC) owned by the company is expected to create added value so that it can improve company performance. Good firm performance is one of the signals that will be considered by investors in making investment decisions. Cenciarelli et al. (2018) in her research showed that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on research and development (RandD) conducted by the company. Zhou and Pan (2018) explained that companies that will develop Intellectual capital require capital for RandD so they are faced with financing constraints. It means, IC efficiency supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao et al. (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. There is a fact that companies in areas of high social trust tend to hide bad news. Management tends to disclose more related information to get investor. Thus, intellectual capital efficiency is needed as a corporate strategy to increase information transparency and financial performance which will manifest towards increasing investor confidence. Based on discussion above, we can hypothesize (H4) that

H4a: Human capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4b: Structural capital efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

H4c: Capital employed efficiency is negatively related to stock price crash risk by using firm performance as intervening variable

3. Research Design

a. Sample

This study uses companies from various sectors as research objects as the sample for the research. The sample collected from Indonesia Stock Exchange (IDX) annual report data in 2018. We also obtain weekly stock data from Yahoo Finance. We then use the following selection criteria: First, similar to Khan and Watts (2009), we require that total assets and book, values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

b. Measurement of Independent variables

Chen et al. (2005) argue that value added intellectual coefficient (VAIC) and its three components, HCE (Human Capital Efficiency), SCE (Structural capital Efficiency), and CEE (Capital Employed Efficiency) represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE, and CEE. It can be expressed in Formula 1.

VAIC = HCE + SCE + CEE ..... Formula 1

To measure VAIC we need value added to be calculated. In its simplest form VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs which are considered to be a value creating entity (Tan et al., 2008). This VA is also defined as the net value created by firms during the year (Chen et al., 2005), VA could be calculated using Formula 2.

VA = S-B = NI + T + DP + I + W .....Formula 2

Notes : S is sales; B is Cost of Goods Sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense; and W is wages and salaries for employee.

i. Human Capital Efficiency (HCE)

Human capital (HC) factors consist of skills, knowledge, productivity, competence, and all the things that fit with employee in the work place. Human capital efficiency (HCE) can be calculated using a calculation developed by

Pulic (1998), where HCE is calculated using the formula value added human capital efficiency (VAHU). VAHU calculations can be seen in Formula 3.

VAHU = VA/HC.....Formula 3

ii. Structural Capital Efficiency (SCE)

Structural Capital (SC) is one of elements in intellectual capital, it consists of organizational networks, patents, strategy, and brand names. Based on Pulic (1998), we calculated SC as in Formula 4. Meanwhile, structural capital efficiency (SCE) is calculated using value added structural capital (STVA) as in Formula 5.

SC = VA – HC.....Formula 4

STVA = SC / VA.....Formula 5

Structural capital efficiency (SCE) is the dollar of SC within the firm, for every dollar of value added, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, the logical inconsistency would remain (Pulic, 1998).

iii. Capital Employed Efficiency (CEE)

Capital Employed Efficiency (CEE) is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on capital employed (CE). We could calculate CE as the total assets minus intangible assets and CEE is defined as value added capital employed (VACA). VACA calculations can be seen in Formula 6.

VACA = VA / CE.....Formula 6

c. Measurement of Dependent variable

The risk of stock price crash is the risk of a stock price decline in a significant range after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen et al. (2017) which can be seen in Formula 7.

$$\text{NCSKEW} = \frac{-[n(n-1)3/2\sum_{T=1}^{n}(w_{i,T,t}-\overline{w}_{i,t})^3]}{[(n-1)(n-2)(\sum_{T=1}^{n}(w_{i,T,t}-\overline{w}_{i,t})^2)^{3/2}]} \quad \text{..... Formula 7}$$

Notes: $W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company's specific stock for year t and n is the

number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

d. Measurement of Intervening variable

This paper uses firm performance as intervening variable. We use ROE to analyze the firm performance. We calculate this ratio with formula 8.

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \quad \text{..... Formula 8}$$

e. Empirical Models

This study uses path analysis that produce two model regression to test our hypotheses.

Model I

$$ROE = \alpha + \beta 1\, VAHU + \beta 2\, STVA + \beta 3\, VACA + \beta 4\, SIZE - \mu$$

Model II

$$\text{NCSKEW} = \alpha - \beta 1\, STVA - \beta 2\, VACA - \beta 3\, AHU + \beta 4\, SIZE - \beta 5\, ROE - \mu$$

Notes: ROE is ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy of stock price crash risk, VAHU is value added human capital, STVA is structural capital value added, VACA is value added capital employed, and SIZE is firm size as control variable in this study.

4. Results

a. Normality Test

Table 1 show that the significance value of Asymp. The Sig (2-tailed) is 0.200. The value is greater than 0.1. Then according to the basis of decision making in the Kolmogorov-Smirnov normality test above, the result can be concluded that the data is normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for data above.

Table1. Normal Probability Test Result

One-Sample Kolmogorov-Smirnov Test

		Unstandardized Residual
N		152
Normal Parameters [a,b]	Mean	0.000
	Std. Deviation	0.924
Most Extreme Differences	Absolute	0.059
	Positive	0.037
	Negative	-0.059

Test Statistic	0.059
Asymp. Sig. (2-tailed)	0.200[c,d]

Notes:
a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.
d. This is a lower bound of the true significance.

b. Multicollinearity Test

The basis for decision making from the multicolinearity test is done by looking at the value of Tolerance and VIF. Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While for the VIF value for each variable is less than 10. Then according to the basis for multicoliniearity test decision making, we can conclude that there are no symptoms of multicoliniearity in the regression model. Table 2 shows the results of the multicollinearity test.

Table 2. Multicollinearity Test Results

Model 1	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	-4.074	1.323		-3.079	0.002		
VAHU	-0.062	0.096	-0.103	-0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	-0.271	1.481	-0.021	-0.183	0.855	0.475	2.104

Note: Dependent Variable (NCSKEW)

c. Heteroskedasticity Test

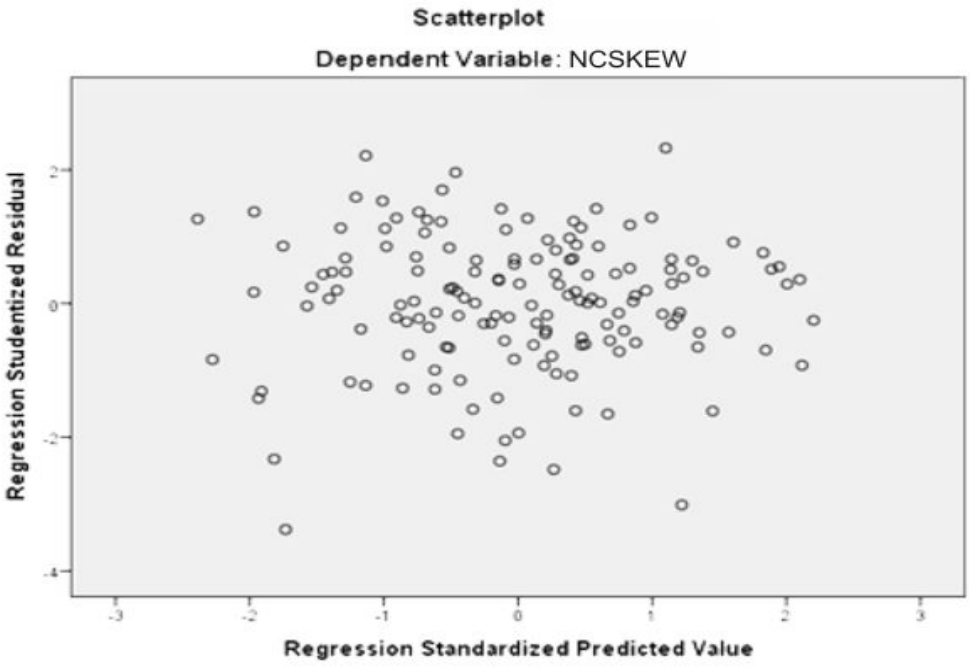
Based on Figure 1, we know that data dots spread above and below or around the number of 0. Then we can see that dots are not clustered just on above or below. The distribution of data points does not form a wavy pattern widened then narrowed and widened again. We also can see that the dots do not make any certain pattern. According from the analyses, we can conclude that there is no heteroscedasticity problem so that a good and ideal regression model can be fulfilled.

d. Path Analysis

In the Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value

of 0.015 and 0,000, respectively. While based on the table given that there is no significant relationship between VAHU and ROE at the 1% significance level, so we can conclude that H1(a) is rejected. Based on a beta test, VACA is variable that have the most influences changes in ROE. The value of Sig. F-statistics show that at a significance level of 1%, VAHU, VACA, and STVA simultaneously influence on ROE. This result is a strong indicator that there is a relationship between intellectual capital and firm performance, thus supporting H1(b) and H1(c). That is, if a firm is able to use its IC more efficiently in one year, this can lead to a performance increase in the same year.

