

Time-Varying Correlation Between Stock and Government Bond in Asia: Flight-to-Quality

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Abstract

This study aims to provide an overview of how the relationship between stock and bond market in Asia when a crisis occurs (in this case the 2008 global crisis and the COVID-19 pandemic) using the DCC-GARCH method to prove the flight-to-quality phenomenon in Asia (China, Japan, Indonesia, Singapore, Malaysia, Thailand, and India). The results showed that during the 2008 global crisis, the flight-to-quality phenomenon happened in Thailand where the correlation between stock returns and government bonds in that country became increasingly negative during the crisis period, indicating that there was a shift in investment from stocks to government bonds. In addition, this research also proved that during the COVID-19 pandemic, the flight-to-quality phenomenon was also proven to occur in Malaysia.

Keywords:

Flight-to-quality; Time-varying correlation; Stock; Government bond

INTRODUCTION

Diversification of investment assets is the most critical strategy for investors to minimize the investment risk that will be borne and optimize the potential return obtained from their investment portfolio. An understanding of the interrelationships between different financial assets is an important consideration when forming an investment portfolio. Investors need information or knowledge about the relationship between risk and return of various financial assets (Fang & Chang, 2017). In this study, the financial investments that will be discussed are stocks and government bonds.

The diversification that stock investors carry out in their portfolios combines stocks from different business industries (intersectoral diversification). Thus, if there is a decline in one industry, it will not directly and significantly affect other industries. In addition to intersectoral diversification, diversification that investors generally do is to combine investment portfolios with financial assets with different levels of risk and return, such as stocks, bonds or government bonds, corporate bonds, and other financial assets.

When the economic crisis hits, the duty of investors to maintain the percentage of returns while minimizing the existing risks becomes more complicated. To retain and maintain the level of return, investors should adjust the portion of assets in their investment portfolio to financial assets that have a lower level of risk (dynamic rebalancing

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strategy). Investors often transfer a percentage of shares and other financial assets in their investment portfolio to government bonds because they are considered financial assets with a low level of risk. Hence, they tend to be safer than stocks (Lee et al., 2019). This phenomenon is called flight-to-safe haven or flight-to-quality, described by the correlation between stocks and government bonds becomes more negative than before the crisis. This description shows a shift in investment flows from the stock market to the bond market due to risk aversion or higher risk aversion when the crisis happened (Cheng & Yang, 2017).

This phenomenon is quite attractive. Many studies discuss flight to safe-haven or flight-to-quality focus on measuring the correlation between stocks and government bonds in several countries. Gencer (2015) researched the phenomenon of flight-to-quality from stocks to bonds in two countries, namely, the United States and Turkey in 2007-2009 (crisis period) and 2010-2013 (post-crisis period). The results of Gencer's research show that the flight-to-quality phenomenon in Turkey is described by a negative correlation between stocks and Turkish government bonds with a lower negative value during the crisis period. Meanwhile, it is not the flight-to-quality phenomenon in the United States, but the contagion effect where the correlation between stocks and US government bonds is positive. The correlation coefficient that increases during the crisis period shows a negative contagion effect. The correlation coefficient decreases during the post-crisis period as measured by the DCC-

GARCH-GJR model indicates a positive contagion effect.

Kolluri et al. (2015) examined the interdependence of India's stock and bond markets with its leading trading and investment partners, namely the United States, United Kingdom, Japan, and China. They perform a bivariate cointegration test of Indian stock and bond markets, and the result is that both markets have the same cointegrating vector. This result shows the tendency of Indian stock and bond markets to be intertwined in a long-run equilibrium relationship. They also carry out the vector error correction model (VECM) testing with TGARCH errors. In addition, they conduct constant and dynamic conditional correlation (CCC and DCC) tests to determine the dynamic relationship between Indian stock and bond markets and foreign stock markets. The test results show that the DCC correlation between Indian stocks and Indian government bonds is more negative than the CCC correlation. This result indicates that DCC better describes the flight-to-quality phenomenon where Indian government bonds hedge the Indian stock market, which has a higher risk. This study also finds that the US stock market has the most substantial influence on the Indian stock market, while the Chinese stock market does not affect the Indian stock market.

Jammazi et al. (2015) tested the pattern of dependencies between stock returns and long-term government bonds in 16 developed countries in the last two decades (1993-2013) using the DCC-GARCH-copula model. Empirical results show that the structure of the

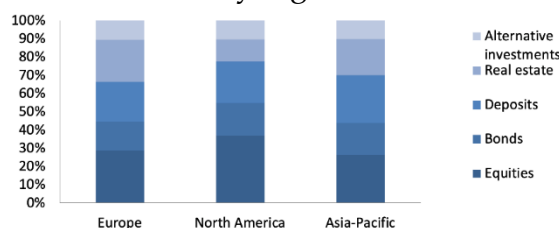
dependency between stock returns and government bonds with maturities of 10 years varies significantly over time in most countries. A positive association between stocks and bonds is found during the 1990s, while the relationship between those two has become negative since the early 2000s. This finding supports the theory that there is a flight-to-quality phenomenon in these countries.

Lee et al. (2019) tested the validity of the flight-to-safe-haven hypothesis in explaining the time-varying co-movement of the three major stock markets (Shanghai, Shenzhen, and Hong Kong stock exchanges) and long-term government bonds in China. The hypothesis is valid on the interdependence of Chinese financial markets and market uncertainty (uncertainty) as proxied by the VIX driver negatively associated with the increased co-movement (realized correlations) between the Chinese stock market and the Chinese government bonds market. In that study, Lee et al. using the VIX driver as a proxy for market uncertainty and using the realized moments technique. In addition, the crises of 2008-2009 (US sub-prime) and 2010-2011 (GIIPS crisis) did not significantly affect the co-movement of government bonds and the three stock markets individually.

Based on previous studies on the correlation between stocks and government bonds, this research will focus on time-varying co-movement on stock exchanges and government bonds in Asian countries for 2005-2020. This research will focus on stocks and bonds because investors in the Asia Pacific

allocate the most significant assets to stocks, deposits, bonds, real estate or property, and other alternative investments as the smallest allocation according to data obtained from EnCor Wealth Management in 2008. Deposits do not have a secondary market, so the data is limited. Therefore bonds, as the largest allocation after deposits, are selected for research. Bonds are then further narrowed down to government bonds because bonds have the lowest risk level or are even risk-free. The flow of investment or the theory of flight-to-quality where investors move their assets to investment instruments with lower risk can be seen and proven more clearly.

Figure 1. Portfolio allocation comparison by region

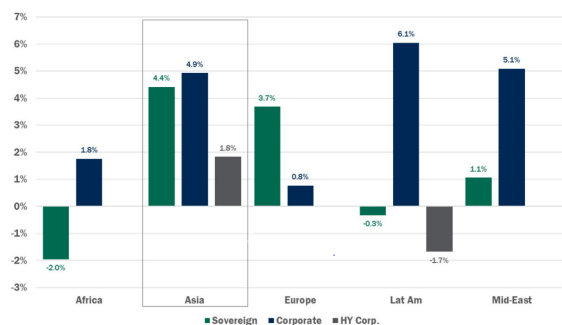


Source: obtained from worldwealthreport.com - EnCor Wealth Management, 2018.

