
The Impact of International Portfolio Flows on Exchange Rate Volatility in Emerging Markets in Asia

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Abstract:

This research explores how inflows of stock and bond portfolios impact the level of volatility in exchange rates, using monthly data from the United States vis a vis seven emerging Asia countries (China Mainland, China Taiwan, The Philippines, India, Indonesia, Malaysia, and Thailand) between 2010 and 2022. The study uses statistical models such as Ordinary Least Square (OLS), Generalized Autoregressive Conditional Heteroscedasticity (GARCH), and Threshold Generalized Autoregressive Conditional Heteroscedasticity (TGARCH). The findings indicate that net stock and net bond flows have a significant impact on exchange rates volatility, and net stock flows have a more significant impact on exchange rates volatility rather than net bond flows.

Keywords: *International Portfolio Flows, Stock, Bonds, Exchanged Rate Volatility.*

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1. Introduction

The relaxation of financial market regulations, which led to an increase in capital flows between countries, is generally considered to be a major factor in the high volatility of some currencies around the world. Hau and Rey (2016) cite the example of the USD, where in 1975, gross inter-country stock and bond portfolio flows amounted to only 4% of GDP, but this percentage increased sharply by 100% in the early 1990s and then reached 245% in 2000. However, these portfolio flows fell dramatically in September 2008 due to the Lehman Brothers case, before picking up again in 2009. Recent research by Lovcha and Perez-Laborda (2013) argues that there is now much evidence to suggest that stock and bond portfolio flows will change with uncertainty in the foreign exchange market. As in the research of Fidora et al. (2007) who found that exchange rate volatility is the main factor causing bias on bilateral portfolios in a number of emerging economies. The International Monetary Fund (IMF) in 2011 stated that there were 31 times net private capital flows to developing countries in Asia since 1993, where the Asian financial crisis and the global financial crisis were the main factors of volatility.

Capital flow in emerging markets in Asia is also influenced by the Quantitative Easing (QE) policy implemented by the Federal Reserve ("The Fed") from 2007 to 2015 due

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to the global financial crisis, recession in America, and Covid-19 (The American Deposit Management Co., 2021), with detailed data as follows:

Table 1. The Federal Reserve's Quantitative Easing Policy

Period	Securities	Nominal
2008	Agency mortgage-backed securities (MBS) dan agency debt	USD600 Billion
2009	Agency securities	USD850 Billion
	Longer-term US Treasury securities	USD300 Billion
2010	Longer-term US Treasury securities	USD600 Billion
2011	US Treasury securities dengan jatuh tempo enam hingga 30 tahun	USD400 Billion
June 2012	US Treasury securities dengan jatuh tempo enam hingga 30 tahun	USD667 Billion
September 2012	Agency MBS	USD40 Billion/month
December 2012	Longer-term US Treasury securities	USD45 Billion/month
June 2020	US Treasury Securities	USD80 Billion/month
	MBS	USD40 Billion/month

Source: Chen *et al.* (2016) and The American Deposit Management Co. (2021), processed 2023

MG Westri Kekalih Susilowati (2022) states that towards the end of 2021, the Fed saw a significant economic recovery due to a surge in the high cost of living, so in November 2021, the Fed announced to conduct monetary policy Tapering Off. The Fed began to reduce its asset purchases in December 2021, and in June 2022, the Fed changed its monetary policy direction to manage the threat of rising costs and focus on controlling inflation. Raddatz, Schmukler dan Williams (2017) stated that, when capital flows are highly volatile, a domestic policy response will become necessary. Another policy undertaken by central banks in addition to QE and tapering off is intensive intervention in the domestic currency market to reduce the impact of capital flows. Gadanez *et al.* (2014) stated that foreign investors tend to hedge their local currency bond holdings in emerging economies to protect their portfolios from high market risk due to the illiquidity of the bonds.