Figure 1. Heteroskedasticity Test Result



In the Table 3, Model 2 shows that all of the components of intellectual capital do not have any significance relationship with stock price crash risk at 1% significance level. From table above we also know that ROE does not have any significance influence on stock price crash risk. Furthermore, we use model 1 and model 2 to do analysis path. After getting the numbers from the table, we calculate the indirect effect by multiplying the effect of the IC component with ROE and ROE with stock price crash risk. Based on the table and path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0,000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk

of stock price crashes. According to the principle of path analysis that if the indirect effect is greater than the direct effect then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA, and VACA do not have any significant relationship to stock price crash risk either directly or indirectly through firm performance.

Table 3. The Results of Regression Model

	Dependent Variable: ROE		Dependent Variable: NCSKEW	
	Predicted Sign	Model 1	Predicted Sign	Model 2
VAHU	+	0.001 (0.005)	-	-0.062 (0.096)
STVA	+	0.128** (0.052)	-	0.144 (0.952)
VACA	+	0.404* (0.037)	-	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	-	0.123 (0.043)
ROE (Intervening)			-	-0.271 (1.481)
Constant		-0.340 (0.068)		-4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. F Stat		0.000*		0.074***
N		152		152

Note: This table presents the correlation coefficient number (β), while the number between parentheses is the standard error. The *, **, and *** signs indicate significance at the levels of 1%, 5%, and 10%.

5. Discussion

Several studies show that intellectual capital (IC) has an important role in improving sustainable company performance and business progress (see e.g. Castillo et al., 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo et al., 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the Indonesia Stock Exchange (IDX). In addition, other results show that the company's performance as represented by return on equity (ROE) also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang et al., 2019). Information inefficiency is a global problem that always exists in the stock market, even

though it is more present in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee et al. (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that the company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment towards stock prices seems to dominate its influence on the operation of the stock market. The sentiment index built on social media has been shown to greatly influence the volatility of stock prices (Liang et al., 2020). The optimistic (pessimistic) sentiment of Internet search-based investors is also able to influence the premium value in the United States stock market (Teti el al. 2020; Klemola, 2020). Meanwhile, Ni et al. (2019) revealed that the fluctuation of stock prices is more sensitively to the intraday sentiment of individuals. Chau et al. (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various previous studies, we believe that investors' optimistic (pessimistic) sentiment towards stock price volatility dominates its influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

6. Conclusions and Implications

a. Conclusions

This study examines the effect of intellectual capital components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX (Indonesia Stock Exchange) and stock price data published by Yahoo Finance. Intellectual capital variables are measured by the Value added Intellectual capital (VAIC) method written by Pulic (1998) and stock price crash risk variables are measured by NCSKEW developed by Chen et al. (2017). Data is processed using the path analysis method to determine the direct effect and indirectly from each of the interrelated variables.

Simultaneously, the VAHU, STVA, and VACA variables have a significant relationship to firm performance but partially the VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three intellectual capital variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed

companies. Finally, we conclude that investor sentiment has dominated its influence on stock price crash risk, so that the IC aspect has become obscured.

b. Implications

So far, research on intellectual capital (IC) has been discussed in 700 articles written by leading authors at various universities (Dubic et al., 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that intellectual capital disclosure, which is proxied by the company's financial performance becomes obscured, while Investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In further research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

REFERENCES

Adesina, K. S. (2019). Bank technical, allocative and cost efficiencies in Africa: The influence of intellectual capital. *North American Journal of Economics and Finance*. 48, 419-433.

Andersson, T. et al., (2006). Financialized accounts: Restructuring and return on capital employed in the SandP 500. *Accounting Forum*. 30, 21-41.

Al-Yahyaee, K. H. et al., (2020). Why cryptocurrency markets are inefficient: The impact of liquidity and volatility. *The North American Journal of Economics and Finance*, 52 (April 2020), 101168.Asiaei, K. and Jusoh, R. (2017). Using a robust performance measurement system to illuminate intellectual capital. *International Journal of Accounting Information Systems*. 26, 1-19.

Asiaei, K. et al., (2018). Intellectual capital and performance measurement systems in Iran. *Journal of Intellectual Capital*, 19(2), 294-320.

Anifowose, M. et al., (2017). Intellectual capital disclosure and corporate market value: does board diversity matter?. *Journal of Accounting in Emerging Economies*, 7 (3), 369-398.

Barrena-Martínez, J. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*, 112 (May 2020), 261-270.

Bartram, S. M. and. Grinblatt. (2021). Global market inefficiencies. *Journal of Financial Economics,* 139 (1), 234-259.

Belcaid, K. and Ghini, A. E. (2019). U.S., European, Chinese economic policy uncertainty and Moroccan stock market volatility. *The Journal of Economic Asymmetries*. 20, e00128.

Bennett, B. et al., (2020). Does the stock market make firms more productive?. *Economics*, 136 (2), 281-306.

Ben-Nasr, H. and Ghouma, H. (2018). Employee welfare and stock price crash risk. *Journal of Corporate Finance*, 48, 700-725.

Berzkalne, I. and Zelgalve, E. (2014). Intellectual capital and company value. *Procedia - Social and Behavioral Sciences*, 110, 887-896.

Boya, C. M. (2019). From efficient markets to adaptive markets: Evidence from the French stock exchange. Research in International Business and Finance, 49 (October 2019), 156-165.

Cao, C. et al., (2016). Social trust and stock price crash risk: Evidence from China. *International Review of Economics and Finance*, 46, 148-165.

Castillo, A. E. et al., (2019). Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises. *Procedia Computer Science*, 160, 567-572.

Cenciarelli, V. G. et al., (2018). Does intellectual capital help predict bankruptcy?. *Journal of* Intellectual Capital, 19(2), 321-337.

Chau, F. et al., (2016). Does investor sentiment really matter?. *International Review of Financial Analysis,* 48 (December 2016), 221-232.

Chen, M.C. et al., (2005). An Empirical Investigation of the Relationship between Intellectual Capital and Firms' Market Value and Financial Performance. *Journal of Intellectual Capital*, 6(2), 159-176.

Chen, C. et al., (2017). Earnings smoothing: Does it exacerbate or constrain stock price crash risk?. *Journal of Corporate Finance*. 42, 36-54.

Ciprian, G. G. et al., (2012). Elaboration of accounting financial report on structural capital. *Procedia - Social and Behavioral Sciences*, 62, 706-710.

Clarke, M. et al., (2011). Intellectual capital and firm performance in Australia. *Journal of Intellectual Capital*, 12(4), 505-530.

Dabić, M. et al., (2020). Two decades of the Journal of Intellectual Capital: a bibliometric overview and an agenda for future research. *Journal of Intellectual Capital*, ahead-of-print.

Dubic, M. et al. (2021). Intellectual agility and innovation in micro and small businesses: The mediating role of entrepreneurial leadership. *Journal of Business Research*, 123 (February 2021), 683-695.

Dženopoljac, V. et al., (2016). Intellectual capital and financial performance in the Serbian ICT industry. *Journal of Intellectual Capital*, 17(2), 373-396.

Gogan, L. M. et al., (2015). Structural capital - A proposed measurement model. *Procedia Economics and Finance*. 23, 1139 – 1146.

Gogan, L. M. et al., (2016). The Impact of Intellectual Capital on Organizational Performance. *Procedia - Social and Behavioral Sciences*. 211, 194-202.

Hayati, M. et al., (2015). The Effect of Intellectual Capital to Value Relevance of Accounting Information Based on PSAK Convergence of IFRS (Manufacture Firms in Indonesia). *Procedia - Social and Behavioral Sciences*. 211, 999 – 1007.

He, Q. and Fang, C. (2019). Regulatory sanctions and stock pricing efficiency: Evidence from the Chinese stock market. *Pacific-Basin Finance Journal*. 58, 101241.

Hejazi, R. et al., (2016). Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q. *Knowledge and Process Management*, 23(4), 259 273.

Hu, j. et al., (2020). Corporate board reforms around the world and stock price crash risk. *Journal of Corporate Finance*, 62(2020), 101557.

Huang, C. J. and Liu, C. J. (2005). Exploration for the relationship between innovation, IT and performance. *Journal of Intellectual Capital*. 6 (2), 237-252.

Huang, C. C. and Huang, S. M. (2020). External and internal capabilities and organizational performance: Does intellectual capital matter?. *Asia Pacific Management Review*. 52 (2), 111-120.

