Chapter

Contagion, Exchange Rate, and Financial Volatility: Indonesian Case in Global Financial Turbulence

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Abstract

Global turbulence after the financial crisis has hit Indonesia and almost all emerging countries. Quantitative Easing (QE) normalization (tapering of) has caused the capital outflows from emerging countries. Trade war and increasing geopolitical tension together raise the pressure. Argentina and Turkey have been experiencing economic shock. Indonesia should identify the contagion possibility and refer to Thai baht contagion experience in 1997. This paper assesses the contagion, exchange rate, and financial volatility triggered by global turbulence and Argentina-Turkey crisis in 2018. We use vector autoregression (VAR), simple correlation, dynamic conditional correlation (DCC), and regression method. We will investigate the potential contagion both in stock and exchange rate markets and in the rupiah exchange rate determination from both contagion and fundamental factors regarding the balance of payment (BOP) condition. The empirical result shows the potential contagion from Argentina and Turkey's financial crisis to the Indonesian economy, especially to the stock market and exchange rate. The regression and correlation result also shows that Turkey has a higher financial contagion effect than Argentina to Indonesian financial market. Balance of payment condition also has the significant effect to explain rupiah exchange rate depreciation.

Keywords: contagion, exchange rate, financial volatility, financial crisis, dynamic conditional correlation

JEL Classification: F32

1. Introduction

Many economists believe that the impact of the crisis comes not only because of the country's weak macroeconomic condition but also because of the interlinkage between the country and investor perception, which has played a bigger role in the emerging market economic crisis. This is proven by the great economic crisis in 1998 and 2008. The economic crisis that hit Southeast Asia and South Korea in 1998 was a dark past in the history of the global economy. The crisis that began in Thailand due to the difficulty in paying high foreign debt spread to various countries including Indonesia. Similarly, the economic crisis in 2008, which was triggered by the subprime mortgage crisis and the subsequent bankruptcy of Lehman Brothers in the United States, transmitted rapidly to Europe, Asia, and Latin America.

As a country with a strong influence, every event that happened in the United States, including the policies taken by their government, can affect the global economic condition. In 2018, the United States decided to raise the benchmark interest rate which made the investment in developing countries look no longer attractive. The Federal Reserve's policy of raising interest rates put pressure on other countries to tighten their monetary policies and reduce US dollar liquidity. Various countries were affected, including Indonesia, but Argentina and Turkey were the worst.

Argentina has a long history of economic crisis [1]. In the period of the 1950s, Argentina experienced severe inflation, which reached 102% in 1959. Their condition improved in the 1960s because of the global booming economy. Unfortunately, in 1975, Argentina's economy was poorly managed, so the inflation at that time reached 335%. In 2001, local government policy brought Argentina to owe the IMF an amount of USD 132 billion. The economic condition of Argentina had not shown signs of improvement. In 2015, Argentina was hit by an economic crisis again. Under President Macri's leadership, the Argentine government was trying to hold capital out. The central bank raised interest rates to 40%, recorded as the highest in the world today. This condition is exacerbated by the decision of the FED to continue to increase its interest rates, so that capital for emerging markets is likely to become more expensive and/or scarce. With an aim to be free of the crisis, the government turned to the International Monetary Fund (IMF) for $57.1 billion or around Rp700 trillion (exchange rate of Rp14,000) in 2018 [2].

Apart from Argentina, the impact of the FED's decision to leave interest rates higher is also experienced by Turkey. Turkey's condition is no less severe than Argentina's because, in addition to the FED interest rate hike, their bad political relations with the United States have resulted in a trade war between the two countries. In 2018, Lira dropped 40% to the US dollar. There are at least three reasons why Turkey drowned in the current economic crisis [3]. *First*, Turkey has been experiencing the current account deficits in the 2000s. Turkey's current account deficit to gross domestic product (GDP) ratio was 5.6% in 2017 and 6.7% during the first quarter of 2018. *Second*, the Turkish economy built on external debt and high expenditure deficits. Based on the data from the Bank for International Settlements (BIS), Turkey has debts to Spanish banks of USD 83.3 billion, French banks of USD 38.4 billion, Italian banks of USD 17 billion, Japanese banks of USD 14 billion, the UK banks of USD 19.2 billion, and the US banks of USD 18 billion. As a result of Turkey's debts with other countries using the dollar, when the dollar increases, the Turkish debt will continue to swell. Gross foreign debt as a share of GDP (%) in Turkey increased from 36.7% in 2011 to 52.9% in the first quarter of 2018. In the midst of a downturn in the global economy, it will be difficult for Turkey to pay its debts and finance its government expenses. *Third*, the Central Bank of the Republic of Turkey (CBRT) gross foreign currency reserves decreased from USD 112.0 billion in December 2013 to USD 78.3 billion in July 2018 and to USD 70.4 billion in August 2018, while Turkey's foreign currency need is an increase.

The crisis that occurred in Argentina and Turkey can have an impact on other developing countries. Reflecting on the previous experience, the government of Indonesia is careful in taking steps so that the impact of the crisis experienced by Argentina and Turkey does not have an impact on the economy of Indonesia (**Figure 1**).

Liberalization of capital flows in the past two decades and an increase in the scale of financial transactions across regions have increased exchange rate movements. This has an impact on exchange rate fluctuations in Indonesia. Since 2011, the rupiah has never returned to its lowest level, which has been around the

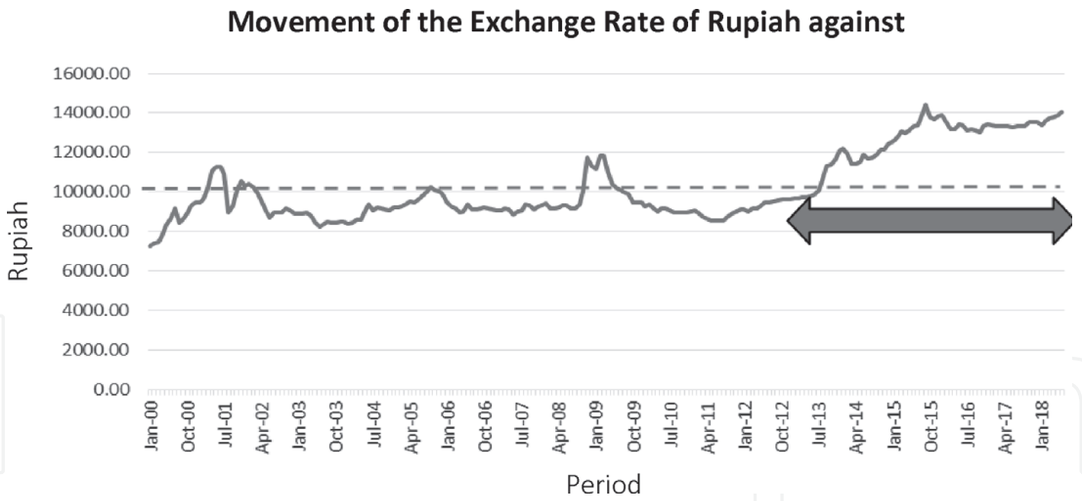

Figure 1.
Movement of the exchange rate of rupiah against the dollar. Source: Authors, 2019.

Rp8500. In the past 7 years, the rupiah has experienced a weakening trend. In the previous period, the rupiah can always return or have a stationary movement. In the periods of 2000–2001, the depreciation period occurred for 16 months, 2000–2003 for 24 months, and 2008–2009 for 10 months. From 2011 until today, the period of depreciation has occurred for three phases, namely, 32, 17, and 16 months. If it is accumulated (because there is at least a period of appreciation and is very thin), the period of depreciation has more or less happened for 65 months. There is no sign of when the rupiah will strengthen at least to the range of Rp12,000–13,000. This is still far from the average exchange rate in the last 18 years in the range of Rp10,000 per dollar. It can be concluded that this downturn period tends to be more persistent and longer. There is no sign that the rupiah can return to this balance in the near future (**Figure 1**).

The condition of the rupiah, which is still weakening, is due to Indonesia's current account deficit and a large and growing budget deficit. Indonesia's current account deficit in 2018 is 2.98%, greater than the deficit in 2017, which reached 2.90% [4]. This has caused Indonesia to rely heavily on capital inflows and foreign debts, so that the crisis in other countries can trigger a capital outflow from Indonesia and a depreciation of the rupiah. The percentage of capital outflow in Indonesia's GDP continues to increase. In 2017, investments coming out of

	Argentina	**Turkey**	**Indonesia**
Current account to GDP	−5.40%	−6.1%	−2.98%
Exchange rate against US dollars	−52%	−40%	−7.6%
Government debt	USD 27,5827.96 billion	USD 466.7 billion	USD 295.7 billion
GDP per capita	USD 11,652.57	USD 11,114.3	USD 4051.7
Debt ratio to GDP	86.2%	28.30%	29.8%
Economic growth Q2 2018	−4.7%	7.22%	5.27%
Annual inflation	47.1% (December 2018); 57.3% (May 2019)	15.85%	3.18%

Source: Trading Economics [5–7].

Table 1.
Comparison between Argentina, Turkey, and Indonesia.

