

The determinants of international reserves in developing countries

Yong Seong Foo

School of Business and Economics, Universiti Putra Malaysia, Serdang, Selangor, Malaysia, e-mail: fyseong82@gmail.com

Lee Chin

School of Business and Economics, Universiti Putra Malaysia, Serdang, Selangor, Malaysia, e-mail: leechin@upm.edu.my

Kong San Chen

School of Business and Economics, Universiti Putra Malaysia, Serdang, Selangor, Malaysia,
e-mail: chnekong03452@gmail.com

Piratdin Allayarov

Tashkent State University of Economics, Uzbekistan, e-mail: p.allayarov@tsue.uz

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Motivated by the recent surge in international reserve holdings in developing countries, this study aims to investigate the determinants of international reserves in developing countries. Two main engaging theories were used in this study, namely, the mercantilist and precautionary views for the demand in international reserves. This study analyzed the data of 21 developing countries over the period 2003–2015 using the static linear panel method. The findings showed that mercantilist motives, such as trade value and exchange rate, are positive determinants of international reserves. As for the view from the angle of precautionary motives, an expansionary monetary policy with an increase in money supply and a decrease in the domestic interest rate will encourage higher international reserve holdings in countries. However, an increasing public debt will lower international reserve holdings. The oil shock of 2013–2015 was the biggest oil price drop in the history. The findings show oil shock will reflect the international reserves holding decrease. Some policy implications are suggested such as diversification and substitution of international reserves holdings. The cooperation between oil export countries are important to stabilizing the oil market and oil price to avoid the depletion of international reserves holdings.

Keywords: international reserves; mercantilist motive; precautionary motive; oil shock

JEL codes: E44, E58, F31

Определяющие факторы международных резервов в развивающихся странах

Фу Ён Сон

Школа бизнеса и экономики, Университет Путра Малайзия, Серданг, Селангор, Малайзия
e-mail: fyseong82@gmail.com

Чин Ли

Школа бизнеса и экономики, Университет Путра Малайзия, Серданг, Селангор, Малайзия
e-mail: leechin@upm.edu.my

Чен Конг Сан

Школа бизнеса и экономики, Университет Путра Малайзия, Серданг, Селангор, Малайзия
e-mail: chnekong03452@gmail.com

Аллаяров Пиратдин

Ташкентский государственный экономический университет, Узбекистан, e-mail: p.allayarov@tsue.uz

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Данное исследование мотивировано резким увеличением объема международных резервов в развивающихся странах в последние годы. Мы изучили факторы, определяющие международные резервы в развивающихся странах. В исследовании были использованы два подхода: с точки зрения меркантилистского и с учётом предупредительного мотива, влияющего на спрос на международные резервы. Проанализированы панельные данные по 21 развивающейся стране за период с 2003 по 2015 гг. Результаты показали, что такие параметры как объем торговли и обменный курс, рассматриваемые в рамках меркантилистского подхода, являются положительными факторами, определяющими международные резервы. С точки зрения мотива предосторожности, экспансионистская денежно-кредитная политика с увеличением денежной массы и снижением внутренней процентной ставки будет способствовать увеличению международных резервов в странах. Однако растущий государственный долг приведет к сокращению международных резервов. Результаты показывают, что нефтяной шок 2013–2015 гг., который сопровождался самым большим падением цен на нефть в истории, отразился на сокращении международных резервов. Нами предложены некоторые рекомендации, такие как диверсификация и замена международных резервов. Сотрудничество между странами-экспортерами нефти важно для стабилизации нефтяного рынка и цен на нефть, чтобы избежать истощения международных резервов.

Ключевые слова: международные резервы; меркантилистский мотив; предупредительный мотив; нефтяной шок

Introduction

International reserves are any kind of reserve funds that can be passed among central banks internationally. They are comprised of foreign currencies, other assets in foreign currency denominations, gold reserves, special drawing rights (SDRs) and IMF reserve positions¹. International reserves play a significant role in preventing a financial crisis. Therefore, policies should be made based on fundamental strategies

¹<https://www.imf.org/external/pubs/ft/ar/archive/pdf/ar1993.pdf>

to prevent a crisis by hoarding large amounts of foreign reserves to maintain financial stability and retain monetary autonomy.