Countries in Asia were selected for research because, based on J.P. Morgan and PineBridge Investments, as of August 31, 2020, bonds in Asia have the most robust returns and are growing faster than other emerging markets, with China as the main driving force. A comparison of returns between Asia and other emerging market regions shown in the Debt Return chart on August 31, 2020 below (Figure 2). The figure shows that the returns on corporate bonds and government bonds in Asia are positive and relatively higher than emerging

markets in Africa, Europe, Latin America, and the Middle East.

Figure 2. Debt return on August 31, 2020



Source: obtained from The Straits Times - J.P. Morgan and PineBridge Investments, 2020.

This study will focus on the 2005-2020 period because there were several events in that period, which are the global crisis in 2008 and the COVID-19 pandemic in 2019. Those events affected the economy of Asia, including the investment activities described through the stock and bond exchanges.

Against the background of the importance of making adjustments to the proportion of investment portfolios to optimize potential returns and minimize risk, especially when a crisis hits, the different levels of crisis impact in each country, and the inconsistency of research results aimed at proving the flight-to-quality phenomenon in different periods and countries, the authors decided to conduct a study entitled *Time-Varying Correlation between Stocks and Government Bonds in Asia: Flight-to-Quality*.

Based on the background of the research that has been described in detail above and some of the phenomena that underlie this background, this study aims to determine the time-varying correlation before and after the 2008

global crisis between stocks and government bonds in Asia and to find out the pattern of relationship (time-varying correlation) before and during the COVID-19 pandemic between stocks and government bonds in Asia.

This study has several limitations related to the availability of data and the research methods used. The Asian countries referred to in this study include China, Japan, Indonesia, Singapore, Malaysia, Thailand, and India. These countries are sampled for countries in Asia because apart from having the highest growth rates in Asia, the data is also available.

RESEARCH METHOD

The data used in this study are daily stock prices and government bonds with a maturity level of 10 years from seven countries studied, namely China, Japan, Indonesia, Singapore, Malaysia, Thailand, and India, from July 2005 to December 2020. The data obtained from Bloomberg in each country's currency. Return is then calculated from the data to be processed.

$$return_t = \frac{(P_t - P_{t-1})}{P_{t-1}} \quad (1)$$

$return_t$ = the return in the t period

P_t = the daily market price of stocks or government bonds in the t period

P_{t-1} = the daily market price of stocks or government bonds in the $t-1$ period.

The research period is used to show the flight-to-quality phenomenon when an event occurs. The 2008 global crisis began with the bankruptcy of Lehman

Brothers on September 15, 2008. This period was chosen referring to previous research conducted by Lamb et al., (2011).

1. Before 2008 Global Crisis: June 29, 2007-September 12, 2008
2. 2008 Global Crisis: September 15, 2008-July 8, 2009

On March 11, 2020, the World Health Organization (WHO) announced that the COVID-19 virus was declared a pandemic. This period is determined by referring to the research that has been carried out by Mariana et al., (2021).

1. Before COVID-19 Pandemic: December 27, 2019-March 10, 2020
2. COVID-19 Pandemic: March 11, 2020-December 31, 2020

This study uses the DCC-GARCH model to describe the dependence structure between stocks and returns from government bonds with a maturity level of 10 years. The DCC-GARCH approach can model the conditional correlation between variables. Bivariate DCC-GARCH (1,1) determines dynamic volatility and linear correlation between stock returns and government bonds.

The DCC-GARCH model was formulated by Engle (2002) to find out the time-varying correlation matrix of several asset returns. If $r_{s,t}$ and $r_{b,t}$ are stock returns and government bond returns at the time t , then the DCC-GARCH bivariate can be written as follows:

$$\begin{pmatrix} r_{s,t} \\ r_{b,t} \end{pmatrix} = \begin{pmatrix} \alpha_s \\ \alpha_b \end{pmatrix} + \begin{pmatrix} \varepsilon_{s,t} \\ \varepsilon_{b,t} \end{pmatrix}, \begin{pmatrix} r_{s,t} \\ r_{b,t} \end{pmatrix} \Big| I_{t-1} \sim N(0, H_t), \tag{2}$$

$$H_t = \begin{bmatrix} h_{s,t}^2 & h_{sb,t} \\ h_{sb,t} & h_{b,t}^2 \end{bmatrix} = \begin{bmatrix} h_{s,t} & 0 \\ 0 & h_{b,t} \end{bmatrix} \begin{bmatrix} 1 & \rho_t \\ \rho_t & 1 \end{bmatrix} \begin{bmatrix} h_{s,t} & 0 \\ 0 & h_{b,t} \end{bmatrix} = D_t R_t D_t = D_t J_t Q_t J_t D_t, \tag{3}$$

$$h_{i,t}^2 = c_i + a_i \varepsilon_{i,t-1}^2 + b_i h_{i,t-1}^2, \quad i = s, b, \tag{4}$$

$$Q_t = (1 - \theta_1 - \theta_2) \bar{Q} + \theta_1 \mathfrak{H}_{t-1} \mathfrak{H}'_{t-1} + \theta_2 Q_{t-1}, \tag{5}$$

where I_{t-1} is information on $t - 1$, H_t is a conditional covariance matrix, $h_{i,t}^2$ is conditional covariance, ρ_t is the time-varying correlation coefficient, $J_t = \text{diag}\{Q_t\}^{-1/2}$, \mathfrak{H}_t as the standardized disturbance vector and the unconditional correlation matrix of \mathfrak{H}_t . θ_1 and θ_2 are the nonnegative parameters of $\theta_1 + \theta_2 < 1$. Before DCC-GARCH is put into operation, descriptive statistical analysis is performed on all available data. The research components used are mean, standard error, standard deviation, kurtosis, skewness, Jarque-Berra, Ljung-Box, and ADF test. The descriptive analysis is used to determine the normality of the data and determine whether the DCC-GARCH model is suitable for the data.

RESULTS AND DISCUSSION

DCC-GARCH between Stocks and Government Bonds 2005-2020

Table 1 shows the estimated parameters of the DCC-GARCH (1,1) bivariate model for all countries included in the sample. The sign (s) indicates stock returns and (b) indicates government bond returns.

Table 1. DCC-GARCH (1,1) Parameter Estimation Model between Stocks and Government Bonds 2005-2020 Period

Country	China	Japan	Indonesia	Singapore	Malaysia	Thailand	India
<i>Conditional mean equation</i>							
mu(s)	0.000371	0.000739	-0.000719	0.000001	0.000236	0.000719	0.000823
mu(b)	-0.000031	-0.000374	0.000664	-0.000108	-0.000446	-0.000159	-0.000049
<i>Conditional variance equation</i>							
omega(s)	0.000001	0.000005	0.000004	0.000000	0.000001	0.000003	0.000002
omega(b)	0.000001	0.000021	0.000003	0.000012	0.000001	0.000006	0.000000
alpha(s)	0.057062	0.113036	0.146099	0.113766	0.100135	0.105329	0.089676
alpha(b)	0.078383	0.207617	0.112622	0.137189	0.095238	0.071825	0.056899
beta(s)	0.940488	0.861537	0.840637	0.880651	0.889619	0.882180	0.902710
beta(b)	0.913071	0.791383	0.874775	0.841959	0.903762	0.906468	0.939758
DCC_alpha	0.007000	0.101582	0.010634	0.002693	0.019240	0.022471	0.007114
DCC_beta	0.990253	0.734530	0.977288	0.987731	0.946357	0.954962	0.985968

Source: Processed data.