According to Caporale *et al.* (2017), net equity and bond portfolio inflows significantly affect exchange rate volatility in most emerging Asian economies. Specifically, the results of data processing show that stock inflows increase exchange rate volatility, while bond inflows decrease exchange rate volatility. This study aims to identify and analyze the level of influence of stock and bond portfolio flows on exchange rate volatility in seven developing Asian countries, as well as to determine

the variables that have a more significant influence on exchange rate volatility in seven developing Asian countries.

2. Theoretical Background

International Capital Flows

Capital flows consist of Foreign Direct Investment, portfolio investment, and loans, all of which have an impact on exchange rates and economic stability. Global capital flows increased rapidly from less than 7% of global GDP in 1998 to more than 20% in 2007, but fell significantly at the end of 2008 (Byrne & Fiess, 2016). After the crisis, global investors were encouraged to seek higher returns in emerging markets (Bussière & Phylaktis, 2016).

Emerging market economies are highly sensitive to capital flows, both in terms of their size and composition. According to Bussière & Phylaktis (2016), foreign portfolio outflows will try to be offset by investments made by domestic investors. The global financial turmoil and the increase in US economic growth have also contributed to international capital flows into emerging market economies. Bussière & Phylaktis (2016) said that, the existence of global financial shocks will affect international capital flows, these flows will affect emerging financial markets. Therefore, the results of previous studies, such as Calvo & Reinhart (2002), say that variable interest rate policy instruments and money market interventions are policies that can help cushion the impact of global financial shocks.

Shares

The Financial Services Authority on its official website explains that shares are a sign of capital transfer from a business entity or individual to a company or limited liability company (issuer), so that the business entity or individual has a claim or right to the issuer's income and assets, and has the right to be present. at the General Meeting of Shareholders (GMS). Factors that influence the level of demand and supply of shares are the performance of the issuer and the performance of the issuer's industry, reference interest rate policy, inflation rate, foreign exchange market, as well as non-economic factors such as social and political conditions. On the OJK's Ilmui Uangmu website, it is also stated that there are two advantages to investing in shares, namely being able to get dividends and capital gains. Investing in shares also has its own risks, such as not getting dividends because the issuer makes a loss, capital loss, and the risk of liquidation when the issuer goes bankrupt.

There are several previous studies that discuss the relationship between shares and exchange rates, such as Chinn (1989) which states that integration into broader equity markets will lead to a stronger relationship between these equity markets and substantial international financial flows. Rodríguez & Rivero (2020) state that during the tequila crisis, the stock market had a dominant role in the transmission of volatility, while during the ruble crisis, dotcom crash, global financial crisis, European sovereignty crisis and Brexit referendum, the foreign exchange market was the main

volatility trigger, and during Asian crisis, there was almost the same distribution of volatility sources between the stock market and the foreign exchange market.

Bond

According to Bank Indonesia (2020) in BPPU 2025, a bond is a statement of debt from the party issuing the bond to the party investing in the bond instrument along with a promise to repay the principal and interest on the bond's maturity date. Nurwulandari (2021) stated that before purchasing bonds, investors need to pay attention to and analyze the rating of the bond. Rating is a risk scale for all securities being traded. Securities coupons are the main factor that investors must calculate and analyze when purchasing bonds.

Government Securities (SBN) based on Law of the Republic of Indonesia no. 24 of 2002 is an acknowledgment of debt in the form of securities denominated in rupiah or foreign currency where the return of principal and interest payments are guaranteed by the Indonesian government, according to the validity period. According to Bakri and Utami (2021), bonds have an influence on exchange rates, where from 2010 to 2013, most of the currencies of emerging market economies appreciated quite highly against the USD, so that bonds in the local currency of developing countries became very attractive for investors. . Gadanecz, Miyajima and Shu (2018) say that since May 2013, emerging market economies have experienced turbulence triggered by the Fed's announcement that it might start reducing large-scale asset purchases earlier than previously estimated. Developing country bond yields in local currency increased sharply again in the first half of 2015. This was also influenced by very high volatility in the exchange rates of emerging market economies, thus indicating that exchange rate risk has an increasingly important role in sovereign debt markets. developing (Gadanecz, Miyajima and Shu, 2018).