Since the Asian financial crisis of 1997–1998, many developing countries have significantly increased their international reserves. The share of global reserves held by developing countries increased after this financial crisis. This can be seen in Figure below, which displays an imbalanced growth of international reserves between developed and developing countries over the last two decades. International reserves for developing countries increased from 0.46 trillion US\$ in 1995 to 7.9 trillion US\$ in 2015 compared to the developed countries, which only raised their international reserves from 1 trillion US\$ in 1995 to 4.1 trillion US\$ in 2015. Starting from the year 2005, reserve holdings in developing countries surpassed those in developed countries. On the other hand, the global oil price shock of 2013–2015 reflected a decline in international reserves in developing countries². This was the biggest oil price shock in the history, oil price dropped by 70% in 2016. The recession caused demand for energy to shrink, and forth oil shock occurred in 2008. The oil price collapsed from 97.64 US\$ per barrel in 2008 to 61.86 US\$ per barrel in 2009, but percentage price drops not greater than oil price shock 2016. However, economists are unclear about the root causes of the rapid growth in reserve holdings by emerging economies. Hence, this study aims at investigating the determinants of international reserves in developing countries.

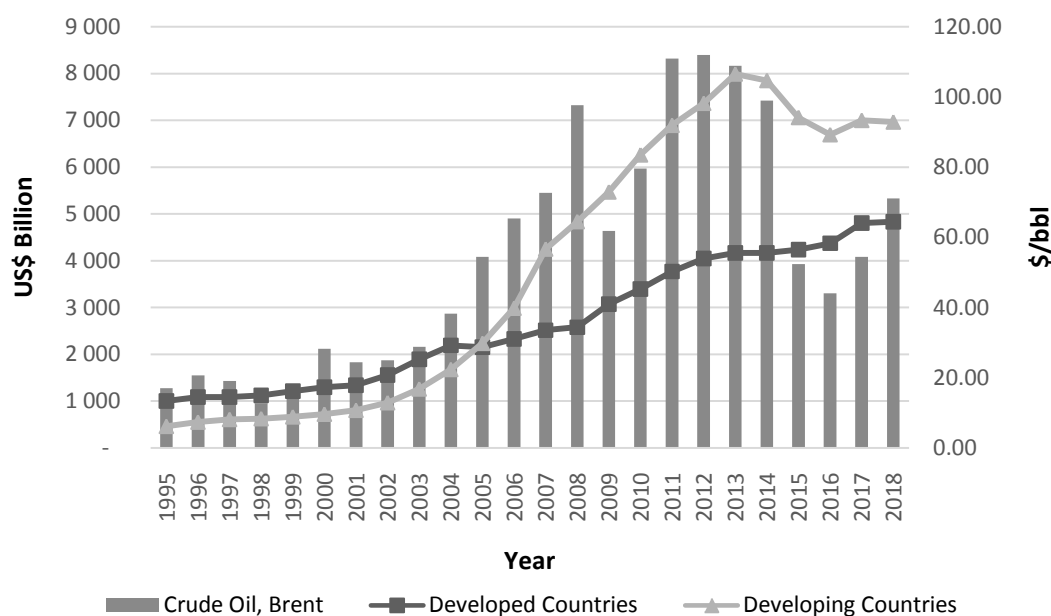


Fig. Total reserves excluding gold with crude oil price, Brent in 1995–2018

Sources: IMF, 2019 and World Bank Commodity Price Data, 2019.

Based on the literature, this research reflected on two important motives for accumulating reserves, namely mercantilist motives (Rodrik, 2008) and precautionary motives (Aizenman and Marion, 2004; Wu and Lee, 2018; Schröder, 2017). Mercantilist motives for reserve holdings stress that reserve holdings are influenced by the growth in trade or exports of a country. Exports, trade openness, currency rates or exchange rates make up the set of factors connected to mercantilist goals. The demand for holdings of foreign reserves will rise as trade transactions increase (Delatte and Fouquau, 2012; Ghosh et al., 2014). Aizenman and Lee (2007) discovered that the promotion of exports can result in the hoarding of reserves when looking into mercantilist motives. The stability of a country's exchange rates is increasingly crucial for intermediate exchange rate regimes since trade openness will lead to higher reserve holdings (Aizenman and Riera-Crichton, 2008; Dooley et al., 2004). According to Dooley et al. (2004), Chin et al. (2007a), Lau et al. (2018) and Kyin et al. (2013), fixed exchange rates will cause an excess in foreign exchange and put the pressure on exchange rates. Thus, the countries with fixed exchange rates that seek to avoid costly adjustment to disturbances in the external sector of the economy should consider the importance

² The oil price declined from 108.86 US\$ per barrel in 2013 to 52.37 US\$ per barrel in 2015 (World Bank Commodity Price Data, 2018).