Jerzak, K. (2015). The essence of human capital in a building company - selected aspects. *Procedia Engineering*. 122, 95-103.

Kamukama, N. and Sulait, T. (2017). Intellectual capital and competitive advantage in Uganda's microfinance industry. *African Journal of Economic and Management Studies*, 8(4), 498-514.

Khan, M. and R. L. Watts. (2009). Estimation and empirical properties of a firm-year measure of accounting conservatism. *Journal of Accounting and Economics*, 48 (2–3), 132–150.

Kim, J.B. and Zhang, L. (2016). Accounting Conservatism and Stock Price Crash Risk: Firm-Level Evidence. *Contemporary Accounting Research*, 33, 412-441.

Kitts, B. et al., (2001). Intellectual capital: from intangible assets to fitness landscapes. *Expert Systems with Applications*. 20, 35-50.

Klemola, A. (2020). Internet search-based investor sentiment and value premium. *Finance Research Letters*, 33 (March 2020), 101224.

Lee, S. M. et al., (2020). Customer concentration and stock price crash risk. *Journal of Business Research*, 110 (2020), 327–346.

Lee, C. C. and Lin, C. K. (2019). The major determinants of influencing the operating performance from the perspective of intellectual capital: Evidence on CPA industry. *Asia Pacific Management Review*, 24 (2), 124-139.

Lentjushenkova, O. and Lapina, I. (2014). The classification of the intellectual capital investments of an enterprise. *Procedia - Social and Behavioral Sciences*. 156, 53-57.

Li, X. (2019). Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test. *Finance Research Letters*, 101395

Liao, Q. and Ouyang, B. (2017). Organized labor, corporate governance, and stock price crash risk. *Review of Accounting and Finance*, 16 (4), 424-443

Liang, C. et al., (2020). Which sentiment index is more informative to forecast stock market volatility? Evidence from China. *International Review of Financial Analysis*, 71 (October 2020), 101552.

Lin, Y. M. et al., (2015). The information content of unexpected stock returns: Evidence from intellectual capital. *International Review of Economics and Finance*. 37, 208-225.

Liu, C. H. and Jiang, J. F. (2020). Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels. *Journal of Hospitality and Tourism Management*. 43, 139 – 148.

Longo, M. and Mura, M. (2011). The effect of intellectual capital on employees' satisfaction and retention. *Information and Management*. 48 (7), 278-287.

Luo, Y. and Zang, C. (2020). Economic policy uncertainty and stock price crash risk. *Research in International Business and Finance*, 51 (January 2020), 101112.

Ma, X. et al.,(2020). Corporate customer concentration and stock price crash risk. *Journal of Banking & Finance*, 119 (October 2020), 105903.

Mahmood, T. and Mubarik, M. S. (2020). Balancing innovation and exploitation in the fourth industrial revolution: Role of intellectual capital and technology absorptive capacity. *Technological Forecasting and Social Change*, 160 (November 2020), 120248.

Martani, D. et al., (2009). The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return. *Chinese Business Review*, 8(6), 44-55.

Martinez, J. B. et al., (2020). Joint forces: Towards an integration of intellectual capital theory and the open innovation paradigm. *Journal of Business Research*. 112, 261-270.

McDowell, W. C. et al., (2018). Building small firm performance through intellectual capital development: Exploring innovation as the "black box". *Journal of Business Research*. 88, 321-327.

Moin, A. et al.,(2020). In search of stock repurchases determinants in listed Indonesian firms during regulatory changes. *Journal of Economic Behavior and Organization*, 176 (August 2020), 145-165.

Mørch, O. et al., (2017). Maximizing the rate of return on the capital employed in shipping capacity renewal. *Omega*. 67, 42-53.

Mustapha, M. and Abdelheq, L. (2018). The Role of Investment in Intellectual Capital in improving organizational performance considering knowledge management: The case study of wireless communication sector in Algeria. *Arab Economic and Business Journal*. 13 (1), 73-91.

Ni, Y. et al., (2019). *A novel stock evaluation index based on public opinion analysis*. Procedia Computer Science, 147 (2019), 581-587.Oppong, G. K. and Pattanayak, J. K. (2019). Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India. *Borsa Istanbul Review*, 19 (3), 219-227.

Örnek, A. S. and Ayas, S. (2015). The Relationship between Intellectual Capital, Innovative Work Behavior and Business Performance Reflection. *Procedia - Social and Behavioral Sciences*, 195, 1387-1395.

Ozkan, N. et al., (2017). Intellectual capital and financial performance: A study of the Turkish Banking Sector. *Borsa Istanbul Review*. 17 (3), 190-198.

Pulic, A. (1998). Measuring the Performance of Intellectual Potential in Knowledge Economy, paper presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential, McMaster
University, Hamilton.

Salvi, A. et al., (2020). Intellectual capital disclosure in integrated reports: The effect on firm value. *Technological Forecasting and Social Change*, 160 (November 2020), 120228.

Sardo, F. et al., (2018). On the relationship between intellectual capital and financial performance: A panel data analysis on SME hotels. *International Journal of Hospitality Management*. 75, 67-74.

Secundo, G. et al., (2020). Sustainable development, intellectual capital and technology policies: A structured literature review and future research agenda. *Technological Forecasting and Social Change*, 153, 119917.

Sharabati, A. A. A. et al., (2010). Intellectual capital and business performance in the pharmaceutical sector of Jordan. *Management Decision*, 48(1), 105-131.

Song, L. (2015). Accounting disclosure, stock price synchronicity and stock crash risk: An emerging-market perspective. *International Journal of Accounting and Information Management*, 23(4), 349-363.

Tan, H. P. et al., (2008). The evolving research on intellectual capital. *Journal of Intellectual Capital*, 9(4), 585-608.

Teti, E. et al., (2019). The relationship between twitter and stock prices. Evidence from the US technology industry. *Technological Forecasting and Social Change*, 149 (December 2019), 119747.

Wen, F. et al., (2019). Retail investor attention and stock price crash risk: Evidence from China. *International Review of Financial Analysis*, 65 (2019), 101376.

Yang, B. et al., (2019). Is informational inefficiency priced in stock markets? A comparison between the U.S. and Chinese cases. *Pacific-Basin Finance Journal*, 55 (June 2019), 222-238.

Yong, J. Y. et al., (2019). Nexus between green intellectual capital and green human resource management. *Journal of Cleaner Production*, 215 (April 2019), 364-374.

Yusliza, M. Y. et al. (2020). A structural model of the impact of green intellectual capital on sustainable performance. *Journal of Cleaner Production*, 249 (March 2020), 119334.

Yusoff, Y. M. et al., (2019). Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method. *Journal of Cleaner Production*, 234 (October 2019), 626-637.

Zhou, Z. and Pan, D. (2018). Can Corporate Innovation Restrain the Stock Price Crash Risk?. *Journal of Financial Risk Management*, 7(1), 39 - 54.

Does intellectual capital have any influence on stock price crash risk?

Agung Nur Probohudono and Adelia Dyaning Pratiwi
Economic and Business, Fakultas Ekonomi, Universitas Sebelas Maret, Surakarta, Indonesia, and
Mahameru Rosy Rochmatullah
Economic and Business, Universitas Muhammadiyah Surakarta, Surakarta, Indonesia

Received 18 September 2020
Revised 5 January 2021
1 April 2021
Accepted 10 May 2021

Abstract

Purpose – This paper explores the influence between intellectual capital (IC) and the risk of stock price crashes by using company performance as an intervening variable.
Design/methodology/approach – This study empirically analyzes the impact of the efficiency of IC on stock price crash risk using a sample size of 152 companies listed on the Indonesia Stock Exchange (IDX) during 2018. To test the research hypotheses, regression analysis and path analysis were applied. In addition, the researchers added exploration to several studies to strengthen the results of this study.
Findings – This study's findings indicate that investors' optimistic (pessimistic) sentiment regarding stock price volatility has obscured aspects of the financial performance of listed companies. This finding implies that investor sentiment has dominated influence on stock price crash risk so that the aspects of IC are obscured.
Originality/value – This research provides new information that IC disclosure in the stock market needs to include knowledge of the volatility of stock prices in order to reveal stock price crash risk.