Exchange rate

Chen (2022b) states that the exchange rate is the rate at which one currency will be exchanged for another currency and influences trade and money movements between countries. The exchange rate between two currencies is generally determined by economic activity, market interest rates, gross domestic product, and unemployment rates in each country. Changes in exchange rates can occur hourly or daily with small changes or in large gradual changes. Muktiyanto & Aulia (2019) stated that exchange rate volatility can give rise to risk, and exchange rate risk is one of the variables that will influence bond yields, because when the local currency depreciates, investors will experience a decrease in the value of their investments in bonds. As the domestic exchange rate weakens, bond yields will continue to increase. Research by Muktiyanto & Aulia (2019) also proves that currency mismatch on company and banking balance sheets will cause an increase in the risk of default on government bonds, which will result in an increase in the risk premium demanded by investors. When the domestic exchange rate appreciates, this will encourage foreign investors to sell their foreign currency and invest in government bonds which will have an impact on reducing the country's bond yield.

Based on the explanations above, the hypothesis of this research is as follows.

Hypothesis 1: International portfolio flows on the stock market have an influence on exchange rate volatility in selected developing Asian countries.

Hypothesis 2: International portfolio flows in the bond market have an influence on exchange rate volatility in selected developing Asian countries.

Hypothesis 3: International portfolio flows in the bond market have a more significant influence on exchange rate volatility in selected developing Asian countries

3. Methodology

Research Data

This study is conducted to examine the impact of net stock and bond portfolio flows on exchange rate volatility between the United States vis-à-vis seven emerging markets in Asia, namely China Mainland, China Taiwan, Philippines, India, Indonesia, Malaysia, and Thailand. This study will use secondary data in the form of monthly historical data of exchange rates and international portfolio flows of stocks and bonds. Portfolio flow data is obtained from the US Treasury International Capital (TIC) System (U.S. Department of The Treasury, 2023) which is data on all purchases and sales of long-term securities made by U.S. residents with foreigners in various countries. (Caporale et al., 2017). The types of long-term securities used in the data are foreign bonds and foreign stocks. Data sources for exchange rates can be obtained from the IMF's official website. (International Financial Statistics, 2023).

Data Processing Method

Ordinary Least Square (OLS) Model

Brooks et al. (2004) and Hau and Rey (2006) state that multiple linear regression such as OLS can be an alternative statistical model that can be used to see the relationship between net flows of stocks and bonds and exchange rates, because regression analysis has the aim of estimating model parameters that express the effect of the relationship between variables. The OLS method in this study has the following formula :

$$r_t = \mu + \sum_{n=1}^{12} \phi_n r_{t-n} + \beta_1 nbf_t + \beta_2 nef_t + \sigma \varepsilon_t,$$

Where r_t = (change in exchange rate), and $\{\varepsilon_t\}$ is i.i.d. error with $E(\varepsilon_t) = 0$ and $E(\varepsilon_t^2) = 1$. nbf_t and nef_t represent the net flow of bonds and the net flow of shares, respectively. Autoregressive $\sum_{n=1}^{12} \phi_n$, with up to twelve lags, is also included to capture exchange rate dynamics.