Indonesia reached 0.198% of GDP, while in 2018, it increased to 0.607% [8]. Plus, the FED's policy to raise the interest rates is also a nightmare for Indonesia because investors will consider it more profitable to invest in the United States than Indonesia, which is a developing country with more vulnerable economic conditions (**Table 1**).

Compared to Argentina and Turkey in 2018, Indonesia's economic condition is still better than the two countries. Only three out of the seven indicators placing Indonesia worse than Turkey, namely, GDP per capita, debt ratio, and economic growth. For Argentina, Indonesia only worse in GDP per capita indicator. Even so, as a fellow developing country, empirical study regarding the contagion of the Argentina-Turkey crisis to the economics of Indonesia is needed to become the basis for future decision-making. Moreover, empirical studies that discuss the contagion of the crisis in Indonesia are still relatively minimal. For this reason, this research will discuss the potential transmission of the Argentina-Turkey crisis in 2018 to the Indonesian economy. This study aims to identify this potential contagion as well as to explain the exchange rate and financial volatility of Indonesian financial sector.

2. Literature review

There are diverse definitions of contagion. Contagion in this paper is defined as the transmission of crisis to a particular country due to its dependence or similarity with another country in crisis. This is in line with Dornbusch et al. [9] that state that contagion is the increasing correlation between countries after the crisis. Pericoli and Sbracia [10] and Forbes and Rigobon [11] define contagion as co-movements in asset prices and quantity across the market. Moreover, Masson [12, 13] says that contagion is the transmission of local shocks to another country or another financial market. Based on those definitions, it can be concluded that contagion is the rise in cross-market linkage aftershocks, measured by movements together on asset prices and financial flows across the market [9, 11, 14].

Kaminsky et al. [15] define contagion as an episode where there are significant effects that evolve over a matter of hours or days in a number of countries after an event. Meanwhile, Fratzscher [16] states that contagion is the transmission of a crisis to a particular country because of mutual financial and real interdependence with countries that have experienced a crisis. By using the vector autoregression (VAR) method, Fratzscher [16] concludes that there are two causes of financial interdependence between countries: (1) direct financial relations, that is, the fact that financial institutions may have large cross-border ownership, and (2) indirect financial relations, in particular the existence of common lenders and decisions by institutional investors, have received much attention in recent years [16].

Kaminsky et al. [15] observe the reasons for cross-border financial contagion occurred in some cases but not others. This paper emphasizes that there are three key elements that cause the contagion or commonly referred to as unholy trinity, that is, a sudden reversal in capital inflows, shocks, and contagion from creditors [15]. *First*, contagion is followed by a surge in international capital inflows, and the sudden initial announcement pricked the capital flow bubble. With rapid contagion, investors and financial institutions are exposed to the crisis of the country and ready to withdraw their investment on short notice [15]. *Second*, the announcement that triggered a chain reaction came as a surprise to the financial markets. The difference between anticipated and unanticipated events seems important because early warning allows investors to adjust their portfolios to limit the damage caused by the crises. *Third*, there are significant direct international consequences of creditor—be it commercial banks, hedge funds, mutual funds, or bondholders—spreading the

crises across the national borders. Kaminsky et al. [15] explain that what happened in Asia in 1997 is an example of cross-border contagion. The Asian countries accounted for 65% of the emerging market loan portfolio of Japanese banks [15]. Because of the floatation experienced by Thai baht in 1997, the Japanese banks retrenched quickly and cut credit lines to emerging Asia. This happens because the shock can spread to other sectors or the wider regions [17]. The bank inflows quickly became outflows. This is in line with Forbes and Rigobon's [14] research that concludes transmission of return volatility and leading to speculative attacks on other countries.

Fratzscher [16] analyzes the role of contagion in the currency crises in emerging markets during the 1990s. The findings suggest that in particular, the degree of financial interdependence and also real integration among emerging markets are crucial not only in explaining past crises but also in predicting the transmission of future financial crises. This paper argues that the main reason for the poor performance of the standard currency crisis model lies in ignoring the role of contagion—the fact that crises can be transmitted across countries through their interdependence with others. The empirical analysis found strong evidence that the 1994–1995 Latin American crisis and the 1997–1998 Asian crisis were contagious, spreading to countries that were not only economically vulnerable but also closely related financially. Moreover, Fratzscher [16] argues that the rapid capital account liberalization and the opening to international markets, which lead to increased real and financial interdependence among emerging markets, played a crucial role in explaining both the timing and the severity of those crises. The result is in line with Claessens and Forbes [18] who discover the occurrence of vulnerability in the country as a result of shocks that occur in other countries.

Kibritcioglu et al. [19] research is to investigate and discuss the predictability of possible currency crises in Turkey by using the leading economic indicators approach. This research concludes that the financial linkages and also investor sentiments and perceptions are the channel of transmission of East Asian crises [19]. The first generation argues that the weak fundamental role is a trigger for the currency crisis. Government budget deficits are at the root of speculative attacks on pegged exchange rates. Therefore, the currency crises are preceded by macroeconomic imbalances that are not consistent with the maintenance of fixed exchange rates. The second generation considers the fundamental aspect of the economy and the behavior of agents as the trigger of the currency crisis. This research also cites a recent study by Paul Krugman [20] and others about the third-generation model of the currency crisis. This new model considers several disputed issues such as (1) moral hazard or asymmetric information problems that lead to an underpricing of risks associated with investment in emerging markets; (2) behavior of herding bankers and portfolio managers; and (3) international contagion effects appearing in several transmission channels such as trade and financial relations between countries.

In addition to review research on contagion, there are also studies that examine the relationship between the exchange rate, interest rate, and stock market. Sensoy and Sobaci [21] analyze the dynamic relationship between the exchange rate (against the US dollar), interest rate, and stock market of Turkey from January 2003 to September 2013. The research reveals that volatility shocks create sudden changes in dynamic correlation, but these effects are only short term. Thus, policymakers and investors do not need to react to volatility shocks to prevent long-term transmission between these markets. The sudden and severe intervention in the money market by central banks in turbulent times can cause considerable losses in foreign currency reserves, which in turn will produce the same results without intervention. On the other hand, investors can maintain their allocation because unexpectedly changing correlations are expected to restore their regular levels in

the medium and long terms. This research suggests the investors in Turkey have sufficient amounts of foreign currency to minimize the risk of their equity portfolio without reducing expected returns, so investors can hedge risks between the stock market and exchange rates, whether if the stock market is stable or volatile, due to sudden changes in the level of correlation (caused by volatility of shocks) between the stock markets and foreign exchange only happens in the short term.

The research witnesses a consistent negative correlation between the bonds and the stock markets [21]. Besides that, there is a consistent positive correlation between bonds and foreign exchange markets in Turkey, which is different from developed countries. This is an evidence of the negative anticipation of the investors when interest rates increase in emerging markets with a history of high budget deficits. Therefore, an increase in interest rates is perceived as a problem in the country. This event results in a severe capital outflow, thus leading to local currency depreciation against the US dollar. Regarding the stock and foreign exchange market relationship, Sensoy and Sobaci [21] discover a positive relation between dollar appreciation against Turkish lira and Turkish stock market returns.

Clark et al. [22] examine the effect of exchange rate volatility on trade over the past 30 years. The analysis shows that there is no evidence of a large negative effect of exchange rate volatility on trade. This shows that exchange rate volatility is not the major policy problem of trade, but this does not exclude the possibility that a high exchange rate volatility can affect the economy through other channels.

Kawai et al. [23] investigate the origins of the East Asian crisis and its contagion and examine the channels of contagion. The research concludes that the financial linkage and also investor sentiments and perceptions are the the channel of transmission of East Asian crises. They summarize some steps to prevent, manage, and resolve the crises. There are three ways in preventing crises and contagion, namely, (1) avoiding large current account deficits financed through short-term private capital inflows; (2) aggressively regulating and supervising financial systems to ensure that banks and nonbank financial institutions manage risks prudently; and (3) putting in place incentives for sound corporate finance to prevent high leverage ratios and overreliance on foreign borrowing. If the crises already happen, the study provides three solutions in managing crises and contagion, such as the following: (1) in the context of sound policies, mobilize timely external liquidity of sufficient magnitude to restore market confidence; (2) at times of crisis, "bail-in" private foreign creditors; and (3) there is no one-size-fits-all monetary and fiscal stance for responding to crises and contagions. The final structural focus of policymakers is to strengthen crisis resolution mechanisms that will create conditions for the initial resolution of the systemic consequences of a crisis. These mechanisms include (1) establishing domestic and international mechanisms to deal with assets and liabilities of banks and companies that cannot survive and (2) mitigating the impact of the crisis on low-income groups through social policies to correct the inevitable social tensions associated with adjustments.

There is also a study that focuses on discussing the contagion of the crisis in Indonesia. Iriana and Sjöholm [24] examine whether the contagion from the 1997 economic crisis in Thailand triggered the crisis in Indonesia. The result shows that contagion was exacerbated by increasing imbalances in the Indonesian economy. The paper also states that contagion occurs because of two reasons. The first fundamental links are related to the normal interdependence across countries. The second category is related to the behavior of financial markets, such a financial panic, herd behavior, loss of confidence, and increased risk aversion. In the case of Indonesia, this study reveals that investors' behavior rather than real links is identified as one important channel for the contagion to Indonesia (**Table 2**).