In the conditional mean equation, mu(s) and mu(b) show the conditional average of stock returns and government bond returns. In the conditional variance equation, omega(s) and omega(b) represent constant terms. Alpha(s) shows the short-term volatility spillover from stock returns to government bond returns. Alpha(b) shows the short-term volatility spillover from government bond returns to stock returns. Beta(s) shows the long-term volatility spillover from stock returns to government bond returns. Beta(b) shows the long-term volatility spillover from government bond returns to stock returns.

Figure 3 is a graph of the dynamic correlation between Indian stock returns and Indian government bonds for the 2005-2020 period. The correlation between Indian stocks and government bonds is generally negative, although around 2006, 2010, 2012, 2016, and 2018 had a positive correlation. Aslanidis & Christiansen (2014) argue that a positive correlation in stocks and government bonds indicates a stable economic condition. Based on this opinion, the worst condition of India's economy as depicted in Graph 4.1 was in 2015. In

fact, what is presented in the news reported by The Economic Times, India's economic growth as seen from GDP growth is quite high: 7.6% (compared to China's 6.9%) and was one of the fastest growing countries in 2015 according to the IMF. However, to improve the country's economic stability, India needs to revitalize the investment cycle and accelerate structural reforms.

Figure 4 is a graph of the dynamic correlation between Thai stock returns and Thai government bonds for the 2005-2020 period. The correlation between Thai stocks and government bonds is generally negative with the lowest correlation around 2006 when the political crisis in Thailand also affected the investment climate in Thailand.

Figure 5 is a graph of the dynamic correlation between Malaysian stock returns and Malaysian government bonds for the 2005-2020 period. Correlation between Malaysian government stocks and bonds. In general, the correlation between stocks and government bonds in Malaysia is negative with the lowest correlation around 2009. This indicates that there is flight-to-quality in Malaysia a few

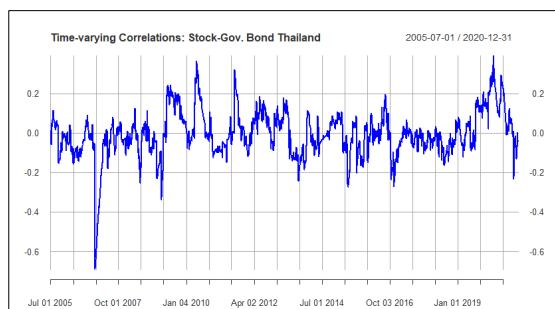
months after the 2008 global crisis, which is marked by the increasingly negative correlation between stocks and government bonds.

Figure 3. Time-varying Correlations: Indian Stock-Government Bond 2005-2020



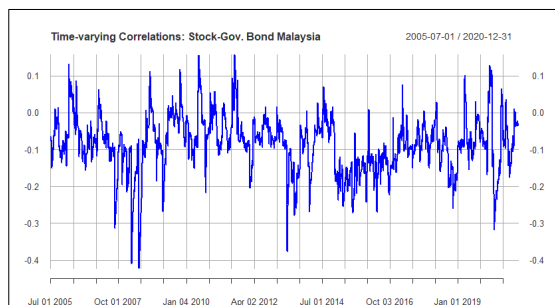
Source: Processed data.

Figure 4. Time-varying Correlations: Thai Stock-Government Bond Thailand 2005-2020



Source: Processed data.

Figure 5. Time-varying Correlations: Malaysian Stock-Government Bond 2005-2020



Source: Processed data.

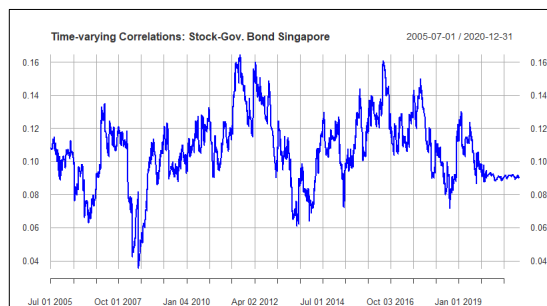
Figure 6 is a graph of the dynamic correlation between Singaporean stock returns and Singapore government

bonds for the period 2005-2020. The correlation coefficient between Singaporean stocks and government bonds is always positive. However, there was a sharp decline around 2008. This indicates a negative spillover where the positive correlation value decreased dramatically but remained positive during the 2008 global crisis period.

Figure 7 is a graph of the dynamic correlation between Indonesian stock returns and Indonesian government bonds for the period 2005-2020. The correlation coefficient between Indonesian stocks and government bonds is generally negative. The sharpest decline occurred around 2020. The correlation value between Indonesian stocks and government bonds became increasingly negative, indicating that there was flight-to-quality during the COVID-19 pandemic period.

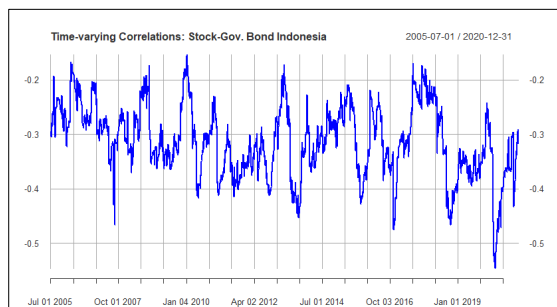
Figure 8 is a graph of the dynamic correlation between Japanese stock returns and Japanese government bonds for the 2005-2020 period. The correlation coefficient between stocks and Japanese government bonds is generally positive. Often changes in the value of the correlation coefficient indicates that it is quite volatile.

Figure 6. Time-varying Correlations: Singaporean Stock-Government Bond 2005-2020



Source: Processed data.

Figure 7. Time-varying Correlations: Indonesian Stock-Government Bond 2005-2020



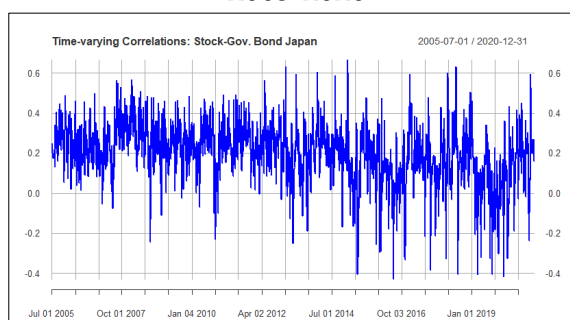
Source: Processed data.

Figure 9. Time-varying Correlations: Chinese Stock-Government Bond 2005-2020



Source: Processed data.

Figure 8. Time-varying Correlations: Japanese Stock-Government Bond 2005-2020



Source: Processed data.

Figure 9 is a graph of the dynamic correlation between Chinese stock returns and Chinese government bonds for the 2005-2020 period. The correlation coefficient between Chinese stocks and government bonds is generally negative. The correlation value between Chinese stocks and government bonds consistently slowly rose from 2017-2019, then decreased around the end of 2019 or during the COVID-19 pandemic period. The decrease in the value of the correlation coefficient but remains positive is a sign of a negative spillover.

Dynamic Correlation between Stocks and Government Bonds in Crisis 2008 Period

Table 2 and Table 3 are descriptive analytics between stocks and government bonds before and during the 2008 crisis period. In general, there was an increase in the standard deviation of stocks and government bonds in China, Japan, Indonesia, Malaysia, Thailand, and India during the 2008 crisis period compared to before the 2008 crisis period. This indicates an increase in the volatility of stock returns and government bonds.