of their monetary authorities' holdings of foreign reserves as part of their national wealth. However, the current level of reserve accumulation appears excessively high to be rationalized with outdated conventional wisdom (Obstfeld et al., 2009, 2010; Jeanne and Ranciere, 2011). Typically, domestic government bills are used to pay for reserves held by fiscal authorities. If the interest rates on reserve assets are less than the domestic interest rates, the reserve holdings will result in quasi-fiscal costs for countries. However, countries whose domestic interest rates are lower than the reserve rate, will benefit by earning more income by holding large reserves. An important consideration for policymakers in determining the level of foreign exchange reserve holdings is the opportunity cost of holding foreign exchange reserves.

The researchers had been studied extensively the precautionary motives on international reserve accumulation (Aizenman and Lee, 2008; Nor et al., 2008; 2011; Beck and Weber, 2011; Calvo et al., 2012; Choi and Taylor, 2017; Ghosh et al., 2017). Governments accumulate foreign exchange reserves as insurance against crises, and monetary policies including money supply, interest rates, and public debt are used to make precautionary adjustments. Global imbalances can be avoided in large part by accumulating reserves for precautionary reasons prior to a financial crisis. After the Asian crisis, most developing countries rapidly increased reserve stock accumulation (Lee and Luk, 2018). According to Lane and Burke (2001), monetary policy regimes are consistent with precautionary incentives and a trend of reserve buildup. A monetary policy maker must achieve financial stability by setting up policy goals such as monetary policy independence and financial market openness (Chin et al., 2007b; Bacchetta et al., 2013; He and Luk, 2017; Jeanne, 2013). The accumulation of international reserves is also influenced by monetary policy instruments like the money supply and interest rate. The global financial crisis demonstrated how crucial international financial flows are to ensuring that sufficient reserves will affect broad money in the nations as well. Reserves are usually invested in safe and high-liquidity assets so that they are available for immediate use. However, Burnside et al. (2001) indicated that deficits associated with implicit guarantees to bankrupt banks, covered by inflation-related revenues and caused the 1997 Asian financial crisis. Domestic interest rates play a role as alternative investments for countries to decide on the stock of accumulated reserves.

Public debt can be used as substitute or supplement to international reserves, most developing countries borrow to finance their budget deficits (Qian and Steiner, 2017). If a rise in international reserves follows a rise in public debt, the two trends complement one another. On the other hand, if it is utilized to fund foreign transactions or pay for external deficits, the public debt turns into a replacement for international reserves (Aizenman et al., 2011). A positive relationship is expected if the public debt acts as a complement for international reserves. On the other hand, if the public debt serves as a substitute for international reserves, a negative relationship is expected between the two variables.

Therefore, this study attempts to answer the research questions: Do mercantilist and precautionary motives significantly affect international reserve holdings? And is there any other factor that is driving the rapid growth in international reserves in developing countries? Moreover, will the uncertainty economy shock like oil crisis collapsing the international reserves accumulated by developing countries? This paper extends the existing literature in two ways. First, we model the determinants of international reserves in developing countries based on mercantilist and precautionary motives. Second, the paper incorporates the global oil price shock into the model. As discussed earlier, the global oil price shock of 2013–2015 caused a decline in international reserve holdings in developing countries. Limited studies deal with the issue of the oil price shock, except for the study by Bahmani-Oskooee (1988). Meanwhile, it is considered to be a new global economic issue that influences international reserve holdings.

The rest of this paper is organized as follows. The next section briefly reviews the literature in relation to the determinants of international reserves. Then we introduce an empirical model for international reserves and discuss the empirical results and findings. The last section concludes and provides policy implications.

Literature review and related theories

This section briefly reviews the theories and literature on the determinants of international reserves. The theories attribute the accumulation of foreign exchange to either mercantilist motives or precautionary motives. International reserve assets allow the central bank to buy the domestic currency, which is regarded as a liability for the institution. As a central bank conducts monetary policies, the amount of foreign exchange reserves can alter, but other elements, such as the backdrop of the level of capital mobility

and the exchange rate regime, also influence the demands of policy makers. It will be impossible for a nation with fixed exchange rates to implement a free-standing monetary policy (Chin and Azali, 2010). A central bank would need to use its reserves to maintain its fixed exchange rates because the supply and demand for a currency tend to affect the value of the currency.