No.	Characteristics	Author
1.	The rises in cross-market linkage aftershocks, measured by movements together on asset prices and financial flows across the market	Dornbusch et al. [9]; Forbes and Rigobon [14]; and Forbes and Rigobon [11]
2.	The occurrence of vulnerability in the country as a result of shocks that occur in other countries	Claessens and Forbes [18]
3.	The crisis that spread to other countries that are geographically separated does not have structural similarities, and there is no direct linkage	Claessens and Forbes [18]
4.	The increasing correlation between countries after the crisis	Dornbusch et al. [9]
5.	The spread of the shock to the sector or the wider region	Allen and Gale [17]
6.	Co-movements in asset prices and quantity across-market	Pericoli and Sbracia [10]; Forbes and Rigobon [11]
7.	Transmission of return volatility and leading to speculative attacks on other countries	Forbes and Rigobon [14]
8.	Transmission of local unanticipated shocks to another country or another financial market	Masson [12, 13]
9.	An episode where there are significant effects that evolve over a matter of hours or days in a number of countries after an event	Kaminsky et al. [15]
10.	The research concludes that there are two generations of the theoretical models on currency crises	Kibritcioglu et al. [19]
11.	The research summarizes three transmissions of a crisis, such as (1) moral hazard or asymmetric information; (2) behavior of herding bankers and portfolio managers; and (3) trade and financial relations between countries	Paul Krugman [20]
12.	The transmission of a crisis to a particular country because of mutual financial and real interdependence with countries that have experienced a crisis	Fratzscher [16]
13.	The financial linkage and also investor sentiments and perceptions are the transmission of the East Asian crises	Kawai et al. [23]
14.	There is no strong evidence of the large negative effects of exchange rate volatility on trade	Clark et al. [22]
15.	Contagion occurs because there are fundamental links across countries and the behavior of financial markets	Iriana and Sjöholm [24]

Source: Authors, 2019.

Table 2.
Literature review of contagion theory.

3. Research method

3.1 VAR and OLS method

The research uses VAR and dynamic conditional correlation (DCC) methods to assess the three important financial and external variables including contagion, exchange rate, and financial volatility of Indonesia triggered by global turbulence and Argentina-Turkey crisis in 2018. Data used in this research are the monthly data from 2004 to 2018. The VAR method has also been conducted by Marcel Fratzscher [16] to examine the impact of exchange rate crisis and its transmission (**Table 3**).

The VAR model can be expressed in Eq. (1):

$$Y_t = \alpha_{1i} + \sum \beta_{1i} Y_{t-n} + \sum \gamma_{1i} X_{t-n} + \epsilon_{1t} \quad (1)$$

where Y_t is the rupiah exchange rate against US Dollar in year t; Y_{t-n} is the rupiah exchange rate against the US dollar in year t-n; X_{t-n} is the economic condition of Indonesia in year t-n; α is the constants; and ϵ is the error.

The model can be estimated using the ordinary least squares (OLS) method separately. The OLS method is widely used to estimate the linear regression parameter model. The OLS model used according to Gujarati [25] is as follows:

$$Y = \beta_0 + \underset{t}{\Sigma} = 1 \ldots p \; \beta_t X_t + \varepsilon \quad (2)$$

where Y is the dependent variable, β_0 is the intercept of the model, X_t corresponds to the t explanatory variable of the model (j = 1 to p), and e is the random error with expectation 0 and variance σ^2.

No.	Variables	Descriptions	Data sources
1.	Stock price	Stock price in ISTANBUL MERVAL, Jakarta, NASDAQ	Bloomberg database
2.	FDI	Foreign direct investment	CEIC database
3.	LER_LIRA	Lira exchange rate to US dollar	Bloomberg database
4.	NFP	Net foreign purchase	Bloomberg database
5.	LER	Indonesia rupiah exchange rate to US dollar	Bloomberg database
6.	ARS	Argentina peso exchange rate to US dollar	Bloomberg database
7.	PUAB	Interbank rates	External sector statistics, Bank Indonesia
8.	NET_EXPORT	Net exports	Indonesia Central Bureau of Statistics
9.	LIP_INA	Production index	Indonesia Central Bureau of Statistics, Central Bank of Indonesia
10.	TB	Balance of trade	External sector statistics, Central Bank of Indonesia
11.	FINANCIAL	Financial accounts. The domestic ownership of foreign assets and the foreign ownership of domestic assets	External sector statistics, Central Bank of Indonesia
12.	PRIMARY_INCOME	The net flow of profits, interests, and dividends from investments in other countries and net remittance flows from migrant workers	External sector statistics, Central Bank of Indonesia
13.	M2	Broad money	Monetary sector statistics, Central Bank of Indonesia
14.	COMPRICE	Commodity price index	International Monetary Fund
15.	DUMMY	Dummy tapering off	1 = after tapering off 2013 0 = before tapering off
16.	AR	*Autoregressive*	

Source: Authors, 2019.

Table 3.
Data operational and sources.

3.2 DCC method

The DCC representation was introduced by Engle [26] to capture the empirically observed dynamic contemporaneous correlations of asset returns. This is the latest method that allows simultaneous variant modeling and conditional correlation from several series. The estimation consists of two steps. First, we estimate the conditional variance of each variable using the univariate autoregressive conditional heteroscedasticity (ARCH) procedure. Second, we use the standard regression residues obtained in the first step to model conditional correlations that vary over time.

The essence of this model is the covariance matrix (H_t), which is compiled into a diagonal matrix from standard conditional deviation (D_t) and matrix correlation containing the conditional correlations (R_t). In the DCC GARCH model, both the D_t and R_t models are designed to be time-varying. The DCC GARCH model is defined as:

$$H_t = D_t R_t D_t \tag{3}$$

where D_t is a diagonal matrix k x k of a standard deviation which has a different time of univariate GARCH with $\sqrt{h_{i,t}}$ on the diagonal i^{th} and R_t is the time variation of the correlation matrix.

$$D_t = \begin{bmatrix} \sqrt{h_{i,t}} & 0 & \cdots & 0 \\ 0 & \sqrt{h_{i,t}} & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & \sqrt{h_{i,t}} \end{bmatrix} \tag{4}$$

where

$$h_{i,t} = \omega_i + \sum_{p=1}^{P_1} \propto_{ip} r_{it-p}^2 + \sum_{q=1}^{Q1} \beta_{iq} h_{it-q} \text{fori} \; = \; 1, 2, 3, \; \ldots, \text{k} \tag{5}$$

$$R_t = \begin{bmatrix} 1 & P_{12,t} & P_{13,t} & \cdots & P_{1n,t} \\ P_{12,t} & 1 & P_{13,t} & \cdots & P_{2n,t} \\ P_{13,t} & P_{23,t} & 1 & \ddots & \vdots \\ \vdots & \vdots & \ddots & \ddots & P_{n-1,n,t} \\ P_{1n,t} & P_{2n,t} & \cdots & P_{n-1,n,t} & 1 \end{bmatrix} \tag{6}$$

Two requirements must be considered when specifying the form of R_t:

1. H_t must be positively defined because it is in the form of a covariance matrix. To ensure positive definite H_t, R_t must be positive too.

2. All elements in the correlation matrix R_t must be equal to or less than one.

Therefore, R_t is structured as follows:

$$R_t = Q_t^{*-1} Q_t Q_t^{*-1} \tag{7}$$

$$Q_t = (1 - a - b)\overline{Q} + \propto \varepsilon_{t-1} \varepsilon_{t-1}^T + b Q_{t-18} \tag{8}$$

where parameters a and b are scalars, $\overline{Q}$ is an unconditional covariance of standardized residues produced from univariate GARCH equations, and Q_t^* is a diagonal matrix consisting of square roots of diagonal elements Q_t:

$$Q_t^* = \begin{bmatrix} \sqrt{q_{i,t}} & 0 & \cdots & 0 \\ 0 & \sqrt{q_{i,t}} & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & \sqrt{q_{i,t}} \end{bmatrix} \tag{9}$$

The typical element R_t is $\rho_{ijt} = \frac{q_{ijt}}{\sqrt{q_{ii}q_{jj}}}$, and the matrix R_t will be a positive/constant. The K asset covariance matrix H_t is thus definite/constant and can be written as $H_t = D_t R_t D_t$.