Keywords Intellectual capital, Stock price crash risk, Firm performance, Disclosure, Social capital, Corporate governance convergence

Paper type Research paper

1. Introduction

Companies nowadays are being replaced with a knowledge-based, fast-changing and technology-intensive economy, including in Indonesia. Most companies use technology to enhance the efficiency of company activities and depress expenses incurred. In this modern economy, for many firms, the most important and essential asset is intellectual capital (IC), in sharp contrast to times when physical capital was the power of companies. Previous studies have shown that company value and capability are often based on the intangible IC that it possesses (Berzkalne and Zelgalve, 2014; Huang and Huang, 2020). Liu and Jiang (2020) have also proven that IC has a positive impact on business progress, such as increasing brand equity and social networking. In addition, IC provides various positive benefits for companies such as employees' job satisfaction and retention (Longo and Mura, 2011), increasing business innovation (Ornek and Ayas, 2015; Adesina, 2019), increasing the relevance of accounting information (Hayati *et al.*, 2015) and cost efficiency (Martinez *et al.*, 2020). In this study, we propose that the application of IC in the company is expected to reduce the risk on stock price crashes.

The purpose of this study is to find out the relationship between efficiency of IC and stock price crash risk in the future by using firm performance as the mediating variable. Clarke *et al.* (2011) stated that IC has a positive influence on firm performance, which is characterized by three components of IC efficiency (ICE): human capital efficiency (HCE), structural capital efficiency (SCE) and capital employed efficiency (CEE). These factors could be a good indicator for company shareholders because a company with good ICE indicates that they have been using their resources efficiently. Several studies have proven that IC reflects good

Journal of Intellectual Capital

1469-1930
DOI 10.1108/JIC-09-2020-0306

competence, skills and knowledge, which can improve financial performance and increase stock returns (Lentjushenkova and Lapina, 2014; Zhou and Pan, 2018). Thus, the company can disclose information in accordance with the needs of the shareholders.

Based on a Taiwanese study by Chen *et al.* (2005), this study uses the quantitative measure, value-added intellectual coefficient (VAIC), developed by Pulic (1998) as a measure of ICE. Data are collected for firms listed on the Indonesia Stock Exchange (IDX) in 2018. We used path analysis to determine whether there is any relation between IC, firm performance and stock price crash risk. Prior VAIC studies have investigated the direct relationship between IC and performance, but there is no research on the relationship between IC and stock price crash risk. This study contributes to the literature by bridging this gap in the knowledge, that is, the relationship between IC and stock price crashes.

This paper proceeds as follows. Section 2 reviews the relevant literature and develops our hypotheses. Section 3 describes the data and research design. Section 4 presents the main empirical results. Section 5 discusses the findings. Section 6 concludes the paper.

2. Literature review and hypothesis

2.1 Strengths and weaknesses of measuring intellectual capital

Basically, IC is measured by various elements such as human capital, physical capital, structural capital, social capital and relational capital. However, previous studies have shown that there are several drawbacks to IC measurement. Adesina (2019) measured IC with three components, namely human capital, physical capital and structural capital; however, only human capital is positively related to all the three efficiencies (technical, allocative and cost). Castillo *et al.* (2019) proved that capabilities of human resources are relevant for these organizations, as well as the internal processes and relationships with customers. On the issue of environmental protection, Yong *et al.* (2019) revealed that green human capital and green relational capital were influenced by green human resource management, but green structural capital was not significantly related to green human resource management. Yusoff *et al.* (2019) also revealed that green human capital does not have a positive relationship with business sustainability.

Although IC possesses weaknesses, its advantages, demonstrated in previous studies, outweigh them. Barrena-Martínez *et al.* (2020) proved that the three components of IC (relational capital, human capital and structural capital) positively affect open innovation performance. Salvi *et al.* (2020) suggested a significantly positive relationship between all three components of IC and firm value, generating multiple implications for reporting entities, investors, regulators and managers. Mahmood and Mubarik (2020) showed that specific policies aimed at developing the IC of a firm, which in turn can enable a firm to maintain a balance between innovation and market exploitation activities. Yusliza *et al.* (2020) indicated the contribution of green IC to be an intangible resource for organizations in achieving sustainable performance, providing a competitive advantage for future researchers. Dubic *et al.* (2021) revealed that the intellectual agility of employees positively influences the innovativeness of micro and small businesses, but this effect is strongly mediated through entrepreneurial leadership, meaning that human capital has an important role in business innovation. This study will explore the efficiency of IC using three measures (human capital, structural capital and capital employed).

2.2 The determinant of information efficiency

Internationally, the efficiency of share price information is influenced by investors' understanding of the long-term relationship between stock market volatility and the uncertainty of international economic policy (Belcaid and Ghini, 2019). A study in France also

shows that stock exchanges find it difficult to maintain the efficiency of stock information during global macroeconomic events (Boya, 2019). Hu *et al.* (2020) revealed that board reforms reduce crash risk by improving financial transparency and enhancing investment efficiency. In Indonesia, sub-optimal financial positions play a role in corporate share repurchase decisions, while the enactment of the regulations has a significant effect on firms undertaking share repurchase programs (Moin *et al.*, 2020). In China, regulations that promote the efficiency of share prices also play an important role in controlling stock prices (He and Fang, 2019). Thus, external factors, namely the ability of investors to analyze stock price volatility, macroeconomic events, financial transparency and government regulations, play a greater role in controlling the risk of stock price crashes, while IC does not play an important role in controlling stock prices.

Luo and Zang (2020) have proven that economic policy uncertainty is significantly and positively associated with aggregated stock price crash risk at the market level. Meanwhile, Wen *et al.* (2019) revealed that higher quality auditing can mitigate the impact of retail investor attention on firms' future crash risk. Lee *et al.* (2020) revealed that a supplier firm with a concentrated customer base experiences a higher crash risk, which is attenuated by lower switching costs and accentuated when the degree of information asymmetry is high. Another study shows that Chinese investor sentiment also affects stock price volatility (Li, 2019). Likewise, Ma *et al.* (2020) suggest that exposure to an undiversified corporate customer base can have a negative bearing on a firm's crash risk. The five studies indicate that economic policy, investor sentiment and audit quality have a significant effect on the risk of stock price crashes.

2.3 Intellectual capital efficiency

IC represents a company's intangible knowledge assets in the form of information and knowledge resources (Kitts *et al.*, 2001). Several studies have revealed that ICE can improve the performance of companies (see, e.g. Clarke *et al.*, 2011; Gogan *et al.*, 2016; Asiaei and Jusoh, 2017; Mustapha and Abdelheq, 2018; McDowell *et al.*, 2018; Sardo *et al.*, 2018; Huang and Huang, 2020). Investors are quite interested in buying shares when the company has implemented ICE. Lin *et al.* (2015) and Ozkan *et al.* (2017) show that the greater the ICE, the more it reduces stock price crashes.

Jerzak (2015) shows that human capital constitutes inborn skills and acquired skills, which, if invested efficiently, can strengthen the company's position, helping it gain competitive advantage. This means that HCE represents a selection of superior IC to be employed in the company's business. Meanwhile, Asiaei *et al.* (2018) have proven that there is a significant positive relationship between HCE levels and the use of a balanced performance measurement system. Dženopoljac *et al.* (2016) also revealed that HCE has a direct positive impact on the financial performance of companies. Therefore, companies that have a higher HCE are more likely to have a higher return on equity (ROE), a higher return on asset (ROA), a higher return on invested capital (ROIC) and tend to be more profitable.

In general, various strategies have been carried out by many companies to regulate structural capital in order to optimize the overall business performance. IC plays a central role in determining the structural capital model used in companies. Gogan *et al.* (2015) posit that determining the right model in structural capital is essential to obtain a competitive advantage in the market. This study indicates that IC plays an important role in determining efficient structural capital so that the organization's desire to be competitive in the market can be achieved. In addition, Ciprian *et al.* (2012) explained that IC is not sufficient to determine the accuracy of structural capital sizes; it is necessary to complement positions on intangible assets that can help to determine company policies and decisions.

Andersson *et al.* (2006) revealed that shareholder demand is a higher return on capital employed, meaning that CEE represents IC, which can perform accurate calculations in capital investment in order to obtain optimal returns. Mørch *et al.* (2017) explained that CEE plays an important role in making investment decisions because accurate calculations are needed regarding the fitness of operations and the financial performance of investments. Thus, ICE plays an important role in investment decisions.

2.4 Intellectual capital efficiency measurement model on stock price risk

Basically, the efficiency of ICE plays a role in the application of HCE, SCE and CEE. This study will examine the effect of ICE on stock price risk. In the testing process, we combine the measurement model of the performance of intellectual potential in the knowledge economy developed by Pulic (1998) and the calculation of the negative coefficient of firm-specific daily returns (NCSKEW) developed by Chen *et al.* (2017). ICE is calculated using three components, namely value-added human capital efficiency (VAHU), value-added structural capital (STVA) and value-added capital employed (VACA). Meanwhile, stock price risk is calculated using NCSKEW. More detailed calculations are explained in the methods section.

