Volatility Transmission
In Indonesia's Conventional and Sharia Stocks Market Index

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Abstract. This study aims to determine the source of volatility transmission and performance of the Indonesia stock market index, both conventional (Jakarta Composite Index-JCI) and sharia (Jakarta Islamic Index – JII). Since there is a differences in investment principles and should be translated to the different source of volatility between these two indexes. Therefore, this study used global macro conditions (proxied by Brent-Oil Prices and Gold Price); relationship among financial markets (proxied by the Dow Jones Industrial Average-DJIA); as well as the fundamental condition of Indonesia (proxied by the Rupiah exchange rate and Yield of Rupiah 10 Year Bonds or SUN) as independent variables that may be becomes the source of volatility. This research used the stochastic econometric approach with the fundamental approach (multibreak structural model) and volatility approach (ARCH/GARCH model). The data used in this study uses daily data between 2 January 2019 to 31 May 2022. Furthermore, found that there were more structural breaks in JKSE than JII. In addition, since the period of structural breaks period of JKSE and JII after the extraordinary pandemic event that was still the same until the end of the observation showed that the impact of the pandemic had not ended yet. In addition, found that Indonesia's economic fundamentals (USDIDR and INDO10) have a larger coefficient of magnitude and impact on the volatility of the both index than other variables. However, the significant impact on BRENT and DOW in several periods of structural break indicates the need for global volatility to be observed.

Keywords: Volatility Transmission, Indonesia's Stocks Market.

1 Introduction

Specifically, capital market terminology is not found in the Quran or Hadith. However, the concepts of multiple ownership, freedom to act and social justice are principles that should not be abandoned in Islamic economics (Karim, 2012). Where one form of embodiment is the concept of profit-loss sharing, which was exemplified by the Prophet Muhammad SAW when conducting trading activities at the age of 16-17 years around the Haram mosque using the Murabaha method.

The compatibility of the concept of muamalah and equity in the stock market based on the profits and or losses that may arise from economic activities/businesses is shared, is expected to be a driving force for the strengthening of the global shariah stock market. Moreover, the Islamic capital market is encouraging ethical characters, good governance, profit distribution. Accountability, fairness and efficiency based on Islamic norms among investors., meanwhile ehe conventional efficient market theory failed to ensure the practical safeguard for tiny and less efficient investors, therefore the shariah stock market can be suggested as a good alternative (Alam, et.al, 2017).

Therefore, the Sharia stock index is expected to explain stock market developments more efficiently and in line with company performance that comply with Sharia principles and reflect industry conditions, liquidity and financial ratio of a country (Hakim and Rashidian, 2002; Nisar and Khatkhatay, 2006; Derigs and Marzban, 2009; Miniaoui, et.al, 2015). Moreover, El-Hawary et al., (2004), stated that Islam encourages the existence of several capital market principles (including the stock market), namely: Prohibits any interest applied when money is loaned and repaid with interest, regardless of whether it is fixed or floating, Prohibition of uncertainty (Gharar), No speculation (Maisir), Prohibits investments (Haram) that are unacceptable from a Shariah perspective, e.g. investments in the alcohol trade, arms and gambling, Risk taking (Mukhatarah) in sharia, so there is a prohibition on guaranteed fixed returns on an investment; otherwise the parties must bear the risk in a transaction .

Furthermore, the limitations in Islamic economics, which should also be reflected in the stock market, are at least in;

QS Ar-Rum ayat 39;

وَمَآ ءَاتَيْتُم مِّن رِّبًا لِّيَرْبُوَا۟ فِىٓ أَمْوَٰلِ ٱلنَّاسِ فَلَا يَرْبُوا۟ عِندَ ٱللَّهِ ۖ وَمَآ ءَاتَيْتُم مِّن زَكَوٰةٍ تُرِيدُونَ وَجْهَ ٱللَّهِ فَأُو۟لَٰٓئِكَ هُمُ ٱلْمُضْعِفُونَ

Meaning: And something usury (additional) that you give so that it increases in human wealth, then usury does not add to the sight of Allah. And what you give in the form of zakat which you mean to achieve the pleasure of Allah, then (who do so) it is those who multiply (the reward).

QS Al-Baqarah ayat 278 - 280;

يَٰٓأَيُّهَا ٱلَّذِينَ ءَامَنُوا۟ ٱتَّقُوا۟ ٱللَّهَ وَذَرُوا۟ مَا بَقِيَ مِنَ ٱلرِّبَوٰٓا۟ إِن كُنتُم مُّؤْمِنِينَ فَإِن لَّمْ تَفْعَلُوا۟ فَأْذَنُوا۟ بِحَرْبٍ مِّنَ ٱللَّهِ وَرَسُولِهِۦ وَإِن تُبْتُمْ فَلَكُمْ رُءُوسُ أَمْوَٰلِكُمْ لَا تَظْلِمُونَ وَلَا تُظْلَمُونَ وَإِن كَانَ ذُو عُسْرَةٍ فَنَظِرَةٌ إِلَىٰ مَيْسَرَةٍ وَأَن تَصَدَّقُوا۟ خَيْرٌ لَّكُمْ إِن كُنتُمْ تَعْلَمُونَ

Meaning: O you who believe, fear Allah and leave the rest of usury (which has not been collected) if you are believers. So if you do not do (leaving the rest of usury), then know that Allah and His Messenger will fight you. And if you repent (from taking usury), then for you the principal of your property; you neither persecute nor be persecuted. And if (the debtor) is in trouble, then give him respite until he is abundant. And giving charity (some or all of the debt) is better for you, if you knew.

Q.S. Shad (38): 24;

قَالَ لَقَدْ ظَلَمَكَ بِسُؤَالِ نَعْجَتِكَ إِلَىٰ نِعَاجِهِ ۖ وَإِنَّ كَثِيرًا مِنَ الْخُلَطَاءِ لَيَبْغِي بَعْضُهُمْ عَلَىٰ بَعْضٍ إِلَّا الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ وَقَلِيلٌ مَا هُمْ ۗ وَظَنَّ دَاوُودُ أَنَّمَا فَتَنَّاهُ فَاسْتَغْفَرَ رَبَّهُ وَخَرَّ رَاكِعًا وَأَنَابَ

Meaning: He (Dawud) said, "Indeed, he has wronged you by asking your goat to be added to his goat. Indeed, many of those who are partners do wrong to others, except those who believe and do good; and very few of them do." And David suspected that We tested him; So he asked forgiveness of his Lord and bowed down and repented.