Table 4 and Table 5 are pairwise correlation coefficients between stocks and government bonds before and during the 2008 crisis period. Negative and increasingly negative correlation coefficients between stocks and government bonds occur in Indonesia and Thailand. This is a sign that government bonds are a safe haven for stocks in Indonesia and Thailand.

Table 2. Descriptive Statistic between Stocks and Government Bonds before the 2008 Crisis Period (June 29, 2007-September 12, 2008)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA	GOVB CHINA	GOVB JAPAN	GOVB INDONESIA	GOVB SINGAPORE	GOVB MALAYSIA	GOVB THAILAND	GOVB INDIA
Mean	-0.00170	-0.00109	0.00129	-0.00132	-0.00074	-0.00045	0.00010	-0.00027	-0.00048	-0.00034	0.00045	0.00090	0.00000	0.00006
Standard Deviation	0.02444	0.01595	0.01239	0.03496	0.01185	0.01365	0.02078	0.00603	0.02169	0.01786	0.02185	0.01013	0.01377	0.00655
Median	0.00000	0.00000	0.00004	-0.00215	0.00000	-0.00034	0.00000	0.00000	-0.00201	0.00076	-0.00007	0.00000	0.00000	0.00000
Kurtosis	1.27111	0.77846	8.14583	4.19149	13.02584	0.85187	1.09405	7.64594	0.63034	3.33599	33.85177	14.51192	2.94041	4.37468
Skewness	-0.01287	-0.20386	1.33683	0.94666	-1.62008	0.30136	-0.02686	-0.47105	0.32989	-0.37849	3.37434	1.66812	0.20429	0.43595
Minimum	-0.07729	-0.05650	-0.04298	-0.09107	-0.09497	-0.03487	-0.07407	-0.03211	-0.06347	-0.07698	-0.06800	-0.04197	-0.05198	-0.02289
Maximum	0.09294	0.04271	0.06434	0.17976	0.04351	0.04430	0.06619	0.03044	0.07405	0.07921	0.22239	0.07808	0.06443	0.03419
Observations	316	316	316	316	316	316	316	316	316	316	316	316	316	316

Source: Processed data.

Table 3. Descriptive Statistic between Stocks and Government Bonds during the 2008 Crisis Period (September 15, 2008-July 8, 2009)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA	GOVB CHINA	GOVB JAPAN	GOVB INDONESIA	GOVB SINGAPORE	GOVB MALAYSIA	GOVB THAILAND	GOVB INDIA
Mean	0.00210	-0.00074	-0.00059	-0.00155	0.00016	-0.00033	0.00038	-0.00093	-0.00064	0.00098	-0.00058	-0.00035	-0.00044	-0.00058
Standard Deviation	0.00092	0.00000	-0.00058	-0.00467	0.00000	0.00018	0.00000	0.00000	0.00000	0.00000	-0.00077	0.00000	0.00000	0.00000
Median	0.02256	0.03101	0.02880	0.08768	0.01160	0.02309	0.03059	0.01348	0.01795	0.02464	0.02759	0.01565	0.02802	0.02048
Kurtosis	2.07485	3.42613	24.10847	1.24893	1.50198	3.88030	4.84518	14.10412	0.75368	3.41040	3.47169	9.93519	11.37034	16.41895
Skewness	0.29128	-0.00478	2.44420	0.32807	0.11761	-0.70013	0.68268	-1.74257	-0.00331	-0.31027	0.42100	-0.09964	1.31066	1.01162
Minimum	-0.06320	-0.11406	-0.11177	-0.27170	-0.03614	-0.10497	-0.10956	-0.09589	-0.05382	-0.10375	-0.09042	-0.07032	-0.11207	-0.10814
Maximum	0.09455	0.14150	0.23760	0.30563	0.04138	0.07841	0.17339	0.05112	0.05700	0.07640	0.13345	0.08172	0.18742	0.14918
Observations	213	213	213	213	213	213	213	213	213	213	213	213	213	213

Source: Processed data.

Table 4. Pairwise Correlation Coefficient between Stocks and Government Bonds before the 2008 Crisis Period (June 29, 2007-September 12, 2008)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA
GOVB_CHINA	-0.04558836	-0.03449005	-0.02627537	-0.03173200	-0.02854157	0.00815387	-0.07289216
GOVB_JAPAN	0.06525866	0.59331426	-0.09257885	0.06716417	0.30512238	0.28894746	0.27063858
GOVB_INDONESIA	0.27232134	0.47732432	-0.18248643	-0.01837148	0.58928917	0.48906533	0.48161800
GOVB_SINGAPORE	-0.00600741	0.21235792	-0.04534321	-0.03812047	0.07213666	0.08144198	0.17108625
GOVB_MALAYSIA	-0.06675174	-0.06282718	0.03229773	0.03046347	-0.21175996	-0.03418861	0.03460294
GOVB_THAILAND	-0.10008768	-0.01759310	0.03294798	0.02478303	0.00884604	-0.02714715	0.03443956
GOVB_INDIA	-0.00805464	-0.09131797	-0.00129743	-0.07040861	0.00945654	-0.06229875	-0.21640707

Source: Processed data.

Table 5. Pairwise Correlation Coefficient between Stocks and Government Bonds during the 2008 Crisis Period (September 15, 2008-July 8, 2009)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA
GOVB_CHINA	-0.01408368	-0.03252310	0.06976838	-0.04775762	-0.04421222	0.01946130	-0.00809078
GOVB_JAPAN	0.19357214	0.33210540	-0.01071757	0.06469605	0.11118753	0.21135982	0.13543900
GOVB_INDONESIA	0.30923090	0.51253289	-0.44935698	0.17794050	0.61531925	0.65236463	0.49875181
GOVB_SINGAPORE	0.15818708	0.20462854	-0.01672503	0.10460161	0.21095451	0.17431073	0.16004266
GOVB_MALAYSIA	0.02536285	0.02773951	0.05985637	-0.10620465	-0.01454983	-0.00181459	0.00507843
GOVB_THAILAND	-0.01529007	0.01564947	0.14406339	0.01736407	0.04272441	-0.03421174	-0.04311866
GOVB_INDIA	0.03884615	0.11659049	0.00754002	-0.06340694	0.07234018	0.06722812	-0.09320293

Source: Processed data.

In accordance with the median dynamic correlation coefficient between stocks and state bonds of each country described in Table 6, the flight-to-quality phenomenon occurred in Thailand during the 2008 global crisis period. The dynamic correlation coefficient became negative after Lehman Brothers went

bankrupt. September 15, 2008 or when the 2008 global crisis was declared. The dynamic correlation coefficient between stocks and government bonds in these two countries is also consistently negative and relatively negative from month to month after the 2008 global crisis occurred.

Table 6. *Dynamic Correlation Coefficient (Median) between Stocks and Government Bonds Before and During the 2008 Crisis Period*

	China	Japan	Indonesia	Singapore	Malaysia	Thailand	India
Pre-Crisis 2008 (June 29, 2007-September 12, 2008)	0.0121422	0.5852306	-0.3031813	0.0462298	-0.1121675	-0.0223655	-0.1638549
Crisis 2008 (September 15, 2008-July 8, 2009)	0.0121422	0.4149843	-0.3031813	0.0676107	-0.0829496	-0.0410338	-0.1421466

Source: Processed data.

