

Spillover Effects of uncertainty shocks on the Asia-Pacific Region

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Very Preliminary Draft

Abstract

This article estimates the effects of uncertainty shocks on several macroeconomic and financial variables for the Asia-Pacific region. We consider two measures of risk: US policy uncertainty and VIX indexes. We find systematic re-allocation of foreign portfolio toward Asia-Pacific region. These countries have responded global uncertainty with accommodative monetary policy. Lower interests rate were coupled with currency appreciation, asset price inflation and strong movements in capital flows. Foreign investors have shifted their preferences for Asia-Pacific bonds. If, prior to the Global Financial Crisis (GFC), the global savings glut hypothesis (i.e. Asian savings flight to the U.S.) was one of the major effects on booming U.S. house prices, it is clear that the reverse effect has dominated the economy after the GFC: funds flight to the Asia-Pacific region putting pressure on asset prices and leading to financial vulnerability.

Our analysis confirms findings arising from on recent discussion recently opened by Rey (2013) on "dilemma", taking over from "trilemma", since central banks appear to lose their monetary policy independency even under floating exchange rates.

Keywords: Uncertainty shocks, international spillovers, capital inflows, Asia-Pacific region, Panel Var.

JEL-Codes: E43, E44, E52, E65, F42, F47

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1. INTRODUCTION

Since the Global Financial Crisis (GFC), many countries in the Asia-Pacific region have experienced several episodes of significant capital inflows and exchange rate appreciation, which have challenged policy makers in maintaining financial stability due to continuing pressures in asset markets. The deep pressure on currencies in the Asia-Pacific region could lead to disruptions in competitiveness and negatively affect the real economy. Many central banks have lowered their policy rate in response to the strong currency appreciation. As a consequence, cheaper external funding amplifies exposure to foreign-currency denominated debt on domestic balance sheets. In addition, some of these flows could fuel credit and asset price booms, thereby amplifying financial fragilities. These stylized facts are the results of a series of monetary policy easing in advanced economies, coupled with policy uncertainty and fluctuations in market volatility.

Does all this fear of uncertainty spillover to Asia-Pacific region? What is the international transmission mechanism of uncertainty? How large are the spillovers to economic activity in this region? And, more importantly, how can we measure uncertainty? This work aims to assess the evolution of spillover effects of the aforementioned channels, and evaluate the implications for the macro economy going forward.

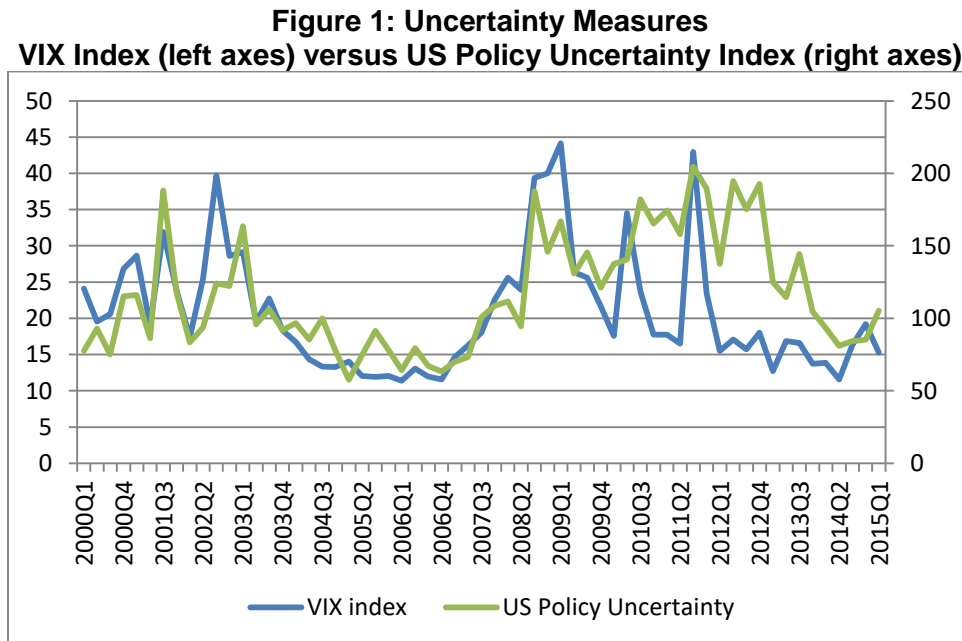
A commonly held view is that high levels of uncertainty are tied with high levels of policy uncertainty, which has held back global investment and output growth in the years following the GFC. Policy uncertainty could also increase global risk aversion, resulting in sharp corrections in financial markets and capital flows to and from emerging markets.

Figure 1 plots the US policy uncertainty (PU) index³ and the Chicago Board Options Exchange Market Volatility Index (VIX). The US PU index is estimated by Baker, Bloom and Davis (2015) who construct the index based on newspaper coverage frequency. The VIX index measures global risk aversion and global financial market uncertainty derived from implied stock market volatility. Figure 1 indicates a strong co-movement between policy uncertainty measures and the VIX index.⁴ Hypothetically, there should be a strong relationship between US economic policy uncertainty and the VIX, higher policy uncertainty equating to higher stock price volatility. The VIX helps to gauge the degree of global risk aversion; the higher the VIX, the more demand for safe-haven currency and the less appetite for risk. US policy uncertainty itself has a major influence on global risk sentiment and international capital flows. Even if the two indices are quite similar, investors can respond in different ways to changes and the spillover effects to emerging economies, along with the international transmission mechanism, can also vary greatly.

³ Baker, S., N. Bloom, and S. Davis (2015), construct the uncertainty policy index by extracting words from 10 leading US newspaper such as “economic” or “economy”; “uncertain” or “uncertainty”; and one or more of “congress”, “deficit”, “Federal Reserve”, “legislation”, “regulation” or “White House”.

⁴ Similar measures are proposed by Fernández-Villaverde and others (2011) and Born and Pfeifer (2011) who use time series methods to estimate the time-varying volatility of taxes and government spending.

The idea that uncertainty can adversely affect economic activity dates back to Bernanke (1983) and Bloom (2009) who found that increasing uncertainty delays investment and the consumption of durables. Since then, a rapidly expanding literature has examined the impact on economic activities of various kinds of uncertainty.⁵ Rey (2013) shows how fluctuations in uncertainty and risk aversion lead to a global financial cycle in gross capital flows, credit creation and asset prices. In particular, Rey (2013) provides evidence of a capital inflows surge coupled with prolonged lowering of the VIX during the period preceding the GFC in 2002-2007. A very high degree of co-movement is detected between credit inflows and portfolio debt inflows, even if, among all flows, credit flows reveal higher volatility and procyclical components, with the same intensity before and during the crisis. Regarding the transmission of uncertainty shocks, Mumtaz and Theodoridis (2012) estimate a TVP-VAR model to evaluate the impact on the UK of US GDP growth volatility shocks. Colombo (2013) carries a similar analysis with a focus on policy uncertainty in the US and the Euro Area, and finds that US policy uncertainty shocks have a deeper spillover effect on Euro Area economic activity than Euro Area policy uncertainty itself. Up to date, there exists minimal literature studying the spillover effects of policy uncertainty on emerging market economies (EMEs). Burger et al. (2015) analyze the impact of portfolio re-allocations on US bond portfolios and find that global push factors such as low US long-term interest rates and quantitative easing have contributed to the increasing appetite of US investors towards emerging market (EMEs) securities. Moreover, they show that capital flows were directed to countries with sound macroeconomic fundamentals, such as low inflation volatility and positive current account balances.



⁵ See Baker et al. (2015), Jurado et al. (2013), Leduc and Liu (2012), and Caggiano et al. (2013).

Fratzscher (2012) and Forbes and Warnock (2012a) show that global risk, proxied by the VIX index, is an important determinant of capital flows. Moreover, they find that among other push/pull factors, policy uncertainty has an impact on portfolio flows. Gauvin, McLoughlin and Reinhardt (2014) show that policy uncertainty in advanced economies spill over to EMEs via gross portfolio bond and equity flows. We expand on these previous papers, by explicitly considering the impact on the Asia-Pacific region not only on capital flows but also on other macro-financial variables.

