

The Impact of External Shocks on Small Open Economies: Evidence from East Asian Countries

Thi Lien Hoa Nguyen¹, Thu Giang Tran¹ & Thi Hong Minh Le¹

¹ School of Finance, University of Economics Ho Chi Minh City, Vietnam

Correspondence: Thu Giang Tran, School of Finance, University of Economics, Ho Chi Minh City, Vietnam.
E-mail: tranthu.giang@ueh.edu.vn

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Abstract

In this paper, we investigate whether external shocks originating from the global economy as well as from the U.S. played an important role in macroeconomic fluctuations of East Asian countries during the period 2001–2012. We further check if these shocks lead to asymmetric or symmetric reactions between the considered countries. Using a structural VAR model for 7 East Asian countries, we find that oil prices and U.S. monetary shocks are more important to the variance of domestic variables than U.S. output shocks. Additionally, impulse responses of domestic variables are highly symmetric when these external shocks occur.

Keywords: external shocks, SVAR, East Asia

1. Introduction

Over the last two decades, the world economies have become more integrated globally, both in real and financial sectors. The development and widespread liberalization of financial markets have resulted in increasing integration and huge capital flows. The most important aspect of this financial integration is that global economies show co-movements in most of the economic variables such as inflation, unemployment, GDP growth in general. This transmission can be explained by “contagion effect” at the times when the prices are falling, or in times of crisis. This effect can be seen clearly in the financial crisis in 2008, resulted from “sub-prime mortgage bubbles” and exceptionally loose monetary policy in the U.S. from 2001–2006. Furthermore, contagion effect seems to not appear in developed economies only.

In the context of global integration, the importance of emerging markets increases over time. The Asian crisis in 1997–1998 has emphasized the role of regional contagion in financial crisis. The symmetric macroeconomic fluctuations of East Asian countries in this crisis have been explained by their high openness degree (Corsetti et al., 1999), as well as by their interdependence (Kaminsky et al., 2003). Recovering from this severe economic downturn, East Asian countries have made considerable efforts to strengthen their monetary cooperation on the regional scale in order to improve their monetary stability. This cooperation is concretized into main agreements as follows: the ASEAN Surveillance Process in 1998, the Chiang Mai Initiative in 2000 which established a financial arrangement under the form of bilateral swaps between ASEAN, China, Japan and South Korea. The recent financial crisis originated in the U.S. banking system has once again raised the anxieties of the vulnerability of East Asian economies to external shocks. In response to the global crisis, the authorities have developed the Chiang Mai Initiative from bilateral to multilateral swaps in 2009. Moreover, a \$120 billion fund was created (this number in 2012 is \$240 billion) to prevent a liquidity crisis in signing countries.

The high openness degree, rapid intra-regional trade integration and the rising effort of East Asian countries in policy coordination motivate us to examine (i) to what extent external shocks, namely oil prices shocks, U.S. output shocks and U.S. monetary policy shocks impact domestic variables including output, exchange rate and price level of East Asian countries, as well as (ii) whether domestic variables in different countries response similarly to the same external shocks. We formulate a structural vector autoregressive (SVAR) model for each country in our dataset over the period 2001–2012.

The rest of the paper is organized as follows. Section 2 reviews literature. In Section 3, we describe the data and methodology framework. Section 4 presents the empirical results and Section 5 provides some concluding remarks.

2. Literature Review

In this section, we summarize the impact of external shocks on macroeconomic fluctuations of a country both theoretically and empirically.