Q.S. al-Nisa' (4):29:

يَا أَيُّهَا الَّذِينَ آمَنُوا لَا تَأْكُلُوا أَمْوَالَكُمْ بَيْنَكُمْ بِالْبَاطِلِ إِلَّا أَنْ تَكُونَ تِجَارَةً عَنْ تَرَاضٍ مِنْكُمْ ۚ وَلَا تَقْتُلُوا أَنْفُسَكُمْ ۚ إِنَّ اللَّهَ كَانَ بِكُمْ رَحِيمًا

Meaning: O you who believe! Do not eat each other's property with vanity (not right), except in trade which is carried out on the basis of consensual between you. And don't kill yourself. Indeed, Allah is Most Merciful to you.

Globally, the emergence Islamic capital market development was initiated by the emergence of the Dow Jones Islamic Market index (DJIM), which was launched in 1999. Meanwhile in Indonesia, the development of the sharia stock market was driven by Jakarta Islamic Index (JII) launch which was launched on 3 July 2000, which was followed by Indonesian Sharia Stock Index launch on 12 May 20011 and JII70 on 17 May 2018. in accordance with global developments and also encouraged by the fatwa of the National Sharia Council of the Indonesian Ulema Council (DSN-MUI) in 2003 concerning capital market transaction as long as the mechanism and object do not conflict with sharia principles is permissibility.
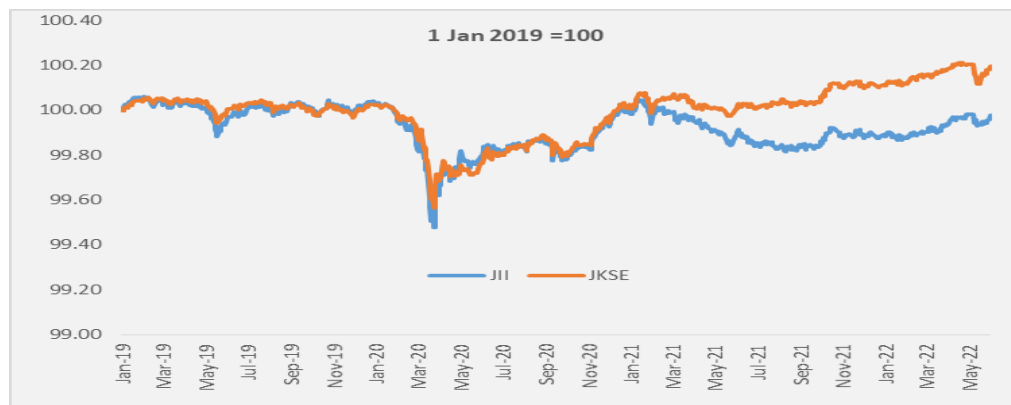
Source : Bloomberg, treated (2022).

Fig. 1. Performance of JII and JKSE, Between 1 Jan 2019 to 31 May 2022
(1 Jan 2019 = 100)

For this reason, stock market volatility analysis is an interesting topic to discuss considering that it can provide substantial information about investing risk patterns, and the transaction process (Mallikarjunappa and Afsal, 2008), providing opportunities to gain some capital gains (Kartika, 2010).), and minimize capital risk (Purawati and Dana, 2016). In addition, reflects a country's

fundamental volatility reflecting stock market volatility (Diebold and Yilmaz, 2010) and can be a leading indicator of a country's economy (Bodie, Kane, and Marcus, 2013). Therefore, knowing the pattern of stock market changes in a country, with the volatility of stock index returns varying from time to time (Hill, Griffiths, and Lim, 2011), financial system stability can be an indicator and be an early warning of possible threats. (Sahel and Vesala, 2001).

Jones and Kaul (1996), found that one of the things that causes stock market volatility is the world oil price. Where there is a significant impact on changes in stock price indexes in the United States and Japan. Then, Filis and Floros (2011) find that there is a negative impact caused by oil price shocks on oil exports (Canada, Mexico, and Brazil), and oil importing stock markets (United States - US, Germany, and the Netherlands) and oil importing stock markets (United States - US, Germany, and the Netherlands), although there is no time correlation difference. - variying between the groups of these two countries. Hossenidoust et al. (2013) found a positive effect of oil prices on the ASEAN-5 stock market index, and also found that the significant effect of volatility of the gold market on the volatility of the Malaysian and Singaporean stock markets.

Not only has a direct effect on stock prices, but changes in oil prices will in fact affect the economic condition of a through several channels country. Hamilton (1983); Jones, Leiby and Paik (2004) argue that changes in oil prices have side effects in the form of an increasing in investment costs, and an increasing cost of basic production inputs, a transfer of wealth from oil-importing countries to oil-exporting countries, and on the other hand also causes unemployment, changes in policy. monetary and interest rates, as well as rising prices or inflation.

However, keep in mind that the relationship between world oil prices and the stock market sometimes has a changing pattern. This is illustrated by Mohaddes and Pesaran (2016) who found that there was a negative relationship between oil prices and stock markets between 1946 and 2016 in 27 countries, but in 2008 and 2016, when world oil prices were at low levels, the form of the relationship between oil prices and the stock market is positive.
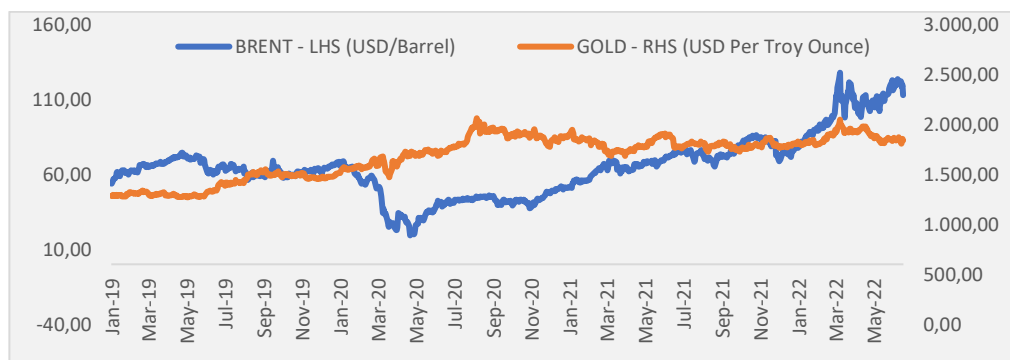
Source : Bloomberg, treated (2022).