We estimate a Panel Vector Autoregressive (VAR) model for 12 countries across the Asia-Pacific region since the GFC. We find that the Asia-Pacific region has responded to global uncertainty with accommodative monetary policy. Lower interest rates were coupled with currency appreciation, asset price inflation and strong movements in capital flows. Foreign investors have shifted their preferences for Asia-Pacific bonds and equities. Prior to the GFC, during periods of low volatility (Great Moderation), the global saving glut hypothesis (i.e. Asian savings flight to the U.S.) was one of the major effects on booming US house prices, whereas after the GFC the reverse path has been clearly dominant: foreign investors leave countries where uncertainty shocks originated and there is a flight of funds to the Asia-Pacific region putting pressure on asset prices and leading to financial vulnerability.

The paper is organized as follows: Section 2 describes the data and defines the transmission channels. Section 3 discusses the Panel VAR technique used in the estimation. Section 4 presents baseline results. Section 5 presents more extended results. Section 7 concludes.

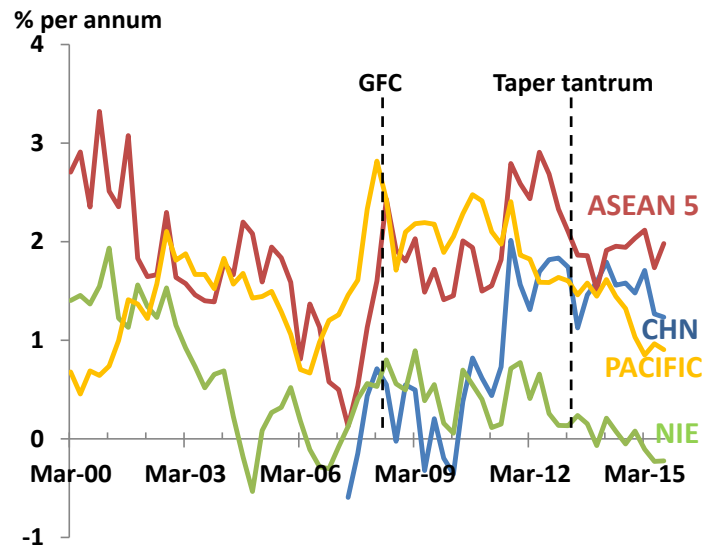
2. STYLIZED FACT AND PORTFOLIO REBALANCING CHANNELS

Asian economies were affected by the global financial crisis and the unconventional monetary policy of advanced economies in several ways. Most importantly, the volatile capital flows placed pressure on asset prices and foreign exchange rates, and made monetary policy and macroeconomic management more complicated. In addition, they created more uncertainty in financial market conditions and real economic activities.

Volatility in international capital flows were driven by both cyclical and structural factors. Cyclically, the relative return on investment in Asian financial assets was higher than in advanced economies. Asia had relatively higher nominal yields and real economic growth prospects than advanced economies. The ten year sovereign bond spreads of Asian countries over the US increased significantly after the global financial crisis, especially in the case of ASEAN-5, Pacific economies and China (Figure 2). The higher relative returns synchronize with higher economic growth prospects in Asia. During the pre-crisis period of 2000-2007 and the post-crisis period of 2008-2013, real economic growth in Asia was quite high, especially in China and ASEAN5; in contrast, advanced economies like the US and EU show negative economic growth (Figure 3). Considering short term interest rates, policy interest rates in Asia have remained positive and by far above the zero lower bound. Policy interest rates in Asia (as in Figure 4) remained high in contrast to advanced economies who acted to maintain low

interest rates and introduced a series of quantitative easing to address weak growth prospects and high unemployment. Apart from higher interest returns from holding Asian assets, the foreign exchange rate return was also attractive to investors. Asian currencies showed strong appreciation trends after the global financial crisis (Figure 5). This increases the expected return from converting the return receipt back into US dollars.

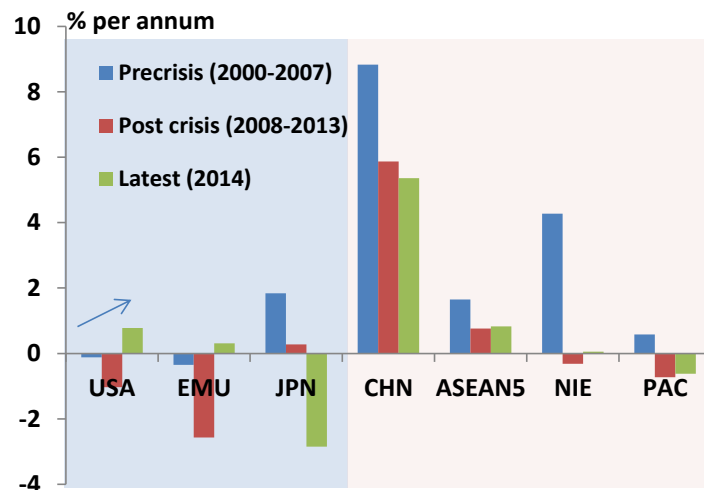
Figure 2: a 10-year sovereign bond spreads over the US (%)



Source: Author's calculation from World Development Indicators, WB.

Note: ASEAN-5 countries consist of Indonesia, Malaysia, the Philippines, Singapore and Thailand; NIE stands for the newly industrialized economies of Asia consisting of Hong Kong SAR and Korea; PAC is Pacific countries which are Australia and New Zealand.

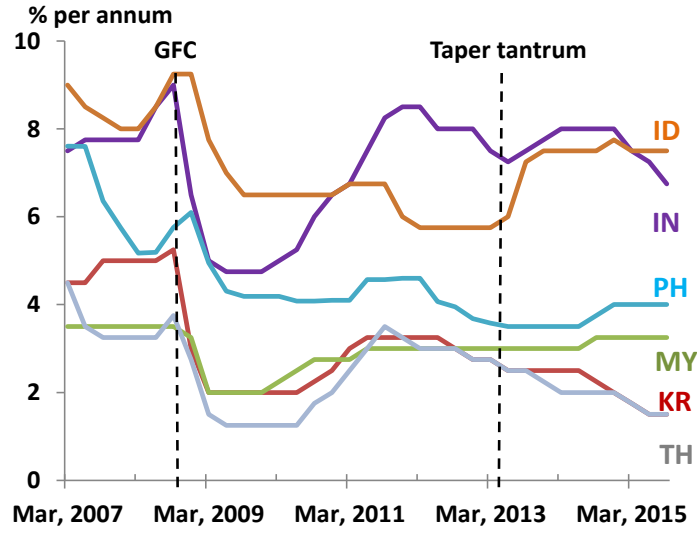
Figure 3: Real GDP growth rate (annual %)



Source: Author's calculation from World Development Indicators, WB.

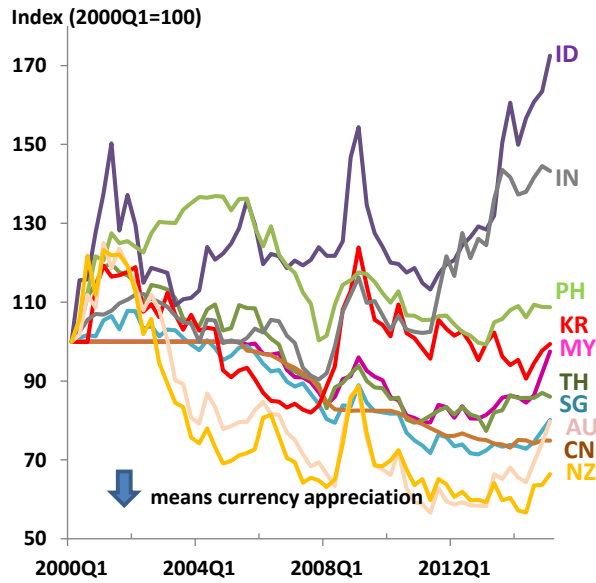
Note: ASEAN-5 countries consist of Indonesia, Malaysia, the Philippines, Singapore and Thailand; NIEs stands for the newly industrialized economies of Asia consisting of Hong Kong SAR and Korea; PAC is Pacific countries which are Australia and New Zealand.

Figure 4: policy interest rates (%)



Source: CEIC and National Central Banks.