Many previous studies have addressed the issue of the demand for international reserves. The literature investigated the accumulation of reserves mainly from the viewpoint of mercantilist and precautionary motives. First, the mercantilist motives involved empirical evidence on international reserves. Nor et al. (2008) found that imports and exports positively influenced the international reserves of Malaysia. Schröder (2017) showed that China's growth in reserves is influenced by real exchange rates, and the undervaluation and distortion of foreign exchange market interventions. Lane and Milesi-Ferretti (2002; 2004) found positive nexus association between real exchange rate and international reserves. Reserve accumulation is associated with real undervaluation (Durdu et al., 2009). Ramachandran and Srinivasan (2007) found that an asymmetric exchange rate intervention occurs in response to an appreciating Rupee and an insignificant response occurs with a depreciating Rupee. The export competitiveness of India seems to have contributed to its large stockpile of reserves. However, the study by Seghezza et al. (2017) found that the monitoring of the Renminbi exchange rate addressed the imbalance of accumulated reserves. Besides, Saha and Biswas (2014) found a negative relationship between exchange rate and foreign exchange reserve in the short-run, but failed to find significant relationship between the variables in the long run.

On the other hand, there have been many studies on the precautionary motives for the accumulation of reserves. Aizenman et al. (2017) used predictions of the precautionary approach to investigate change in the patterns of international reserves in Korea after the crisis of 1997–1998. The study found that the precautionary demand had a positive influence on the accumulated international reserves and brought growth to the production output of the country. The results also showed that the Mexican and Asian financial crises had a negative impact on international reserve holdings. Pina (2017) found that there is a positive relationship between international reserves and global interest rates, where an increase in interest rates will lead to an increase in the transfer of international reserves. Moreover, a study by Taguchi et al. (2011) found that the accumulation of international reserves helps in the retention of monetary autonomy, such as by preventing interest rates from rising rapidly. The fiscal policy of a poor government with a budget deficit and a huge public debt will influence its international reserves holding (Burnside et al., 2006). Nor et al. (2011) found that current account balance had a positive impact on international reserve holdings. A study by Cheung and Ito (2009) identified that financial and institutional factors have a positive influence on international reserves. However, public debt has a negative impact on international reserves. Besides that, Aizenman and Lee (2007) studied the determinants of international reserves among groups with both mercantilist and precautionary motives, and the findings revealed that precautionary motives are a more important determinant of reserve holdings than mercantilist motives.

International reserve accumulation plays the role of self-insurance or precautionary savings due to roll-over risk (Bianchi et al., 2016; Hur and Kondo, 2016; Jeanne, 2007). The global economic shock such as the financial and oil crises is devastating for national economies. Therefore, nations should build up enough international reserves to avert such a crisis. Numerous studies have been conducted on the accumulation of foreign reserves and reserve policy choices in relation to the current global crisis. Dominguez et al. (2012) investigated whether differences in post-crisis economic performance across countries can be explained by the accumulation of pre-crisis foreign exchange reserves and reserve policy actions taken during the global financial crisis. The results demonstrated that there was a greater buildup of foreign reserves prior to the global financial crisis and a swift growth in GDP following the crisis. Blanchard et al. (2010) and Aizenman and Sun (2012) discovered that the global financial crisis led to a reduction in international reserves. Moreover, the emerging markets had a sizable amount of foreign liabilities during the global financial crisis of 2008–2009 (Aizenman and Hutchison, 2012). Depreciation in exchange rates in the countries caused a loss in reserves with the exchange market shock. The study by Bahmani-Oskooee (1988) found the instability of the reserve demand in first oil shock in 1973. However, the demand for reserves experienced at structural shift in the second oil shock in 1979.

Based on the above discussions, it can be concluded that most of the studies focused mainly on the perspectives of mercantilist motives and precautionary motives. In addition, limited studies investigated the impact of the global oil price shock of 2013–2015 on international reserve holdings.

Methodology and empirical models

A static linear panel data analysis was applied to study the determinants of international reserves in developing countries. As discussed earlier, the two motives for international reserve holdings are mercantilist motives and precautionary motives. This study incorporated both motives into an integrated framework. The estimation of a reserves demand function allowed an analysis to be made of whether the mercantilist motives or precautionary motives were more influential in the hoarding of reserves.