3.3 Net correlation after controlling fundamental

3.3.1 Net correlation for stock market

Normally, stock market correlation already represents the interdependence of stock market between countries. However, it might be overestimated due to fundamentals. Therefore, we perform an estimation to obtain a fundamental factor-free stock return for country i in period t $(\varepsilon_{i,t})$. The estimation is in Eqs. (10)–(12):

$$Stock_{indo,t} = \alpha + \beta_1 Balance_{indo,t} + \beta_2 Int_{indo,t} + \beta_3 Inf_{indo,t} + \beta_4 World_t + \varepsilon_{indo,t} \tag{10}$$

$$Stock_{arg,t} = \alpha + \beta_1 Balance_{arg,t} + \beta_2 Int_{arg,t} + \beta_3 Inf_{arg,t} + \beta_4 World_t + \varepsilon_{arg,tt} \tag{11}$$

$$Stock_{tur,,t} = \alpha + \beta_1 Balance_{tur,t} + \beta_2 Int_{tur,t} + \beta_3 Inf_{tur,t} + \beta_4 World_t + \varepsilon_{tur,t} \tag{12}$$

Note:

Stock: stock market returns country *i* period *t.*
Balance: trade balance country *i* period *t.*
Int: interest rate country *i* period *t.*
Inf: inflation rate country *i* period *t.*
World: world stock market period *t.*

To perform the estimation, we use several variables retrieved from various sources. We obtain the stock market index data for each country from Yahoo Finance. The data are available in monthly; hence, we calculate month-on-month (m-o-m) stock return from the data and then calculate the quarterly average from the obtained m-o-m return. We calculate the trade balance by subtracting the export value from the import value within period t in the US dollar denomination. These data are obtained from the International Financial Statistics (IFS). For interest rate, ideally, we use policy rates for each country. However, the data is not available for Turkey and incomplete for Indonesia because Indonesia changed its policy rate from BI rate to BI7DRR (7-day reverse repo rate) in 2016 and thus not comparable with the interest rate in the period earlier than 2016.

We obtain a year-on-year (y-o-y) quarterly inflation rate, which is publicly available from the Organization for Economic Co-operation and Development (OECD) database. Unfortunately, Argentina does not report monthly inflation rate before 2018. The annual inflation rate for Argentina is also not reported. As a result, we decided to interpolate the annual GDP deflator into quarterly deflator to

substitute inflation rate. We also clean up the stock return from the international market sentiment. Hence, following Fratzscher [16], we use trading volume-weighted average of S&P 500, FTSE 100, and Nikkei return as explanatory.

3.3.2 Net correlation for exchange rate

Normally, the exchange rate correlation already represents the interdependence of stock market between countries. However, it might be overestimated due to fundamentals. Therefore, we perform an estimation to obtain fundamental factor-free exchange rate for country i in period t ($\varepsilon_{i,t}$). To ensure stationarity, we run the regression in first-difference form as in Eqs. (13)–(15):

$$d(Exrate_{idn,t}) = \alpha + \beta_1 d(m_{idn,t} - m_{us,t}) + \beta_2 d\left(inf_{idn,t} - inf_{us,t}\right) + \beta_3 d(r_{idn,t} - r_{us,t}) + \beta_4 d\left(y_{idn,t} - y_{us,t}\right) + \varepsilon_{idn,t} \tag{13}$$

$$d(Exrate_{tur,t}) = \alpha + \beta_1 d(m_{tur,t} - m_{us,t}) + \beta_2 d\left(inf_{tur,t} - inf_{us,t}\right) + \beta_3 d(r_{tur,t} - r_{us,t}) + \beta_4 d\left(y_{tur,t} - y_{us,t}\right) + \varepsilon_{tur,t} \tag{14}$$

$$d(Exrate_{arg,t}) = \alpha + \beta_1 d(m_{arg,t} - m_{us,t}) + \beta_2 d\left(inf_{arg,t} - inf_{us,t}\right) + \beta_3 d(r_{arg,t} - r_{us,t}) + \beta_4 d\left(y_{arg,t} - y_{us,t}\right) + \varepsilon_{arg,t} \tag{15}$$

Note:

Exrate: exchange rate in USD country i period t.
m: money supply growth country i period t.
inf : inflation rate country i period t.
r: interest rate country i period t.
y: real GDP market period t.

Variables within the model are coming from various sources. Our dependent variable is coming from the IFS. As in Engel (2002), we use the end-of-quarter nominal exchange rate. Other explanatories including money supply, consumer price index (CPI), and real GDP are obtained from the OECD database. As we compared the variables for each country with those of the United States, we have to ensure that the variables are in the same unit. Hence, money supply, consumer price index, and real GDP are used in growth. For money supply and GDP, we use quarterly growth. However, for CPI growth, we have to use the annual inflation rate instead of quarterly inflation rate for Indonesia, Turkey, and the United States, since we have to use interpolated annual GDP deflator as a proxy for change in price level for Argentina due to the unavailability of quarterly CPI data for Argentina.

For interest rate, ideally, we use policy rates for each country. While we use policy rate for Argentina and the United States, policy rate data is not available for Turkey and incomplete for Indonesia since Indonesia changed its policy rate from BI rate to BI7DRR (7-day reverse repo rate) in 2016; hence, we use money market rate for both countries.

4. Result and analysis

4.1 Indonesia trade link with Argentina and Turkey

The following figures summarize the share of Indonesian export and import to and from Turkey and Argentina, as well as with the United States as a benchmark.

The United States is one of the Indonesia's main trade partners, besides China. Indonesia's export share to the United States has a declining trend. Even so, the value is higher than the value of the US product imports into Indonesia. In 2018, the value of Indonesia's exports to the United States was USD 18,439,760.7 thousand, while the value of imports from the United States to Indonesia reached USD 10,176,226.6 thousand.

Indonesian exports to Argentina and Turkey tend to be stable. **Figure 2** shows that in the last 3 years, imports from Argentina were higher than imports from Turkey and the Philippines. Even the value of Argentine imports to Indonesia is higher than Indonesian exports to Argentina. The Indonesian Ministry of Trade data from 2014 to June 2019 shows that the trade balance resulting from Indonesia's trade activities was negative throughout the period (**Figure 3**).

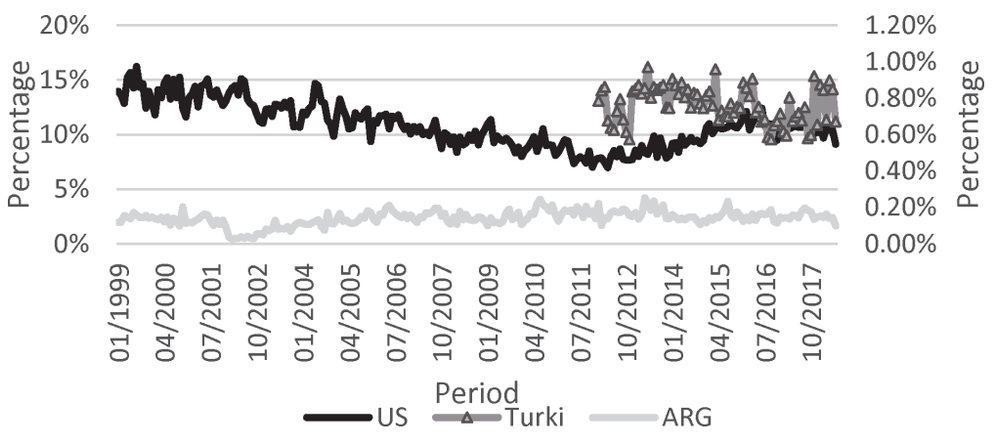

Figure 2.
Share of Indonesia export to several countries. Source: CEIC database.

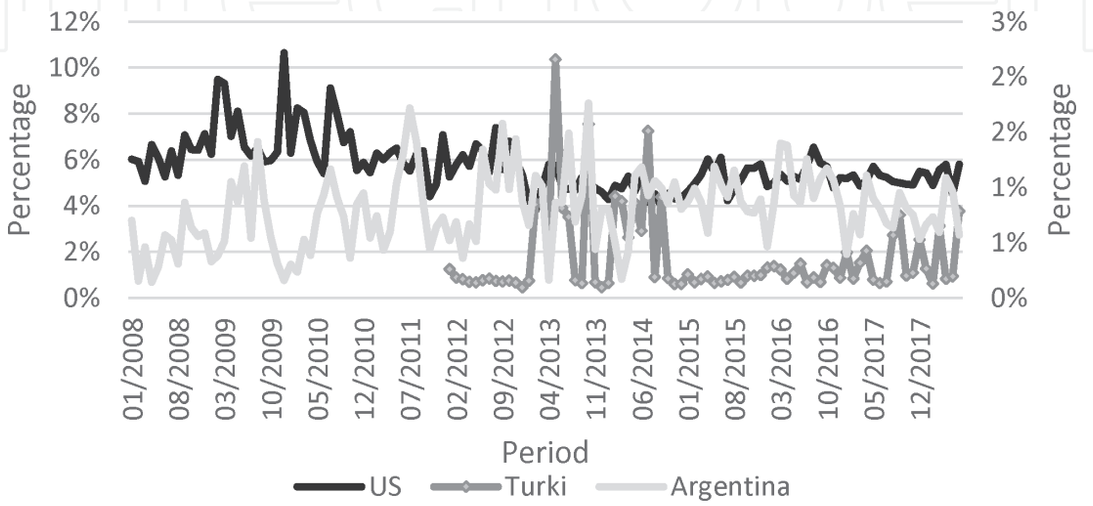

Figure 3.
Share of Indonesia import from several countries. Source: CEIC database.