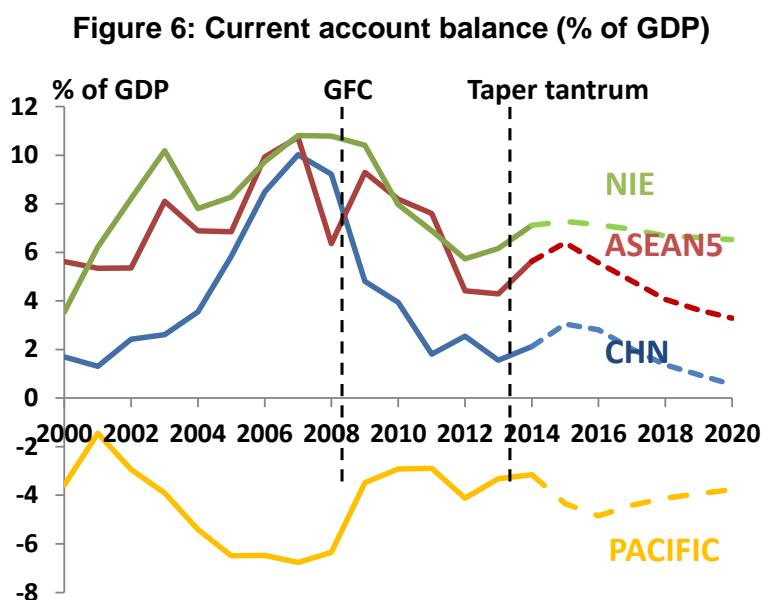
Figure 5: Exchange rate (local currency versus US dollar)



Source: Authors' calculation from Bloomberg.

Structurally, the inflows into Asia have also been due to a fundamentals-based rebalancing of institutional portfolios toward EM assets. Asian economies were resilient during the GFC, and maintained better external and fiscal fundamentals than many advanced economies. As a result, the risk premium on holding Asian assets has declined, as reflected in a positive trend for Asian sovereign ratings. Figure 6 shows that during 2000-2007, the external fundamentals of Asian economies were very strong as the current account improved drastically. During 2008-2013, the current account remained in surplus, although it slowed down due to weakening global trade and economy.

Both cyclical and structural factors thus reinforced the attractiveness of these markets for foreign investors. Global liquidity and portfolio rebalancing play major role in capital inflows to the Asia-Pacific region. The increase in capital flows was rapid and mostly made up of portfolio flows; banking flows remained slow in this period. To identify the portfolio balance channel the candidates are the yield spread, risk premium, GDP growth, and external fundamentals. All these variables capture the effect generated by quantitative easing policies in lowering long-term yields, and hence temporal rebalancing toward assets in the Asia-Pacific region.



Source: World economic outlook, IMF

Note: ASEAN-5 countries consist of Indonesia, Malaysia, the Philippines, Singapore and Thailand; NIEs stands for the newly industrialized economies of Asia consisting of Hong Kong SAR and Korea; PAC is Pacific countries which are Australia and New Zealand; figures after 2014 are the IMF forecasts.

3. MODEL AND IDENTIFICATION

This work aims to estimate the impact of uncertainty shocks on the Asia-Pacific region by using a Panel Vector Auto Regression (Panel VAR) model. Our sample includes several Asian countries (China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore and Thailand) and the other two Pacific countries (Australia and New Zealand). The time period covered is from the first quarter of 2000 through to the last quarter of 2015.

The Panel VAR solves the following system:

$$Y_{it} = A Y_{it-1} + B X_{it-1} + u_i + e_{it}$$

where Y_{it} indicates a (1xk) vector of dependent variables, X_{it-1} refers to a (1x1) vector of exogenous covariates and u_i and e_{it} represent a (1xk) vectors of dependent variable-specific panel fixed-effects and idiosyncratic errors, respectively. For all $t>s$, $E[e_{it}]=0$, $E[e_{it}' e_{it}]=\Sigma$ and $E[e_{it}' e_{is}]=\Sigma 0$.

The Panel VAR is estimated using the GMM (General Method of Moments) technique; this means that each endogenous variable is estimated on its own lag(s) as well as the lags of all other variables in the system. We follow Love and Zicchino (2006) in applying forward mean differencing and orthogonal deviations (the Helmert procedure) to remove the fixed effects, all variables in the model are transformed in deviations from forward means. See Arellano and Bover (1995).

The identification scheme follows the Cholesky's decomposition of the covariance matrix, where a recursive exogeneity structure is assumed.⁶ As a result the first variable in the Panel VAR reacts contemporaneously to its own shock, the second variable in the Panel VAR reacts contemporaneously to the shocks of the first variable and to its own shock, and similar for the rest of the variables. Therefore, the last variable in the system reacts to all shocks of previous variables in the ordering. We order the variable representing the uncertainty shock first in the system of the Panel VAR because we assume that this shock comes from the conduct of the US monetary policy and Asia-Pacific variables respond to this exogenous shock through different channels. We set the number of lags in the Panel VAR equal to one, based on the Schwarz information criterion and Hannan–Quinn information criterion.

4. IMPULSE RESPONSES OF BASIC MODEL

In order to understand what proxy to use to identify uncertainty shocks, we first estimate a basic Panel VAR which includes the US policy uncertainty index, the VIX index, current account (%GDP), nominal exchange rate and short-term (ST) policy rate in the Asia-Pacific region. We include the following variables:

$$Y_{it} = \{\text{US Policy Uncertainty, VIX Index, CA (\%GDP), Nom. Exch. Rate, ST Rate}\}$$

It is not easy to capture the right ordering of variables. We assume that the VIX Index responds to current and past values of the US policy uncertainty index. However, the

⁶ The orthogonalized shocks should not be interpreted as structural shocks, but rather as orthogonalized reduced-form shocks. Identification of structural shocks is possible under a different shock identification scheme, such as a combination of long-run and short-run restrictions or sign restrictions.

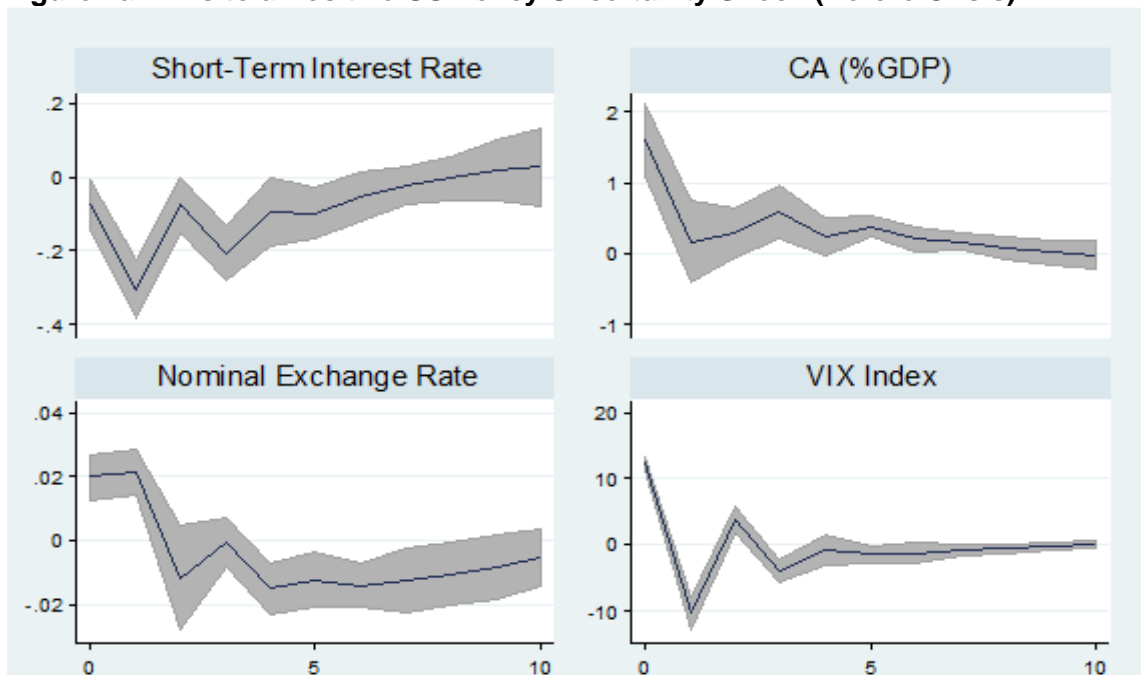
ordering is invariant. Results of the Granger causality tests show that policy uncertainty Granger-causes market volatility, and the VIX index Granger-causes the policy uncertainty index. We study the spillover effects via the portfolio rebalancing channel; therefore we assume that international investors react to policy uncertainty and market volatility by increasing their asset allocation to the Asia-Pacific region. The resulting surge of capital inflow leads to currency appreciation and central banks accommodate their policy rates in order to prevent excess appreciation. As a result, short-term policy rates are placed last in the ordering since they reflect the reaction of Central Bank to global phenomena.

