Impacts of US Monetary Policy, Domestic Micro and Macro Variables on the Indonesia Stock Market during Quantitative Easing Period in 2008-2020

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Abstract

This research is aimed to establish US (macro)as well as domestic (micro and macro) determinants of the Indonesia stock market since the Federal Reserve started quantitative easing (QE) policy in 2008 until end of 2020. Error Correction Model (ECM) is applied on models with co-integrated variables and Vector Autoregression(VAR) in first differenceis applied on those without co-integrated ones. This research finds that QE positively affects the Indonesia equity market through the currency exchange rate. Another US macro determinant for the Indonesia equity market is S&P 500 index. On local determinants, this research finds that Credit Default Swaps (CDS) index and market volatility negatively affect the stock market, while Rupiah exchange rate, stock market liquidity and valuation positively impact the Jakarta Composite Index. To the author's knowledge, there has been no research on the influence of the CDS index on stock markets in Indonesia since the QE policy was launched by the US central bank in 2008.

Keywords: US monetary policy, Credit Default Swaps Index, Market Volatility, Market Liquidity, Market Valuation

1. Introduction

The performance of the world stock markets is strongly influenced by economic and financial phenomena, one of the biggest impacts of which is the global financial crisis triggered by the *subprime mortgage* problem in the US in 2008, which caused the bankruptcy of financial companies in the US, increased risk-free interest rates and the unemployment rates. The financial crisis led to volatility in financial markets in many countries which had far-reaching effects on the economy of those countries. The great financial crisis prompted US central bank (*Federal Reserve*, or *The Fed*) to make *quantitative easing* (QE) monetary policy to help the economies and financial markets get out of the crisis (Labonte & Makinen, 2020)starting in 2008 with several breaks until 2014, then restarted in 2020 to help overcome the major economic crisis, caused by the Covid-19 pandemic. This study will examine the impacts of such policy, as well as domestic determinants on stock market performance in Indonesia. The research is conducted taking into consideration that stock market is getting more important, shown by ratio

of stock market capitalization to world GDP which rose sharply from 30.8% in 1980 to 91.9% in 2019 (World Bank, 2021). Kartika & Manurung(2020) mentioned that performance of the composite stock index is an important indicator of equity investment.

2. Literature Review

Stock prices are fundamentally determined by the formula below(Homa & Jaffee, 1971):

$$PDV_o = \Sigma_{t=o}^{\infty} \quad \frac{D_o(1+g_t)^t}{(1+r_t+\rho_t)^t}$$

Where:
PDV_0 : Present *value* of *expected dividends*
D_0 : Current dividend rate
g_t : Expected dividend growth rate in period t
r_t : Risk-free interest rate
ρ_t : *risk premium*

The risk-free interest rate variable often uses the *yield of 10-year US Treasury notes*, which can be simply formulated as follows:

$$r_t \text{ (US Treasury yield)} = \frac{\text{C (coupon payment of bonds)}}{\text{P (US Treasury price)}}$$

When the *Fed* purchases large amounts of *Treasury notes/treasury bills*, the price of these government bonds increases, causing the risk-free interest rate (r_t) to fall. As a result, the stock price (PDV_0) increases (Homa&Jaffee, 1971).Homa and Jaffee's findings are consistent with the data: the assets of the US central bank increased from USD1,969,444 billion in October 2008 before QE began to USD7,363,351 billion at the end of December 2020, an increase of 274%. During that period, the S&P 500 stock market index increased from 969 to 3756, yield on the 10-year *US Treasury* fell from 3.95% to 0.92%. The positive impact of QE on S&P 500performance is supported by previous studies (Al-Jassar & Moosa, 2019; Bedikanli, 2019; Bhar, Malliaris, & Malliaris, 2015; Lima, Vasconcelos, Simão, & de Mendonça, 2016).The important role of the S&P 500 index is not limited to the US economy, but also to the economy and financial markets in other countries, as shown by previous research and will be tested in this study. Berument & Ince (2005) found positive effects of the S&P 500 index on the Turkish stock market. Benson & Kong(2019) found that the S&P 500 index had a positive effect on stock markets in the Asia Pacific region in general, but the response from each country in the region was not the same.