Generalized Autoregressive Conditional Heteroscedasticity (GARCH)

The next econometric approach in this research is to use the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model. Engle (1982) and Bollerslev (1986) in their research stated that the GARCH methodology is the most appropriate model for analyzing data with unstable (volatile) characteristics. Based on

previous research using economic data with volatile characteristics as variables, such as shares, bonds, exchange rates, commodities and other capital market instruments, it is stated that the ideal GARCH model that can be used is GARCH (1,1) (Barguelli et al., 2018; Bathia et al., 2020; Bodart & Reding, 1999; Caporale et al., 2015; Charles & Darné, 2019; Girard & Omran, 2009; Ibraheem, 2020; Ninanussornkul C., McAleer M., 2009). So to test the direct influence between stock net flows and bond net flows on exchange rate volatility, this research uses the GARCH (1,1) model with the following formula:

$$r_t = \mu + \sum_{n=1}^{12} \phi_n r_{t-n} + \varepsilon_t, \quad \varepsilon_t | \Omega_{t-1} \sim N(0, \sigma_t^2)$$

$$\sigma_t^2 = \omega + \alpha \varepsilon_{t-1}^2 + \beta \sigma_{t-1}^2 + \psi_1 nbf_t + \psi_2 nef_t,$$

Where $\varepsilon_t | \Omega_{t-1} \sim N(0, \sigma_t^2)$ is a conditionally normal innovation with zero mean and variance σ_t^2 . ψ_1 and ψ_2 are the main parameters for calculating respectively the net flow of bonds and the net flow of shares on the conditional variance σ_t^2 of exchange rate changes. Finally, the standard regular conditions apply to the models $\alpha, \beta > 0$ and $\alpha + \beta < 1$.

Threshold Generalized Autoregressive Conditional Heteroscedasticity (TGARCH)

This research also uses an asymmetric GARCH model, namely Threshold GARCH (TGARCH). This model is used to capture asymmetric characteristics such as leverage effects, where negative shocks will have a greater impact on volatility than positive shocks of the same magnitude (Glosten et al., 1993; Zakoian, 1994). Additionally, Glosten et al. (1993) and Zakoian (1994) also state that TGARCH includes volatility clustering, namely when large (small) price changes tend to follow large (small) price changes. The TGARCH model also allows calculating leptokurtosis and skewness, which indicate deviations from data normality, so it can accommodate the volatile characteristics of stock, bond and exchange rate data.

Several previous studies, such as those conducted by Muharam (2013), Girard dan Omran (2009), Susanti, Mastur dan Mariani (2016), Tyas, Maruddani dan Rahmawati (2019), Dadan Kusnandar (2020), serta Ibraheem (2020), stated that that the best TGARCH model that can be used for volatile data characters is TGARCH (1,1). So TGARCH (1,1) can be described with the following formula :

$$\sigma_t^2 = \omega + \sum_{i=1}^u (\alpha_i + \gamma_i I_{t-i}) \varepsilon_{t-i}^2 + \sum_{j=1}^s \beta_j \sigma_{t-j}^2$$

Where ω is a constant, α_i is a parameter of ARCH, then β_j is a parameter of GARCH, ε_{t-i} is a residual that provides news related to volatility clustering, and γ_i is an asymmetric constant. I_{t-1} is a dummy variable that has the value 1 when $\varepsilon_{t-1} < 0$ and will have the value 0 when $\varepsilon_{t-1} \geq 0$.

4. Empirical Findings/Result

Ordinary Least Square (OLS) Model Estimation Results

The estimation results of the Ordinary Least Square (OLS) model based on equation (1) can be seen in the following table :

Table 2. OLS Model Estimation Results

Independen	China Mainland	China Taiwan	Filipina	India	Indonesia	Malaysia	Thailand
C	68.29148***	96.96618***	92.86636***	130.0570***	117.3764***	91.20112**	110.0712***
AR (1)	0.319991***	0.085755	0.002564	-0.004120	-0.071541	0.017036	0.064721
AR (2)	-0.091501	-0.034897	-0.051629	-0.118982	-0.076846	-0.009835	-0.008048
AR (3)	0.093600	0.104288	0.120679	0.054467	-0.043550	0.082594	-0.072009
AR (4)	-0.005225	-0.124678		-0.230638***	0.050887		-0.084987
AR (5)					-0.032206		
Bond	0.0000133	-0.0000788	-0.0000396	0.0000842	0.0000514*	-0.0000548	0.0000497
Stock	0.000034	0.000119*	0.000132	0.000122	0.000315*	0.000167	0.000388
R ²	0.103285	0.072298	0.024761	0.090224	0.100398	0.007821	0.032170
Loglik	-131.0466	-71.32178	-69.83181	-119.6966	1.533684	-298.5668	-121.1023