We also split the sample period in to two subsamples in order to evaluate if the spillover effects of uncertainty shocks on the Asia-Pacific region has changed after the GFC.

Figures 7a-7b consider the impact of US policy uncertainty shock before the crisis (2000q1-2006q4) and after the crisis (2008q1-2015q1). We want to address is whether foreign investors buy assets abroad during the financial crisis. In particular, we want to address if the heightened stress following the global crisis systematically increases the tendency of portfolio outflows from countries under stress, relative to calm periods such as the Great Moderation.

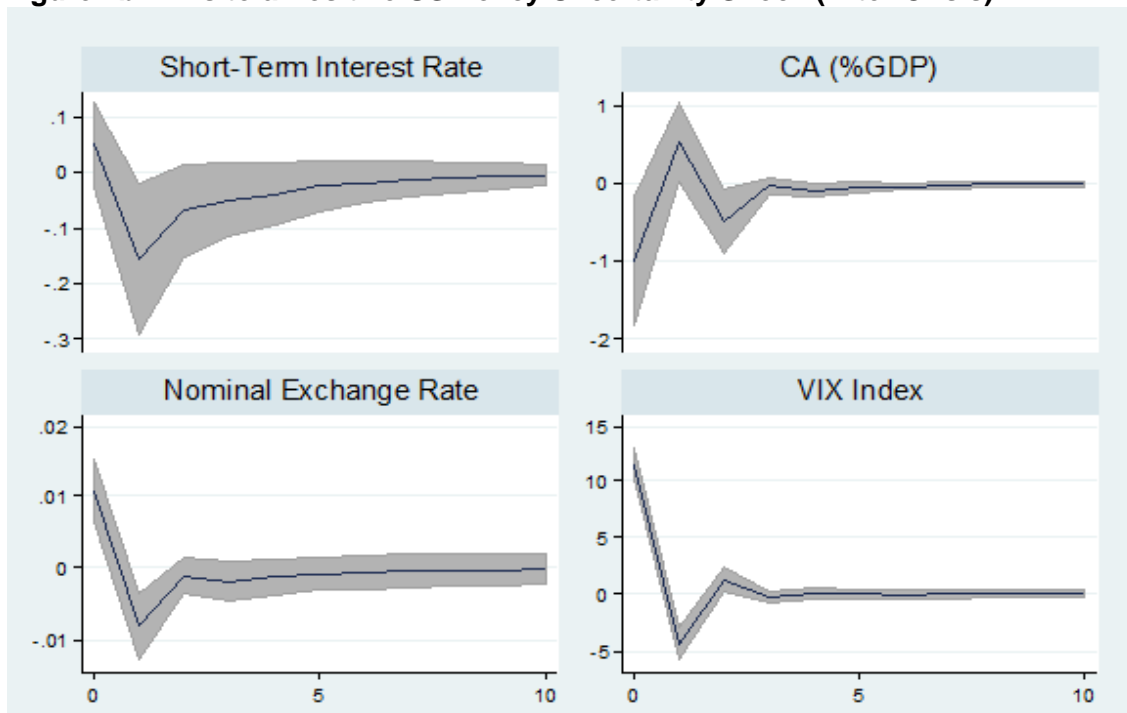
Positive US policy uncertainty leads to a current account surplus before the crisis and a current account deficit after the crisis. This can be explained by the fact that increasing US policy uncertainty since the global financial crisis in 2007 has generates a negative impact on US economic activities and negative sentiment on the global economy. This worsens the trade conditions of Asian economies. The sustained global economic slowdown during 2008-2013 resulted in a weakening external position for emerging countries; the current account of Asia-Pacific economies deteriorates.

Figure 7a: IRFs to a Positive US Policy Uncertainty Shock (Before Crisis)



Confidence Interval 95%.

Figure 7b: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



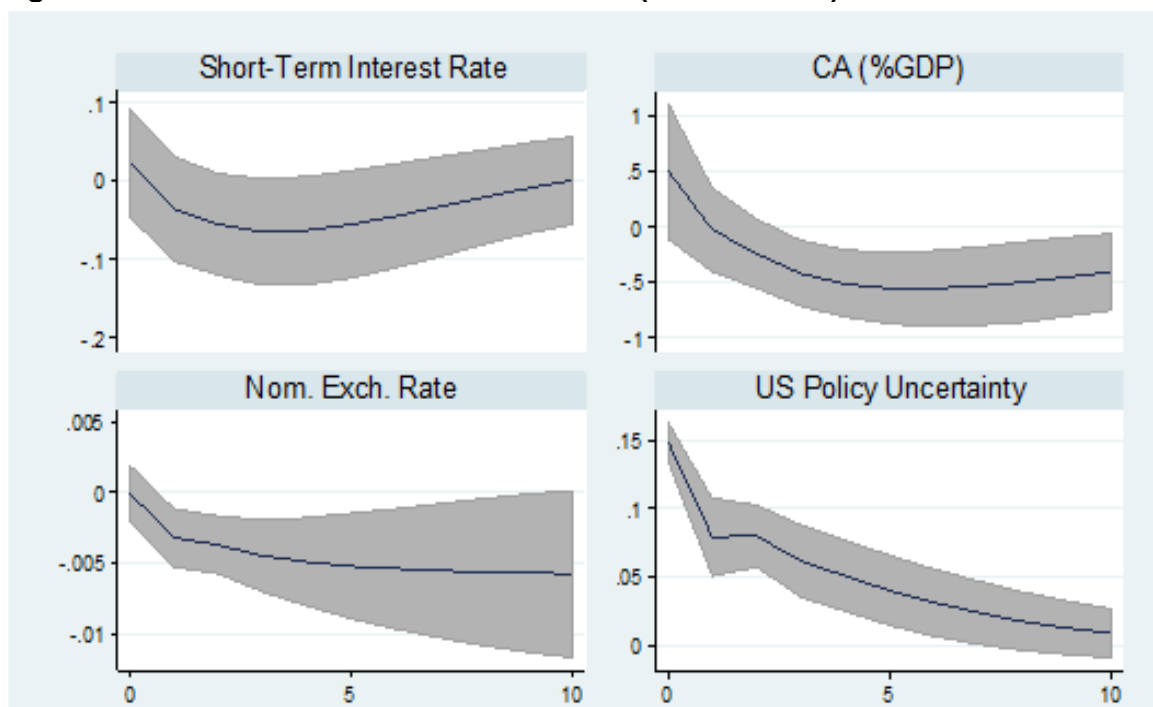
Confidence Interval 95%.

The VIX index increases on impact, before and after the crisis. The index then becomes negative after a few quarters. This result is in line with data showing high volatility of the VIX index since the beginning of the US recession. Exchange rate depreciates before the crisis and appreciates afterwards. This is due to increasing capital inflow into Asian countries with foreign investors searching for higher expected returns on investment. Short-term interest rates become negative just one quarter after the crisis only after 1 quarter, as policy authorities have to lower the policy rate to avoid excess currency appreciation.

Figures 8a-8b reports impulse responses to a positive shock to the VIX index. Relative to policy uncertainty shocks, VIX index shocks lead to increasing policy uncertainty and decreasing interest rates. Figures 8a and 8b report different signs from an increase in market volatility, except for the US policy uncertainty index. The main difference with the latter index is that, before the crisis, the response is much long-lasting relative to post crisis periods. The Asia-Pacific region responds to a increase in the VIX index by running a current account deficit before the crisis, although only after 3 quarters, while a current account surplus is detected after the crisis. Responses on the current account are mainly driven by Pacific countries.



Figure 8a: IRFs to a Positive VIX Index Shock (Before Crisis)



Confidence Interval 95%.