Theoretical review on local macro and micro determinants is discussed below.
Credit Default Swapsis a form of loan derivative contract which allows investors to swap credit risk in a company, institution or country with other parties. The CDS index can reflect investors' views on the possibility of default in a country, therefore, the CDS index is an indicator of risk associated with investing in securities in a country, not limited to bonds but also stocks (Ibhagui,

2020). Da Fonseca & Gottschalk(2020)found that there is a bidirectional causality between the stock market index and the CDS index. (Sovbetov, Yhlas & Saka, 2018) found a bidirectional causality between the stock market index and the CDS index. Chan, Fung, & Zhang(2009)found a strong negative correlation between the sovereign CDS spread and stock market indexes in six developing countries in Asia.

Merton (1974) introduced a credit risk model based on a structural approach, where company liabilities are seen as contingent claims to assets. Default occurs when the value of an asset is insufficient to pay the obligation as it falls due. The asset value following the *Brownian* geometric movement is calculated as follows:

$$dV_t = r \cdot V_t \cdot dt + \sigma \cdot V_t \cdot dW_t$$

Where:
V : Value of company assets
r : Risk-free interest rate
σ : The volatility of the firm's asset value

The value of equity at maturity T is:

$$E_t = V_t \cdot N(d_1) - \exp(-r(T-t)) \cdot D \cdot N(d_2)$$

$$d_1 = \frac{\ln(V_t/D) + (r + \sigma^2/2) \cdot (T-t)}{\sigma \cdot \sqrt{T-t}}$$

$$d_2 = d_1 - \sigma \cdot \sqrt{T-t}$$

Where:
E : Value of equity
N(x) : The standard function of the normal cumulative distribution
D : nominal value of bonds

Stock market volatility: Since volatility reflects uncertainty, the volatility of the stock market has a negative impact on the performance of the stock market index. Chung & Chuwonganant(2018)find that the negative relationship between volatility and stock market performance. Demirer, Gupta, Lv, & Wong(2019)found a causal relationship between return dispersion and market volatility through a nonlinear multivariate causality test. Jebran & Iqbal(2016) in Pakistan, China, Hong Kong and Sri Lanka.

Stock market liquidity: Bhattacharya (2019) states that the definition of liquidity for financial assets is the ability of an asset to be traded quickly without price distortion. Lee & Chung, (2018) find that the lack of liquidity in the US stock markets (NYSE, AMEX and NASDAQ) increases the negative effect of volatility shocks on stock market returns. Various studies have found a close relationship between volatility and liquidity, there are the same factors that affect both volatility and liquidity of financial markets.

Currency exchange rates: One of the widely used theory of exchange rateis the theory of interest rate parity (IRP). Interest rate parity, proposed by Keynes (1923) is a fundamental equation that governs the relationship between interest rates and exchange rates. This theory assumes that the foreign exchange market is in an equilibrium position, and the interest rate parity condition implies that the expected return on assets in the domestic market will be the same as the expected return on assets denominated in foreign currencies because it has been adjusted in terms of exchange rates. There are two forms of interest rate parity: Uncovered, where the exposure to exchange rate risk is not protected, and *covered*, where the exposure to exchange rate risk is protected by a forward contract. The formula for interest rate parity is as follows:

$$F_0 = S_0 \times \left(\frac{1 + i_c}{1 + i_b} \right)$$

Where:
F_0 : Forward rate
S_0 : Spot rate
i_c : Interest rates in country *c*
i_b : Interest rates in country *b*

Dynamic relationship between currency exchange rates and stock market indices plays an important role in the economy and has long attracted the attention of academics and researchers. Several studies have shown a positive relationship between currency exchange rates and stock market indices(Bahmani-Oskooee & Saha, 2016; Caporale, Menla Ali, & Spagnolo, 2015; Kartika& Manurung, 2020; Naresh, Vasudevan, Mahalakshmi, & Thiyagarajan, 2018)

In addition, increase in the money supply through QE also causes the exchange rate of the US dollar to weaken against the currencies of other countries and the strengthening of the exchange rates of these countries against the US dollar increases the attractiveness of investment in a country's stock market and reduces the default risk of default on foreign debt. the country. This study finds the transmission mechanism of the impact of QE policies on the stock markets of Indonesia, through currency exchange rates.