Several studies have used this model, which shows mixed results as well. Hejazi *et al.* (2016) found that increasing IC should increase firm value. Meanwhile, Kamukama and Sulait (2017) showed a positive and significant relationship between human capital, relational capital and structural capital on competitive advantage. Another study shows that the three sub-constructions of IC together have a positive and substantive relationship with business performance (Huang and Liu, 2005; Sharabati *et al.*, 2010). The four studies indicate that innovation and creation play a dominant role in describing the latent constructs of IC. Based on the discussion above, hypothesis (H1) is as follows:

H1a. HCE is positively related to firm performance.

H1b. SCE is positively related to firm performance.

H1c. CEE is positively related to firm performance.

Chen *et al.* (2005) have confirmed that investors place higher value on companies with better ICE. Furthermore, Song (2015) has shown that the management tends to hide some negative information and suddenly release negative information in the future if the company has a higher level of accounting disclosure of IC. Dong and Zhang (2016) have also shown that environmental control, information and communication and monitoring components significantly reduce the risk of accidents, while risk assessment and control activity components do not show any relation to the risk of a stock price crash. Ben-Nasr and Ghouma (2018) explained that employee welfare is also a factor that contributes to the risk of stock price crashes. Further analysis shows that a strong corporate governance mechanism can reduce the risk of rising stock price crashes in less unionized companies and that there is a negative impact of union strength on the risk of stock price crashes (Liao and Ouyang, 2017). Meanwhile, Anifowose *et al.* (2017) showed a positive relationship between IC as a whole and the market capitalization value of a company. Some of these studies imply that IC can reduce the risk of stock investment. Based on the above discussion, hypothesis (H2) is as follows:

H2a. HCE is negatively related to stock price crash risk.

H2b. SCE is negatively related to stock price crash risk.

H2c. CEE is negatively related to stock price crash risk.

Bennett *et al.* (2020) explained that the management, directly or indirectly, learns from its firm's stock price so that more informative stock prices should make the firm more

productive. This means that the informativeness of stock prices indicates that the company's performance is better. Martani *et al.* (2009) mentioned that a company's financial performance is shown by the profitability ratio, and the market value ratio significantly influences returns in the company. Based on this, the following hypothesis (H3) can be formulated as

H3. Firm performance is negatively related to stock price crash risk.

IC owned by the company is expected to create added value so that it can improve company performance. Good firm performance is an indicator that will be considered by investors in making investment decisions. Cenciarelli *et al.* (2018) show that bankruptcy prediction models that include IC have superior predictive capabilities over standard models. Meanwhile, stock price crashes are very likely to occur if the organization's internal controls are ineffective. The effectiveness of internal control depends on the research and development (R&D) conducted by the company. Zhou and Pan (2018) explained that companies that develop IC require capital for R&D, so they are faced with financing constraints. This means that ICE supports the effectiveness of internal control. In addition, the level of social trust also plays a role in the risk of stock price crashes. According to Cao *et al.* (2016), social trust, as a socioeconomic factor, is negatively correlated with accident risk. Companies in areas of high social trust tend to hide bad news. The management tends to disclose more related information to acquire investors. Thus, ICE is needed as a corporate strategy to increase information transparency and financial performance, which will result in increasing investor confidence. Based on the discussion above, we can hypothesize (H4) that

H4a. HCE is negatively related to stock price crash risk by using firm performance as an intervening variable.

H4b. SCE is negatively related to stock price crash risk by using firm performance as an intervening variable.

H4c. CEE is negatively related to stock price crash risk by using firm performance as an intervening variable.

3. Research design

3.1 Sample

This study uses companies from various sectors as research objects and sample for the research. The sample was collected from IDX's annual report data for 2018. We also obtained weekly stock data from Yahoo Finance. We then used the following selection criteria: First, similar to Khan and Watts (2009), we required that total assets and book values of equity for each firm be greater than zero. Second, to be included in the sample, a firm must have at least 20 weekly returns for each fiscal year. We also excluded incomplete company data and financial information. Finally, we obtained samples from 152 companies to apply to the study.

3.2 Measurement of independent variables

Chen *et al.* (2005) argue that VAIC and its three components, HCE, SCE and CEE, represent the independent variables. In order to calculate VAIC, we have to know the amount of HCE, SCE and CEE. This can be expressed in Formula (1).

$$\text{VAIC} = \text{HCE} + \text{SCE} + \text{CEE} \qquad \text{Formula 1}$$

To measure VAIC, we need value added (VA) to be calculated. In its simplest form, VA is the difference between output and input. Output represents net sales revenues and input contains all the expenses incurred in earning the sales revenues except labor costs, which are

considered to be a value-creating entity (Tan *et al.*, 2008). This VA is also defined as the net value created by firms during the year (Chen *et al.*, 2005). VA can be calculated using Formula (2).

$$\mathrm{VA} = S - B = \mathrm{NI} + T + \mathrm{DP} + I + W \qquad \text{Formula 2}$$

S is sales; B is cost of goods sold; NI is net income after tax; T is taxes; DP is depreciation; I is interest expense and W is employee wages and salaries.

3.2.1 Human capital efficiency. Human capital factors consist of skills, knowledge, productivity, competence and all aspects that pertain to an employee in the work place. HCE can be calculated using a calculation developed by Pulic (1998), where HCE is calculated using the formula VAHU. VAHU calculations can be seen in Formula (3).

$$\mathrm{VAHU} = \mathrm{VA}/\mathrm{HC} \qquad \text{Formula 3}$$

3.2.2 Structural capital efficiency. Structural capital is an element in IC and consists of organizational networks, patents, strategy and brand names. Based on Pulic (1998), we calculated SCE as in Formula (4). Meanwhile, SCE is calculated using STVA as in Formula (5).

$$\mathrm{SC} = \mathrm{VA} - \mathrm{HC} \qquad \text{Formula 4}$$

$$\mathrm{STVA} = \mathrm{SC}/\mathrm{VA} \qquad \text{Formula 5}$$

SCE is the dollar of SC within the firm, for every dollar of VA, and as HCE increases, SCE increases. If the efficiency measures for both HCE and SCE were calculated with VA as the numerator, a logical inconsistency would remain (Pulic, 1998).

3.2.3 Capital employed efficiency. CEE is the efficiency that SCE and HCE fail to capture. Pulic (1998) argues that IC cannot create value on its own, and so it must be combined with capital (physical and financial) employed (CE). CEE shows how much VA is created by a dollar spent on CE. We could calculate CE as the total assets minus intangible assets and CEE is defined as VACA. VACA calculations can be seen in Formula (6).

$$\mathrm{VACA} = \mathrm{VA}/\mathrm{CE} \qquad \text{Formula 6}$$

3.3 Measurement of dependent variable

The risk of stock price crash is the risk of a significant stock price decline after the price had soared (Kim and Zhang, 2016). This variable was developed using a model developed by Chen *et al.* (2017), which can be seen in Formula (7).

$$\mathrm{NCSKEW} = \frac{-\left[\frac{n(n-1)^3}{2}\sum_{T=1}^{n}\left(w_{i,T,t} - \overline{w}_{i,t}\right)^3\right]}{\left[(n-1)(n-2)\left(\sum_{T=1}^{n}\left(w_{i,T,t} - \overline{w}_{i,t}\right)^2\right)^{3/2}\right]} \qquad \text{Formula 7}$$

$W_{i,T,t}$ is the company's weekly specific stock returns for T weeks in year t, $\overline{wi}$, t is the average weekly return of the company's specific stock for year t and n is the number of weeks for year t. The larger NCSKEW represents a greater negative slope rate of return, which means a greater risk of stock price crashes that can occur.

3.4 Measurement of intervening variable

This study uses firm performance as the intervening variable. We use ROE to analyze firm performance. We calculate this ratio with Formula (8).

$$\text{ROE} = \frac{\text{Earning after tax}}{\text{Equity}} \qquad \text{Formula 8}$$

3.5 Empirical models

This study uses path analysis that produce two model regressions to test our hypotheses.

$$\text{ROE} = \alpha + \beta 1\ \text{VAHU} + \beta 2\ \text{STVA} + \beta 3\ \text{VACA} + \beta 4\ \text{SIZE} - \mu \qquad \text{Model I}$$

$$\text{NCSKEW} = \alpha - \beta 1\ \text{STVA} - \beta 2\ \text{VACA} - \beta 3\ \text{AHU} + \beta 4\ \text{SIZE} - \beta 5\ \text{ROE} - \mu \qquad \text{Model II}$$

ROE is the ratio for measuring firm performance, NCSKEW is the negative coefficient of firm-specific daily returns as a proxy for stock price crash risk, VAHU is value-added human capital, STVA is value-added structural capital, VACA is value-added capital employed and SIZE is firm size as the control variable in this study.