2.1 The Impact of External Shocks on Economy

In the era of globalization, domestic macroeconomic variables are influenced not only by domestic shocks but also by external ones. One of the most important external shocks is the oil price shock. From a theoretical perspective, oil price shocks affect the performances of macroeconomic variables through the following transmission channels (Brown & Yucel, 2002):

- Supply side shock effect: focusing on the direct impact on output due to the change in marginal producing costs caused by oil-price shock.
- Wealth transfer effect: emphasizing on the different marginal consumption rate of petrodollar and that of ordinary trade surplus.
- Inflation effect: analyzing relationship between domestic inflation and oil prices.
- Real balance effect: investigating the change in money demand and monetary policy.
- Sector adjustment effect: estimating the adjustment cost of industrial structure, which is mainly used to explain the asymmetry in oil-price shock impact.
- Unexpected effect: focusing on the uncertainty over oil price and its impact.

In addition to oil price shock, macroeconomic indicators of large developed economies, exemplified by the U.S.'s ones, tend to cause considerable effects on the rest of the world. According to World Economic Outlook 2007 of IMF, past U.S. recessions usually coincide with significant reductions in global growth. Table 1 indicates that the United States remains the world's dominant economy in term of proportion in global GDP. Up to 2012, the U.S. is the second largest importer after the euro area and the third largest exporter after the euro area and China. This implies that the U.S. output shock may have a significant impact on other countries through trade channel. Moreover, the U.S. financial markets have been and remain the largest, reflecting not only the size of the economy but also their depth. Changes in U.S. asset prices tend to have strong signaling effects worldwide, and spillovers from U.S. financial markets have been important, especially during periods of market stress. In particular, correlations across national stock markets are highest when the U.S. stock market is declining. Those basic facts buttress up the leading role of the U.S. economy in both real and financial markets worldwide.

Table 1. Role of large economies in the global economy (in percent of world total; period averages)

	Period	United States	Euro area	Japan	China
GDP	1971–1975	22.5	21.3	8	3
	1986–1990	21.5	18.4	8.4	5.8
	2001–2005	20.5	15.7	6.7	14
	2012	18.9	13.7	5.6	14.9
Exports	1971–1975	15.7	21.2	8.5	1.2
	1986–1990	13.2	20.1	10.9	2
	2001–2005	11.6	18.5	7.4	7.2
	2012	9.8	24.9	4.1	10
Imports	1971–1975	15.9	21.2	7.9	1.3
	1986–1990	18.6	19	7.4	2.1
	2001–2005	19.7	16.9	5.8	6.2
	2012	12.3	16.4	4.6	9.4

Source: *Direction of Trade Statistics, World Economic Outlook (IMF) and WTO.*

Note: 1. Euro area: Excluding intra-euro area trade. 2. China: data in 1971–1975 column are for 1976–1980. 3. GDP: At PPP exchange rates.

In this paper, we focus on the monetary policy shock to address the financial impact of U.S. economy. Generally the framework used in this type of studies is the Mundell–Fleming–Dornbusch (MFD) model. Under the floating exchange rate regime and when the capital is perfectly mobile, a contraction monetary policy leads to decrease in output on domestic front and increase in output on foreign front under “beggar-thy-neighbor” policy framework as the domestic economy suffers at the benefit of other foreign country. Under a fixed exchange rate regime, increase in discount rate leads to monetary contraction in domestic as well as foreign front. Under flexible exchange rate regime and when there is imperfect capital mobility, domestic country's monetary policy contraction decreases its

price level and output. Nevertheless, as the exchange rates move, there are no output implications for the other country except that the foreign consumer prices will increase as a result of exchange rate change.

2.2 The Impact of External Shocks on Economy—Empirical Studies

In this paper, we emphasize on empirical studies related to emerging markets, especially in Asia. Using structural VAR model, Ng (2002) analyses three shocks, including external, domestic supply and domestic demand shocks, for five Southeast Asian countries over the period 1971–1995. His results show a higher correlation of domestic responses to external shocks compared to which of EU and NAFTA countries, suggesting that these countries are suitable for a monetary union.