3. Methodology and Data

3.1 Methodology

As mentioned above, this study aims to assess determinants of the Indonesia stock market performance, and micro variables are calculated using the following formula:

Stock Market Volatility = Standard deviation of stock market movements of the last 200 trading days

$$\text{Stock Market Liquidity} = \frac{\text{Transaction volume in the stock market}}{\text{Number of shares listed on the stock exchange}}$$

Return on Equity = Aggregate net profit of companies listed on the Indonesia Stock Exchange
Aggregate equity value of companies listed on the Indonesia Stock Exchange

Price to Book Value = Market Capitalization of Jakarta Composite Index
Aggregate equity value on balance sheets of listed companies

To process the time series data, this research applies two methods of estimation: Error Correction Model (ECM) and Vector Autoregression (VAR) in difference. Before applying ECM or VAR *in difference*, a test was conducted to see if the data was stationary using *the Augmented* Dickey Fuller *unit root* test. Because not all of the data being tested is stationary, further testing is carried out whether the variables are cointegrated, to see the long-term relationship between the variables. Cointegration implies that there is an adjustment process that prevents *errors* in the relationship between variables from becoming larger in the long run. If there is cointegration between variables, then the ECM estimation method is used. However, if the variables are not cointegrated, then the VAR *in difference* estimation method is used, by using the VAR method on data that has been made in the form of differences from the previous period *(first difference)*.

According toAsteriou & Hall(2019), the *Error Correction Model* estimation method has several advantages. First, this model measures the correction of the imbalance in the previous period. Basically, ECM analyzes the long-term relationship between variables while taking into account the short-term fluctuations between the variables studied. Pesaran(2020) states that ECM is suitable for use in small *sample* sizes. On the other hand, VAR estimation method has the advantage of being flexible Mostafa & Mostafa Bentour (2015)and facilitating the integration of new data. VAR is one of the most widely used estimation models for *time series* data, has good predictive ability and is easy to apply. VAR can also be used to detect bi-directional causality between variables. The results and goodness-of-fit of the VAR model are interpreted by conducting a Granger causality test to see the relationship and influence between each variable and the relationship between several variables together.

The F test is performed, which is a combined test for the relevance of all explanatoryvariables in the model, to test the combined hypothesis, Thehypothesis to be tested for the multipleregression model with explanatory variables of N -1 and coefficients of N:

$$y = \beta_1 + \beta_2 x_2 + \beta_3 x_3 + \ldots \beta_N x_N + \varepsilon$$

To test whether all *explanatory variables* as a whole are able to explain y, the following hypothesis is built:

H_0: $\beta_2 = 0$, $\beta_3 = 0$, …, $\beta_N = 0$

H_a: At least one of $\beta_n = 0$, for $n = 2,3, \ldots N$

Decision making criteria:

a. If prob F $\leq$ 0.10, then H_0 is rejected

b. If prob F > 0.10, then $H_{0\ is}$ accepted

3.2 Data

The data used in this study is secondary data, namely data obtained by researchers indirectly from published sources. The author used Bloomberg to obtain monthly data for all variables used in the study, for the period November 2008 to December 2020, 146 monthly data for each variable.The collected *time series* data is converted in the form of ln *(natural log)* so that the variance is more stable(Akaike, 1998). This study uses dummy variables with value of 1 in 2009 and 2020 to reflect the global recession in those years, and a value of 0 in other periods.

4. Results

4.1 Descriptive Statistics

Analysis of results of this study is laid out in two subsections. The first describes characteristics of the variables using descriptive statistics. The second discusses determinants of the Jakarta Composite Index in more details, the ones significantly affect the JCI and those which do not.

Table 1: Descriptive Statistics

	US Variables			Indonesia Variables						
	FB	SNP	VIX	ICDS	IDR	IVOLA	ILIQ	IROE	IPB	JCI
Mean	3804127	1973.37	19.79644	175.80	0.000087	19.07	36,859.01	12.00	2.43	4,608.37
Median	4064256	1972	17.035	159.44	0.000081	17.21	30,682.00	11.43	2.48	4,811.00
Maximum	7363351	3756	55.28	708.89	0.000118	42.26	176,939.00	18.13	3.34	6,606.00
Minimum	1916461	735	9.51	65.98	0.000061	8.34	12,538.00	4.13	0.36	1,242.00
Std. Dev.	1217801	728.1054	8.733154	103.87	0.000017	7.59	22,286.21	3.33	0.50	1,295.16
Observations	146	146	146	143	146	146	146	146	146	146

Source: Research data, processed using EViews program

The following is a description of the names of the variables studied.