Fig. 2. Brent Oil Price and gold Price, Between 1 Jan 2019 to 31 May 2022

The development of changing patterns of volatility in the stock market is becoming increasingly interesting as financial liberalization becomes more common throughout the world. So that the movement of the stock market in a country does not only depend on itself, but is also influenced by the development of regional and global stock exchanges. Liu (2007) found an asymmetric relationship between stock markets in ASEAN countries and stock markets in the US and China's stock markets. This is echoed by Sok-Gee and Karim (2010) who found that ASEAN-5 stock market returns and volatility are largely affected by the US stock market, compared to the Japanese stock market. Balcilar et al. (2015) also found a causal effect between volatility in the US stock market and volatility in the Pacific Rim stock market, compared to the Japanese stock market. The magnitude of US market influencing volatility in the ASEAN stock market is also shown by Lee and Goh (2016) who found the spillover effect is mainly caused by US market on the ASEAN-5 stock market, so that the ASEAN-5 stock market tends to react strongly to news. which is on the US stock market, especially the less favorable news.

Regional relations between stock markets can also be seen in the research of Tuan, et.al,. (2015). Where he finds that in the short term, the Indonesian stock market and Singapore stock market volatility has affected the Indian stock market volatility, but on the other hand, there is no effect caused by Indian stock market volatility spillover to the ASEAN-5 stock market. Johansson (2010) found that there is a dynamic correlation between stock markets and debt securities markets in Asian countries. This relationship is increasing along with the economic instability in several countries, which reflects the existence of cross-asset contagion effect.
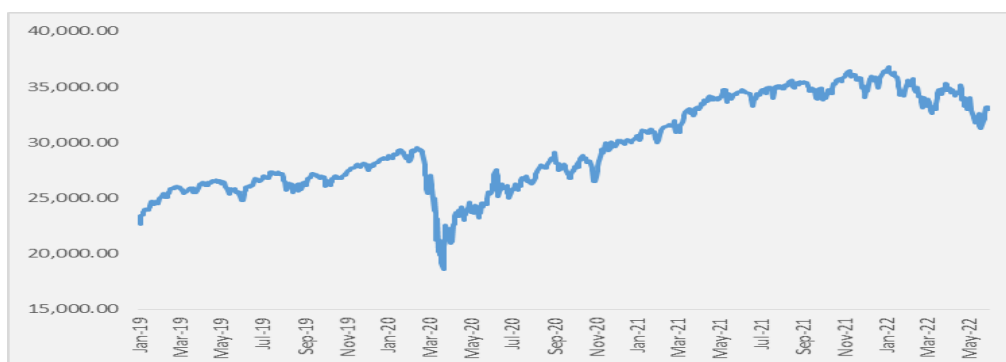
Source : Bloomberg, treated (2022).

Fig. 3. Dow Jones Industrial Average Performances, Between 1 Jan 2019 to 31 May 2022

However, Dornbusch and Claesens (2000) warn that way to estimate spillover volatility is not only by the relationship (or cross-market) of stock price movements between countries. This is because domestic economic conditions (fundamental) are things that also affect volatility in the stock market. Engle and West (2003) state that the country's fundamental factor is reflecting exchange rate because it is also affected by other fundamental variables, such as the interest rate, inflation rate, output and relative money supply. This is reaffirmed by Sarno and Schmeling (2014) who find that the strong and significant predictive power caused by exchange rate for future macro fundamentals.

Source : Bloomberg, treated (2022).

Fig. 4. USDIDR and Sovereign Yield Indonesia's 10 Year Performances,
Between 1 Jan 2019 to 31 May 2022

The development of returns and risks between asset portfolios in a country is also something that should be considered in seeing how it impacts the stock market in a country. Puteh, Saputra and Halim (2021) state that the how resistant Islamic stock market is to financial crises or economic shocks compared to conventional stock market. In addition, the Islamic stock index can be used as a form of diversification against volatility and financial uncertainty in the United States (Aziz, et.al, 2021). Even Islamic issuers offer potential diversification benefits (Abbes and Trichilli, 2015).

Even so, Miniaoui, et.al, (2015) found that Islamic stock indices in Gulf Cooperation Councils countries have the same risk profile as their conventional counterparts. Likewise, Zulaikha, Kareem and Masih (2018) found that global interest rates have a similar impact on financial markets, both Islamic and conventional stock markets in Indonesia. On the other hand, Suryadi, Endi, Yasid (2020) found that there was a difference in the level of risk-return which was reflected in the sharpe ratio between the conventional and Islamic stock markets in Indonesia.

Referring to the various developments above, both from the different concepts in investing, the differences in the possible sources of volatility between stock indexes and how the possible differences in the pattern of relationships formed encourage researchers to discuss the Volatility Transmission Patterns of the Islamic Stock Market and the Conventional Stock Market in Indonesia.

2 Methodology

2.1 Literature Review

Economy and the Pandemic. Severe Acute Respiratory Syndrome (SARS) causes differences in investment and consumption behavior of companies (Lee and McKibbin, 2004), has stopped tourism in Hong Kong (Chien and Law, 2003), Taiwan (Siu and Wong, 2004), and has a negative impact on tourism activities. economy (Waugh 2003) and caused the largest stock

market crash in Taiwan's history (Chen et al., 2007) but with differing impacts between sectors (Chien and Law, 2003) and between countries (Hai et al., 2004).

Nail and mouth disease (FMD) has a negative but indirect impact on tourism and economic activity in the UK (Blake et al., 2003), as well as the Ebola virus for West African countries (UNDP, 2014), even Ebola has a relationship with price declines. assets in the US (Marinc, 2016).

Stock Market and Pandemic. The basic assumption of the efficient market hypothesis is that information, both public and private, will be reflected in stock prices and indexes (Fama et al., 1969). While in the mean time, the risk of a pandemic is inversely related to the emotions and sentiments of investors (Smith 2006, and Wang et al. 2013). For example, anxiety and stress as negative emotions are related to risk and crises positively (Burns et al., 2012), as well as the bearish trend caused by the pandemic (In et al., 2002; Lee and McKibbin 2004; and Liu 2020), moreover followed by negative news related to the pandemic (Donadelli et al., 2017, Ashraf, 2020, and Baek et al. 2020) as well as confirmed cases and lockdowns (Baig et al., 2021).