A great deal of effort to reinforce monetary cooperation of Asian countries motivates Huang and Guo (2006) to investigate the possibility of regional monetary union. The authors apply a structural VAR model to macroeconomic variables of nine Asian countries from 1970–2002 and use nine EU countries as benchmarks. They find that external shocks have a significant impact and also lead to symmetric responses in considered countries. This makes them jump to a conclusion that Hong Kong, Singapore, Indonesia, Malaysia and Thailand will benefit from forming a common currency.

Against the background of the rapid integration of emerging Asia into the global economy, Ruffer et al. (2007) investigates the role of domestic and external factors in driving individual emerging economies in Asia. They estimate VAR models for ten countries over the period 1979Q1–2003Q4, controlling for external factors, and use sign restrictions to identify structural domestic shocks. Variance decompositions indicate that Asian emerging economies are to a large part driven by external developments. This result is explained by the export-orient business strategy supporting by the depreciation of domestic currency of those countries. Moreover, domestic responses to external shocks tend to be more symmetric than those to regional shocks.

Using a structural VAR for data over the period 1986–2000, Mackowiak (2007) finds that external shocks are an important source of macroeconomic fluctuations in emerging markets. Furthermore, U.S. monetary policy shocks affect quickly and strongly interest rates and the exchange rate in a typical emerging market. The price level and real output in a typical emerging market respond to U.S. monetary policy shocks by more than the price level and real output in the U.S. itself.

In a recent paper, Allegret et al. (2012) investigate the importance of external shocks in domestic fluctuations of East Asian countries and examine whether these shocks lead to asymmetric or symmetric reactions between the considered countries. External shocks consist of oil price, U.S. output and U.S. monetary policy and MSCI shocks. Domestic variables include output, production price and nominal exchange rate. They find that external shocks have an increasing importance to East Asian economies since 90s.

3. Data and Methodology Framework

We use monthly data over the period 2001M1–2012M12. All data are in logarithm and seasonally adjusted by Census X12 method, except that Fed Fund rate is in percentage point at an annual rate. Table 2 contains details of the data.

The dataset consists of 7 emerging markets from East Asia (Vietnam, Indonesia, Malaysia, Philippines, China, Singapore and Korea). For each country, external variables includes oil prices (OIL), a measure of U.S. real aggregate output (UIP) and the Federal Funds rate (UIR); domestic variables includes the nominal exchange rate¹ (EX), a measure of real aggregate output (IP) and a measure of aggregate price level (CPI).

Table 2. Data description

Variables		Description		Source
External variables	Oil prices	OIL	Crude Oil (petroleum), Price index, 2005 = 100, simple average of three spot prices; Dated Brent, West Texas Intermediate, and the Dubai Fateh.	IMF
	Industrial Production of the U.S. as a measure of U.S. real aggregate output	UIP	Index (2005 = 100)	IMF
	Fed Funds rate	UIR		Federal Reserve
Domestic variables	Industrial Production as a measure of real aggregate output	IP	Index (2005 = 100)	IMF
	Consumer Price Index as a measure of aggregate price level	CPI	Index (2005 = 100)	IMF
	Nominal exchange rate	EX		IMF

The model is formulated separately for each country in a dataset. We assume that East Asian countries are small open economies. This assumption implies the domestic shocks do not affect the external variables. Regarding the external shocks, we assume that oil prices are not contemporaneously affected by U.S. variables. However, oil prices have a contemporaneous impact on U.S. real output and U.S. monetary policy (Leeper et al., 1996). Following Mackowiak (2007), the U.S. monetary policy cannot respond contemporaneously to the U.S. output shock and vice-versa.

4. Results

4.1 The Importance of External Shocks in the Variance of Domestic Variables

In order to recognize the ability of external shocks to explain domestic variables fluctuations at different horizons, as well as the relative importance of each shocks, we perform a standard variance decomposition forecast error. The results of this decomposition are reported in tables 3, 4 and 5.