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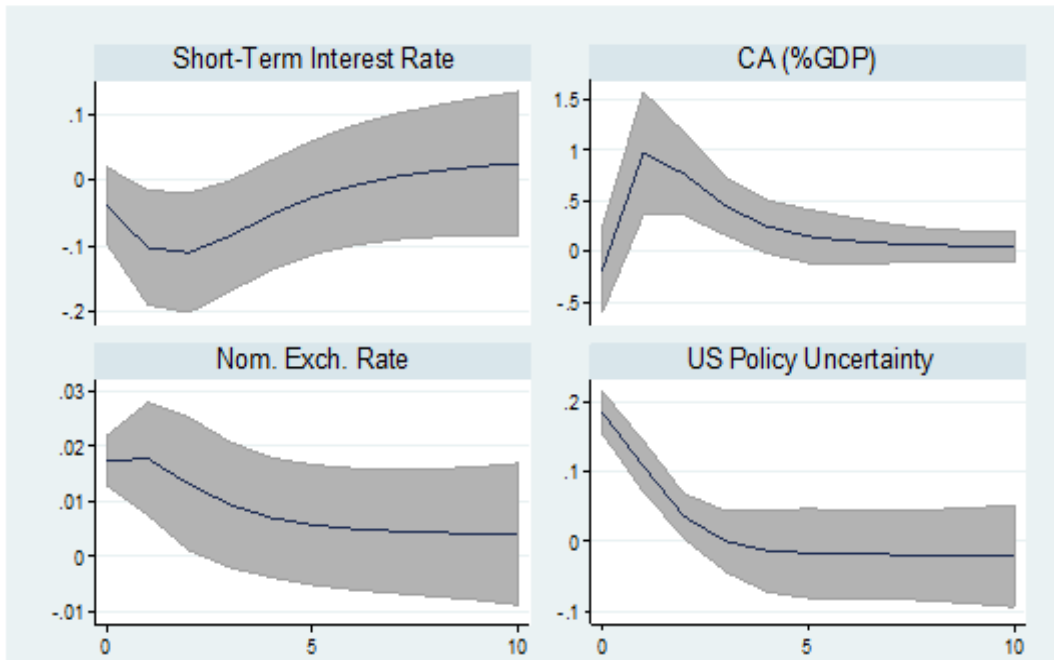
The bilateral nominal exchange rate appreciates before the crisis and depreciates after the crisis. We would expect an appreciation after the crisis, rather than depreciation. However, India and Indonesia show strong bilateral depreciation of their local currencies against the US dollar, and therefore must respond strongly to volatility changes in global markets. The response to the short-term interest rate is not significant before the crisis, while it is briefly negative post-crisis. This means that Asia-Pacific economies decrease their policy rate in order to stimulate the economy at a given market volatility.

Table 1 reports the variance decomposition of the forecast error, only for the after crisis period. We show only the steps at 1, 4, 12 and 24. The VIX index explains about 54% at 1-step horizon and about 34% at 24-steps horizon of the variance of the US policy uncertainty index, respectively. On the other hand, the US policy uncertainty index explains very little of the volatility of the VIX index. However, the US policy uncertainty explains more than the VIX index, in terms of bilateral exchange rate volatility. Indeed, the latter index explains about 29% of the forecast error of the exchange rate, versus a 40% at 24-steps explained by US policy uncertainty.

This result shows that, under this VAR specification, transmission occurs mainly through the exchange rate channel.

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Figure 8b: IRFs to a Positive VIX Index Shock (After Crisis)



Confidence Interval 95%.

Table 1: Forecast-error variance decomposition (after Crisis)

Response Variable And Forecast Horizon	US Policy Uncertainty	VIX Index	CA (%GDP)	Nominal Exchange Rate	Short-Term Interest Rate
US Policy Uncertainty					
4.	.6669305	.0114699	.0605308	.2588161	.0022527
12.	.5266409	.0098006	.056466	.3841202	.0229723
24.	.4967662	.0094048	.0546681	.4083089	.030852
VIX Index					
4.	.4218604	.3360519	.0215348	.1731096	.0474433
12.	.3578867	.2857813	.022132	.2668381	.0673619
24.	.3440655	.2748612	.022181	.2875415	.0713507

5. IMPULSE RESPONSES OF FULL MODEL

In this section we focus on capital flows, rather than current account, to better evaluate the portfolio rebalancing channel. We also add some additional interesting key variables.

The new Panel VAR includes the following variables:

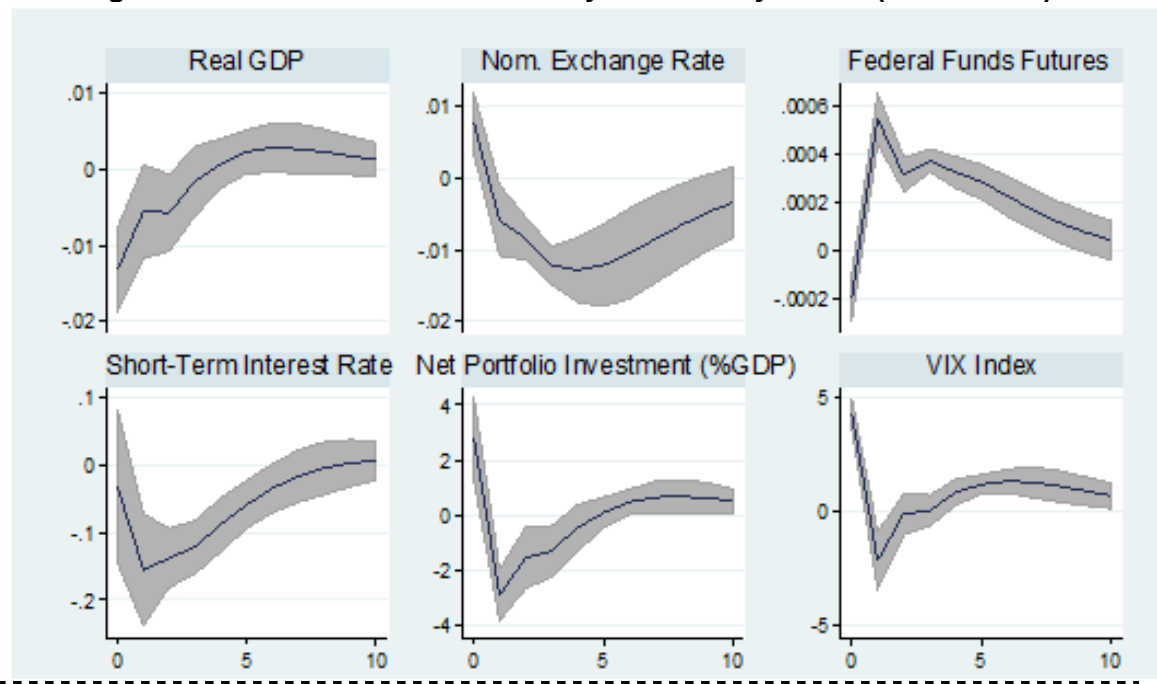
$Y_{it} = \{\text{US Policy Uncertainty, VIX Index, Federal Funds Futures, Net Portfolio Investment (\%GDP), Nom. Exch. Rate, ST Rate, Real GDP}\}$

Federal funds futures explicitly account for market expectations of future monetary policy and can influence the investors' decisions to invest in their own country or abroad. The net portfolio investment (%GDP) flows includes both bonds and equities. In this section, because of space limitations, we reports impulse responses functions only for the period after the crisis.

Mendoza and Terrones (2008), Gourinchas and Obstfeld (2012), Schularick and Taylor (2012) and Forbes and Warnock (2012b) show that large surges and stops of debt inflows lead to sharp increases in credit and in the probability of crises. When capital inflows from advanced to emerging economies, real exchange rates tend to appreciate, corporate debt increases and asset prices tick up, leading to adverse effects on financial stability.

Figure 9 reports impulse responses to a positive US policy uncertainty shock. The VIX index and federal funds futures increase, however the impact on funds futures is minimal; this is because the fed funds rate hit its zero lower bound and the Fed has been implementing several measures of quantitative easing, therefore market expectations on future monetary policy are quite fixed.