Al-Awadhi et al. (2020) and Liu et al. (2020) there were negative abnormal returns during a pandemic in 21 global stock markets. Meanwhile, Phan and Narayan (2020) found that there was an opposite reaction between the news of the pandemic and stock markets in 25 countries.

Stock Market Volatility and Pandemic. Volatility is explained by the upward or downward fluctuation of the index and stock returns (Bhowmik and Wang 2020). The source of volatility in the US stock market can come from negative news related to Covid-19 (Baek, et al., 2020) as well as political risks and oil prices - as in late 2020 (Sharif, et al., 2020).

Likewise, Covid-19 impact on stock markets in Asia (Sharma, 2020), India (Bora and Basistha 2020) and 34 world countries (Uddin et al., 2021). Onali (2020) uses the GARCH model to explain volatility in the stock market – the Dow Jones and S&P 500 indexes – due to the Covid-19 pandemic. Baig et al. (2021) uses the GARCH (1,1) model to explain the number of deaths, lockdowns carried out and the number of cases confirmed on liquidity and volatility on the US stock exchange.

The difference in volatility due to the news of the pandemic at the level of stock prices - sharia and non-sharia - was found by Ashraf (2022). The performance of differences in volatility between stock prices – Islamic and non-Sharia – was also found in Salisu and Shaik (2022), although the effectiveness of hedging in Islamic stocks is lower than conventional stocks. This difference is also found on the Tehran stock exchange (Moradi et al., 2021).

Dharani et al. (2022) used the pooled regression model to explain the lower volatility of Islamic stock index compared to non-Sharia stock index in the S&P-1200 in the period 2010 to 2020. While Abdullahi (2021) uses the GARCH and GMM models in explaining the pandemic effects on the volatility of the Islamic stock index. Thus, Yarovaya et al. (2020) found a conventional stock indicies spillover to Islamic stock indices during the pandemic.

Saleem, Bárczi, and Sági (2021) found that the volatility of the Islamic stock market in Bahrain, Qatar, UAE. ASEAN, BRIC, GCC, MENA, MENASA and Australia in the pre-pandemic

period were lower. However, during the pandemic, the shariah stock markets in Qatar, United Arab Emirates, ASEAN, MENA, MENASA and Bahrain were significantly affected by these conditions in the short term. That volatility persisted throughout the pandemic period, except for Qatar.

Darinda and Permana (2019) found that there is a different pattern between the oil price-Brent and the Dow Jones Industrial Average Index to the stock market in Asean-5 countries of volatility transmission, during the "High-Oil Price" era with the "Low-Oil" era. Prices". This study uses the Asymmetric GARCH (1,1)-BEKK model, with the data period between January 4, 2012 to June 30, 2017.

Kusumahadi and Permana (2021) using daily data from 15 countries during January 2019 to June 2020, found that the volatility of stock indices changed during the pandemic, except for stock indices in the United Kingdom.

In summary, this research reference is built from the research contained in the following table:

Table 1. Research References

No.	Researcher	Object	Period	Method
1	Johansson (2011)	Conventional Stock Exchanges in China, Hong Kong, Indonesia, South Korea, Malaysia, Philippines, Singapore, Taiwan and Thailand	December 31, 1993 to December 31, 2008	*Bivariate Stochastic Volatility Model*
2	Antonio, Hafidhoh and Fauzi (2013)	Jakarta Islamic Index, and FTSE Bursa Malaysia Hijrah Shariah Index.	January 2006 to December 2010	*VECM*
3	Darinda and Permana (2019)	Stock Exchanges in Indonesia, Malaysia, Thailand, Singapore and the Philippines	January 2, 2012 to June 30, 2017	*VAR* and *Asimetris GARCH (1,1)-BEKK*
4	Hakim, et.al (2020)	Dow Jones Industrial Average, and Dow Jones Islamic Market	11 May 2001 to 3 April 2020	*VARMA-GARCH Model*
5	Yanik, Osman dan Ozturk (2020)	Stock Indices in Turkey	April 2015 to February 2019	*Granger Causality*
6	Saleem, Bárczi, and Sági (2021)	Thomson Reuters IdealRatings Islamic Index in Australia, Qatar, UAE, ASEAN, BRIC, MENA, MENASA and Bahrain.	1 January 2019 to 10 August 2020	*Event Study* and *GARCH*
7	Yanik, Osman and Ozturk (2020)	Stock Indices in Turkey	April 2015 to February 2019	*Granger Causality*
8	Kang (2021)	Stock Indices in China	December 2017 to March 2021	*Logistic Regression Model*
9	Kusumahadi and Permana (2021)	Stock Indices in US, Italy, Spain, Germany, China, France, UK,	1 January 2019 to 30 June 2020	*Fundamental Equation*

No.	Researcher	Object	Period	Method
		Canada, South Korea, Brazil, Australia, Indonesia, South Africa, Singapore and Morocco		and *TGARCH Model*

2.2 Research Method

Based on the literature review, this study use data from Indonesia's stock market, namely conventional (JKSE) and sharia (JII). Where the data will be collected from various sources. With the research period planned between early January 2019 to end of May 2022 with a total of 890 observations. The data are secondary data obtained from Bloomberg Terminal. We use the Eview application as a tool for data and research analysis.

Based on literature, we use the global macro conditions (proxied by Brent oil prices - BRENT and Gold Price - GOLD); relationship among financial markets (proxied by the Dow Jones Industrial Average-DJIA); as well as the fundamental condition of Indonesia (proxied by the Rupiah exchange rate - USDIDR and Yield of Rupiah 10 Year Bonds – INDO10) as independent variables that may be becomes the source of volatility. And since the Covid-19 outbreak happen around the globe, we expect that the observation period contain a structural change, either single or multiple. This structural change based on empirical studies from Andrews, Lee and Ploberger, (1996), Garcia and Perron (1996), Liu, Wu and Zidek (1997), Lumsdaine and Papell (1997), and Morimune and Nakagawa (1997); Bai and Perron (1998, 2003).

In the early stages of the data processing, we change the data unit into daily returns that are continuously compounded returns, which are calculated as follows:

$$R = (\frac{Pt}{Pt-1}) \times 100 \tag{1}$$

Note:

R = return obtained by an investor for variables in period.

P = closing price of variable i in period t.

P-1 = closing price of variable i in period t-1.