In this study, the dependent variable was international reserves, while the independent variables were the proxies of the mercantilist motives and precautionary motives. This study modified the theoretical model of Aizenman and Lee (2007) for the estimation of a reserves demand function with mercantilist and precautionary views. Similar to most of the previous studies, the proxies of the mercantilist motives were trade and exchange rate, while the proxies of the precautionary motives were money supply, interest rate and debt. However, this study differed from Aizenman and Lee (2007) in few ways. First, this study used the total trade to capture both the extent of the loss in export earnings and the propensity to import, instead of export growth and import shares. Second, the nominal effective exchange rate (NEER) was used in this study as the proxy for exchange rate, instead of exchange rate volatility. Finally, the variables, monetary policy and public debt, represented the precautionary motives of reserve demand, and this was different from the previous study, based on the degree of capital account liberalization.

The main specifications of the empirical model can be expressed as follows:

$$LIR_{it} = \beta_0 + \beta_1 LTRADE_{it} + \beta_2 LNEER_{it} + \beta_3 LM2_{it} + \beta_4 TBIR_{it} + \beta_5 LGOVDEBT_{it} + \varepsilon_{it}, \quad (1)$$

where: $i = 21$ developing countries; $t =$ period 2001 to 2015; $IR =$ International reserves; $TRADE =$ Total trade value of exports and imports; $NEER =$ Nominal effective exchange rate; $M2 =$ Broad money; $TBIR =$ Treasury bills interest rate; $GOVDEBT =$ Government debt.

In addition, this study tested the robustness of the model which was extended to include the oil revenue variable to examine whether the recent decline in international reserve holdings in developing countries was related to the oil price shock.

The extended model was as follow:

$$LIR_{it} = \beta_0 + \beta_1 LTRADE_{it} + \beta_2 LNEER_{it} + \beta_3 LM2_{it} + \beta_4 TBIR_{it} + \beta_5 LGOVDEBT_{it} + \beta_6 OPxER_{it} + \varepsilon_{it}, \quad (2)$$

where: $OPxER =$ Oil Revenue (Oil Price x Exchange Rate).

The data for the international reserves and the determinant variables were taken from secondary sources such as the databases of the World Bank, International Monetary Fund (IMF), and International Financial Statistics (IFS). The dataset was a panel data consisting of 21 developing countries over the period from 2003 to 2015. The countries included Algeria, Armenia, Belize, Bolivia, Brazil, Dominica, Fiji, Ghana, Guyana, Malaysia, Mexico, Moldova, Nigeria, Pakistan, Philippines, Sierra Leone, Solomon Islands, South Africa, St. Vincent and the Grenadines, Uganda and Zambia. The data measurements are shown in Table 1.

Table 1

List of summary variables and data sources

Variables	Measurement	Data source	Expected sign
Dependent variables:			
International Reserves (IR)	Total reserves excluding gold (US \$)	IMF	
Independent variables:			
Trade	Total trade value of exports & imports (US \$)	World Bank	+
Exchange Rate (NEER)	Nominal effective exchange rate (Unit 2010 = 100)	IMF	+
Money Supply (M2)	Broad money M2 (current LCU)	World Bank	+
Interest Rate (TBIR)	Treasury bills interest rate (%)	IMF	-
Government Debt (GOVDEBT)	Government gross debt (current LCU)	World Bank	+/-
Oil Revenue (OPxER)	Oil Price, Brent (US\$ per barrel) x Exchange Rate (current LCU)	World Bank	+

Source: Authors.

Empirical findings

The final panel regression results are presented in Table 2. First, main specifications of the empirical is the basic model. To gauge the sensitivity of the results, a robustness analysis was extended to include the oil revenue variable in the model with Brent oil price. Each model in Table 2 had been tested with a pooled OLS, random effects and fixed effects. The most appropriate model was selected from the presented results based on the Breusch-Pagan and Hausman tests. The results from the Breusch-Pagan test, with a p-value of less than 0.01, indicated a preference for random effects over the pooled OLS for the estimation models. Next, the results of Hausman test indicated a preference for fixed effects-over random effects model. The Breusch-Pagan and Hausman test results indicated that both models were fixed effects models.

Table 2

Results of panel data analysis

Variable	Basic Model	Model with Brent oil price
LTRADE	0.4596*** (0.1199)	0.3156** (0.1361)
LNEER	0.6373*** (0.1437)	0.7812*** (0.1572)
LM2	0.7155*** (0.1070)	0.7308*** (0.1064)
TBIR	-0.0145** (0.0059)	-0.0151** (0.0058)
LGOVDEBT	-0.1924*** (0.0638)	-0.1932*** (0.0633)
LOP x ER	-	0.1706** (0.0783)
CONS	-5.5069*** (1.1797)	-6.2002*** (1.2134)
Breusch-Pagan test	419.4204 (0.0000)	411.6800 (0.0000)
Hausman test	16.2400 (0.0062)	18.89 (0.0043)
No. of observations	273	273

Note: Values in the first row refer to the coefficients, while values in parentheses refer to standard error. ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

Source: Authors.