FB = Fed balance sheet
SNP = S&P 500 index
VIX = Chicago Board Options Exchange Market Volatility Index
ICDS = Indonesia CDS index
IDR = Rupiah exchange rate against US dollar
IVOLA = JCI volatility
ILIQ = JCI trading liquidity
IROE = JCI return on equity
IPB = JCI price to book value
JCI = JakartaComposite Index

The following is discussion on the descriptive statistics of all variables shown in Table 1.

The FB variable has a maximum value of 7,363,351 which was achieved in December 2020 and a minimum value of 1,916,461 in February 2009. The mean value is 3,824,127 and the standard deviation is 1,217,801. The data shows that balance sheet of the Fed increased significantly as the US Central Bank implements QE policy.

The SNP variable has a maximum value of 3.756 which was achieved in December 2020 and a minimum value of 735 in February 2009. The mean value was 1.973 and the standard deviation was 728. The data shows that as the Fed balance sheet expanded to maximum value, S&P 500 also reached its maximum value in December 2020.

The VIX variable has a maximum value of 55.28 which was achieved in November 2008 and a minimum value of 9.51 in September 2017. The mean value is 19.80 and the standard deviation is 8.73.

The ICDS variable has a maximum value of 708.89 which was achieved in July 2011 and a minimum value of 65.98 in July 2018. The mean value is 175.80 and the standard deviation is 102.89, showing that Indonesia CDS index is highly volatile during the study period.

The IDR variable has a maximum value of 0.000118 (equivalent to an exchange rate of IDR 8,504 per US dollar) which was reached in July 2011, and a minimum value of 0.000061 (equivalent to an exchange rate of IDR 16,310 per US dollar) in March 2020, which is two days after the closing announcement. public spaces in Jakarta to reduce the rate of transmission of the Covid-19 pandemic. The mean value is 0.000087 (equivalent to an exchange rate of IDR 11.494 per US dollar) and the standard deviation is 0.000017.

The IVOLA variable has a maximum value of 42.26 in June 2019 and a minimum value of 8.34 in October 2017. The mean value is 19.07 and the standard deviation is 7.59.

The ILIQ variable has a maximum value of 176,939 which was reached on May 31, 2009. The stock trading volume increased after the holiday on the previous day and that date was the last day before the Eid al-Fitr holiday. The ILIQ variable reached a minimum value of 12,538.00 in February 2020. The mean value is 36,859.01 and the standard deviation is 22,286.21.

The IROE variable has a maximum value of 18.13 which was achieved in November 2008 and a minimum value of 4.13 in December 2020. The mean value is 12.00 and the standard deviation is 3.33.

The IPB variable has a maximum value of 3.34 which was achieved in October 2010 and a minimum value of 0.36 in June 2020. The mean value is 2.43 and the standard deviation is 0.50.

Maximum value of the JCI is 6,606.00, achieved in January 2018 while the minimum value of 1,242.00, occurred in November 2008. The JCI variable has a mean value of 4,608.37 and a standard deviation of 1,295.16.

4.2 Macro and micro determinants of the Jakarta Composite Index

Independent variables affecting the Jakarta Composite Index are divided into US (macro) and domestic (macro and micro) variables. On US variables, S&P 500 affects the JCI while Fed balance sheet indirectly affects the JCI through its effect on rupiah exchange rates. On domestic factors, Indonesia CDS index negatively affects the JCI at confidence level 1%.To the author's

knowledge, impact of CDS index to the JCI during the QE period has not been a topic of previous studies. The stock market volatility impacts the JCI negatively at α=5%. On the other hand, Rupiah exchange rate, stock market liquidity and valuation positively impact the JCI.ECT (Error Correction Term) has a negative and significant coefficient at α= 1%, prompting error correction process to take place. The estimated value of the ECT coefficient indicates that 7.6367% of the deviation of the long-term balance is corrected every month.This study applies ECM method as data are found to be co-integrated, the method resulted in a model shown in table 2 below.