Thailand is a developing country where although the market potential is very good, the volatility of investment in developing countries tends to be greater or more volatile and more volatile than investment in developed countries. The characteristics of financial and investment markets in developing countries certainly influenced investors' attitudes in determining their investment portfolios, especially when the 2008 global crisis occurred. Investors who invest in Thailand tend to shift their investment to safer assets (flight-to-quality), in this case shifting their investment from stocks to government bonds.

The results of this study are in line with the research conducted by Gencer in 2015 where the flight-to-quality phenomenon was proven to occur during the 2008 global crisis period in Turkey, which is also a developing country. Investors in Turkey tend to reduce the proportion of shares in their portfolios by shifting to long-term government bonds, similar to investors in Indonesia and Thailand as illustrated in the results of this study.

In addition to the research conducted by Gencer in 2015, the results of this study are also in line with the results of previous research conducted by Cheng and Yang in 2017. In this study, it was proven that flight-to-quality happened in

developing countries in Asia in the 2008 global crisis period. The difference between the results of this study and the research conducted by Cheng and Yang is that flight-to-quality in developing countries in Asia occurs because investors shift their investment assets from stocks to short-term government bonds, while in this study flight-to-quality occurs because investors move their investment assets from stocks to long-term government bonds.

However, if you look at the graph of the time-varying correlation between stocks and government bonds on a daily basis, some interesting things were found. In Figure 10, the flight-to-quality phenomenon was only seen in India in early 2009. This could be due to the fact that in early 2009, the financial scandal of Satyam Computer Services emerged to the public. Satyam is one of the biggest companies in India with back-office software and services business with big clients such as Nestle and General Electric. The scandal resulted in the Indian stock market slumping sharply with the Sensex index down 692.37 points. The decline in the stock market has made investors shift their investment to government bonds as a safer investment instrument, marked by the price of government bonds which continues to rise from day to day. Figure 12 shows that the flight-to-quality

phenomenon occurred around April 2008 and July 2008 or before September 2008 when Lehman Brothers went bankrupt. This is probably because internal factors in Malaysia have more influence on the financial market in Malaysia, considering that during that period the Malaysian stock market

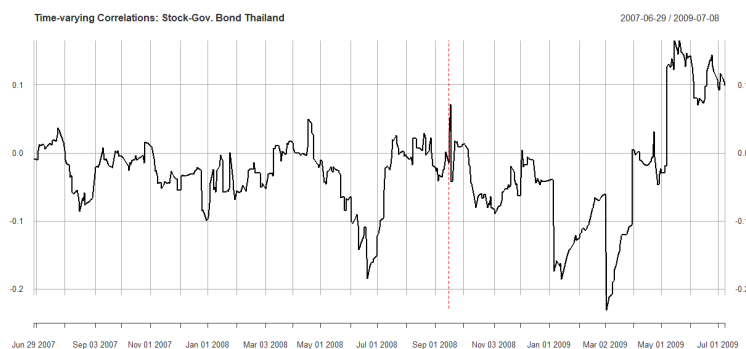
plummeted due to public disappointment with the election results, making it possible to shift their investment instruments to government bonds which are much safer, even though the rate of return tends to be relatively low.

Figure 10. Time-varying Correlations: Indian Stock-Government Bond in 2008 Crisis



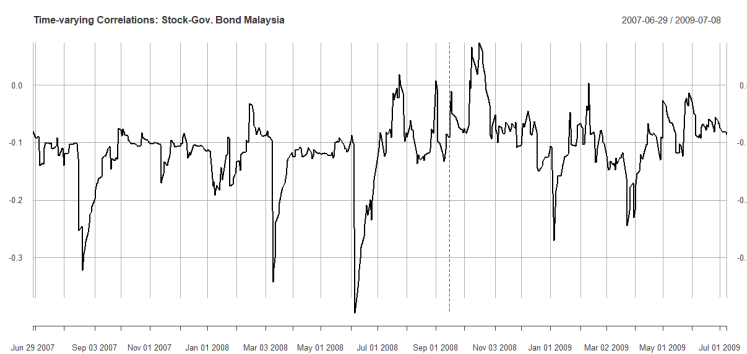
Source: Processed data.

Figure 11. Time-varying Correlations: Thai Stock-Government Bond in 2008 Crisis



Source: Processed data.

Figure 12. Time-varying Correlations: Malaysian Stock-Government Bond in 2008 Crisis



Source: Processed data.

Figure 13 shows that the flight-to-quality phenomenon occurred in Singapore around March-April 2008, before September 2008 when Lehman Brothers went bankrupt. This is probably due to the close relationship between the Singapore and the United States stock exchanges, so that since the early signs of a market crash in the United States, the Singapore stock exchange has felt the effects, which investors responded to by shifting their assets to safer investment instruments.

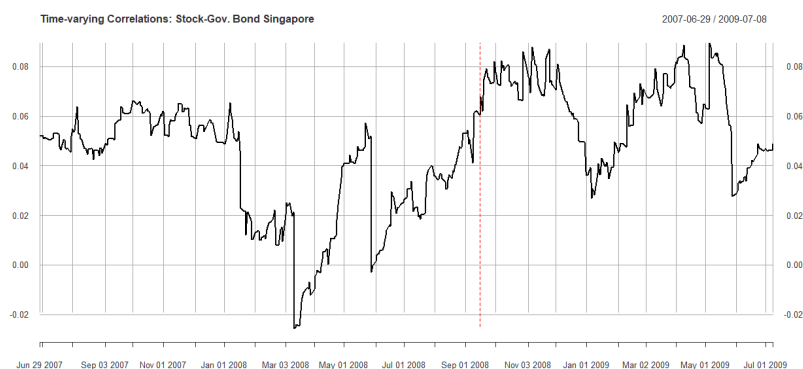
Although the movement is depicted in Figure 14, the dynamic correlation coefficient between stocks and government bonds in Indonesia tends to be stable (0,3031813). This indicates that the flight-to-quality phenomenon did not occur in Indonesia during the 2008 global crisis period.

In Figure 15, the time-varying correlation between stocks and Japanese

government bonds is always positive. The decline in correlation occurred around October-November 2008 and January-February 2009 with the correlation coefficient remained positive. This indicates that the negative spillover phenomenon occurred in Japan which may be influenced by the decline in prices of most automotive stocks due to declining demand from the United States and several countries in Europe so that it is possible for Japanese investors to sell their shareholdings from these companies and retain ownership government bonds.

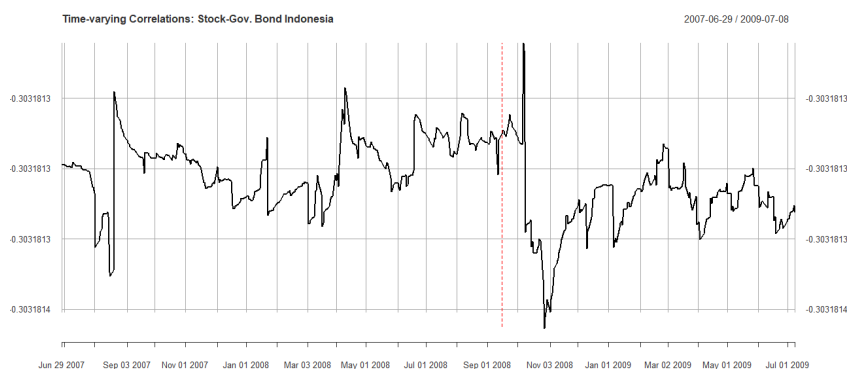
Although the movement is depicted in Figure 16, the dynamic correlation coefficient between stocks and government bonds in China tends to be stable (0,012142). This indicates that the flight-to-quality phenomenon did not occur in China during the 2008 global crisis.