4. Results

4.1 Normality test

Table 1 shows the significance value of Asymp. The Sig (two-tailed) is 0.200. The value is greater than 0.1. According to the basis of decision making in the Kolmogorov–Smirnov normality test above, it can be concluded that the data are normally distributed so that the assumptions or statements of normality in the regression model have been fulfilled for the data above.

4.2 Multicollinearity test

The basis for decision-making from the multicollinearity test is the value of tolerance (Tol) and variance inflating factor (VIF). Based on the output table, it is known that the tolerance value of each variable is greater than 0.1. While the VIF value for each variable is less than ten. Then, according to the basis for the multicollinearity test decision-making, we can conclude that there are no symptoms of multicollinearity in the regression model. Table 2 shows the results of the multicollinearity test.

One-sample Kolmogorov–Smirnov test

		Unstandardized residual
N		152
Normal Parameters[a,b]	Mean	0.000
	Std. deviation	0.924
Most extreme differences	Absolute	0.059
	Positive	0.037
	Negative	−0.059
Test statistic		0.059
Asymp. Sig. (two-tailed)		0.200[c,d]

Note(s): a. Test distribution is normal; b. Calculated from data; c. Lilliefors significance correction and d. This is a lower bound of the true significance

Table 1. Normal probability test result

4.3 Heteroskedasticity test

Based on Figure 1, we know that data dots spread above and below or around the number 0. We can then see that the dots are not just clustered above or below. The distribution of data points does not form a wavy pattern, widening then narrowing and then widening again. We can also see that the dots do not make a certain pattern. According to the analyses, we can conclude that there is no heteroscedasticity problem; so a good and ideal regression model can be fulfilled.

4.4 Path analysis

In Table 3, Model 1 shows that the STVA and VACA coefficients have a significant positive effect on ROE at a significance level of 1% with a significance value of 0.015 and 0.000, respectively. While, based on Table 2, there is no significant relationship between VAHU and ROE at the 1% significance level; so we can conclude that H1(a) is rejected. Based on a beta test, VACA is the variable that most influences changes in ROE. The value of Sig. *F*-statistics shows that at a significance level of 1%, VAHU, VACA and STVA simultaneously influence

Table 2. Multicollinearity test results

Model 1	Unstandardized coefficients *B*	Unstandardized coefficients Std. error	Standardized coefficients Beta	*t*	Sig.	Collinearity statistics Tolerance	Collinearity statistics VIF
(Constant)	−4.074	1.323		−3.079	0.002		
VAHU	−0.062	0.096	−0.103	−0.640	0.523	0.247	4.052
STVA	0.144	0.952	0.025	0.151	0.880	0.236	4.231
VACA	0.958	0.891	0.117	1.076	0.284	0.538	1.860
SIZE	0.123	0.043	0.248	2.857	0.005	0.847	1.181
ROE	−0.271	1.481	−0.021	−0.183	0.855	0.475	2.104

Note(s): Dependent variable (NCSKEW)

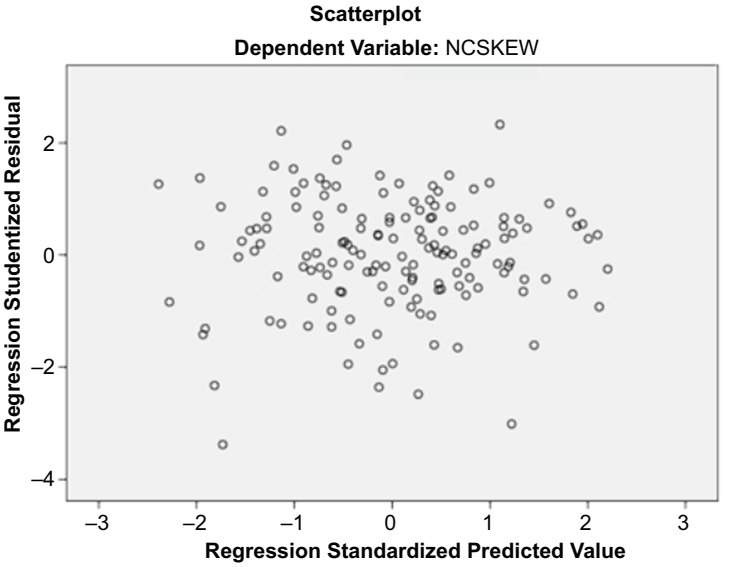


Figure 1. Heteroskedasticity test result

	Dependent variable: ROE		Dependent variable: NCSKEW	
	Predicted sign	Model 1	Predicted sign	Model 2
VAHU	+	0.001 (0.005)	–	−0.062 (0.096)
STVA	+	0.128** (0.052)	–	0.144 (0.952)
VACA	+	0.404* (0.037)	–	0.958 (0.891)
SIZE (Control)	+	0.010* (0.002)	–	0.123 (0.043)
ROE (Intervening)			–	−0.271 (1.481)
Constant		−0.340 (0.068)		−4.074 (1.323)
R-square (R^2)		0.525		0.066
Sig. *F*-stat		0.000*		0.074***
N		152		152

Note(s): This table presents the correlation coefficient number (β), while the number within parentheses is the standard error. *, ** and *** indicate significance at the levels 1%, 5% and 10%, respectively

Table 3.
Results of the regression model

ROE. This result is a strong indicator that there is a relationship between IC and firm performance, thus supporting H1(b) and H1(c). That is, if a firm can use its IC more efficiently in one year, this can lead to a performance increase in the same year.

In Table 3, Model 2 shows that all of the components of IC do not have any significant relationship with stock price crash risk at the 1% significance level. From Table 2, we also know that ROE does not have any significant influence on stock price crash risk. Furthermore, we use Model 1 and Model 2 for path analysis. After acquiring the numbers from Table 2, we calculated the indirect effect by multiplying the effect of the IC component with ROE and then ROE with stock price crash risk. Based on Table 2 and the path analysis calculation, VAHU has a direct effect on stock price crash risk of 0.103 while the indirect effect of VAHU on stock price crash risk through ROE is 0.000399. STVA has a direct effect on the risk of a stock price crash of 0.025 while STVA has an indirect effect on the risk of a stock price crash of 0.005922. Furthermore, the VACA component has a direct effect of 0.117 and an indirect effect of 0.01264 on the risk of stock price crashes. According to the principle of path analysis, if the indirect effect is greater than the direct effect, then it means there is a significant relationship in the indirect relationship between variables. We can conclude from the data that VAHU, STVA and VACA do not have any significant relationship with stock price crash risk either directly or indirectly through firm performance.

5. Discussion

Several studies show that IC plays an important role in improving sustainable company performance and business progress (see, e.g. Castillo *et al.*, 2019; Lee and Lin, 2019; Oppong and Pattanayak, 2019; Secundo *et al.*, 2020). However, the test results in this study prove that IC has no effect on stock crash risk on the IDX. In addition, other results show that the company's performance, as represented by ROE, also has no effect on stock price crash risk. We find that information inefficiency results in general distrust of stock markets in developing countries (Yang *et al.*, 2019). Information inefficiency is a global problem that always exists in the stock market, although more prevalent in developing countries than developed countries (Boya, 2019; Bartram and Grinblatt, 2021). Meanwhile, Al-Yahyaee *et al.* (2020) explain that high liquidity that is not balanced with low volatility will weaken information efficiency in the stock market. This indicates that a company's financial performance appears to be no longer considered in the share purchase decision.

Investors' optimistic (pessimistic) sentiment toward stock prices seems to dominate influence on the operation of the stock market. The sentiment index built on social media has

been shown to greatly influence the volatility of stock prices (Liang *et al.*, 2020). The optimistic (pessimistic) sentiment of Internet search-based investors can also influence premium value in the United States stock market (Teti *et al.*, 2019; Klemola, 2020). Meanwhile, Ni *et al.* (2019) reveal that the fluctuation of stock prices is more sensitive to the intraday sentiment of individuals. Chau *et al.* (2016) explain that sentiment-induced buying and selling is an important determinant of stock price variation. Based on explanations from various studies, we believe that investors' optimistic (pessimistic) sentiment toward stock price volatility dominates influence on buying or selling decisions, so that the financial performance aspects of listed companies are obscured in the stock market.

6. Conclusions and implications

6.1 Conclusions

This study examines the effect of IC components on stock price crash risk by using firm performance as an intervening variable. This research is a quantitative study using secondary data on annual reports published by the IDX and stock price data published by Yahoo Finance. IC variables are measured by the VAIC method written by Pulic (1998), and stock price crash risk variables are measured by NCSKEW developed by Chen *et al.* (2017). Data were processed using the path analysis method to determine the direct effect and indirect effect from each of the interrelated variables.