The results of basic model showed that all the explanatory variables; trade value (TRADE), exchange rate (NEER), broad money supply (M2), interest rate (TBIR) and government debt were statistically significant. In particular, value of trade (TRADE), nominal effective exchange rate (NEER) and broad money supply (M2) had a positive impact on international reserves, while interest rate (TBIR) and government debt had a negative effect on reserve holdings. The findings showed that the key drivers of international reserve holdings were variables of mercantilist motives, which include trade and exchange rate, and the variables of precautionary motives, including broad money, interest rate and government debt. The negative and significant government debt in the model showed that government debt acted as a substitute for international reserves holding. Hence, a rise in government debt will cause the international reserves holding to decline. The result appears to be consistent with Cheung and Ito's (2009) finding that international reserves and public debt are substitutes. Government policy plays an important role, whether it be monetary or fiscal policies, in determining the holding of international reserves. Since government debt is one of the tools of a fiscal policy to solve the problem of a budget deficit in the country, government debt can act either as a substitute or complement to international reserve holdings.

The biggest oil price shock of 2013–2015 was a new issue that may have influenced international reserves holding of a country, a robustness check with additional oil revenue variable was carried out to investigate the oil shock on international reserves holdings. As discussed in Section 3, Model with Brent oil price included the oil revenue variable (oil price x exchange rate). The robustness analysis model showed that all the explanatory variables, including oil revenue, were statistically significant. The posi-

tive and significant oil revenue in robustness check model showed that oil price acted as a complement for international reserves holding. Hence, an increase in oil price will result in a rise of the international reserves holding. The signs for the other explanatory variables were also the same as with Basic Model, where trade, NEER and M2, in particular, were positive, while TBIR and government debt were negatively related to international reserves.

Overall, the results of this study provide several outcomes. First, both mercantilist and precautionary motives are important for determining international holdings. An increase in the mercantilist and precautionary motives for holding reserves will increase the international reserves holding of a country. Second, the findings of this study identified value trade, exchange rate and money supply as positive determinants of international reserves. However, domestic interest rates and government debt have negative impact on international reserves.

Third, 2013–2015 global oil price shock did affect the international reserve holdings of developing countries, the biggest oil price drop reflected a decline in international reserves.

Conclusions and policy implications

This study presents a framework for the factors influencing the international reserves holdings in developing countries. Two important conclusions can be derived from the empirical findings. First, we show that mercantilist and precautionary motives are significant in the determination of international reserve holdings. Mercantilist motives have a very strong, positive and significant influence over international reserve holdings. Value trade and exchange rate demonstrate a positive relationship with international reserve holdings. Second, an oil price shock adversely affects the international reserve holdings in developing countries.

Since the oil price shock will affect the international reserves holding of countries, the oil export countries should well manage the oil production and oil revenue countries to avoid the instability of international oil price. Although the Organization of the Petroleum Exporting Countries (OPEC) plays a significant role in stabilizing the volatile oil market, the challenges of stabilizing the oil market and guaranteeing secure demand and supply cannot be carried out by OPEC alone. Cooperation between OPEC and non-OPEC producers are necessary to keeping oil prices in a moderate range. Moreover, the non-OPEC countries are encouraged to join as the member of OPEC to play a role in the global oil market. The history of the oil price shock occurred by interruptions in oil supply and oversupply led to dramatic rise in oil prices and biggest oil price drop. Thus, the depletion of international reserves holding of the countries, especially developing ones, result in inability to resist global economy shock. The expansion of the member of OPEC are also important that members cooperate to reduce oil market competition and stabilize the oil price. Thus, the developing countries experience less depletion of international reserves caused from the oil crisis to improve the country economic growth.

However, international reserves are a more favored type of investment than liquid assets and low-risk assets, and they offer low expected returns to the nations holding the reserves. For the former, a proper specification of the opportunity cost variable happens to be the most important factor for the substitution of international reserves. Central banks may consider diversifying their reserves to minimize a potential valuation loss from their reserve holdings. Since countries face a high opportunity cost for holding their reserves, policy makers should implement a reserves policy with a diversification of reserves and alternative investments to attract countries to hold international reserves.