Table 3. The fraction of the domestic output to external shocks

External shocks	Period (months)	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
OIL	1–12	3.66	0.56	3.26	4.29	4.01	1.94	4.49
	13–24	7.28	1.10	6.50	8.45	4.91	3.91	6.02
UIP	1–12	2.55	2.35	2.46	2.44	2.14	0.87	2.27
	13–24	4.97	3.84	3.60	5.03	3.64	1.42	4.57
UIR	1–12	2.62	1.27	2.07	3.42	1.12	3.06	2.15
	13–24	5.29	1.75	4.27	6.83	2.04	4.78	3.61
Sum	1–12	8.84	4.18	7.80	10.14	7.27	5.87	8.90
	13–24	17.54	6.69	14.37	20.31	10.59	10.11	14.19

Note: “1–12” stands for the average between 1 month after a shock and 12 months after the shocks. “13–24” stands for the average between 13 month after a shock and 24 months after the shocks.

Table 3 presents the variance decomposition of the forecast error of domestic output. Oil prices seem to be the dominant external shocks. External shocks tend to have persistent impact as their weight in domestic output variances increases with time horizon. In the long run, for all studied countries, except Indonesia, external shocks account for at least 10 percent of output variances. This may due to the fact that Indonesia is the only country in our sample exhibiting a declining trend in trade openness after 1998 (Allegret et al., 2012).

Table 4. The fraction of the exchange rate to external shocks

External shocks	Period (months)	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
OIL	1–12	1.44	6.96	2.89	4.81	1.88	2.35	7.46
	13–24	2.79	10.37	4.50	7.91	3.88	3.96	13.72
UIP	1–12	1.36	7.39	3.30	4.89	1.26	1.08	6.17
	13–24	3.09	12.60	4.24	8.18	2.99	2.32	12.17
UIR	1–12	1.35	2.52	3.33	3.92	1.49	3.33	2.19
	13–24	2.82	4.50	5.88	7.76	2.91	6.87	4.44
Sum	1–12	4.14	16.87	9.52	13.62	4.63	6.76	15.81
	13–24	8.70	27.47	14.62	23.86	9.78	13.16	30.33

The results of the nominal exchange rate reported in Table 4 are in line with the De Facto Classification of Exchange Rate Arrangements of IMF. External shocks explain less than 15 percent in the case of Vietnam, Malaysia, China and Singapore. According to IMF classification, these countries implement soft peg regime. On the other hand, external account for more than 23 percent in exchange rate variance in such countries following the floating regime (Indonesia, Philippines and Korea).

Table 5. The fraction of the price to external shocks

External shocks	Period (months)	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
OIL	1–12	20.23	1.55	5.03	3.85	3.14	5.33	13.54
	13–24	30.75	2.89	7.25	6.08	4.96	10.74	17.51
UIP	1–12	3.19	2.36	1.78	3.44	2.28	2.01	2.29
	13–24	4.41	4.64	3.74	6.16	4.35	4.19	3.86
UIR	1–12	6.75	1.69	9.27	3.85	5.48	1.82	3.27
	13–24	14.76	3.47	18.00	8.35	5.20	3.34	6.32
Sum	1–12	30.17	5.60	16.08	11.14	10.90	9.15	19.10
	13–24	49.92	11.00	28.99	20.59	14.51	18.27	27.69

As shown in Table 5, external shocks explain more in variance of price level than variance of output and exchange rate. The mammoth foreign exchange reserves incorporated with sterilization intervention allow China to stabilize both exchange rate and price level regarding external fluctuations. Singapore's authorities are also successful in pegging its currency as well as keeping inflation at a low rate. On the other hand, Southeast Asian countries like Vietnam, Indonesia, Malaysia and Philippines indicate the tradeoff between exchange rate and price level stability in the presence of external shocks. Korea is an outlier with both two variables' fluctuations explained largely by external shocks. This is due to the dependence of this country to oil imports. Opposing to other countries in the sample, Korea has to import crude oil for most energy demand.