Simultaneously, the VAHU, STVA and VACA variables have a significant relationship to firm performance; however, partially, VAHU does not have a significant effect like STVA and VACA. Capital employed has the biggest influence on firm performance. The results state that the three IC variables do not have a significant direct or indirect relationship with stock price crash risk. This result is in line with several previous studies. So far, the optimistic (pessimistic) sentiment of investors regarding the volatility of share prices has obscured aspects of the financial performance of listed companies. We conclude that investor sentiment has dominated influence on stock price crash risk so that the IC aspect has become obscured.

6.2 Implications

So far, research on IC has been discussed in 700 articles written by leading authors at various universities (Dubic *et al.*, 2020). However, there is no research that discusses IC disclosure on the stock market. This research provides an understanding that the stock market is driven by the optimistic (pessimistic) sentiment of investors. This fact implies that IC disclosure, which is proxied by the company's financial performance, becomes obscured, while investors prefer to analyze the volatility of stock prices as a parameter in buying or selling decisions. In future research, it is necessary to modify the measurement of the intellectual property associated with knowledge of stock price volatility.

Basically, the ability and knowledge for compiling a stock portfolio that reveals specific information about the company is needed to increase shareholders' confidence (Chance and Yang, 2007). Meanwhile, specific information about the company will produce idiosyncratic volatility, which is the best predictor of stock returns and is proven to have a positive impact on investors' heterogeneous beliefs (Kongsilp and Mateus, 2017; He *et al.*, 2020). Zhan (2019) argues that there was a positive relationship between synchronization of stock price movements and stronger stock market volatility for emerging markets during the financial crisis from June 2007 to December 2008. As regards practical application, IC represents the knowledge and ability for preparing a stock portfolio that contains company-specific information, which is needed to minimize stock price crash risk.

References

Adesina, K.S. (2019), "Bank technical, allocative and cost efficiencies in Africa: the influence of intellectual capital", *North American Journal of Economics and Finance*, Vol. 48, pp. 419-433.

Al-Yahyaee, K.H., *et al.* (2020), "Why cryptocurrency markets are inefficient: the impact of liquidity and volatility", *The North American Journal of Economics and Finance*, Vol. 52, April 2020, 101168.

Andersson, T., *et al.* (2006), "Financialized accounts: restructuring and return on capital employed in the SandP 500", *Accounting Forum*, Vol. 30, pp. 21-41.

Anifowose, M., *et al.* (2017), "Intellectual capital disclosure and corporate market value: does board diversity matter?", *Journal of Accounting in Emerging Economies*, Vol. 7 No. 3, pp. 369-398.

Asiaei, K. and Jusoh, R. (2017), "Using a robust performance measurement system to illuminate intellectual capital", *International Journal of Accounting Information Systems*, Vol. 26, pp. 1-19.

Asiaei, K., *et al.* (2018), "Intellectual capital and performance measurement systems in Iran", *Journal of Intellectual Capital*, Vol. 19 No. 2, pp. 294-320.

Barrena-Martínez, J., *et al.* (2020), "Joint forces: towards an integration of intellectual capital theory and the open innovation paradigm", *Journal of Business Research*, Vol. 112, May 2020, pp. 261-270.

Bartram, S.M. and Grinblatt, . (2021), "Global market inefficiencies", *Journal of Financial Economics*, Vol. 139 No. 1, pp. 234-259.

Belcaid, K. and Ghini, A.E. (2019), "US European, Chinese economic policy uncertainty and Moroccan stock market volatility", *The Journal of Economic Asymmetries*, Vol. 20, e00128.

Ben-Nasr, H. and Ghouma, H. (2018), "Employee welfare and stock price crash risk", *Journal of Corporate Finance*, Vol. 48, pp. 700-725.

Bennett, B., *et al.* (2020), "Does the stock market make firms more productive?", *Economics*, Vol. 136 No. 2, pp. 281-306.

Berzkalne, I. and Zelgalve, E. (2014), "Intellectual capital and company value", *Procedia-Social and Behavioral Sciences*, Vol. 110, pp. 887-896.

Boya, C.M. (2019), "From efficient markets to adaptive markets: evidence from the French stock exchange", *Research in International Business and Finance*, Vol. 49, October 2019, pp. 156-165.

Cao, C., *et al.* (2016), "Social trust and stock price crash risk: evidence from China", *International Review of Economics and Finance*, Vol. 46, pp. 148-165.

Castillo, A.E., *et al.* (2019), "Factorial Analysis in the Intellectual capital's dimensions on micro, small, and medium-sized export enterprises", *Procedia Computer Science*, Vol. 160, pp. 567-572.

Cenciarelli, V.G., *et al.* (2018), "Does intellectual capital help predict bankruptcy?", *Journal of Intellectual Capital*, Vol. 19 No. 2, pp. 321-337.

Chance, D.M. and Yang, T.-H. (2007), "Black–scholes–merton, liquidity, and the valuation of executive stock options", in Hirschey, M., John, K. and Makhija, A.K. (Eds), *Issues in Corporate Governance and Finance (Advances in Financial Economics, 12)*, Emerald Group Publishing, Bingley, pp. 271-310.

Chau, F., *et al.* (2016), "Does investor sentiment really matter?", *International Review of Financial Analysis*, Vol. 48, December 2016, pp. 221-232.

Chen, M.C., *et al.* (2005), "An empirical investigation of the relationship between intellectual capital and firms' market value and financial performance", *Journal of Intellectual Capital*, Vol. 6 No. 2, pp. 159-176.

Chen, C., *et al.* (2017), "Earnings smoothing: does it exacerbate or constrain stock price crash risk?", *Journal of Corporate Finance*, Vol. 42, pp. 36-54.

Ciprian, G.G., *et al.* (2012), "Elaboration of accounting financial report on structural capital", *Procedia - Social and Behavioral Sciences*, Vol. 62, pp. 706-710.

Clarke, M., *et al.* (2011), "Intellectual capital and firm performance in Australia", *Journal of Intellectual Capital*, Vol. 12 No. 4, pp. 505-530.

Dabić, M., *et al.* (2020), "Two decades of the journal of intellectual capital: a bibliometric overview and an agenda for future research", *Journal of Intellectual Capital*, Vols ahead-of-print.

Dubic, M., *et al.* (2021), "Intellectual agility and innovation in micro and small businesses: the mediating role of entrepreneurial leadership", *Journal of Business Research*, Vol. 123, February 2021, pp. 683-695.

Dženopoljac, V., *et al.* (2016), "Intellectual capital and financial performance in the Serbian ICT industry", *Journal of Intellectual Capital*, Vol. 17 No. 2, pp. 373-396.

Gogan, L.M., *et al.* (2015), "Structural capital - a proposed measurement model", *Procedia Economics and Finance*, Vol. 23, pp. 1139-1146.

Gogan, L.M., *et al.* (2016), "The impact of intellectual capital on organizational performance", *Procedia-Social and Behavioral Sciences*, Vol. 211, pp. 194-202.

Hayati, M., *et al.* (2015), "The effect of intellectual capital to value relevance of accounting information based on PSAK convergence of IFRS (manufacture firms in Indonesia)", *Procedia - Social and Behavioral Sciences*, Vol. 211, pp. 999-1007.

He, M., *et al.* (2020), "Heterogeneous beliefs and idiosyncratic volatility puzzle: evidence from China", *China Finance Review International*, Vol. 11 No. 1, pp. 124-141.

He, Q. and Fang, C. (2019), "Regulatory sanctions and stock pricing efficiency: evidence from the Chinese stock market", *Pacific-Basin Finance Journal*, Vol. 58, 101241.

Hejazi, R., *et al.* (2016), "Intellectual, human and structural capital effects on firm performance as measured by Tobin's Q", *Knowledge and Process Management*, Vol. 23 No. 4, pp. 259-273.

Hu, j., *et al.* (2020), "Corporate board reforms around the world and stock price crash risk", *Journal of Corporate Finance*, Vol. 62 No. 2020, 101557.

Huang, C.C. and Huang, S.M. (2020), "External and internal capabilities and organizational performance: does intellectual capital matter?", *Asia Pacific Management Review*, Vol. 52 No. 2, pp. 111-120.

Huang, C.J. and Liu, C.J. (2005), "Exploration for the relationship between innovation, IT and performance", *Journal of Intellectual Capital*, Vol. 6 No. 2, pp. 237-252.