REFERENCES

- Aizenman, J., Hutchison, M. (2012). Exchange market pressure and absorption by international reserves: Emerging markets and fear of reserve loss during the 2008–2009 crisis. *Journal of International Money and Finance* **31**(1), 1076–1091.
- Aizenman, J., Lee, J. (2007). International reserves: precautionary versus mercantilist views, theory and evidence. *Open Economies Review* **18**(2), 191–214.
- Aizenman, J., Lee, J. (2008). Financial versus monetary mercantilism: long run view of large international reserves hoarding. *World Economy* **31**(5), 593–611.
- Aizenman, J., Marion, N. (2004). International reserve holdings with sovereign risk and costly tax collection. *The Economic Journal* **114**(497), 569–591.

- Aizenman, J., Riera-Crichton, D. (2008). Real exchange rate and international reserves in an era of growing financial and trade integration. *The Review of Economics and Statistics* **90**(4), 812–815.
- Aizenman, J., Sun, Y. (2012). The financial crisis and sizable international reserves depletion: From “fear of floating” to the “fear of losing international reserves”? *International Review of Economics and Finance* **24**, 250–269.
- Aizenman, J., Jinjara, Y., Park, D. (2011). International reserves and swap lines: Substitutes or complements? *International Review of Economics and Finance* **20**(1), 5–18.
- Aizenman, J., Lee, Y., Rhee, Y. (2017). International reserves management and capital mobility in a volatile world: Policy consideration and a case study of Korea. *Journal of the Japanese and International Economies* **21**, 1–15.
- Bacchetta, P., Benhima, K., Kalantzis, Y. (2013). Capital controls with international reserve accumulation: Can this be optimal? *American Economic Journal: Macroeconomics* **5**(3), 229–262.
- Bahmani-Oskooee, M. (1988). Oil price shocks and stability of the demand for international reserves. *Journal of Macroeconomics* **10**(4), 633–641.
- Beck, R., Weber, S. (2011). Should larger reserve holdings be more diversified? *International Finance* **14**(3), 415–444.
- Bianchi, J., Hatchondo, J., Martinez, L. (2016). *International reserves and rollover risk*. Federal Reserve Bank of Minneapolis Working Papers 735.
- Blanchard, O., Faruqee, H., Das, M. (2010). *The initial impact of the crisis on emerging market countries*. Brookings Papers on Economic Activity, Spring, pp. 263–323.
- Burnside, C., Eichenbaum, M., Rebelo, S. (2001). Prospective deficits and the Asian currency crisis. *Journal of Political Economy* **109**(6), 1155–1197.
- Burnside, C., Eichenbaum, M., Rebelo, S. (2006). Government finance in the wake of currency crises. *Journal of Monetary Economics* **53**(3), 401–440.
- Calvo, G., Izquierdo, A., Loo-Kung, R. (2012). *Optimal holdings of international reserves: Self-insurance against sudden stop*. NBER Working Papers 18219.
- Cheung, Y., Ito, H. (2009). A cross-country empirical analysis of international reserves. *International Economic Journal* **23**(4), 447–481.
- Chin, L., Azali, M., Matthews, K. (2007a). The monetary approach to exchange rate determination for Malaysia. *Applied Financial Economics Letters* **3**(2), 91–94.
- Chin, L., Azali, M., Yusop, Z., Yusoff, M. (2007b). The Monetary Model of Exchange Rate: Evidence from the Philippines. *Applied Economics Letters* **14**(13), 993–997.
- Chin, L., Azali, M. (2010). Currency linkages among ASEAN. *Singapore Economic Review* **55**(3), 459–470.
- Choi, W., Taylor, A. (2017). *Precaution versus mercantilism: Reserve accumulation, capital controls, and the real exchange rate*. NBER Working papers 23341.
- Delatte, A.-L., Fouquau, J. (2012). What drove the massive hoarding of international reserves in emerging economies? A time-varying approach. *Review of International Economics* **20**(1), 164–176.
- Dominguez, K., Hashimoto, Y., Ito, T. (2012). International reserves and the global financial crisis. *Journal of International Economics* **88**(2), 388–406.
- Dooley, M., Folkerts Landau, D., Garber, P. (2004). The revived Bretton Woods system. *International Journal of Finance & Economics* **9**(4), 307–313.
- Durdu, C., Mendoza, E., Terrones, M. (2009). Precautionary demand for foreign assets in sudden stop economies: An assessment of the new mercantilism. *Journal of Development Economics* **89**(2), 194–209.
- Ghosh, A., Ostry, J., Tsangarides, C. (2014). Accounting for emerging market countries’ international reserves: Are Pacific Rim countries different? *Journal of International Money and Finance* **49**, 52–82.
- Ghosh, A., Ostry, J., Tsangarides, C. (2017). Shifting motives: Explaining the buildup in official reserves in emerging markets since the 1980s. *IMF Economic Review* **65**, 308–364.
- He, D., Luk, P. (2017). A model of Chinese capital account liberalization. *Macroeconomic Dynamics* **21**(8), 1902–1934.
- Hur, S., Kondo, I. (2016). A theory of rollover risk, sudden stops, and foreign reserves. *Journal of International Economics* **103**, 44–63.
- Jeanne, O. (2007). *International reserves in emerging market countries: Too much of a good thing?* Brookings papers on Economic activity, 2007(1), 1–79.
- Jeanne, O. (2013). Capital account policies and the real exchange rate. *NBER International Seminar on Macroeconomics* **9**(1), 7–42. Chicago, IL: University of Chicago Press.
- Jeanne, O., Ranciere, R. (2011). The optimal level of international reserves for emerging market countries: A new formula and some applications. *The Economic Journal* **121**(555), 905–930.