Figure 13. Time-varying Correlations: Singapore Stock-Government Bond in 2008 Crisis Period



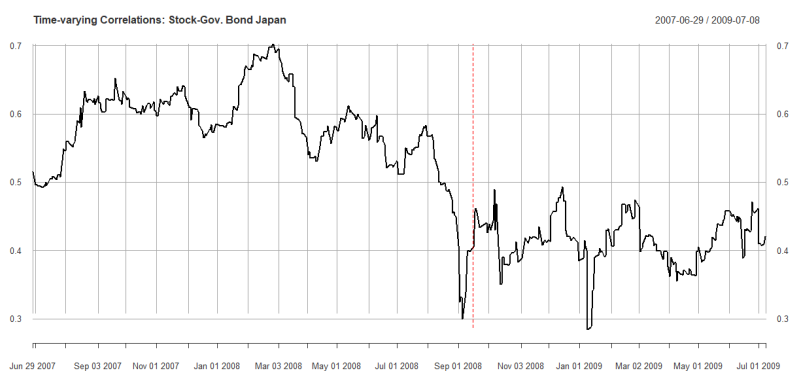
Source: Processed data.

Figure 14. Time-varying Correlations: Indonesian Stock-Government Bond in 2008 Crisis Period



Source: Processed data.

Figure 15. Time-varying Correlations: Japanese Stock-Government Bond in 2008 Crisis Period



Source: Processed data.

Figure 16. Time-varying Correlations: Chinese Stock-Government Bond in 2008 Crisis Period



Source: Processed data.

Dynamic Correlation between Stocks and Government Bonds in COVID-19 Period

Table 7 and Table 8 are descriptive analytics between stocks and

government bonds before and during the COVID-19 period. In general, there was an increase in the standard deviation of stocks and government bonds of China,

Japan, Indonesia, Malaysia, Thailand, and India during the COVID-19 period, compared to before the COVID-19 period. This indicates an increase in the volatility of stock returns and government bonds.

Table 9 and Table 10 are pairwise correlation coefficients between stocks and government bonds before and during the COVID-19 period. The correlation coefficient that becomes negative and/or becomes increasingly negative between stocks and government bonds occurs in Malaysia and India. The correlation coefficient

between stocks and government bonds in Malaysia before the COVID-19 period was -0,07571190 and became increasingly negative when WHO declared COVID-19 a pandemic, becoming -0,19688028.

The correlation coefficient between stocks and government bonds in India before the COVID-19 period was positive, namely 0.04407873 and turned negative during the COVID-19 period, which was -0.18633508. This is a sign that government bonds are a safe haven for stocks in Malaysia and India during the COVID-19 period.

Table 7. Descriptive Statistic between Stocks and Government Bonds before COVID-19 Period (December 27, 2019-March 10, 2020)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA	GOVB CHINA	GOVB JAPAN	GOVB INDONESIA	GOVB SINGAPORE	GOVB MALAYSIA	GOVB THAILAND	GOVB INDIA
Mean	0.00065	0.00014	-0.00041	0.00120	-0.00048	-0.00060	0.00004	-0.00071	-0.05886	-0.00047	-0.00158	-0.00108	-0.00289	-0.00054
Median	0.00000	0.00000	0.00000	0.00000	-0.00002	0.00000	0.00000	0.00000	0.00000	0.00000	-0.00025	-0.00025	-0.00041	0.00000
Standard Deviation	0.01198	0.00984	0.00794	0.01287	0.00563	0.00901	0.00917	0.00794	1.26940	0.00845	0.02081	0.00752	0.02006	0.00725
Kurtosis	8.59275	3.80728	8.16178	12.81050	8.40266	23.01769	7.52490	7.06782	54.42190	11.46357	26.44320	8.64668	13.39405	7.61034
Skewness	-0.95614	-0.56052	0.40619	1.36706	-1.52803	-3.08939	0.05786	-0.96562	-5.20736	-1.51303	-0.73640	-0.08008	-0.52571	-1.07637
Minimum	-0.07725	-0.05065	-0.03708	-0.04604	-0.03974	-0.07961	-0.05167	-0.04562	-13.66667	-0.06379	-0.17352	-0.03464	-0.13062	-0.04797
Maximum	0.05601	0.03883	0.05024	0.10180	0.01405	0.02942	0.05323	0.03237	5.00000	0.02936	0.15934	0.04004	0.12931	0.02551
Count	316	316	316	316	316	316	316	316	316	316	316	316	316	316

Source: Processed data.

Table 8. Descriptive Statistic between Stocks and Government Bonds during COVID-19 Period (December 27, 2019-March 10, 2020)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA	GOVB CHINA	GOVB JAPAN	GOVB INDONESIA	GOVB SINGAPORE	GOVB MALAYSIA	GOVB THAILAND	GOVB INDIA
Mean	0.00076	0.00164	-0.00074	0.00000	0.00068	0.00078	0.00160	0.00092	-0.08187	0.00077	-0.00091	-0.00029	0.00248	-0.00012
Median	0.00000	0.00000	-0.00055	0.00000	0.00007	0.00000	0.00303	0.00000	0.00000	0.00000	-0.00339	0.00000	0.00000	0.00000
Standard Deviation	0.01146	0.01589	0.01016	0.00000	0.01244	0.01803	0.02093	0.01035	1.46651	0.01666	0.03590	0.01418	0.04103	0.00853
Kurtosis	4.00763	5.58185	10.36302	0.00000	5.89487	11.95929	11.04887	1.30015	57.33019	7.42597	5.94347	7.36025	31.88211	12.96948
Skewness	0.14687	0.57689	1.21705	0.00000	0.06948	-1.30890	-1.41868	0.30787	-5.08638	0.50481	1.04192	0.00733	3.86358	-1.39204
Minimum	-0.04498	-0.06081	-0.04059	0.00000	-0.05261	-0.10799	-0.13153	-0.02968	-15.00000	-0.05201	-0.14694	-0.06400	-0.14980	-0.05952
Maximum	0.05711	0.08038	0.06391	0.00000	0.06851	0.07954	0.08975	0.04480	7.50000	0.10191	0.17272	0.06935	0.36128	0.03283
Count	213	213	213	213	213	213	213	213	213	213	213	213	213	213

Source: Processed data.