4.2 Indonesia FDI link with Argentina and Turkey

Based on **Figure 4**, the share of FDI from Turkey to Indonesia is from 0 to 0.749%. The range is higher than from Argentina, which is only 0–0.001%. The FDI trend from the United States is declining, while those from China are increasing. It is also necessary to be aware of the decline in FDI flows from countries affected by the Turkey and Argentina crises (direct and indirect). Besides that, exploring the FDI flows between China and Turkey, China and Argentina, the United States and Turkey, the United States and Argentina, Europe and Turkey, and Europe and Argentina is also important.

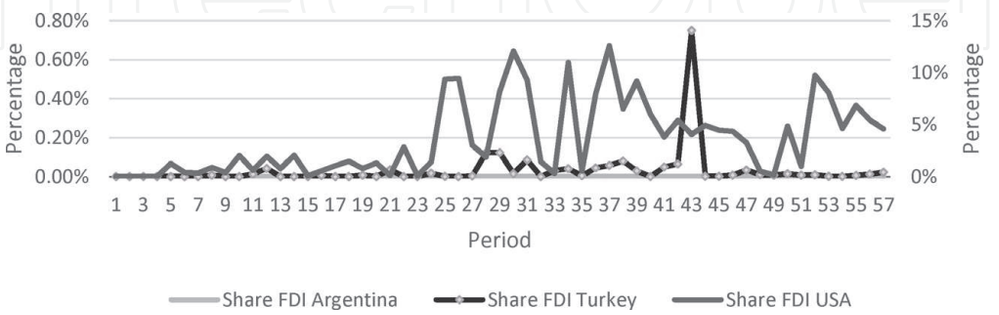

Figure 4.
Share of foreign direct investment to Indonesia. Source: CEIC database.

4.3 Indonesia financial link with Argentina and Turkey

4.3.1 Measuring contagion with correlation

The figure above shows that Jakarta composite index (JCI) has the highest correlation with MERVAL, namely, the Argentina exchange (0.9), and the second highest is with ISTANBUL (0.89) or Turkish stock exchange. Thus, the government of Indonesia has to pay attention to the high correlation potential with both countries. Correlation with NASDAQ (US exchange) is significant but slightly below Turkey (0.88). NASDAQ has a high and significant correlation with the three emerging market stock exchanges (Turkey, Indonesia, and Argentina) (**Figure 5** and **Table 4**).

Table 5 shows the adjusted correlation coefficients before and during the crisis. All of the coefficients increase during the crisis, except the contagion between Indonesia and Malaysia which the stock price fell sharply. Meanwhile, the correlation between the Thai and Indonesian exchange rates and between the Thai and Malaysian exchange rates experiences a high surge during the crisis.

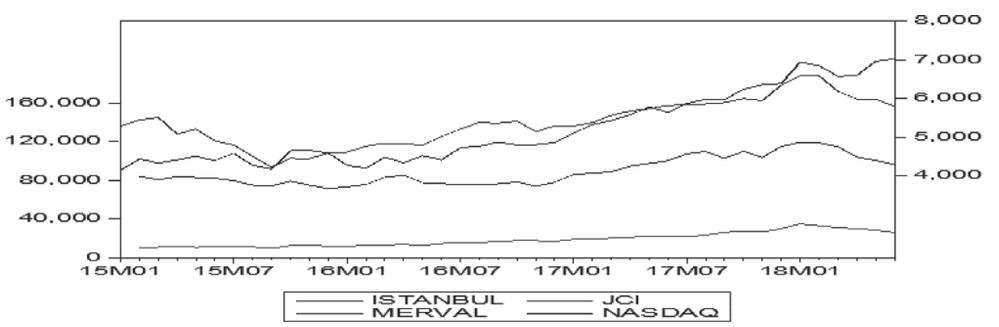

Figure 5.
Stock price index graph (United States, Turkey, Argentina, Indonesia). Source: Authors, 2019.

Correlation	NASDAQ	MERVAL	JCI	ISTANBUL	BROAD_USD
NASDAQ	1.000				
	—				
MERVAL	0.964	1.000			
	22.783	—			
JCI	0.878	0.901	1.000		
	11.436	12.995	—		
ISTANBUL	0.896	0.905	0.891	1.000	
	12.578	13.295	12.280	—	
BROAD_USD	0.025	0.062	−0.094	−0.208	1.000
	0.155	0.387	−0.593	−1.330	—

Source: Authors Calculation, 2019.

Table 4.
Correlation result.

Period	Stock market			Exchange rate		
	Thailand-Indonesia	Malaysia-Indonesia	Thailand-Malaysia	Thailand-Indonesia	Malaysia-Indonesia	Thailand-Malaysia
Tranquil	0.25	0.26	0.08	0.02	0.12	0.14
Crisis	0.29	0.07	0.09	0.19	0.14	0.31
Statistically significant	−0.54	2.55**	−0.14	−2.26**	−0.037	−2.29**

***Significant at a 5% level.*
Source: Iriana and Sjöholm [24].

Table 5.
Contagion in the currency and stock markets (adjusted correlation coefficients) in 1997 from Iriana and Sjöholm [24].

A negative and statistically significant coefficient means that there is evidence of contagion. The increases in the correlation between the Thai and Indonesian exchange rate and between the Thai and Malaysian exchange rate are statistically significant. Therefore, the results show that difficulties in Thailand are transmitted to the Indonesian and Malaysian currency markets. There are no signs of contagion on the stock market because an increase in the correlation coefficient is not

Stock market			Exchange rate		
Year	JCI-MERVAL	JCI-Turkey	Year	IDR-ARS	IDR-TRY
2015	−0.338	0.779	2015	0.341	0.930
2016	0.924	−0.154	2016	−0.252	0.279
2017	0.917	0.932	2017	0.713	0.725
2018	0.952	0.950	2018	0.841	0.826

Source: Authors Calculation, 2019.

Table 6.
Potential contagion: correlation rises during crisis.

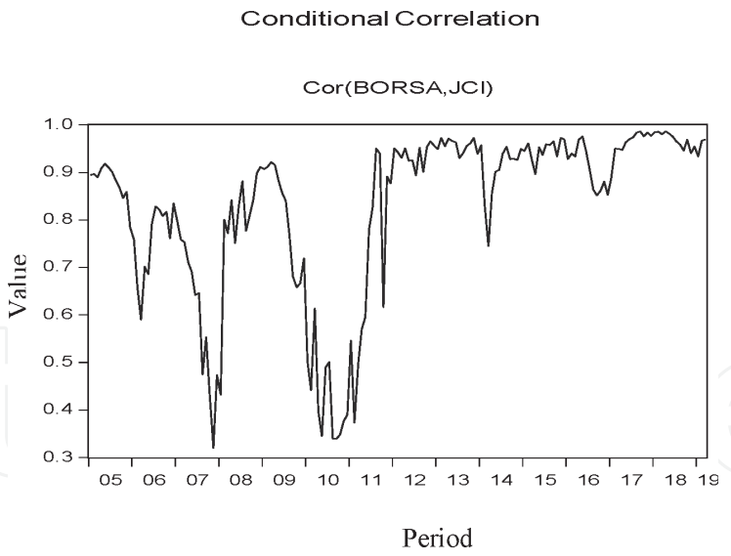

Figure 6.
BORSA (Turkey)—JCI (Indonesia) correlation 2005–2019. Source: Authors, 2019.

statistically significant. In fact, there is a statistically significant decrease in the correlation coefficient between the Malaysian and Indonesian stock markets. One plausible explanation for this decline is the adoption of Malaysian capital controls in late August and early September 1998 [24].

Table 6 shows the correlation coefficients of the stock market and exchange rate in some years. Changes in the correlation between the stock market and the exchange rate of Indonesia from 2017 to 2018 were not as big as when the economic crisis of 1997. This happens because after the crises, Indonesia becomes more vigilant so that various agencies were formed to predict and overcome crises. There is an increase in the correlation between Indonesian stock prices from 2017 to 2018 both with Argentina and Turkey's stock prices. Something similar also happens to the exchange rate. There is an increase in the correlation between the Indonesian exchange rate from 2017 to 2018 both with the exchange rates of Argentina and Turkey (**Table 6**).

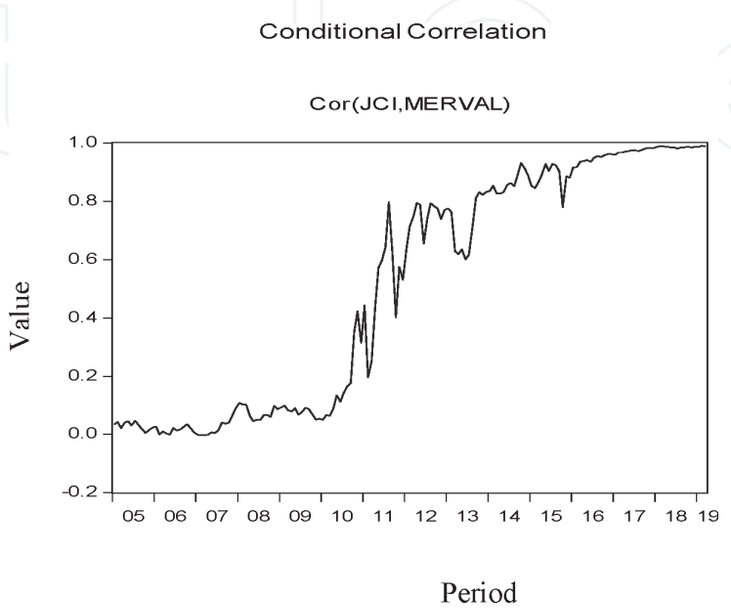

Figure 7.
MERVAL (Argentina)—JCI (Indonesia) correlation 2005–2019. Source: Authors, 2019.