Generally, oil prices and U.S. monetary policy shocks are more important than U.S. output shocks in explaining fluctuations of domestic variables. The increasing role of U.S. monetary policy may indicate the financial deepening process of East Asian countries. On the other hand, the limited influence of U.S. output shocks is consistent with two major changes in international trade in our sample's period. Firstly, most of countries' proportions of exports to U.S. to total exports have decreased since 2000. Secondly, the emergence of China as a main importer has risen significantly both at the worldwide level and the regional one. The higher share of China in intra-regional trade suggests an increasing role of this country in the East Asia trade with other areas, particularly the United States. These facts reveal that U.S. output shock tends to indirectly affect East Asia via the role of China. From this perspective, Allegret and Essaadi (2011) find that total intra-regional imports of China are co-integrated with the U.S. GDP, confirming this indirect influence. In World Economic Outlook 2007, IMF staff also predict a decreasing role of U.S. in real economy while emphasize the potential impact of U.S. financial variables.

4.2 The Impact of External Shocks on Domestic Variables

Theoretically, oil prices shocks are expected to have negative impacts on the economy through varied transmission mechanisms as mentioned above. In contrast, our results in Table 6 point out the opposite relationship, oil prices shocks make domestic outputs increase.

Table 6. Impulse response functions of output to external shocks

External shocks	Period (months)	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
OIL	1-6	0.0263	0.0011	0.0075	0.0193	-0.0006	0.0100	-0.0049
	1-12	-0.0140	-0.0009	-0.0002	0.0132	0.0000	0.0007	-0.0013
UIP	1-6	0.0024	0.0004	0.0071	0.0054	0.0014	0.0059	-0.0068
	1-12	0.0016	-0.0010	0.0121	0.0108	-0.0001	0.0045	-0.0004
UIR	1-6	-0.0058	-0.0006	0.0054	-0.0022	-0.0001	0.0155	-0.0057
	1-12	-0.0040	0.0016	0.0122	0.0166	0.0001	0.0184	-0.0011

Note: "1-6" stands for the accumulated responses in 6 month after a shock. "1-12" stands for the accumulated responses in 12 months after a shock.

Those striking impulse responses can be explained by Kilian (2009). According to Kilian, oil shocks have three types: oil supply shocks, precautionary demand shocks and aggregate demand shocks. While the two first shocks may lead to a negative response of output, the latter may lead to a positive one. Since 2000, oil prices shocks are largely driven by demand shocks. Increasing oil prices may reflect the rapid growth of developed countries. As a result, exports of East Asia to those countries should be higher, resulting in the positive response of output. This perspective is confirmed by Allegret et al. (2012). Being a proxy for the growth of developed economies, U.S. output shocks may support output growth of those countries which have large trade openness like East Asia. However, U.S. output shocks have weak influences on domestic outputs. This result supports the viewpoint that the direct impact of U.S., or advanced economies in general, on business cycle of Asian countries has decreased in recent years (Kose & Prasad, 2010). Regarding the presence of U.S. monetary policy shocks, only Chinese output remains constant while other countries' outputs experience an upward trend. To sum up, responses of East Asian outputs to external shocks tend to be positive in the long-term, implying the business cycle of in-sample economies.

Table 7. Impulse response functions of exchange rate to external shocks

External shocks	Period (months)	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
OIL	1-6	0.0011	-0.0080	-0.0014	0.0063	-0.0002	0.0021	0.0807
	1-12	0.0004	-0.0008	0.0013	0.0137	-0.0002	0.0029	0.0877
UIP	1-6	0.0016	-0.0141	-0.0029	-0.0089	-0.0002	-0.0003	-0.0021
	1-12	0.0010	-0.0132	-0.0063	-0.0125	-0.0002	0.0007	0.0065
UIR	1-6	-0.0013	-0.0015	-0.0003	-0.0029	0.0001	0.0010	-0.0045
	1-12	-0.0025	-0.0066	-0.0037	-0.0059	-0.0001	0.0024	-0.0165