Tabel2: Model on Determinants of the JCI

Dependent Variable: JCI				
Independent Variables	**Coeficient**	**Std. Error**	**t-Stat**	**Prob.**
C	0.006429	0.002787	2.306738	0.0226
FB	0.014403	0.083804	0.171869	0.8638
SNP	0.311773	0.096690	3.224447	0.0016
VIX	0.021120	0.015600	1.353861	0.1781
ICDS	-0.092353	0.021727	-4.250620	0.0000
IDR	0.556079	0.116600	4.769124	0.0000
IVOLA	-0.070796	0.028975	-2.443329	0.0159
ILIQ	0.013696	0.007462	1.835523	0.0687
IROE	0.011620	0.023124	0.502506	0.6161
IPB	0.027274	0.012930	2.109395	0.0368
DUMMY	0.001521	0.006783	0.224286	0.8229
ECT	-0.076367	0.036722	-2.079602	0.0395

To analyze the impact of Fed balance sheet on Rupiah exchange rate, the method used is VAR in first difference (lag=2), as the data are found to be not co-integrated. Table 3 below shows the model showing the impacts. Fed balance sheet one month ago positively impacts the Rupiah exchange rate (coefficient = 0.373428) while FB two months ago negatively impacts the Rupiah exchange rate with a smaller coefficient of -0.181071.

Dependent Variable: IDR			
Independent Variables	**Coeficient**	**t-Stat**	**Prob.**
C	-0.036470	-1.57035	0.00232
IDR_{t-1}	0.056524	0.67535	0.08370
IDR_{t-2}	0.112054	1.28396	0.08727
FB_{t-1}	0.373428	4.45454	0.08383
FB_{t-2}	-0.181071	-2.37530	0.07623
DUMMY	0.004325	0.72408	0.00597

5. Conclusion

This research concludes the following points:

1. On US macro variables. the amount of assets on the Fed balance sheet (FB) does not have a direct effect on the performance of the Indonesian stock markets, but has indirect impact on the market through the rupiah exchange rate.Value of assets on the Fed balance sheetone month ago has a positive and significant effect on the Rupiah exchange rate against the US dollar (FB two months ago has a negative effect on the Rupiah exchange rate, but the coefficient of -0.181071, much smaller than the FB coefficient one month ago at 0.373428). The S&P 500 index has a positive and significant effect while VIX has not significant impact on the Indonesian stock market index.
2. On domestic variables, the Indonesia CDS index and Indonesia stock market volatility have a negative and significant effect on the JCI performance. On the other hand, stock market liquidity, price to book value and the rupiah exchange rate against the US dollar has a positive effect on the stock market index, while return on equityhas no significant effect on the market.
3. DUMMY (reflecting the global recession) does not significantly affect the performance of the Indonesia stock market andon the exchange rate of Rupiah against the US dollar.
4. This study supports previous research on negative impact of CDS index on the stock market (Chan, Fung, & Zhang, 2009), on a positive relationship between currency exchange rates and stock market indices (Bahmani-Oskooee&Saha, 2016; Caporale, Menla Ali, &Spagnolo, 2015; Kartika&Manurung, 2020), This study also supports previous research on negative relationship between volatility and stock market performance (Naresh, Vasudevan, Mahalakshmi, &Thiyagarajan, 2018) and positive impact of liquidity on the stock market performance (Chung &Chuwonganant, 2017). On price to book, this research supports the findings in previous studies that valuation has a positive effect on the stock market index (Beneda, 2002).

References:

Akaike, H. (1998). *Information Theory and an Extension of the Maximum Likelihood Principle*. (June), 199–213. https://doi.org/10.1007/978-1-4612-1694-0_15

Al-Jassar, S. A., & Moosa, I. A. (2019). The effect of quantitative easing on stock prices: a structural time series approach. *Applied Economics*, *51*(17), 1817–1827. https://doi.org/10.1080/00036846.2018.1529396

Asteriou, D., & Hall, S. G. (2019). Applied Econometrics. *Applied Econometrics*. https://doi.org/10.4324/9780429024429

Bahmani-Oskooee, M., & Saha, S. (2016). Asymmetry cointegration between the value of the dollar and sectoral stock indices in the U.S. *International Review of Economics and Finance*, *46*, 78–86. https://doi.org/10.1016/j.iref.2016.08.005

Bedikanli, M. (2019). Quantitative Easing and US Stock Prices. *SSRN Electronic Journal*, (I). https://doi.org/10.2139/ssrn.2656329

Benson, E. D., & Kong, S. X. (2019). The influence of U.S. Equity returns on Asian-Pacific equity markets. *Investment Management and Financial Innovations*, *16*(4), 46–60. https://doi.org/10.21511/imfi.16(4).2019.05

Berument *, H., & Ince, O. (2005). Effect of S&P500's return on emerging markets: Turkish experience. *Applied Financial Economics Letters*, *1*(1), 59–64.