Then, the econometric methods that we use in this research :

Multiple linear regression with m-breaks. The model based on Bai and Perron, (2003):

$$y_t = x'_t \beta + z'_t \delta_j + u_t \tag{2}$$

For *j =1 ……. m +1*. In this model, yt is the observed dependent variable at time *t*; x_t *(p×1)* and *zt (q×1)* are vectors of covariates and *β* and *δj (j = 1 ..... m +1)* are the corresponding vectors of coefficients; ut is the disturbance at time t. The indices *(T_1……,T_M)*, or the breakpoints are explicitly treated as unknown *(T_0 = 0 and T_{m+1} = T)*, to estimate the unknown regression coefficient together with the break point when T observations on variables *(y_t, x_t and z_t)* are available. Then, when p=0, we obtain a pure structural change model where all the coefficients are subject to change. The variance of ut needs not be constant. Indeed, breaks in variance are permitted provided at the same dates as breaks in the parameters of the regression.

Volatility Model (GARCH Model). We use a GARCH model to overcome the heteroskedasticity that arises from highly volatile data. Moreover, we use the GARCH model to allow for different effects of good and bad news on volatility. The model used in this study is as follows:

$$R = \mu i + e \tag{3}$$

$$\sigma^2 = \delta + \alpha_i \varepsilon^2_{i,t-1} + \beta_i \sigma_{i,t-1} \tag{4}$$

Equation (3) is the conditional mean equation for stock index returns, and equation (4) is the variance equation, which models the volatility. We use the parameter α in equation (4) to investigate the autoregressive conditional heteroskedasticity (ARCH) effect, that is, whether a shock in the previous period affects stock return volatility. Moreover, we use the parameter β to check whether stock return volatility is affected by volatility in the previous period (i.e., the GARCH effect).

3 Result and Discussion

3.1 Descriptive Analytic

We conduct a descriptive analysis of the analysis period, defined as 2 January 2019 to 31 May 2022. We are processed the data at the daily return level in order to align data between variables. Based on the Table (1), we can conclude that – Brent (Brent oil price), GOLD (Gold Price), DOW (Dow Jones Industrial Average), USDIDR (Rupiah per USD), INDO10 (Yield of Indonesia's 10 year), JKSE and JII – have a different variability in statistics in dataset, in Raw Data or in Return Data's set.. It is indicated by different range of mean to maximum and minimum level and different standard deviation between variables. This calculation, hopefully, will prevents the result in a variance of zero.

Table 2. Descriptive Statistics

	BRENT	GOLD	DOW	USDIDR	INDO10	JKSE	JII
Raw Data							
Mean	64.5904	1,682.9110	29,721.0600	14,336.7400	6.8989	6,038.2150	607.1871

	BRENT	GOLD	DOW	USDIDR	INDO10	JKSE	JII
Median	64.2400	1,766.2400	28,640.0700	14,268.0000	6.8225	6,180.6680	593.8115
Maximum	127.9800	2,063.5400	36,799.6500	16,575.0000	8.3080	7,276.1930	727.0110
Minimum	19.3300	1,270.6900	18,591.9300	13,583.0000	5.8610	3,937.6320	393.8630
Std. Dev.	19.7146	212.3953	4,071.9790	401.7513	0.6024	655.2002	66.6711
Return Data							
Mean	0.1386	0.0448	0.0492	0.0024	-0.0111	0.0222	-0.0025
Median	0.2968	0.0842	0.0491	0.0000	0.0000	0.0000	0.0000
Maximum	21.0186	5.0920	11.3650	4.5326	5.9296	10.1907	12.8103
Minimum	-24.4036	-5.6947	-12.9266	-2.7002	-4.7815	-6.5787	-7.8394
Std. Dev.	2.9960	0.9348	1.4287	0.4145	0.7968	1.1032	1.4028
Observations	890	890	890	890	890	890	890

Source : Author's calculation (2022).

Figure 5 shows that the highest daily volatility return in conventional stock market index (JKSE) and syariah stock market index (JII) occuring between March 2020 to May 2020. The "abnormal" volatility between March 2020 to May 2020 also reflects the COVID-19 pandemic risk in Indonesia. As we know, at 2 March 2020, emerged the first Covid cases in Indonesia. Then at 14 March 2020, Indonesia's government announced the Covid-19 pandemic as the extraordinary events (kejadian luar biasa). We also observe that JKSE and JII exhibit time-varying volatility.
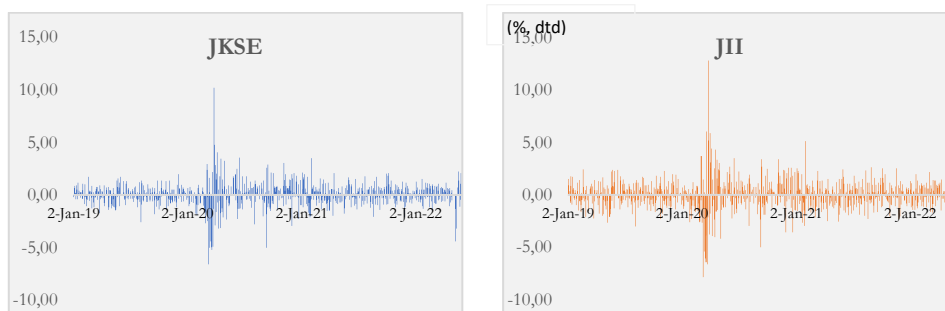
Source : Bloomberg, treated (2022).

Fig. 5. Daily Stock Index Return Volatility in JKSE and JII

3.2 Empirical Analysis

Multiple Breakpoint Test. Likewise any other time-series data, we conduct a unit root test, namely the augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979) and the Phillips-Perron (PP) test (Phillips & Perron, 1988). The summary of unit root tests (shown at table 2) produce that all of the return variables in our analysis are stationary and have the same degree of integration.

Then, we calculate the breakpoint test that aims to identifying periods when abnormal changes occur by identifying the structural breaks in observation periods, especially if we expects a

different structural in the economy. Bai and Perron (2003) considers multiple structural changes issues, occurring at unknown dates, estimated by multiple linear regression with m-breaks model (equation 2).

Table 3. Summary of Unit Root Test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-31.4891	0.0000	7	6135
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	578.892	0.0000	7	6135
PP - Fisher Chi-square	1078.46	0.0000	7	6223

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source : Author's calculation (2022).