- Kyin, T., Chin, L., Habibullah, M. (2013). Monetary policy and exchange market pressure in Malaysia. *Pertanika Journal of Social Sciences and Humanities* **21**(S), 29–46.
- Lane, P., Burke, D. (2001). The empirics of foreign reserves. *Open Economies Review* **12**, 423–434.
- Lane, P., Milesi-Ferretti, G. (2002). External wealth, the trade balance, and the real exchange rate. *Europ. Econ. Rev.* **46**, 1049–1071.
- Lane, P., Milesi-Ferretti, G. (2004). The transfer problem revisited: Net foreign assets and real exchange rates. *Rev. Econ. Stat.* **86**, 841–857.
- Lau, E., Yong, J., Pasca, P. (2018). Tracing exchange rate volatility in Cambodia, Laos, Myanmar and Vietnam (CLMV). *Electronic Journal of Applied Statistical Analysis* **11**(1), 168–181.
- Lee, S., Luk, P. (2018). The Asian Financial Crisis and international reserve accumulation: A robust control approach. *Journal of Economic Dynamics and Control* **90**, 284–309.
- Nor, E., Azali, M., Law, S. (2008). International reserves, current account imbalance and external debt: Evidence from Malaysia. *IIUM Journal of Economics and Management* **16**(1), 47–75.
- Nor, E., Azali, M., Law, S. (2011). International reserves, current account imbalance and short term external debt: a comparative study. *International Journal of Economics and Finance* **3**(4), 83–94.
- Obstfeld, M., Shambaugh, J., Taylor, A. (2009). Financial instability, reserves, and central bank swap lines in the panic of 2008. *American Economic Review* **99**(2), 480–486.
- Obstfeld, M., Shambaugh, J., Taylor, A. (2010). Financial stability, the trilemma, and international reserves. *American Economic Journal: Macroeconomics* **2**(2), 57–94.
- Pina, G. (2017). International reserves and global interest rates. *Journal of International Money and Finance* **74**, 371–385.
- Qian, X., Steiner, A. (2017). International reserves and the maturity of external debt. *Journal of International Money and Finance* **73**, 399–418.
- Ramachandran, M., Srinivasan, N. (2007). Asymmetric exchange rate intervention and international reserve accumulation in India. *Economics Letters* **94**(2), 259–265.
- Rodrik, D. (2008). *The real exchange rate and economic growth*. Brookings papers on economic activity, 2008(2), pp. 365–412.
- Saha, A., Biswas, S. (2014). Macroeconomic fundamentals and exchange rate volatility during the floating exchange rate regime in India. *International Journal of Economics and Management* **8**(1), 10–39.
- Schröder, M. (2017). Mercantilism and China's hunger for international reserves. *China Economic Review* **42**, 15–33.
- Seghezza, E., Morelli, P., Pittaluga, G. (2017). Reserve accumulation and exchange rate policy in China: The authoritarian elite's aim of political survival. *European Journal of Political Economy* **47**, 163–174.
- Sula, O. (2011). Demand for international reserves in developing nations: A quantile regression approach. *Journal of International Money and Finance* **30**(5), 764–777.
- Taguchi, H., Nataraj, G., Sahoo, P. (2011). Monetary autonomy in selected Asian economies: The role of international reserves. *Journal of Asian Economics* **22**(6), 471–482.
- Wu, P., Lee, C. (2018). The non-linear impact of monetary policy on international reserves: macroeconomic variables nexus. *Empirica* **45**(9), 165–185.