*signifikan pada level 5%

**signifikan pada level 1%

***signifikan pada level 0.1%

Source: Eviews Output

The above results show that in some countries such as Mainland China and India, exchange rate changes are significantly influenced by its own movements in the past. Bond portfolio net flows and stock portfolio net flows that have a significant effect on exchange rate changes only occur in Indonesia. Net flows of stock portfolios that have a significant effect on changes in exchange rates only occur in China Taiwan. While in China Mainland, the Philippines, India, Malaysia and Thailand, the net flow of bond portfolios and net flow of stock portfolios do not have a significant effect on changes in exchange rates.

GARCH Model Estimation Results

The estimation results of the selected model for all selected emerging Asian countries can be seen in the following table.

Independen	China Mainland	China Taiwan	Filipina	India	Indonesia	Malaysia	Thailand
Conditional mean equation							
AR(1)	0.625243***	0.199621**		0.199985***	0.199827***	0.338181*	0.200232**
AR(2)	0.117255*	0.200243**		0.200260***	0.199868***	0.388827***	0.200134**
AR(3)	0.257243***	0.200180**		0.200378***	0.199911***	0.095102	0.199934**
AR(4)		0.200040**		0.200261***	0.199881***	0.179038*	0.200193**
AR(5)		0.200036**		0.200263***	0.199870***		0.200084**
Bond			-0.025289*				
Stock			-0.284536*				
Conditional variance equation							
C	30.02418	6740.131	9254.269**	6163.996	4808.285***	179.4782	6081.519
ϵ^2	57.84391	-0.070353	0.171429	0.439731	0.035566	1.916667	1.014672
GARCH(-1)	0.873186***	0.419363		0.382707	0.252078		0.381828

BOND	0.117396	-8.663430	-3.524836	-1.246676**	0.033442	1.455227
STOCK	-0.321874	1.005749	2.876829	13.36812**	0.264940	12.37808*

Table 3. GARCH Model Estimation Results

*signifikan pada level 5%

**signifikan pada level 1%

***signifikan pada level 0.1%

Source: Eviews Output

Based on the estimation results of the GARCH model in the table above, net flows of bond portfolios and net flows of stock portfolios in Indonesia have a significant influence on changes in exchange rates. Likewise with the Philippines, where the net flow of bond portfolios and net flow of stock portfolios have a significant influence on changes in exchange rates. While in Thailand, only the net flow of the stock portfolio has a significant influence on changes in exchange rates. While for China Mainland, China Taiwan, India and Malaysia, the net flow of bond portfolios and net flow of stock portfolios do not have a significant influence on changes in exchange rates.

TGRACH Model Estimation Results

The results of the robustness test with TGARCH modeling on seven emerging Asian countries can be seen in the following table.

Table 4. TGARCH Model Estimation Results

Independen	China Mainland	China Taiwan	Filipina	India	Indonesia	Malaysia	Thailand
Conditional mean equation							
AR(1)	0.617902***	0.207932***		0.207316***	0.199807***	0.304102*	0.200014**
AR(2)	0.127519	0.198104**		0.195314***	0.199876***	0.357790**	0.200080**
AR(3)	0.254543***	0.198062**		0.198610***	0.199926***	0.140389	0.200268**
AR(4)		0.198003**		0.200238***	0.199876***	0.198553*	0.200097**
AR(5)		0.197946**		0.199552***	0.199867***		0.200127**
Bond			-0.024880*				
Stock			-0.298476*				
Conditional variance equation							
C	5.031817	6775.302	8225.005***	6218.005	4814.386	182.3811	6091.025
ε^2	363.0386	-0.061629	0.114782	60.30048	-0.011137	4.076962	-0.117886
$\varepsilon^2 * \varepsilon_{t-1} < 0$	388.0829	0.057119	0.336186	362.4211	0.056050	-2.040649	0.055772
GARCH(-1)	0.816987***	0.418187		0.410297	0.253159		0.386814
BOND	0.030808	-8.629421		-3.449651	-1.252903**	0.032991	1.448058
STOCK	-0.106893	0.992854		2.535997	13.55046**	0.272064	12.44906*