From the breakpoint test result, we found that along the period, JKSE have two structural breaks, which is at 9/20/2019 (2 September 2019) and 4/01/2020 (1 April 2020). Using these result, the JKSE's structural breaks modes divided into three period, namely; (i) Period 1, between 1/02/2019 to 9/19/2019, (ii) Period 2, between 9/20/2019 to 3/31/2020, (iii) Period 3, between 4/01/2020 - 5/31/2022.

Meanwhile, from the JII's breakpoint test result, we found JII only one structural breaks, which is at 4/06/2020 (6 April 2020). That means the JII's structural breaks modes divided only into two period, namely; (i) Period 1, between 1/02/2019 to 4/05/2020, (ii) Period 2, between 4/06/2020 to 5/31/2022.

Table 4. Summary of Multiple Structural Breaks Result

Dependent Variable	BRENT	GOLD	DOW	USDIDR	INDO10	C
JKSE	All Period (1/02/2019 to 5/31/2022 -- 890 obs)					
	0.02334**	0.03199	0.12860*	-0.71399*	-0.33450*	0.00915
	Structural Breaks 1st Period (1/02/2019 - 9/19/2019 -- 187 obs)					
	-0.03962***	-0.04688	-0.00365	-0.73111*	-0.17640***	-0.00187
	Structural Breaks 2nd Period (9/20/2019 - 3/31/2020 -- 138 obs)					
	0.05475	-0.09378	0.03187	-0.33756	-0.96527*	-0.06811
	Structural Breaks 3rd Period (4/01/2020 - 5/31/2022 -- 565 obs)					
	0.01447	0.06519	0.17785*	-0.61868*	-0.14396	0.05008
JII	All Period (1/02/2019 to 5/31/2022 -- 890 obs)					
	0.04268*	0.03716	0.12456*	-0.94297*	-0.38331*	-0.01822
	Structural Breaks 1st Period (1/02/2019 - 4/03/2020 -- 328 obs)					
	0.09410*	-0.01816	0.02002	-0.92110*	-0.71385*	-0.03141
	Structural Breaks 2nd Period (4/06/2020 - 5/31/2022 -- 562 obs)					

Dependent Variable	BRENT	GOLD	DOW	USDIDR	INDO10	C
	0.01405	0.07873	0.18564*	-0.75608*	-0.15079	0.00515

Source : Author's calculation (2022).

Based on the breakpoint test form of the JKSE and JII;s model, we found that JKSE and JII's probably affected by the Covid-19 pandemic, since the 2nd structural breaks at JKSE and structural breaks at JII are happen after 14 March 2020 or after Indonesia's government announced the as the extraordinary events (kejadian luar biasa). Then since the events, JKSE and JII's doesn't have any structural breaks after, makes we can conclude that the pandemic's effect still exist in the coth stock indexes. At the same time, since the structural breaks time of JKSE's have more structural breaks than JII's, we can conclude that JKSE's are more volatile than JII's along period of observation.

After we find the structural breaks, we try to find the regression result from all period 1/02/2019 to 5/31/2022 and from each structural break periods by JKSE's and JII's model. The regression result try to find the difference in independent variable effects to the dependent variabel (JKSE and JII) in every period.

Besides, we also found that there is a different impact of independent variable into JKSE and JII. The JII's consistenly negative-significantly affected by USDIDR in every period, while JKSE only affected by USDIDR in All period, Structural Breaks 1st Period and Structural Breaks 3rd Period. Then, when we were looking at the bigger number constanta of USDIDR to JII's rather than JKSE's, we can conclude that JII are more volatile than JKSE when there is a volatility in Rupiah's exchange rate's in observed period.

Thus, DOW positive-significant affected to JKSE at the All period and Structural Breaks 3rd Period, while JII's affected by DOW at the All period and Structural Breaks 2nd Period. It shows that volatility transmission between global and domestic stock indexes emerged, especially in the Covid-19 period. Meanwhile, we found that GOLD are insignificantly affected to JKSE nor JII's in every observed period.

Volatility Model (ARCH/GARCH Model). Before performing regressions using the ARCH/GARCH model, we determine whether the residuals are normally distributed by examining the Jarque-Berra P-values, skewness, and kurtosis of their distribution by performing a normality. The non-normal distribution existence indicates volatility clustering for the returns.

Table 5. Normality Test Result

	BRENT	GOLD	DOW	USDIDR	INDO10	JKSE	JII
Skewness	-0.69792	-0.50853	-0.63260	1.76452	0.60383	0.17393	0.42087
Kurtosis	18.38885	7.12583	22.81442	32.38016	13.89981	15.37596	14.47271
Probability	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Source : Author's calculation (2022).

Table 5 shows the results of the residual normality test for the returns. We found that all of the variables have skewness values that are different from zero, meaning that the distribution is left-

skewed. In addition, the kurtosis values are greater than three, indicating a leptokurtic, or non-normal, distribution. Then, using an alpha value of 0.05, we can reject the null hypothesis that the residuals follow a normal distribution. Thus, we can conclude that the residual distribution of the returns is not normal.

Table 6. ARCH/GARCH Effect Test Result

Heteroskedasticity Test: ARCH			
JKSE			
F-statistic	36.97713	Prob. F(1,886)	0.0000
Obs*R-squared	35.57584	Prob. Chi-Square(1)	0.0000
JII			
F-statistic	58.99397	Prob. F(1,886)	0.0000
Obs*R-squared	55.43596	Prob. Chi-Square(1)	0.0000

Source : Author's calculation (2022).

We perform the ARCH effect test (shown at table 5) to evaluate the heteroskedastic properties of the return variables. The null hypothesis is that there is no ARCH effect because the variance residuals are constant. We find strong evidence that the variance residuals of the variables exhibit ARCH effects. Based on this result, we use the ARCH/GARCH model by using multiple structural breaks model to perform the different impact of independent variable – especially at the Covid-19 period – into JKSE and JII.