https://doi.org/10.1080/1744654052000314662
Bhar, R., Malliaris, A. G., & Malliaris, M. (2015). The impact of large-scale asset purchases on the S&P 500 index, long-term interest rates and unemployment. *Applied Economics*, *47*(55), 6010–6018. https://doi.org/10.1080/00036846.2015.1061646
Caporale, G. M., Menla Ali, F., & Spagnolo, N. (2015). Exchange rate uncertainty and international portfolio flows: A multivariate GARCH-in-mean approach. *Journal of International Money and Finance*, *54*(March), 70–92. https://doi.org/10.1016/j.jimonfin.2015.02.020
Chan, K. C., Fung, H. G., & Zhang, G. (2009). On the Relationship Between Asian Credit Default Swap and Equity Markets. *Journal of Asia Business Studies*, *4*(1), 3–12. https://doi.org/10.1108/15587890980000414
Chung, K. H., & Chuwonganant, C. (2018). Market volatility and stock returns: The role of liquidity providers. *Journal of Financial Markets*, *37*(2010), 17–34. https://doi.org/10.1016/j.finmar.2017.07.002
Da Fonseca, J., & Gottschalk, K. (2020). The Co-Movement of Credit Default Swap Spreads, Equity Returns and Volatility: Evidence from Asia-Pacific Markets. *International Review of Finance*, *20*(3), 551–579. https://doi.org/10.1111/irfi.12237
Demirer, R., Gupta, R., Lv, Z., & Wong, W. K. (2019). Equity return dispersion and stock market volatility: Evidence from multivariate linear and nonlinear causality tests. *Sustainability (Switzerland)*, *11*(2). https://doi.org/10.3390/su11020351
Homa, K., & Jaffee, D. (1971). of FINANCE. *The Journal of Finance*, *XXVI*(5). https://doi.org/10.1111/j.1540-6261.1984.tb03646.x
Ibhagui, O. (2020). Sovereign Risk, Cross-Currency Basis and Equity Markets: A Cross-Market Dynamic Interaction. *SSRN Electronic Journal*, (100946). https://doi.org/10.2139/ssrn.3517901
Jebran, K., & Iqbal, A. (2016). Dynamics of volatility spillover between stock market and foreign exchange market: evidence from Asian Countries. *Financial Innovation*, *2*(1), 1–20. https://doi.org/10.1186/s40854-016-0021-1
Kartika, T. R., & Manurung, A. H. (2020). Determinants of Composite Index in Indonesia Stock Exchange. *Journal of Seybold Report*, *15*(8), 2177–2189.
Labonte, M., & Makinen, G. E. (2020). Monetary policy and the federal reserve: Current policy and conditions. *Monetary Policy at the Cutting Edge*, 1–20.
Lee, J., & Chung, K. H. (2018). Foreign ownership and stock market liquidity. *International Review of Economics and Finance*, *54*, 311–325. https://doi.org/10.1016/j.iref.2017.10.007
Lima, L., Vasconcelos, C. F., Simão, J., & de Mendonça, H. F. (2016). The quantitative easing effect on the stock market of the USA, the UK and Japan: An ARDL approach for the crisis period. *Journal of Economic Studies*, *43*(6), 1006–1021. https://doi.org/10.1108/JES-05-2015-0081
Merton, R. (1974). On the pricing of corporate debt: The risk structure of interest rates. *The Journal of Finance*, *29*(2), 449–470.
Mostafa, E., & Mostafa Bentour, E. (2015). *Munich Personal RePEc Archive A ranking of VAR and structural models in forecasting A ranking of VAR and structural models in forecasting*. (61502).
Naresh, G., Vasudevan, G., Mahalakshmi, S., & Thiyagarajan, S. (2018). Spillover effect of US dollar on the stock indices of BRICS. *Research in International Business and Finance*, *44*(December 2018), 359–368. https://doi.org/10.1016/j.ribaf.2017.07.105

Pesaran, M. H. (2020). General diagnostic tests for cross-sectional dependence in panels. *Empirical Economics*. https://doi.org/10.1007/s00181-020-01875-7

Sovbetov, Yhlas & Saka, H. (2018). *Journal of Economics and Financial Analysis Does it take two to tango : Interaction between Credit Default Swaps and National Stock Indices. 1*(1), 129–149. https://doi.org/10.1991/jefa.v2i1.a15