*signifikan pada level 5%

**signifikan pada level 1%

***signifikan pada level 0.1%

Source: Eviews Output

Consistent with table 4.6, the results in the table above also show that the net flows of bond portfolios and net flows of stock portfolios in Indonesia and the Philippines have a significant influence on changes in exchange rates. Likewise, in Thailand, only the net flow of the stock portfolio has a significant effect on changes in the exchange rate.

5. Discussion

The results of the Ordinary Least Square (OLS) model estimation reveal significant differences in the impacts of bond and stock portfolio flows on exchange rates across emerging Asian economies. In Mainland China and India, previous exchange rate movements exhibit a strong influence on current exchange rates, indicating that the internal dynamics of these countries play a critical role in driving exchange rate volatility. This aligns with existing literature that emphasizes the importance of market expectations and historical trends in shaping currency values (Bacchetta & van Wincoop, 2000; Barguellil et al., 2018).

Conversely, Indonesia's findings suggest that net portfolio flows from both bonds and stocks significantly affect changes in exchange rates. This indicates a substantial reliance on external capital flows for maintaining exchange rate stability, reflecting the heightened sensitivity of Indonesia's currency to international investor behavior (Bathia et al., 2020; Brooks et al., 2004). In Taiwan, the analysis shows that only net stock portfolio flows significantly impact exchange rate changes, suggesting a more selective relationship between equity investment and currency value.

In contrast, the results for the Philippines, Malaysia, and Thailand indicate that neither bond nor stock portfolio flows have a significant effect on exchange rate changes. This lack of significant impact may suggest that these markets are less sensitive to portfolio investments or that other factors, such as domestic economic conditions or monetary policy, may play a more substantial role in determining exchange rate movements.

Further analysis using the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model provides additional insights into the volatility dynamics associated with market conditions. In Indonesia and the Philippines, both bond and stock net flows are found to significantly influence exchange rate volatility, indicating that fluctuations in portfolio investments can lead to increased uncertainty in currency values. Similarly, in Thailand, net stock portfolio flows are crucial in affecting exchange rate fluctuations. This finding is consistent with the hypothesis that a more integrated capital market is sensitive to external capital dynamics, leading to greater exchange rate volatility in response to changing investor sentiments.

Overall, these findings underscore the importance of understanding the varying relationships between portfolio flows and exchange rate dynamics in emerging Asian economies. They highlight the necessity for policymakers to consider both internal and external factors when addressing exchange rate stability and the potential influence of portfolio investments in shaping currency values across different contexts.

6. Conclusions

Based on the results of research and discussion, it can be concluded that the net flow of the stock portfolio has a significant influence on changes in exchange rates in China Taiwan, the Philippines, Indonesia, and Thailand. The net flow of bond portfolios has a significant effect on changes in exchange rates in the Philippines and Indonesia. The net flow of the stock portfolio has a more significant effect on changes in exchange rates than the net flow of the bond portfolio. This is due to the response of more volatile demand on the stock market in developing Asian countries.

It is expected for future research to be able to deepen or complement the limitations of this study by adding observed countries such as Japan, Singapore, and Hong Kong so as to compare the impact of international portfolio flows on exchange rate volatility in developing and developed countries and can use data with the latest period.

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