Table 7. ARCH/GARCH Estimation Result

Dependent Variables	MEAN EQUATION						VARIANCE EQUATION		
	BRENT	GOLD	DOW	USDIDR	INDO10	C	C	ARCH Effect	GARCH Effect
	All Period (1/02/2019 to 5/31/2022 -- 890 obs)								
	0.00913	0.02642	0.13515*	-0.69290*	-0.19763*	0.01163	0.07590*	0.16121*	0.74549*
	Structural Breaks 1st Period (1/02/2019 - 9/19/2019 -- 187 obs)								
	-0.03455	-0.06870	-0.00478	-0.70873*	-0.17858*	0.00471	0.17446	0.09618	0.42678
JKSE	Structural Breaks 2nd Period (9/20/2019 - 3/31/2020 -- 138 obs)								
	0.09176*	0.08791	0.07688*	-0.15887	-0.60457*	-0.15216*	0.08127**	0.50263*	0.53598*
	Structural Breaks 3rd Period (4/01/2020 - 5/31/2022 -- 565 obs)								
	0.00641	0.04207	0.15430*	-0.71828*	-0.15053*	0.06426***	0.13243*	0.14605*	0.69395*
	All Period (1/02/2019 to 5/31/2022 -- 890 obs)								
	0.03429*	0.02607	0.10210*	-0.71781*	-0.28864*	-0.01950	0.10142*	0.11289*	0.80629*
JII	Structural Breaks 1st Period (1/02/2019 - 4/03/2020 -- 328 obs)								
	0.06953*	0.00938	0.02860	-0.57294*	-0.49457*	-0.08588	0.04973	0.14023*	0.83370*
	Structural Breaks 2nd Period (4/06/2020 - 5/31/2022 -- 562 obs)								
	0.01832	0.05022	0.12570*	-0.73710*	-0.19062*	0.01689	0.14105**	0.07617*	0.80376*

Note : *Significant at the 99% confidence level; **: Significant at the 95% confidence level, ***: Significant at the 90% confidence level.

Source : Author's calculation (2022).

We used the previous multiple breakpoint test during the observed period (shown at table 6) to estimate the ARCH/GARCH effect in the model. We found that in JKSE and JII's volatility model negative-significantly consistently affected by INDO10 in every (all- Structural Breaks 1st, 2nd and 3rd) period. Then, we can conclude that, JKSE's and JII's volatility are affected by the volatility in the INDO10.

The estimation results in Table 6 also provide the evidence that BRENT only have positive-siginificantly impact to the JKSE's return volatility only in Structural Breaks 1st Period, while BRENT have positive-siginificantly impact to the JII's return volatility in the All Period and Structural Breaks 1st Period.

Additionally, we also found the ARCH and GARCH effects in Table 6. The ARCH effect means that independent variable shock's volatility in a given day is affected by the previous days's shock. And we only find evidence of the ARCH effect for JKSE model at All Period, Structural Breaks 2nd Period and Structural Breaks 3rd Period, while we found the positive-signfiicant ARCH effect in every JII's period.

The GARCH effect means that stock return volatility is affected by the previous day's volatility. And we find that the GARCH significantly affected at the same period as the ARCH effects in both stock indexes. every period of observation.

4 Conclusion

This study aims to determine the source of volatility transmission and performance of the Indonesia stock market, both conventional (Jakarta Composite Index-JCI) and sharia (Jakarta Islamic Index – JII). Since there is a differences in investment principles and should be translated to the different source of volatility between the two indices.

Therefore, this study used global macro conditions (proxied by Brent-Oil Prices and Gold Price); relationship among financial markets (proxied by the Dow Jones Industrial Average-DJIA); as well as the fundamental condition of Indonesia (proxied by the Rupiah exchange rate and Yield of Rupiah 10 Year Bonds or SUN) as independent variables that may be becomes the source of volatility.

This research used the stochastic econometric approach with the fundamental approach (multibreak structural model) and volatility approach (ARCH/GARCH model). The data used in this study uses daily data between 2 January 2019 to 31 May 2022 with a 890 total observations.

Meanwhile, we found that there were more structural breaks in JKSE than JII. While we can conclude that fundamental disturbance in JKSE are higher than JII in observed period. In addition, since the period of structural breaks period of JKSE and JII after the extraordinary pandemic event that was still the same until the end of the observation period, we also conclude that the impact of the pandemic had not ended yet.

Thus, using the result of the fundamental and volatility model, we found that Indonesia's economic fundamentals (USDIDR and INDO10) have a larger coefficient of magnitude and

impact on the volatility of the both index than other variables. Furthermore the INDO10 are negative-significantly affected the JKSE also JII's volatility model in every period of observation. That's make us doubt to the investor motive on JII (syariah stock index), since the interest (or riba) that reflected by the domestics cost of fund indicator (INDO10) is prohibited in Islam. That's also indicates that JII's investor still less concern about the syariah practical investment principles in stock market (JII).

However, BRENT and DOW are significantly impact the both indexes in several periods. Thats indicates the need for global volatility to be observed as their impact to the JKSE and JII's volatility.

Then since a different structural breaks and different magnitude also source of volatility, we recommend different approaches need to be used as an early warning system to private and authority to take action as the volatility happens. As well as, the more campaign and financial literacy to the moslem society to implementing the syariah principles in domestic;s stock market, especially in JII.

References

[1] Alam, M.M., Akbar, C.S., Shahriar, S.M., and Elahi, M.M.: The Islamic Shariah Principles for Investment in Stock Market, Qualitative Research in Financial Markets. Vol. 9(2), pp. 132-146 (2017)

[2] Andrews DWK, Lee I, Ploberger W.: Optimal Changepoint Tests for Normal Linear Regression. Journal of Econometrics. Vol. 70, pp. 9– 38 (1996)

[3] Antonio, Hafidhoh and Fauzi.: The Islamic Capital Market Volatility: A comparative Study Between in Indonesia and Malaysia. Bulletin of Monetary, Economics and Banking. Vol. April 2013, pp. 378 – 400 (2013)

[4] Bai J, Perron P.: Estimating and Testing Linear Models With Multiple Structural Changes. Econometrica. Vol. 66, pp. 47– 78 (1998)

[5] Bai J, Perron P.: Computation and Analysis of Multiple Structural Change Model. Journal of Applied Econometrics. Vol. 18, pp. 1 – 22 (2003)

[6] Balcilar, M., Gupta, et.al.: Causal Effects of the United States and Japan on Pacific-Rim Stock Markets: Nonparametric Quantile Causality Approach. Working Paper University of Nebraska-Omaha and Loughborough University (2015)

[7] Bodie, Z., Kane, A., and Marcus, A. J.: Essentials of Investments (9th ed.). McGraw-Hill, New York (2013)

[8] Dickey, D. A., & Fuller, W. A.: Distribution of the Estimators for Autoregressive Time Series with a Unit Root. Journal of the American Statistical Association. Vol. 74(366), p. 427 (1979)