4.3.1.1 Dynamic conditional correlation

4.3.1.1.1 Stock market

Throughout 2005–2019, the correlation between the Turkish stock market and Indonesian stock market is in the range of 0.6–0.9. The biggest decline occurs in 2007 and 2010 which reach 0.3, and the highest correlation increase occurs in 2018 (**Figure 6**). Meanwhile, **Figure 7** shows a correlation between Argentine stock market and Indonesian stock market which experience an upward trend since 2011. The upward trend between Argentina's stock market and Indonesia's stock market also happened since 2013, as well as in the periods of 2016–2018.

4.3.1.1.2 Exchange rate

The exchange rate correlations between 2005 and 2019 experience fluctuations. The correlation between lira and rupiah begins with a negative value, which is almost touching −0.5. In addition to 2005, in 2008 and 2014 lira and rupiah are also

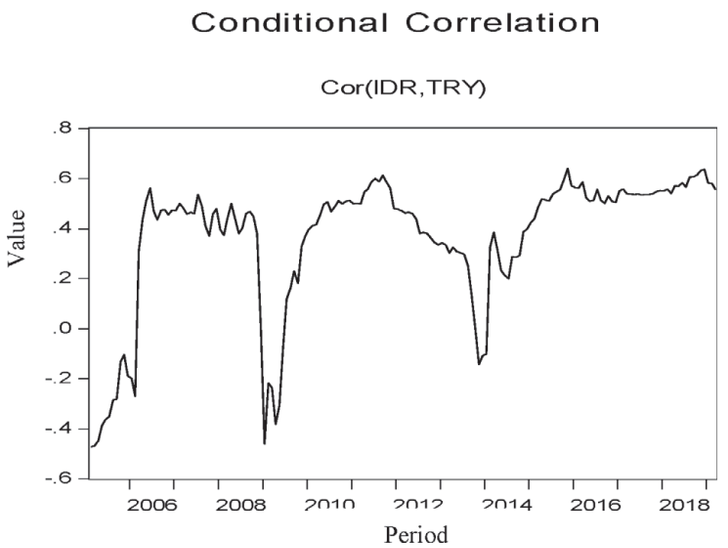

Figure 8.
Turkey lira—Indonesia rupiah correlation 2005–2019. Source: Authors, 2019.

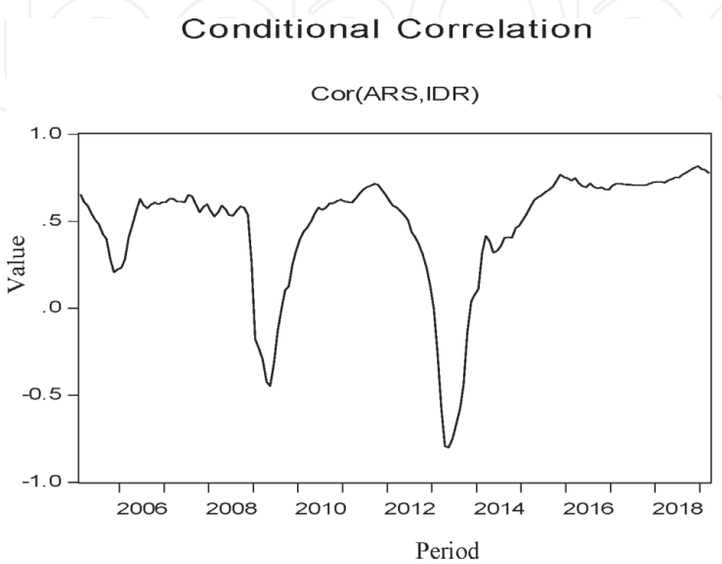

Figure 9.
Peso Argentina—Indonesia rupiah correlation 2005–2019. Source: Authors, 2019.

Correlation	Argentina	Indonesia	Turkey
	2002Q3–2008Q4		
Argentina	1.000	0.036	0.125
Indonesia	**0.036**	1.000	0.046
Turkey	0.125	0.046	1.000
	2009Q1 - 2018Q4		
Argentina	1.000	0.207	0.088
Indonesia	0.207	1.000	0.423
Turkey	0.088	**0.423**	1.000

Source: Author Calculation, 2019.

Table 7.
Net correlation in stock market after extracting fundamental.

negatively correlated. Meanwhile, the correlation between peso and rupiah experiences a negative correlation from the end of 2008 to the beginning of 2009 and at the beginning of 2013 (**Figures 8** and **9**).

Table 7 shows the net correlation after controlling fundamental between Argentina, Indonesia, and Turkey in terms of capital markets. The results show that the highest correlation was between Indonesia and Turkey from 2009 to 2018. Meanwhile, the lowest correlation was between Indonesia and Argentina in 2002 quarter 3 to the end of 2008.

4.3.2 VAR results

By using monthly data and the lira exchange rate as the endogenous variables, the research will analyze the impact of weaker lira on the Indonesian economy (VAR dynamic method). **Table 8** shows that the change in lira exchange rate is dominant in explaining changes in the rupiah exchange rate (26–37%).

Period	SE	Lira	Net foreign purchase	Rupiah	Interbank rates	Net export	LIP (production index)
1	0.031	26.635	0.096	73.269	0.000	0.000	0.000
2	0.033	35.264	0.080	63.237	0.177	0.852	0.390
3	0.033	35.947	0.216	62.291	0.174	0.895	0.476
4	0.034	37.063	0.224	61.157	0.174	0.881	0.500
5	0.034	37.077	0.263	61.073	0.174	0.909	0.504
6	0.034	37.088	0.264	61.058	0.175	0.910	0.506
7	0.034	37.092	0.266	61.049	0.175	0.913	0.505
8	0.034	37.092	0.266	61.048	0.175	0.914	0.506
9	0.034	37.092	0.266	61.048	0.175	0.914	0.506
10	0.034	37.092	0.266	61.048	0.175	0.914	0.506

Source: Authors, 2019.

Table 8.
Variance decomposition of rupiah exchange rate (level).

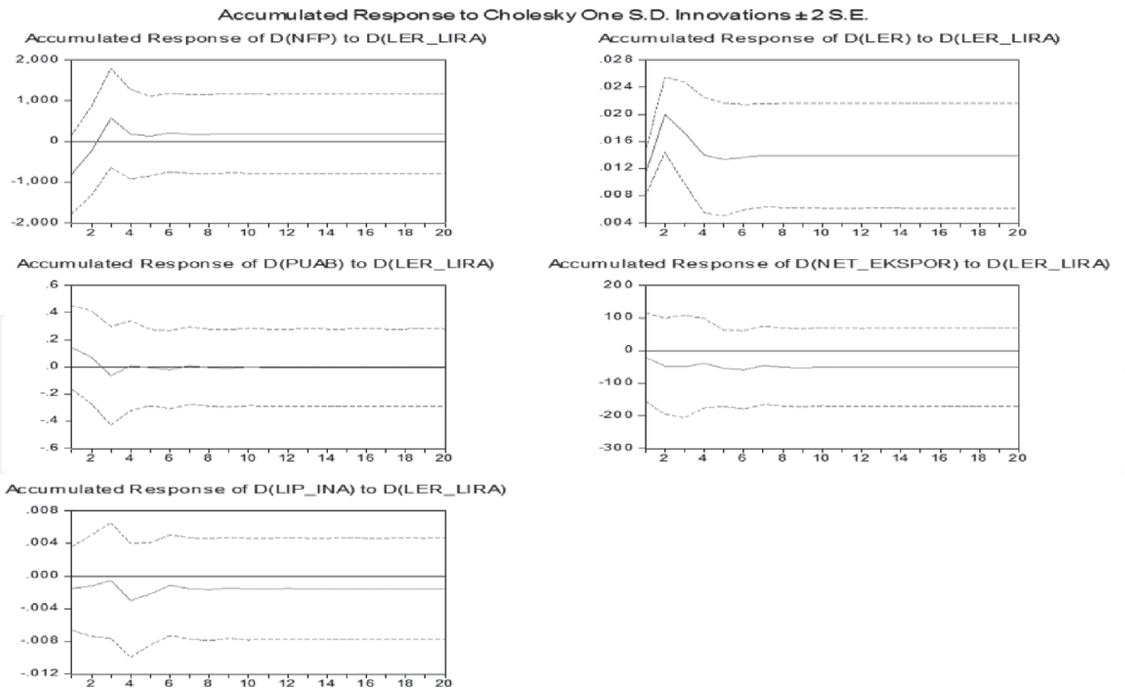

Figure 10.
IRF graph. Source: Authors, 2019.