According to Table 7, responses of exchange rates diverge across countries following different exchange rate regimes. Exchange rates of pegging group including Vietnam, Malaysia, China and Singapore tend to be stable. Being the third largest oil exporting in the region, Indonesia has domestic currency appreciated in the aftermath of the oil shocks. On the other hand, Korean Won depreciates after a slight appreciation in the first six months. U.S. output shocks let the USD depreciate against other currencies. This finding can be explained by income effect. An increase in U.S. output may make American wealthier, encouraging them to use imports, leading to the depreciation of USD. U.S. monetary shocks have insignificant impacts on domestic currencies excluding Korean Won which has the highest level of flexibility. In particular, after four months, Korean Won appreciates and this trend remains in the long-term. This response is consistent with Uncovered Interest rate Parity, which predicts a

depreciation of a currency following an increase in interest rate.

Table 8. Impulse response functions of prices to external shocks

External shocks	Period (months)	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
OIL	1-6	0.0005	0.0024	0.0027	0.0007	0.0002	0.0021	-0.0002
	1-12	-0.0001	0.0041	0.0028	-0.0007	0.0001	0.0036	0.0001
UIP	1-6	-0.0004	-0.0016	-0.0007	-0.0024	0.0001	0.0007	0.0000
	1-12	0.0001	-0.0009	-0.0005	-0.0025	0.0001	0.0018	-0.0001
UIR	1-6	-0.0011	-0.0017	-0.0011	-0.0011	0.0002	-0.0007	-0.0002
	1-12	0.0002	-0.0010	-0.0005	-0.0010	0.0001	-0.0003	0.0000

Considering the fluctuations of domestic price level in Table 8, oil prices shocks have significant positive impacts on prices in the region. Those impacts are persistent reflecting the importance of oil in price level of East Asian countries. In contrast, the impact of U.S. output shocks does not seem to exert a significant impact on prices. This may due to the high levels of productive capacity of countries in our sample, making supply effects become predominant relative to demand ones on price behavior. Responses of prices to U.S. monetary shocks are quite similar; in this case, price levels tend to go down. An increase in Fed Fund rate may affect the capital flows; in particular, reduce the inflows of East Asia. This may result in a decrease in domestic investment as well as in aggregate demand, placing a downward pressure on domestic prices. Additionally, for countries applying soft peg, a rise in foreign interest rate may lead to the co-movement in domestic interest rates, making price levels decrease.

Our dataset considers seven East Asian countries which follow different exchange rate regimes as well as monetary frameworks. As can be seen from the results, responses of exchange rates are varied across countries implementing soft peg and floating. However, responses of domestic outputs and prices are quite similar in sign. This evidence suggests that the signs of impulse responses may not depend on the choice of exchange rate regimes. Flood and Rose (1995) support this point when investigating OECD countries. They conclude that the fluctuations of macroeconomic variables are not significantly different between countries with different exchange rate regimes. In a recent study, Mackowiak (2007) confirms this idea using data of Asian and Latin American emerging markets.

4.3 Correlations of Domestic Variables Responses to External Shocks

In order to examine the co-movement of economies in the region, we calculate the correlations of domestic responses to external shocks, following the work of Canova (2005). Indeed, positive correlations can indicate symmetric responses while negative or insignificant correlations may indicate asymmetric ones.