[9] Diebold, F. X., and Yilmaz, K.: Macroeconomic Volatility, and Stock Market Volatility, Worldwide. In T. Bollerslev, J. R. Russell, & M. W. Watson (Eds.), Volatility, and Time Series Econometrics : Essays in Honor of Robert F. Engle, pp. 97–116 (2010)

[10] Dornbusch, R., Park, Y. C., and Claessens, S.: Contagion : How it spreads and How It Can Be Stopped, World Bank Research Observer, pp. 1–24 (2000)

[11] Engel, C., and West, K. D.: Exchange Rates and Fundamentals. European Central Bank Working Paper Series, No. 248 (2003)

[12] Filis, G., Degiannakis, S., and Floros, C.: Dynamic Correlation between Stock Market and Oil Prices: The Case of Oil-importing and Oil-exporting Countries, International Review of Financial Analysis. Vol. 20(3), pp. 152–164 (2011)

[13] Frale, C., M. Marcellino, G. L. Mazzi, and T. Proietti.: EUROMIND: A Monthly Indicator of The Euro Area Economic Conditions, Journal of The Royal Statistical Society Series A. Vol. 174(2), pp. 439–470 (2011)

[14] Garcia R, Perron P.: An analysis of the real interest rate under regime shifts. Review of Economics and Statistics. Vol. 78, pp. 111– 125 (1996)

[15] Hamilton, J. D.: Oil and The Macroeconomy since World War II, The Journal of Political Economy. Vol. 91(2), pp. 228–248 (1983)

[16] Hakim, et. al.: Modeling The Interaction Across International Conventional And Islamic Stock Indices. Cogent Economics & Finance (2021)

[17] Hill, R. C., Griffiths, W. E., and Lim, G. C.: Principles of Econometrics (4th ed.), Hoboken. John Wiley & Sons, Inc, New Jersey (2011)

[18] Hossenidoust, E., Janor, H., Yusefi, M., and Majid, H. A.: Volatility Spillovers Across Commodity and Stock Markets among ASEAN Countries, Prosiding Perkem VIII. Vol. 3, pp. 1401–1412 (2013)

[19] Johansson, Anders C.: Stock and Bond Relationships in Asia, CERC Working Paper 14 : April 2010 (2010)

[20] Jones, C. M., and Kaul, G.: Oil and the Stock Market, The Journal of Finance. Vol. (2), pp. 463–491 (1996)

[21] Jones, D. W., Leiby, P. N., and Paik, I. K.: Oil Price Shocks and the Macroeconomy : What Has Been Learned Since 1996, The Energy Journal (2004)

[22] Kang, Qiong.: Correlation Analysis of Stocks and PMI Index Based on Logistic Regression Model, Journal of Sensors. Vol. 2021 (2021)

[23] Kartika, A.: Volatilitas Harga Saham di Indonesia dan Malaysia, Jurnal Ilmu Ekonomi ASET. Vol. 12(1), pp. 17–26 (2010)

[24] Kusumahadi, T., and Permana: Impact of COVID-19 on Global Stock Market Volatility, Journal of Economic Integration. Vol. 36(1), pp. 20-45 (2021)

[25] Lee, S. S. P., & Goh, K. L.: Regional and International Linkages of The ASEAN-5 Stock Markets: A Multivariate GARCH Approach, Asian Academy of Management Journal of Accounting and Finance. Vol. 12(1), pp. 49–71 (2016)

[26] Liu, L.: Volatility and Mean Spillover from US and China to ASEAN. School of Economics and Management, Lund University. Vol. May (2007)

[27] Liu J, Wu S, Zidek JV.: On segmented multivariate regressions. Statistica Sinica, Vol. 7 pp. 497–525 (1997)

[28] Lumsdaine RL, Papell DH.: Multiple trend breaks and the unit root hypothesis. Review of Economics and Statistics, Vol. 79 pp. 212– 218 (1997)

[29] Mallikarjunappa, T., & M, A. E.: The Impact of Derivatives on Stock Market Volatility: A Study of the Nifty Index, Asian Academy of Management Journal of Accounting and Finance (AAMJAF). Vol. 4(2), pp. 43–65 (2008)

[30] Mohaddes, K., and Pesaran, M. H.: Oil Prices and The Global Economy: Is It Different This Time Around?, IMF Working Paper, (2016)

[31] Morimune K, Nakagawa M.: Unit root tests which allow for multiple breaks. Discussion Paper No. 457. Kyoto Institute of Economic Research, Kyoto University (1997)

[32] Phillips, P. C. B., & Perron, P.: Testing for a Unit Root in Time Series Regression. Biometrika. Vol. 75(2), pp. 335–346 (1988)

[33] Purbawati, N. L. K., and Anda, I. M.: Perbandingan Volatilitas Indeks Harga Saham Gabungan (IHSG) Sebelum and Setelah Krisis Subprime Mortgage. E-Jurnal Manajemen Universitas Udayana, Bali. Vol. 5(2), pp. 1014–1042 (2016)

[34] Rao, C. R.: Linear Statistical Inference and Its Application: Second edition. Wiley, New York (1973)

[35] Sahel, B., and Vesala, J.: Financial Stability Analysis Using Aggregated Data, Marrying the Macro-and Micro-Prudential Dimensions of Financial Stability. Vol. 1, pp. 160-185 (2001)

[36] Saleem, Bárczi, and Sági.: COVID-19 and Islamic Stock Index: Evidence of Market Behavior and Volatility Persistence. Journal of Risk and Financial Management. Vol. 14, p. 389 (2021)

[37] Sarno, L., and Schmeling, M.: Which Fundamentals Drive Exchange Rates? A Cross- Sectional Perspective, Journal of Money, Credit and Banking. Vol. 46(2–3), pp. 267–292 (2014)

[38] Sok-Gee, C., and Karim, M. Z. A.: Volatility Spillovers of the Major Stock Markets in ASEAN-5 with the U.S. and Japanese Stock Markets. International Research Journal of Finance and Economics. Vol. 44, pp. 156–168 (2010)

[39] Tuan, T. K., Hwa, Y. S., Chua, S. Y., and Lean, H. H.: Do Indian Economic Activities Impact ASEAN-5 Stock Markets?, Jurnal Ekonomi Malaysia. Vol. 49(2), pp. 61–76 (2015)

[40] Yanik, Osman and Ozturk: Impact of Manufacturing PMI on Stock Market Index: A Study on Turkey. Journal of Administrative and Business Studies (2020)