Figure 9: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)

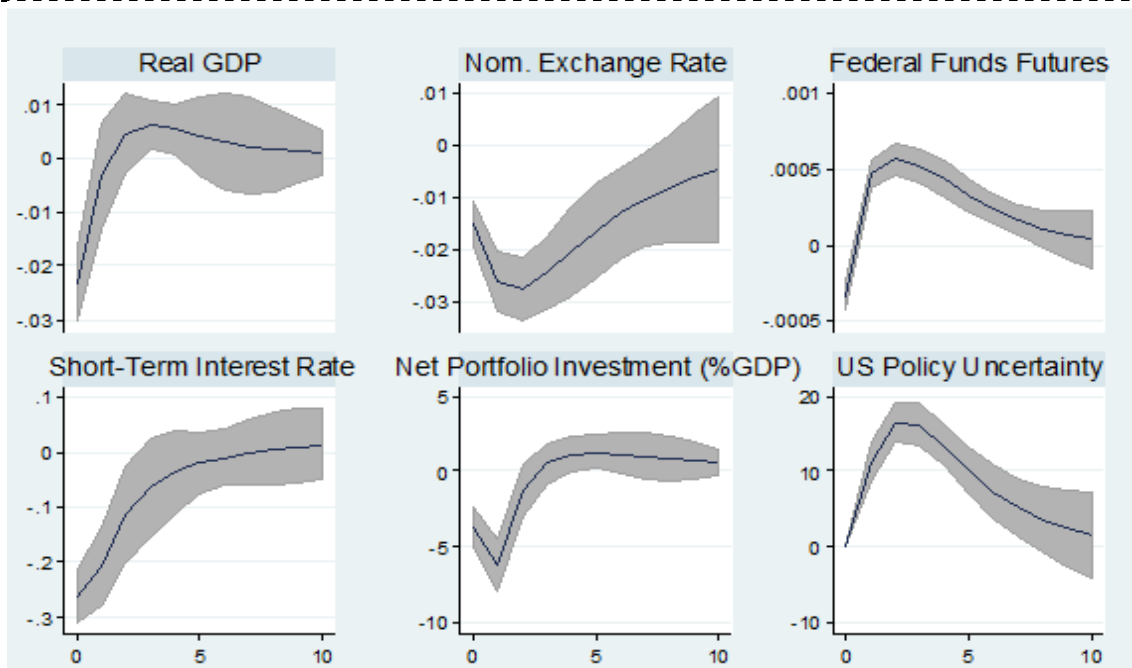


Confidence Interval 95%.

Net portfolio investment (%GDP) increases on impact but becomes negative after 1 quarter. A negative response indicates that either assets decrease, i.e. capital outflows, or liabilities increases, i.e. capital inflows. Therefore, when US investors are more exposed to domestic risk, in the sense of uncertainty about their domestic policy, then they have more incentive to diversify their portfolios away from the domestic market. The same occurs with foreign investors when they are hit by a global risk shock to which the domestic financial market is largely exposed. Due to capital inflows, exchange rates depreciate and central banks in the Asia-Pacific region accommodate their monetary policy by decreasing interest rates. The uncertainty leads also to a slowdown in economic growth.

Figure 10 reports impulse responses to a positive VIX index shock. The increase in markets' uncertainty leads to an increase in both the US policy uncertainty and the federal funds futures rates, i.e. increasing expectations on monetary policy. An increase in the VIX index leads to a portfolio diversification to reduce the overall level of risk and a larger foreign portfolio investment. Therefore, net portfolio investments decrease because of capital inflows from foreign investors, exchange rate appreciation and loosened monetary policy. Initially real GDP decreases, but it briefly recovers after 1. Therefore, global volatility is very important to understand capital flows into the region and global business cycles.

Figure 10: IRFs to a Positive VIX Index Shock (After Crisis)

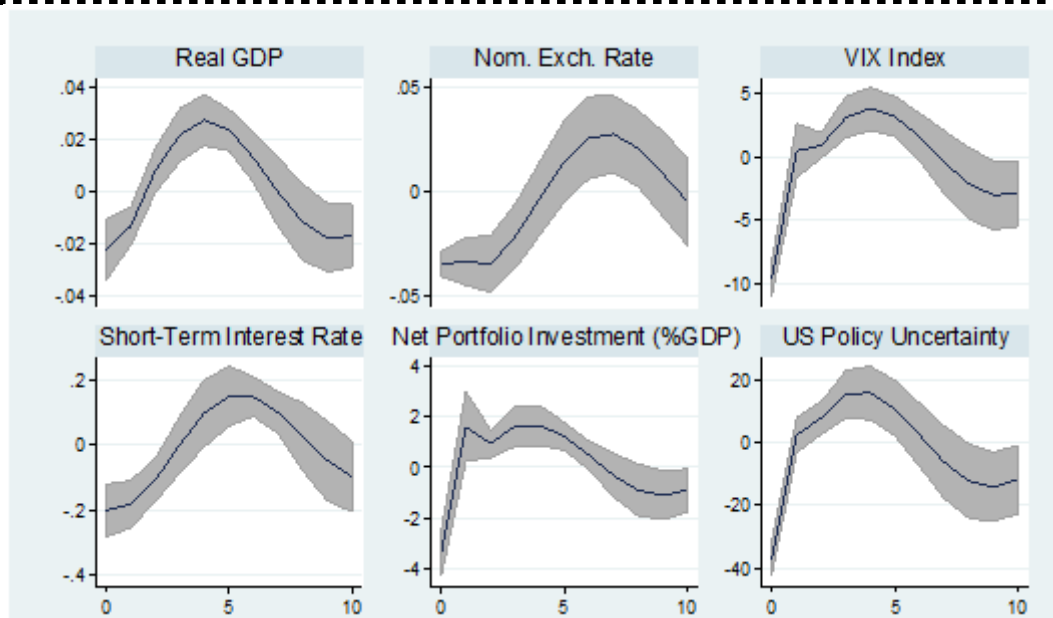


Confidence Interval 95%.

Since 2008, the US policy rate hit its zero lower bound. In response to the almost zero rates, the Federal Reserve has implemented several measures of unconventional policy instruments, as alternative tools to conventional monetary policy.

Burger et al. (2015) analyze the impact of portfolio re-allocations on US bond portfolios and find that global push factors such as low US long-term interest rates and quantitative easing have contributed to the increasing appetite for emerging market (EMEs) securities among US investors. Quantitative easing and forward guidance have important spillover effects on the Asia-Pacific region. Figure 11 shows that an increase in central bank balance sheet generates a decrease in policy uncertainty and the VIX index on impact, coupled with capital inflows and exchange rate appreciation. Asian central banks respond with accommodating monetary policy, which will have an impact on economic growth after 3 quarters. However, the possible tapering of quantitative easing generates an increasing uncertainty in both the VIX index and US policy uncertainty. This can be observed in the increase of both indexes after 3 quarters.

Figure 11: IRFs to a Positive US Unconventional Monetary Policy (After Crisis)



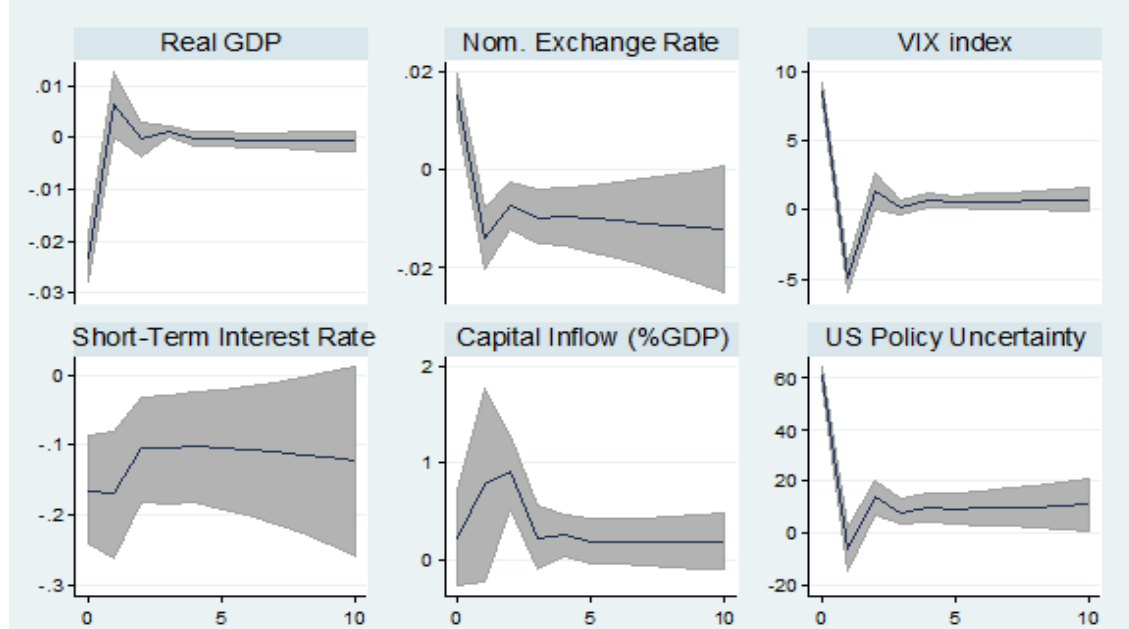
Confidence Interval 95%.