Table 9. Correlations of output responses to external shocks

Oil prices	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.2213	1.0000					
Malaysia	0.0960	0.7660	1.0000				
Philippines	0.1343	0.4270	0.4051	1.0000			
China	0.1557	0.0221	-0.0239	0.3829	1.0000		
Singapore	0.7786	0.1726	0.1132	0.4853	0.0480	1.0000	
Korea	0.1873	0.2995	0.3910	0.5798	0.6343	0.1726	1.0000
U.S. output	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	-0.3719	1.0000					
Malaysia	0.2956	-0.3031	1.0000				
Philippines	-0.2047	-0.2025	-0.3476	1.0000			

China	0.3723	-0.2001	0.7325	-0.5266	1.0000		
Singapore	0.0011	0.0631	0.5309	-0.2809	0.3083	1.0000	
Korea	0.1557	-0.4384	0.2716	-0.0059	-0.2162	0.2250	1.0000
U.S. monetary policy	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.4025	1.0000					
Malaysia	0.2665	0.1388	1.0000				
Philippines	-0.6677	-0.6566	-0.1055	1.0000			
China	0.7644	0.6707	0.0213	-0.6122	1.0000		
Singapore	0.2242	0.0035	-0.4495	0.1380	0.2911	1.0000	
Korea	0.1677	-0.0010	0.7339	-0.0125	0.1245	-0.5644	1.0000

Note: Significantly positive coefficients are bold. The correlation coefficients are calculated over 5 years.

Table 9 exhibits the correlations of output responses to external shocks. Against the oil prices shocks, domestic outputs have positive correlations for many pairs of countries. As mentioned above, oil prices shocks exert positive impacts on in-sample countries. This can be explained by interpreting these shocks as proxies for growth of advanced countries instead of supply-side shocks. Thus, oil prices shocks may lead to symmetric responses in outputs of East Asian economies. Nevertheless, no clear trend emerges in correlations of output responses to two U.S. shocks. This finding implies U.S. economy does not have broad influence in East Asia; in other words, the dependence degrees of those countries to U.S. are different. The results also reflect the role of China. When U.S. shocks occur, output of China tends to correlate with the one of Vietnam, Indonesia and Malaysia. These co-movements confirm the point that the trade impact of U.S. in Southeast Asia has been transmitted through China.

Table 10. Correlations of exchange rate responses to external shocks

Oil prices	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.5127	1.0000					
Malaysia	0.4978	0.7907	1.0000				
Philippines	0.3527	0.6791	0.6888	1.0000			
China	0.3160	0.4997	0.5744	0.0337	1.0000		
Singapore	0.3681	-0.2104	-0.2006	-0.1975	-0.0506	1.0000	
Korea	0.7178	0.7352	0.8058	0.6589	0.4088	-0.1632	1.0000
U.S. output	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	-0.2093	1.0000					
Malaysia	-0.4564	0.2903	1.0000				
Philippines	-0.2372	0.4340	0.1988	1.0000			
China	0.3475	-0.2195	0.0438	-0.1142	1.0000		
Singapore	0.5521	0.4010	-0.4046	0.2239	-0.1504	1.0000	
Korea	-0.2225	0.7310	0.5657	0.3938	0.0486	0.1016	1.0000
U.S. monetary policy	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.2052	1.0000					
Malaysia	0.4911	0.0787	1.0000				

Philippines	0.3752	0.0284	0.6053	1.0000			
China	0.1139	0.3153	0.2043	-0.1400	1.0000		
Singapore	-0.3126	0.4402	-0.2567	-0.2855	0.3723	1.0000	
Korea	0.2882	-0.0160	0.5678	0.2803	-0.4089	-0.3280	1.0000

Oil prices also lead to symmetric responses in exchange rates while two U.S. shocks do not. Compared to two other domestic variables, price level is the one seemed to be mostly correlated. Oil prices remain the dominant shocks that lead to positive correlations in a whole sample. Regarding the impact of U.S. shocks, prices of developing Southeast Asian countries (Vietnam, Indonesia, Malaysia and Philippines) indicate clear interactions while responses of price in China, Singapore and Korea appear to be uncorrelated in most cases.