Table 9. Pairwise Correlation Coefficient between Stocks and Government Bonds during COVID-19 Period (March 11, 2020-December 31, 2020)

	STOCK CHINA	STOCK JAPAN	STOCK INDONESIA	STOCK SINGAPORE	STOCK MALAYSIA	STOCK THAILAND	STOCK INDIA
GOVB_CHINA	0.25692139	0.24388792	-0.19247774	0.09019967	0.23399972	0.26179824	0.19779163
GOVB_JAPAN	-0.07899424	-0.05445016	0.06128799	-0.09396000	-0.00288887	-0.10991878	-0.12212683
GOVB_INDONESIA	0.28896674	0.41964545	-0.58256419	0.08923856	0.50146647	0.48315861	0.37418997
GOVB_SINGAPORE	0.27452125	0.45913308	-0.35991107	0.06726287	0.37662743	0.50570852	0.30421121
GOVB_MALAYSIA	0.03650645	0.11694458	0.10357363	-0.07963917	-0.07571190	-0.10366038	-0.07176189
GOVB_THAILAND	0.19844681	0.31967769	-0.14413645	0.10905316	0.28081361	0.42139117	0.23635692
GOVB_INDIA	0.16805208	0.19019500	-0.07378667	-0.00135056	0.09183342	0.12486214	0.04407873

Source: Processed data.

Table 10. Pairwise Correlation Coefficient between Stocks and Government Bonds during COVID-19 Period (March 11, 2020-December 31, 2020)

	<i>STOCK_CHINA</i>	<i>STOCK_JAPAN</i>	<i>STOCK_INDONESIA</i>	<i>STOCK_SINGAPORE</i>	<i>STOCK_MALAYSIA</i>	<i>STOCK_THAILAND</i>	<i>STOCK_INDIA</i>
GOVB_CHINA	0.27729516	0.08152559	-0.04354388	0.00000000	0.06408774	0.12391507	0.11826338
GOVB_JAPAN	0.03292707	0.10290332	-0.02645029	0.00000000	0.04188500	0.02090394	0.05750487
GOVB_INDONESIA	0.28911497	0.21207856	-0.53758854	0.00000000	0.44143936	0.42489482	0.49467073
GOVB_SINGAPORE	-0.02417587	0.01490619	0.16513425	0.00000000	-0.08274031	0.13805203	0.14725939
GOVB_MALAYSIA	-0.11491148	-0.16486699	0.42941199	0.00000000	-0.19688028	-0.04124080	-0.10705835
GOVB_THAILAND	-0.05920464	-0.24106832	0.23734020	0.00000000	-0.19150893	0.09233375	0.04073372
GOVB_INDIA	-0.11578460	-0.05441712	0.27160964	0.00000000	-0.18623937	-0.13467014	-0.18633508

Source: Processed data.

Table 11. Dynamic Correlation Coefficient (Median) between Stocks and Government Bonds Before and During COVID-19 Period

	China	Japan	Indonesia	Singapore	Malaysia	Thailand	India
Pre-COVID-19 (December 27, 2019-March 10, 2020)	0.2506010	-0.1011746	-0.4198714	0.0466890	-0.0432469	0.1622154	-0.0620429
COVID-19 (March 11, 2020-December 31, 2020)	0.2464152	0.0035159	-0.4148874	0.0466890	-0.0666939	0.1721773	-0.0620429

Source: Processed data.

In accordance with the median dynamic correlation coefficient between stocks and state bonds of each country described in Table 4.12, the flight-to-quality phenomenon occurred in Malaysia during the COVID-19 period. The dynamic correlation coefficient has become increasingly negative after WHO declared COVID-19 a pandemic on March 11, 2020. The dynamic correlation coefficient between stocks and government bonds in the two countries is also consistently negative and relatively negative from month to month during the COVID-19 period. . Meanwhile, in Indonesia, Singapore, and India, the correlation coefficient between stock returns and government bonds tends to stagnate. In Japan, there was a negative contagion, which was indicated by the negative correlation coefficient between stock returns and government bonds before the COVID-19 pandemic, becoming positive when the pandemic occurred.

In accordance with the notion of flight-to-quality conveyed by Baur and

Lucey (2009) that when WHO announced the outbreak for the first time, the correlation coefficient between stock returns and government bonds in Malaysia was increasingly negative, indicating that flight-to-quality occurred. In China, there is a decrease in the correlation coefficient, but the decline is not too significant and the correlation coefficient between stock returns and government bonds is still positive.

The results of this study are in line with previous research conducted by Papadamou et al., (2021) where flight-to-quality occurs in 10 countries in Europe, Asia, America, and Australia where these countries consist of developing countries and developed countries which, if compared with the results of this research, Malaysia is a developing country.

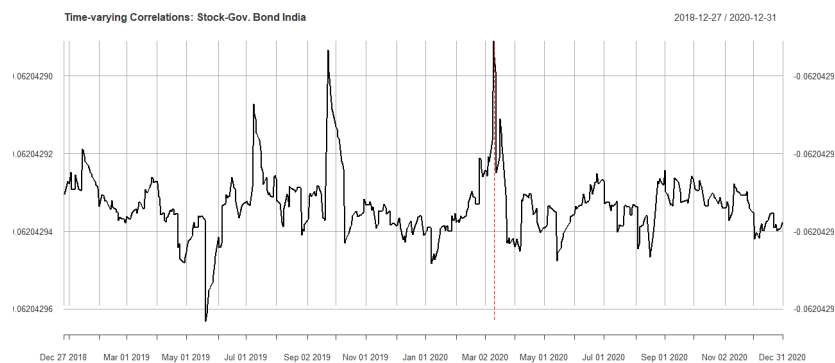
However, if you look at the graph of the time-varying correlation between stocks and government bonds on a daily basis, some interesting things were found. Although the movement is depicted in Graph 4.15, the dynamic

correlation coefficient between stock returns and government bonds in India tends to be stable, namely -0.0620429 . The same thing also occurs in Graph 4.18 where the movement is indeed depicted but in terms of coefficients, the dynamic correlation between stock returns and government bonds in Singapore tends to be stable, namely 0.04668 . This indicates that the flight-to-quality phenomenon did not occur in India and Singapore during the COVID-19 pandemic period. Investors in both countries do not feel the need to shift their investment to government bonds or other investment

assets that are considered safer than stocks.

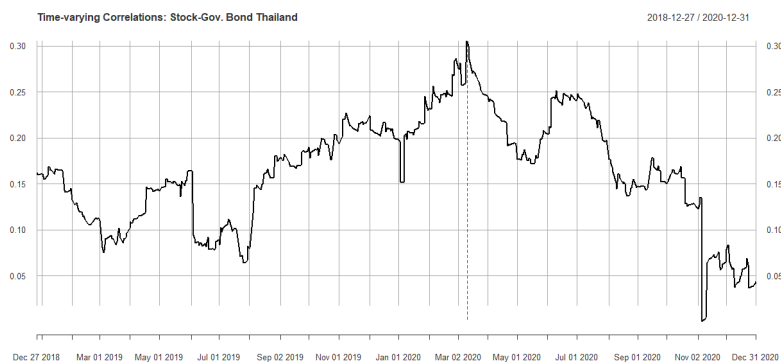
Graph 4.16 and Graph 4.21 show that there is a movement in the correlation coefficient between stock returns and government bonds of Thailand and China. However, the movement tends to be small, and the coefficient remains positive. This indicates that the negative spillover phenomenon occurred in the two countries, which indicates that it is possible for investors to sell their shareholdings while still maintaining ownership of government bonds during the COVID-19 pandemic.