Next, we focus on the specific impact on gross flows, rather than net flows. The dynamic of capital flow can be misunderstood when only net flows are taken into account. Domestic and foreign investors behave differently in the allocation of their savings. A decrease in net capital inflows can be driven by sudden stop, i.e. a reduction in the purchases of domestic assets by foreigner investors, or by capital flight, i.e. an increase in the purchases of foreign assets by domestic investors. The distinction is important to help policy makers to address the more appropriate policy before and after crisis periods. The importance of gross flows has already been discussed in the literature. Shin (2012) emphasizes that the easy US credit conditions

were mainly due to gross cross-border positions rather than net capital flows. Rey (2013) shows how fluctuations in uncertainty and risk aversion lead to a global financial cycle in gross capital flows, credit creation and asset prices. Borio and Disyatat (2011) show that current accounts and net capital flows provide very little information about financing. They reveal information about changes in net claims and net resource flows by observing the international trade in goods and services, but they fail to capture the evolution of gross flows in terms of transactions of financial assets. As a result, current account captures very little in terms of international borrowing and lending and the impact of cross-border capital flows on domestic financial conditions, such as credit standards and asset prices. Punzi and Kauko (2015) also distinguish between gross and net flows in explaining the impact of cross-border funding on the build-up of the US housing market. Broner et al. (2013) suggest that policymakers need to monitor and regulate separately the behavior of domestic and foreign investors before and after periods of turbulence. Therefore, distinguishing between net and gross flows and evaluating the macroeconomic impact of these flows is very important in achieving financial stability.

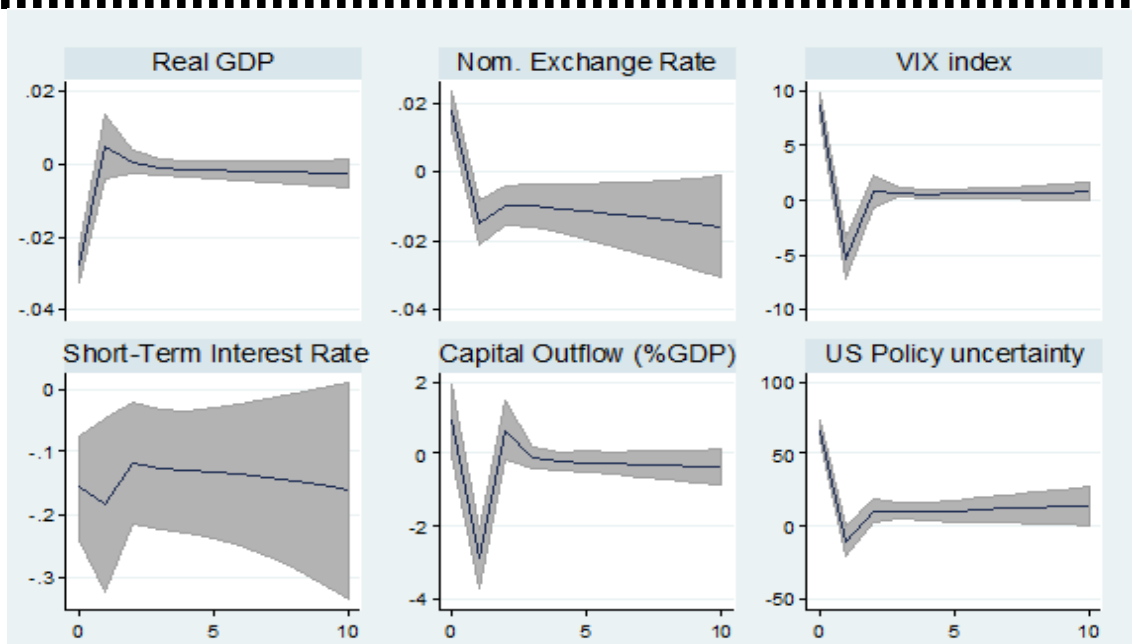
Figure 12a-12b show that the US policy uncertainty leads to increasing capital inflows and decreasing capital outflows. This result shows that net capital inflows are mainly driven by capital flight, i.e. an increase in the purchases of foreign assets by domestic investors.

Figure 12a: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



Confidence Interval 95%.

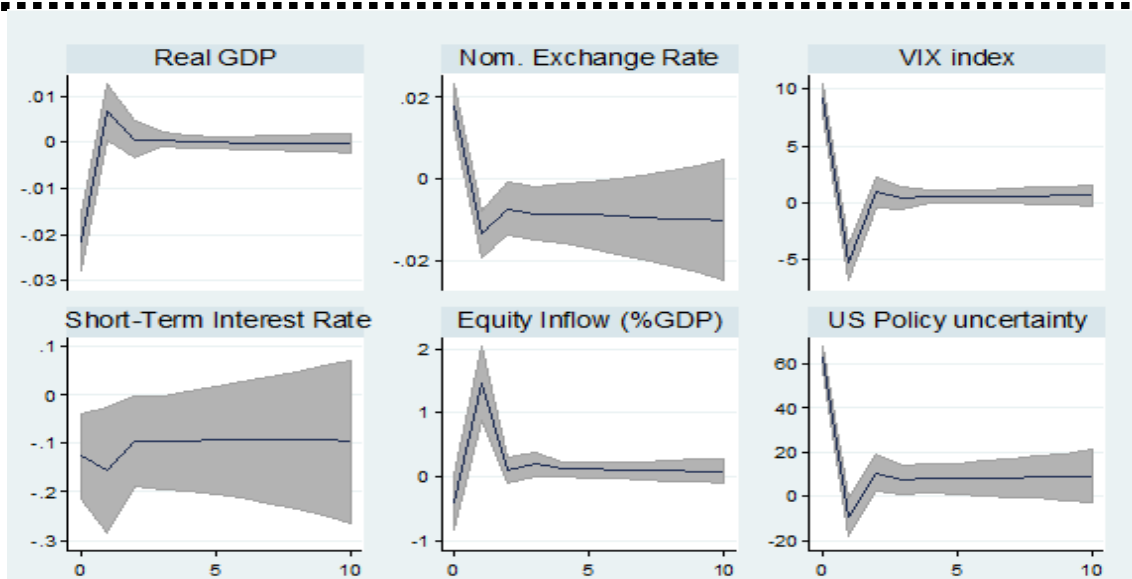
Figure 12b: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



Confidence Interval 95%.

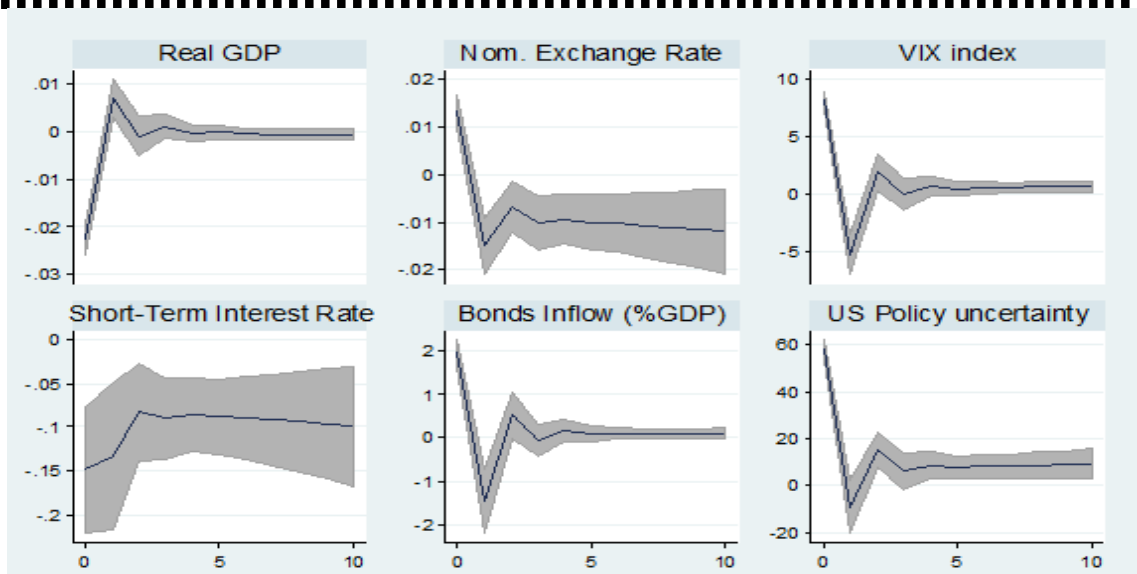
We also analyze the allocation components of the investment portfolio, and we study the impact on capital inflow for equity and bonds. Figures 13a-13b shows that a positive shock to US policy uncertainty leads to a short-lived positive response in the VIX index, bonds and equities inflows. In both cases, central banks in the Asia-Pacific region respond by lowering the interest rate on impact.