Jerzak, K. (2015), "The essence of human capital in a building company - selected aspects", *Procedia Engineering*, Vol. 122, pp. 95-103.

Kamukama, N. and Sulait, T. (2017), "Intellectual capital and competitive advantage in Uganda's microfinance industry", *African Journal of Economic and Management Studies*, Vol. 8 No. 4, pp. 498-514.

Khan, M. and Watts, R.L. (2009), "Estimation and empirical properties of a firm-year measure of accounting conservatism", *Journal of Accounting and Economics*, Vol. 48 Nos 2–3, pp. 132-150.

Kim, J.B. and Zhang, L. (2016), "Accounting conservatism and stock price crash risk: firm-level evidence", *Contemporary Accounting Research*, Vol. 33, pp. 412-441.

Kitts, B., *et al.* (2001), "Intellectual capital: from intangible assets to fitness landscapes", *Expert Systems with Applications*, Vol. 20, pp. 35-50.

Klemola, A. (2020), "Internet search-based investor sentiment and value premium", *Finance Research Letters*, Vol. 33, March 2020, 101224.

Kongsilp, W. and Mateus, C. (2017), "Volatility risk and stock return predictability on global financial crises", *China Finance Review International*, Vol. 7 No. 1, pp. 33-66.

Lee, C.C. and Lin, C.K. (2019), "The major determinants of influencing the operating performance from the perspective of intellectual capital: evidence on CPA industry", *Asia Pacific Management Review*, Vol. 24 No. 2, pp. 124-139.

Lee, S.M., *et al.* (2020), "Customer concentration and stock price crash risk", *Journal of Business Research*, Vol. 110 No. 2020, pp. 327-346.

Lentjushenkova, O. and Lapina, I. (2014), "The classification of the intellectual capital investments of an enterprise", *Procedia - Social and Behavioral Sciences*, Vol. 156, pp. 53-57.

Li, X. (2019), "Does Chinese investor sentiment predict Asia-pacific stock markets? Evidence from a nonparametric causality-in-quantiles test", *Finance Research Letters*, 101395.

Liang, C., *et al.* (2020), "Which sentiment index is more informative to forecast stock market volatility? Evidence from China", *International Review of Financial Analysis*, Vol. 71, October 2020, 101552.

Liao, Q. and Ouyang, B. (2017), "Organized labor, corporate governance, and stock price crash risk", *Review of Accounting and Finance*, Vol. 16 No. 4, pp. 424-443.

Lin, Y.M., *et al.* (2015), "The information content of unexpected stock returns: evidence from intellectual capital", *International Review of Economics and Finance*, Vol. 37, pp. 208-225.

Liu, C.H. and Jiang, J.F. (2020), "Assessing the moderating roles of brand equity, intellectual capital and social capital in Chinese luxury hotels", *Journal of Hospitality and Tourism Management*, Vol. 43, pp. 139-148.

Longo, M. and Mura, M. (2011), "The effect of intellectual capital on employees' satisfaction and retention", *Information and Management*, Vol. 48 No. 7, pp. 278-287.

Luo, Y. and Zang, C. (2020), "Economic policy uncertainty and stock price crash risk", *Research in International Business and Finance*, Vol. 51, January 2020, 101112.

Ma, X., *et al.* (2020), "Corporate customer concentration and stock price crash risk", *Journal of Banking and Finance*, Vol. 119, October 2020, 105903.

Mahmood, T. and Mubarik, M.S. (2020), "Balancing innovation and exploitation in the fourth industrial revolution: role of intellectual capital and technology absorptive capacity", *Technological Forecasting and Social Change*, Vol. 160, November 2020, 120248.

Martani, D., *et al.* (2009), "The effect of financial ratios, firm size, and cash flow from operating activities in the interim report to the stock return", *Chinese Business Review*, Vol. 8 No. 6, pp. 44-55.

Martinez, J.B., *et al.* (2020), "Joint forces: towards an integration of intellectual capital theory and the open innovation paradigm", *Journal of Business Research*, Vol. 112, pp. 261-270.

McDowell, W.C., *et al.* (2018), "Building small firm performance through intellectual capital development: exploring innovation as the "black box", *Journal of Business Research*, Vol. 88, pp. 321-327.

Mørch, O., *et al.* (2017), "Maximizing the rate of return on the capital employed in shipping capacity renewal", *Omega*, Vol. 67, pp. 42-53.

Moin, A., *et al.* (2020), "In search of stock repurchases determinants in listed Indonesian firms during regulatory changes", *Journal of Economic Behavior and Organization*, Vol. 176, August 2020, pp. 145-165.

Mustapha, M. and Abdelheq, L. (2018), "The role of investment in intellectual capital in improving organizational performance considering knowledge management: the case study of wireless communication sector in Algeria", *Arab Economic and Business Journal*, Vol. 13 No. 1, pp. 73-91.

Ni, Y., *et al.* (2019), "A novel stock evaluation index based on public opinion analysis", *Procedia Computer Science*, Vol. 147 No. 2019, pp. 581-587.

Oppong, G.K. and Pattanayak, J.K. (2019), "Does investing in intellectual capital improve productivity? Panel evidence from commercial banks in India", *Borsa Istanbul Review*, Vol. 19 No. 3, pp. 219-227.

Örnek, A.S. and Ayas, S. (2015), "The relationship between intellectual capital, innovative work behavior and business performance reflection", *Procedia - Social and Behavioral Sciences*, Vol. 195, pp. 1387-1395.

Ozkan, N., *et al.* (2017), "Intellectual capital and financial performance: a study of the Turkish Banking Sector", *Borsa Istanbul Review*, Vol. 17 No. 3, pp. 190-198.

Pulic, A. (1998), *Measuring the Performance of Intellectual Potential in Knowledge Economy, Paper Presented in 1998 at the 2nd McMaster World Congress on Measuring and Managing Intellectual Capital by the Austrian Team for Intellectual Potential*, McMaster University, Hamilton.

Salvi, A., *et al.* (2020), "Intellectual capital disclosure in integrated reports: the effect on firm value", *Technological Forecasting and Social Change*, Vol. 160, November 2020, 120228.

Sardo, F., *et al.* (2018), "On the relationship between intellectual capital and financial performance: a panel data analysis on SME hotels", *International Journal of Hospitality Management*, Vol. 75, pp. 67-74.

Secundo, G., *et al.* (2020), "Sustainable development, intellectual capital and technology policies: a structured literature review and future research agenda", *Technological Forecasting and Social Change*, Vol. 153, 119917.

Sharabati, A.A.A., *et al.* (2010), "Intellectual capital and business performance in the pharmaceutical sector of Jordan", *Management Decision*, Vol. 48 No. 1, pp. 105-131.

Song, L. (2015), "Accounting disclosure, stock price synchronicity and stock crash risk: an emerging-market perspective", *International Journal of Accounting and Information Management*, Vol. 23 No. 4, pp. 349-363.

Tan, H.P., *et al.* (2008), "The evolving research on intellectual capital", *Journal of Intellectual Capital*, Vol. 9 No. 4, pp. 585-608.

Teti, E., *et al.* (2019), "The relationship between twitter and stock prices. Evidence from the US technology industry", *Technological Forecasting and Social Change*, Vol. 149, December 2019, 119747.

Wen, F., *et al.* (2019), "Retail investor attention and stock price crash risk: evidence from China", *International Review of Financial Analysis*, Vol. 65 No. 2019, 101376.

Yang, B., *et al.* (2019), "Is informational inefficiency priced in stock markets? A comparison between the US and Chinese cases", *Pacific-Basin Finance Journal*, Vol. 55, June 2019, pp. 222-238.

Yong, J.Y., *et al.* (2019), "Nexus between green intellectual capital and green human resource management", *Journal of Cleaner Production*, Vol. 215, April 2019, pp. 364-374.

Yusliza, M.Y., *et al.* (2020), "A structural model of the impact of green intellectual capital on sustainable performance", *Journal of Cleaner Production*, Vol. 249, March 2020, 119334.

Yusoff, Y.M., *et al.* (2019), "Do all elements of green intellectual capital contribute toward business sustainability? Evidence from the Malaysian context using the Partial Least Squares method", *Journal of Cleaner Production*, Vol. 234, October 2019, pp. 626-637.

Zhan, F. (2019), "Individualism, synchronized stock price movements, and stock market volatility", *International Journal of Managerial Finance*, Vol. 15 No. 3, pp. 371-403.

Zhou, Z. and Pan, D. (2018), "Can corporate innovation restrain the stock price crash risk?", *Journal of Financial Risk Management*, Vol. 7 No. 1, pp. 39-54.

Corresponding author
Agung Nur Probohudono can be contacted at: anprobohudono@staff.uns.ac.id