Figure 17. Time-varying Correlations: Indian Stock-Government Bond in COVID-19 Pandemic Period



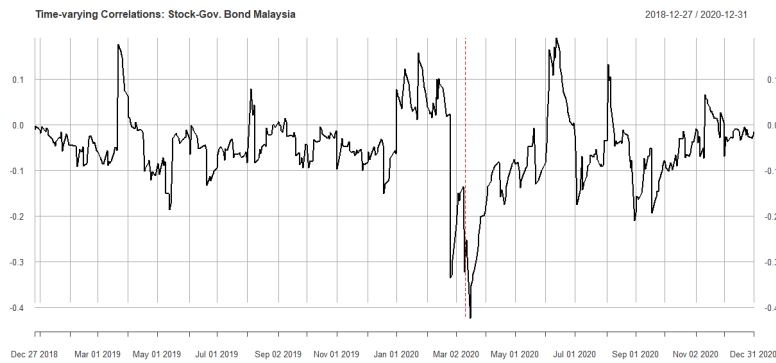
Source: Processed data.

Figure 18. Time-varying Correlations: Thai Stock-Government Bond in COVID-19 Pandemic Period



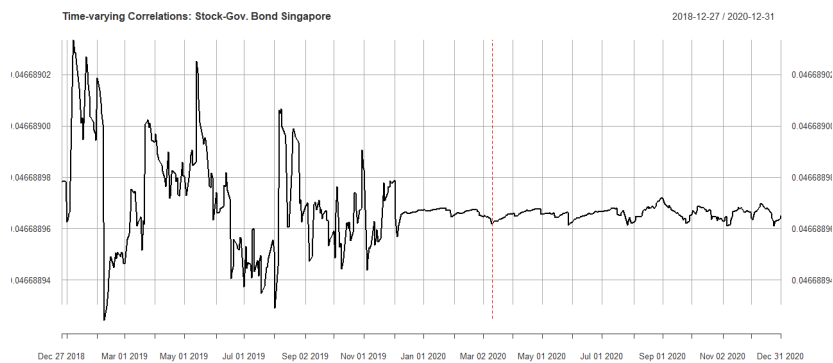
Source: Processed data.

Figure 19. Time-varying Correlations: Malaysian Stock-Government Bond in COVID-19 Pandemic Period



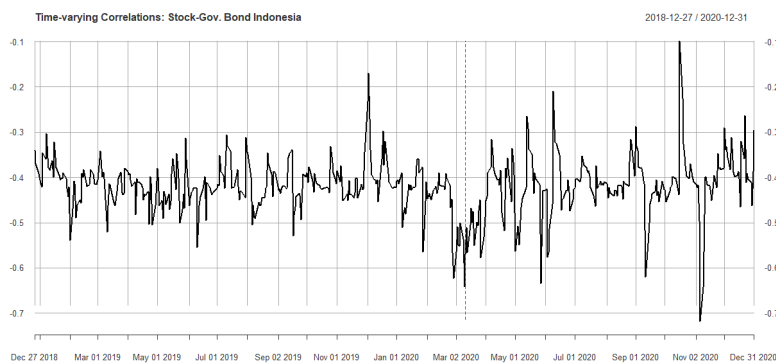
Source: Processed data.

Figure 20. Time-varying Correlations: Singapore Stock-Government Bond in COVID-19 Pandemic Period



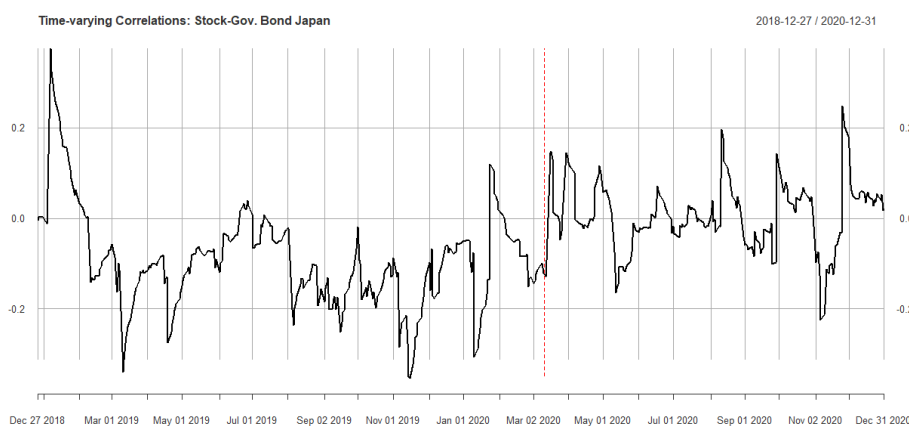
Source: Processed data.

Figure 21. Time-varying Correlations: Indonesian Stock-Government Bond in COVID-19 Pandemic Period



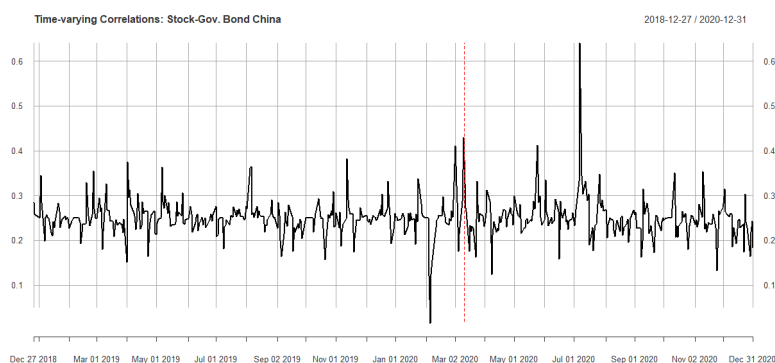
Source: Processed data.

Figure 22. Time-varying Correlations: Japanese Stock-Government Bond in COVID-19 Pandemic Period



Source: Processed data.

Figure 23. Time-varying Correlations: Chinese Stock-Government Bond in COVID-19 Pandemic Period



Source: Processed data.

CONCLUSION

During the 2008 global crisis period, it was proven that the flight-to-quality phenomenon in Thailand was marked by a negative correlation coefficient between stock returns and government bonds and became increasingly negative when the 2008 crisis occurred. This situation illustrates that investors in these countries tend to shift their investment assets from stocks to government bonds. Thailand is a developing country where the stock market is very volatile and risky, despite high growth. Investors belong to the risk-averse group, so they prefer to move

their investment assets to government bonds which have less risk, even though the rate of return is low. The implication of the results of this study is that when investors move their investment from stocks to government bonds, the stock price decreases. Meanwhile, the price of government bonds continued to increase due to increased demand for government bonds during the 2008 global crisis.

During the COVID-19 pandemic, the flight-to-quality phenomenon was proven to have occurred in Malaysia. Investors in Malaysia tend to move their

investment assets to lower risk investment instruments due to the volatility of stock prices and the instability of financial markets during this period, so investors prefer low risk even though the rate of return is low. The implication of the tendency of investors to prefer government bonds as an investment instrument in addition to rising bond market prices is that the government can issue new bonds in the hope that investors will immediately buy them so that the government's resources to manage the country's economy, especially in dealing with the COVID-19 pandemic, are increasing.

Thus, this research is still not perfect and has several limitations. The object of this research is limited to stocks and government bonds of several countries in Asia, so that the results of the study are not able to describe the overall existence of the flight-to-quality phenomenon in world financial markets with various other investment instruments. Besides, this study only looks at the transfer of investment flows from stocks to government bonds in one country, does not explain or test the possibility of investment flows from one country to another.

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