Period	SE	D (LER_LIRA)	D (NFP)	D (LER)	D (PUAB)	D (NET_EXPORT)	D (LIP_INA)
1	6080.729	0.222	1.287	0.152	1.396	3.926	93.015
2	6982.743	0.202	1.954	0.349	1.376	4.916	91.202
3	7130.040	0.223	1.866	4.273	3.866	4.797	84.973
4	7163.440	0.672	1.781	4.370	6.371	5.101	81.703
5	7169.733	0.721	1.772	4.351	6.560	5.234	81.363
6	7173.949	0.802	1.775	4.366	6.739	5.223	81.095
7	7176.103	0.811	1.779	4.367	7.014	5.250	80.778
8	7176.375	0.812	1.780	4.366	7.051	5.260	80.731
9	7176.617	0.814	1.780	4.366	7.060	5.260	80.719
10	7176.858	0.815	1.782	4.366	7.085	5.263	80.688

Source: Authors Calculation, 2019.

Table 9.
Variance decomposition of Indonesia's industrial production index.

The changes in the Indonesia production index in response to changes in the lira exchange rate variable are relatively small. Interbank rates, net exports, and rupiah exchange rates (apart from the production index itself) get the highest change. So we can conclude that the contagion for Turkey has hit Indonesia more on the financial market, especially exchange rate, and has a small effect on real sector activity represented by industrial production index (**Figure 10** and **Table 9**).

The weakening lira is proven to be the reason why the rupiah moves downward, but the shock would disappear after 5 months (the rupiah value returned to balance). Not only rupiah but also weaker lira also has an impact on the interbank rates

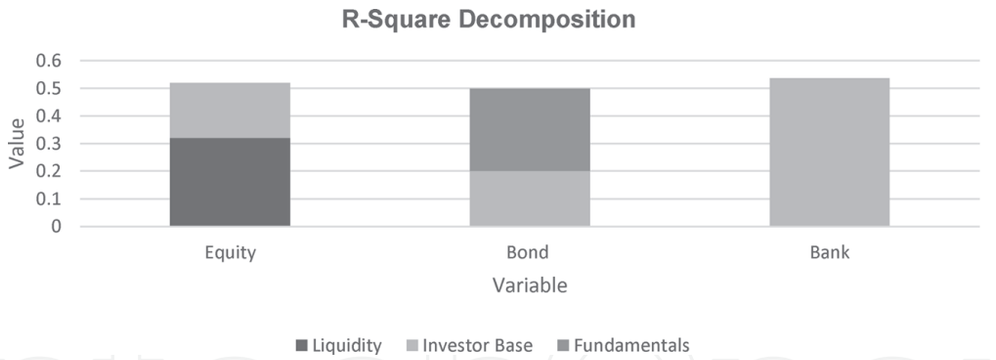

Figure 11.
R-square decomposition based on Shepley decomposition. Source: [27].

and NFP. The decline of the lira may increase in the interbank rates, but there is a decline in NFP at the start, even though the NFP could recover after the third month. The weakening of lira also caused a decline in net exports and a manufacturing production index even though with little impact (**Figure 10**).

Claessens [27] explains that the main reasons of fragility are liquidity and investor based, while macrofundamentals only have a little explaining power except for bond (**Figure 11**). According to **Table 10**, Indonesia, Turkey, and Argentina are sensitive to get the impact of capital flow.

4.4 Rupiah exchange rate model results

Indonesian capital and financial account in the fourth quarter of 2018 showed a good performance and even had obtained the highest value since 2012. Unfortunately, this is not supported by the current account condition. The current account in the fourth quarter of 2018 continued to deteriorate compared to the previous periods. This occurs because of the global economic slowdown that is currently happening so that Indonesia's exports to several countries have decreased (**Figure 12**).

4.5 Exchange rate model result

$$EXCH\_RATE_t = \alpha_{10} + \beta_{11} TB_{t-1} + \beta_{12} FINANCIAL_{t-1} + \beta_{13} PRIMARY\ INCOME_{t-1} + \beta_{14} LIRA_t + \beta_{15} DUMMY_t + \beta_{16} AR(1)_t + \epsilon_t \quad (16)$$

Based on the regression results, it can be concluded that Indonesia's trade balance and financial account have a significant impact on the exchange rate on α 0.1 with a negative coefficient (the surplus of financial account caused rupiah to appreciate). In contrast, lira and crisis dummy have a significant positive effect on exchange rates (Lira depreciation followed by rupiah depreciation, and crisis dummy caused rupiah to depreciate) (**Table 11**).

$$LOG(EXCH\_RATE)_t = \alpha_{10} + \beta_{11} TB_t + \beta_{12} LOG(M2)_t + \beta_{13} DUMMY_t + \beta_{14} AR(1)_t + \epsilon_t \quad (17)$$

Based on **Table 12**, it can be concluded that broad money (M2) and dummy variables significantly influence the exchange rate. Thus, if there is a higher amount

Country	Equity	Bond	Bank
Turkey	0.56	0.42	0.42
Argentina	0.37	0.14	0.32
Indonesia	0.51	0.69	0.43
South Africa	0.46	0.58	0.50
Israel	0.17	0.36	−0.03
Brazil	0.58	0.52	0.46
Chile	−0.06	0.15	0.19
Colombia	0.16	0.02	0.23
Mexico	0.30	0.38	0.27
Peru	0.27	0.33	0.45
Uruguay	−0.09	0.44	0.02
Venezuela, Rep. Bol.	−0.06	0.29	−0.18
India	0.67	0.16	0.23
China PR: Mainland	0.41	−0.08	0.57
Korea	0.49	0.27	0.43
Malaysia	0.38	0.29	0.45
Pakistan	0.90	0.40	0.12
Philippines	0.64	0.36	0.19
Thailand	0.58	0.36	0.40

Source: Claessens [27].

Table 10.
Results of variance decompositions.

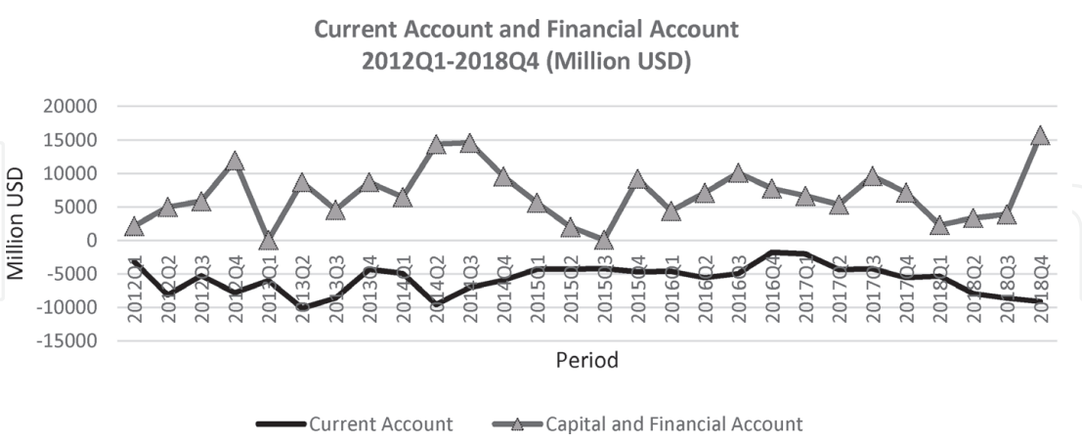

Figure 12.
Current account and financial account 2012Q1–2018Q4. Source: Economics and Finance Statistics, Central Bank of Indonesia.

of money circulating in the community, then there is a decline in the rupiah exchange rate.

$$LOG(EXCH\_RATE)_t = \alpha_{10} + \beta_{11}FINANCIAL_t + \beta_{12}COMPRICE_t + +\beta_{13}LOG(M2)_t + \beta_{14}DUMMY_t + \beta_{15}AR(1)_t + \epsilon_t \quad (18)$$

Based on the table above, it can be concluded that the commodity price variable is significant at a significance level of 5%. The impact of commodity price to exchange rate is negative; thus when there is an increase in commodity prices by 1%, the value of the rupiah will appreciate by 0.876%. On the other hand, the broad money and crisis dummy have a significant and positive coefficient, which means that if money supply increases and crisis happens, rupiah exchange rate will depreciate (**Table 13**).

$$EXCH\_RATE_t = \alpha_{10} + \beta_{11}TB_t + \beta_{12}FINANCIAL_t + \beta_{13}PRIMARY_{INCOMEt-2} + \beta_{14}\mathrm{ARS}_t + \beta_{15}DUMMY_t + \beta_{16}AR(1)_t + \epsilon_t \quad (19)$$

Table 14 shows that financial accounts significantly influence the exchange rate at a significance level of 10% with a negative direction. The increase in financial accounts surplus can cause rupiah appreciation. The condition of the peso exchange

Variable	Coef.	Prob
C	8450.149	0.000
TB (−1)	−0.052	0.078*
FINANCIAL (−1)	−0.016	0.095*
PRIMARY_INCOME (−1)	−0.071	0.256
LIRA	9.022.642	0.000***
DUMMY	1,084,258	0.003***
AR (1)	0.872	0.000***
Adj R^2		0.968
Prob (F-stat)		0.000

**Significant at α 0.1.*
***Significant at α 0.05.*
****Significant at α 0.01.*
Source: Authors, 2019.

Table 11.
Exchange rate determination regression results – Full model with lira variables.