Table 11. Correlations of prices responses to external shocks

Oil prices	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.4019	1.0000					
Malaysia	0.6302	0.1560	1.0000				
Philippines	0.6462	0.0390	0.6510	1.0000			
China	0.7937	0.4179	0.8059	0.6697	1.0000		
Singapore	0.7962	0.6743	0.3760	0.3549	0.6678	1.0000	
Korea	0.3538	-0.0776	0.6910	0.4949	0.7208	0.1712	1.0000
U.S. output	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.3544	1.0000					
Malaysia	0.3887	0.6603	1.0000				
Philippines	0.5290	0.6382	0.4069	1.0000			
China	0.1990	-0.4030	0.2575	-0.1494	1.0000		
Singapore	0.4079	0.5720	0.7686	0.2311	0.3250	1.0000	
Korea	0.1249	0.5977	0.0928	0.2708	-0.6326	0.1791	1.0000
U.S. monetary policy	Vietnam	Indonesia	Malaysia	Philippines	China	Singapore	Korea
Vietnam	1.0000						
Indonesia	0.5703	1.0000					
Malaysia	0.3664	0.8074	1.0000				
Philippines	0.6542	0.5000	0.5980	1.0000			
China	0.1204	0.0451	-0.0049	-0.0216	1.0000		
Singapore	0.4243	0.3412	0.1705	0.4102	0.5172	1.0000	
Korea	0.5126	0.8379	0.6187	0.4765	0.3187	0.5187	1.0000

5. Conclusions

This paper investigates the importance of external shocks in the domestic variables volatilities of East Asian countries. Using data from seven countries in region following different exchange rate regimes as well as monetary frameworks, we aim to capture whether those countries response symmetrically to the same external shocks.

The variance decomposition results show that oil prices shocks and U.S. monetary policy shocks explain more fluctuations in domestic variables than U.S. output shocks. This may reflect East Asian economies tend to be increasingly exposed to financial shocks as opposed to trade shocks. The importance of external shocks in the

variance of exchange rates is distinguished between pegging currencies and floating ones. Incorporating the results of exchange rates and price levels may reveal the authorities' decisions in implementing Impossible Trinity. While some countries seem to be successful in controlling both exchange rates and inflation (China and Singapore), the others experience the tradeoff (Vietnam, Indonesia, Malaysia and Philippines). According to impulse responses functions, exchange rates responses tend to be different between two regime groups. On the other hand, the responses of output and prices are quite more similar. Those similarities confirm the finding in the literature that macroeconomic indicators fluctuations do not depend on exchange rate regimes.

Correlations of responses of domestic variables to external shocks display three main findings. The first one is the dominant role of oil prices shocks, leading to symmetric responses in outputs, exchange rates and prices. Secondly, the trade impact of U.S. output to Southeast Asian economies has been transmitted through China. And the last one, there is no clear convergence in the responses of countries which follow the same exchange rate regimes and monetary frameworks. In particular, Indonesia, Philippines and Korea choose floating regimes and inflation targeting; however, those countries do not exhibit a high degree of symmetry in the responses of domestic variables. Our findings challenge the conclusion of Rose (2011) but are consistent with Mackowiak (2007) and Allegret et al. (2012).

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Note

Note 1. The exchange rate is defined as the number of units of the currency of a given emerging market per one U.S. dollar.

Appendix

Appendix A. The exchange rate regimes and monetary frameworks of seven East Asian countries

Country	Currency	Code	Exchange Rate Regime	Monetary Framework				
				(1)	(2)	(3)	(4)	(5)
China	Yuan	CNY	Crawl-like arrangement		x			
Korea	Won	KRW	Floating			x		
Indonesia	Rupiah	IDR	Floating			x		
Malaysia	Ringgit	MYR	Other managed arrangement					x
Philippines	Peso	PHP	Floating			x		
Singapore	Dollar	SGD	Other managed arrangement	x				
Vietnam	Dong	VND	Stabilized Arrangement	x				

Note: (1) Exchange rate anchor; (2) Monetary aggregate target; (3) Inflation targeting framework; (4) IMF-supported or other monetary program; (5) Other.

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