Variable	Coef.	Prob
C	7937.000	0.000
TB	0.000	0.103
LOG(M2)	0.089	0.061*
DUMMY	0.155	0.002***
AR (1)	0.787	0.000***
Adj R^2		0.917
Prob (F-stat)		0.000

**Significant at α 0.1.*
***Significant at α 0.05.*
****Significant at α 0.01.*
Source: Authors, 2019.

Table 12.
Exchange rate determination regression results – Trade balance only.

Variable	Coef.	Prob
C	8.854	0.005
FINANCIAL	−0.000	0.144
LOG(COMPRICE)	−0.876	0.016**
LOG(M2)	0.298	0.062*
DUMMY	0.094	0.016**
AR (1)	0.946	0.000***
Adj R^2		0.950
Prob (F-stat)		0.000

Significant at α 0.1.

**Significant at α 0.05.*

***Significant at α 0.01.*

Source: Authors, 2019.

Table 13.
Exchange rate model: Financial flows only.

Variable	Coef.	Prob
C	10,250,890	0.000
TB (−1)	−0.049	0.149
FINANCIAL (−1)	−0.019	0.072*
PRIMARY_INCOME (−1)	−0.077	0.286
ARS	5,932,025,000	0.081*
DUMMY	1,091,684,000	0.011**
AR (1)	0.923	0.000***
Adj R^2		0.957
Prob (F-stat)		0.000

Significant at α 0.1.

**Significant at α 0.05.*

***Significant at α 0.01.*

Source: Authors, 2019.

Table 14.
Exchange rate determination regression results: Full model with Argentina variables.

rate has a positive association with rupiah exchange rate. If the peso depreciates to the dollar by one unit, the rupiah will depreciate too. The significance of Argentina peso is in 10% level of significance. Compared to lira regression in **Table 11**, the significance of lira is in 1% level of significance, which has the interpretation that Turkey has been proven to have larger potential effects to Indonesian financial sector than Argentina. In addition, the crisis dummy variables significantly influence the exchange rate with a positive direction, which means that crisis has caused rupiah to depreciate.

$$LOG(EXCH\_RATE)_t = \alpha_{10} + \beta_{11}TB_t + \beta_{12}FINANCIAL_t + \beta_{13}PRIMARY\ INCOME_{t-2} + \beta_{14}\mathrm{LOG}(M2)_t + \beta_{15}DUMMY_t + \beta_{16}AR(1)_t + \epsilon_t \quad (20)$$

Variable	Coef.	Prob
C	6.443	0.001
TB	−0.000	0.247
FINANCIAL	−0.000	0.060*
PRIMARY_INCOME (−2)	−0.000	0.1715
LOG(M2)	0.187	0.126
DUMMY	0.103	0.018**
AR (1)	0.912	0.000***
Adj R^2		0.952
Prob (F-stat)		0.000

**Significant at α 0.1.*

***Significant at α 0.05.*

****Significant at α 0.01.*

Source: Authors, 2019.

Table 15.
Exchange rate model: full BOP component.

If all BOP component included in the regression of Rupiah exchange rate model (**Table 15**), only financial account and crisis dummy that significantly affect rupiah exchange rate.

5. Conclusion and discussion

The empirical result shows the potential contagion from Argentina and Turkey's financial crisis to the Indonesian economy, especially to the stock market and exchange rate. The contagion from Argentina and Turkey in the stock market has been stronger than the exchange rate. The correlation between Indonesia's stock market with Turkey's is higher than the correlation with Argentina's stock market.

Regression results also show that Indonesia's financial account, money, and commodity prices significantly affect exchange rates with different significance and magnitude. Regarding the exchange rate model, the Indonesian exchange rate, explained by the exchange rate of rupiah against the US dollar, has a strong positive association with the Turkish lira and Argentine peso exchange rate. The regression result also shows that Turkey has higher financial contagion effect than Argentina to Indonesian financial market. Indonesia and other emerging markets should be careful with the potential of financial contagion that has a probability to harm real sector activity. Policy anticipation to financial contagion should be taken as well as the structural fundamental policy to repair balance of payment and current account sustainability.

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References

[1] Saxton J. Argentina's economic crisis: Causes and cures. Joint Economic Committee. 2003:202-224

[2] Nelson RM. Argentina's Economic Crisis. Congressional Research Service Paper; 2018

[3] Oyvat C. The End of Boom and the Political Economy of Turkey's Crisis. Greenwich Papers in Political Economy 21403, University of Greenwich; 2018

[4] World Bank. Current account balance (% of GDP). 2019a. Available from: https://data.worldbank.org/indicator/BN.CAB.XOKA.GD.ZS?locations=ID

[5] Trading Economics. Argentina - Economic Indicators. 2019a. Available from: https://tradingeconomics.com/argentina/indicators

[6] Trading Economics. Indonesia - Economic Indicators. 2019b. Available from: https://tradingeconomics.com/indonesia/indicators

[7] Trading Economics. Turkey - Economic Indicators. 2019c. Available from: https://tradingeconomics.com/turkey/indicators

[8] World Bank. Foreign direct investment, net outflows (% of GDP); 2019b

[9] Dornbusch R, Park YC, Claessens S. Contagion: Understanding how it spreads. The World Bank Research Observer. 2000;**15**(2):177-197

[10] Pericoli M, Sbracia M. A primer on financial contagion. Journal of Contagion, Exchange Rate, and Financial Volatility: Indonesian Case in Global Financial. 2003;**17**(4):571-608. DOI: 10.1111/1467-6419.00205

[11] Forbes K, Rigobon R. Contagion in Latin America: Definitions, measurement, and policy implications. In: NBER Working Paper, Vol. 7885; 2001. DOI: 10.3386/w7885

[12] Masson P. Contagion: Monsoonal Effects, Spillovers, and Jumps Between Multiple Equilibria (No. WP/98/142); 1998

[13] Masson P. Contagion: Macroeconomic models with multiple Equilibria. Journal of International Money and Finance. 1999; **18**:587-602

[14] Forbes KJ, Rigobon R. No contagion, only interdependence: Measuring stock market comovements. The Journal of Finance. 2002;**57**(5):2223-2261. DOI: 10.1111/0022-1082.00494

[15] Kaminsky GL, Reinhart CM, Vegh CA. The unholy trinity of financial contagion. Journal of Economic Perspectives. 2003;**17**(4):51-74

[16] Fratzscher M. Working Paper No. 139 on Currency Crises and Contagion; 2002

[17] Allen F, Gale D. Financial contagion. Journal of Political Economy. 2000; **108**(1):1-33

[18] Claessens S, Forbes K. International financial contagion: The theory, evidence and policy implications. The IMF's Role in Emerging Market Economies: Reassessing the Adequacy of Its Resources. 2004. Available from: http://web.mit.edu/~kjforbes/www/Shorter Articles/International FinancialContagion-Theory%26 Evidence.pdf

[19] Kibritcioglu B, Kose B, Ugur G. A Leading Indicators Approach to the Predictability of Currency Crises: The Case of Turkey. General Directorate of Economic Research The Undersecretariat of Treasury, Ankara,

Turkey, SSRN; 2001. DOI: 10.2139/ssrn.283132

[20] Krugman P. Balance sheets, the transfer problem, and financial crises. International Tax and Public Finance. 1999;**6**:459-472

[21] Sensoy A, Sobaci C. Effects of volatility shocks on the dynamic linkages between exchange rate, interest rate and the stock market: The case of Turkey. Economic Modelling. 2014;**43** (September 2008):448-457. DOI: 10.1016/j.econmod.2014.09.005

[22] Clark PB, Tamirisa N, Wei S. A New Look at Exchange Rate Volatility and Trade Flows a New Look at Exchange Rate. IMF Occasional Paper, No 235, Washingthon DC; 2004

[23] Kawai M, Newfarmer R, Schmukle S. Crisis and Contagion in East Asia. World Bank Policy Research Working Papers; 2001

[24] Iriana R, Sjöholm F. Indonesia's economic crisis: Contagion and fundamentals. Developing Economies. 2002;**40**(2):135-151. DOI: 10.1111/j.1746-1049.2002.tb01004.x

[25] Gujarati DN. Basic Econometrics. 4th ed. The McGraw-Hill Companies. McGraw Hill; 2004

[26] Engle R. Dynamic conditional correlation – A simple class of multivariate GARCH models. Journal of Business & Economic Statistics. 2002; **20**(1999):1-34

[27] Claessens S. Macroprudential and Capital Flows Management Policies in a World with Demand for Safe Assets. South African Reserve Bank Conference; October 2016