Figure 13a: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



Confidence Interval 95%.

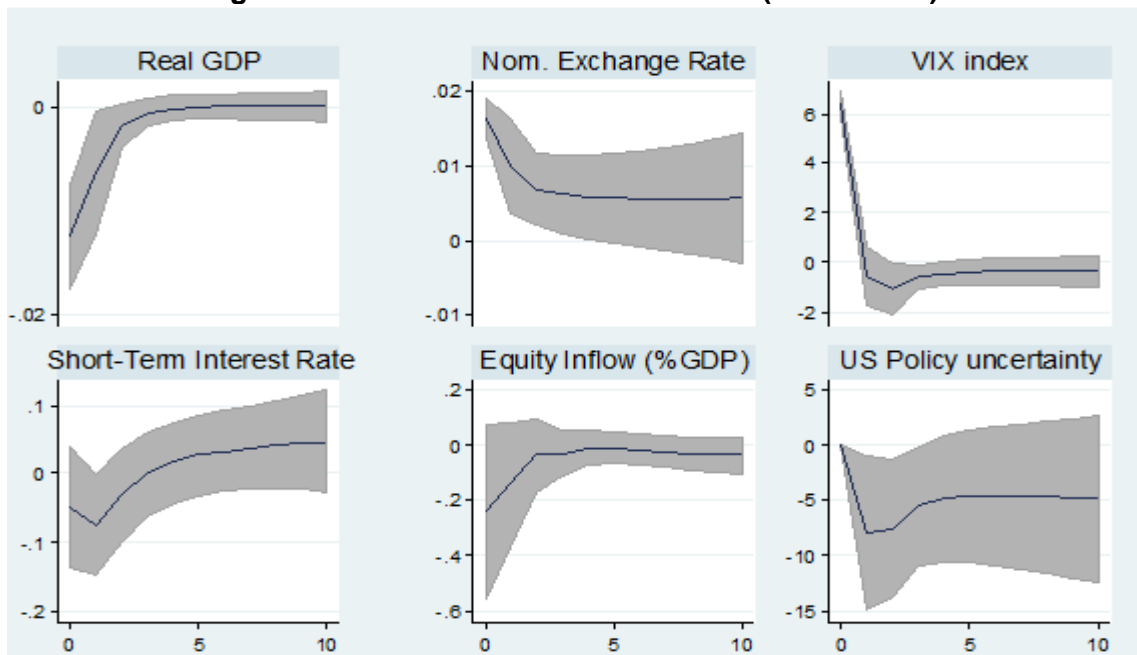
Figure 13b: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



Confidence Interval 95%.

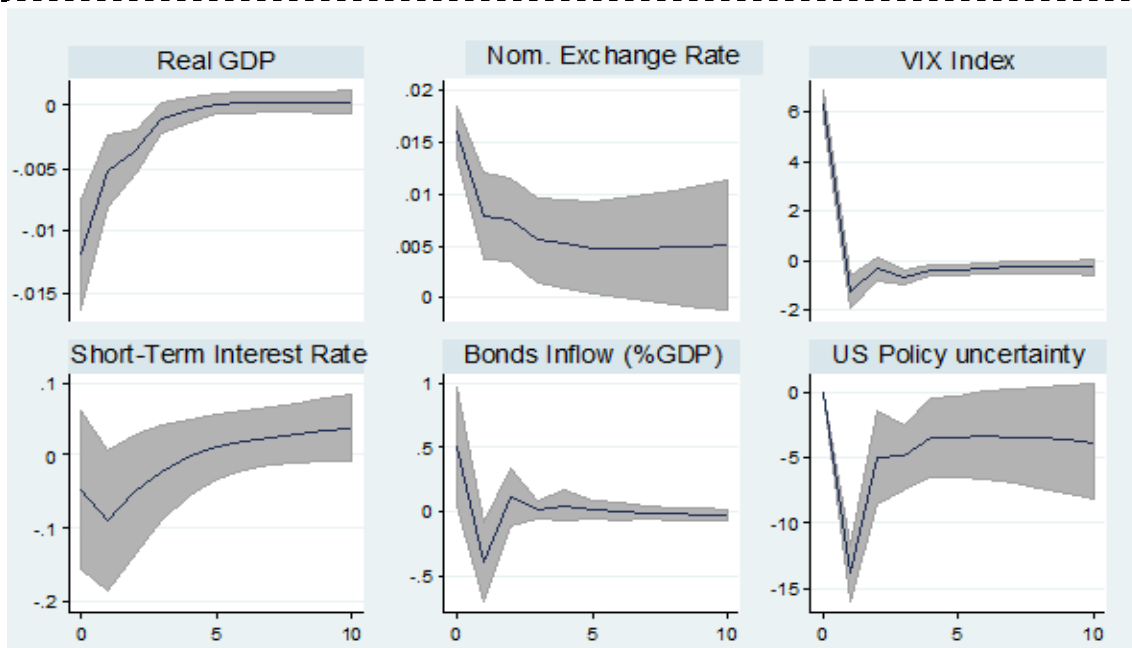
Alternatively, an increase in the VIX index leads to an increase in bond inflows, but only on impact, while the response in equity is statistically insignificant. The exchange rate depreciates in both experiments, while economic recovery does not occur. The response in policy rate is also statistically insignificant. See Figures 14a-14b. When we specify for the components of the investment portfolio, our results show that US policy uncertainty is the key shock able to replicate the stylized fact occurring in the Asia-Pacific region.

Figure 14a: IRFs to a Positive VIX Index (After Crisis)



Confidence Interval 95%.

Figure 14b: IRFs to a Positive VIX Index (After Crisis)

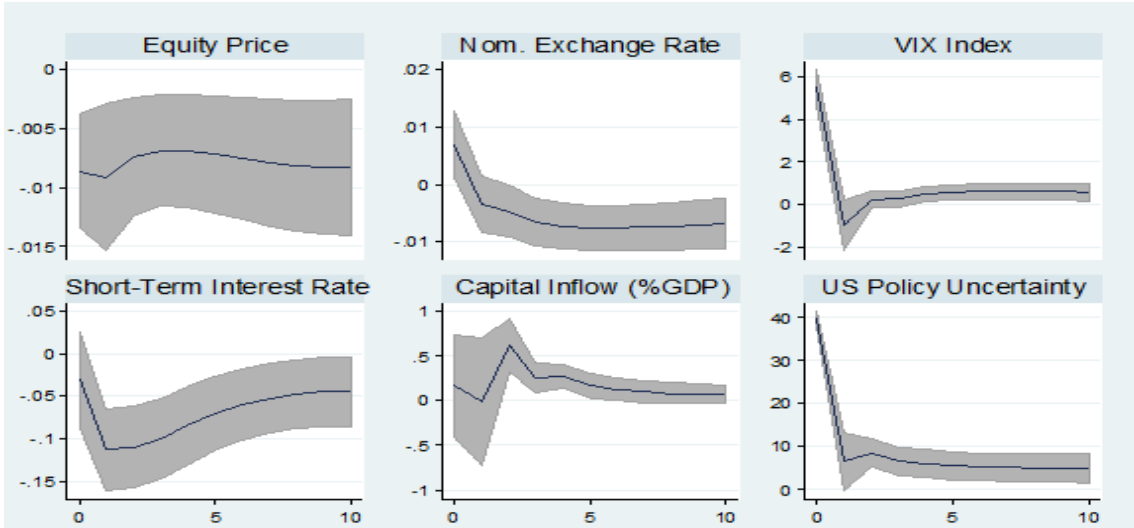


Confidence Interval 95%.

Finally, we evaluate the impact on assets prices. Ferrero (2012), Mendicino and Punzi (2014) and Sá and Wieladek (2015) emphasize that capital inflow shocks have a significant effect on house prices. In particular, they show that perceived safety of US assets encourages foreign investors to move their savings into US. assets, leading to an increase in consumption and a widening current account deficit.

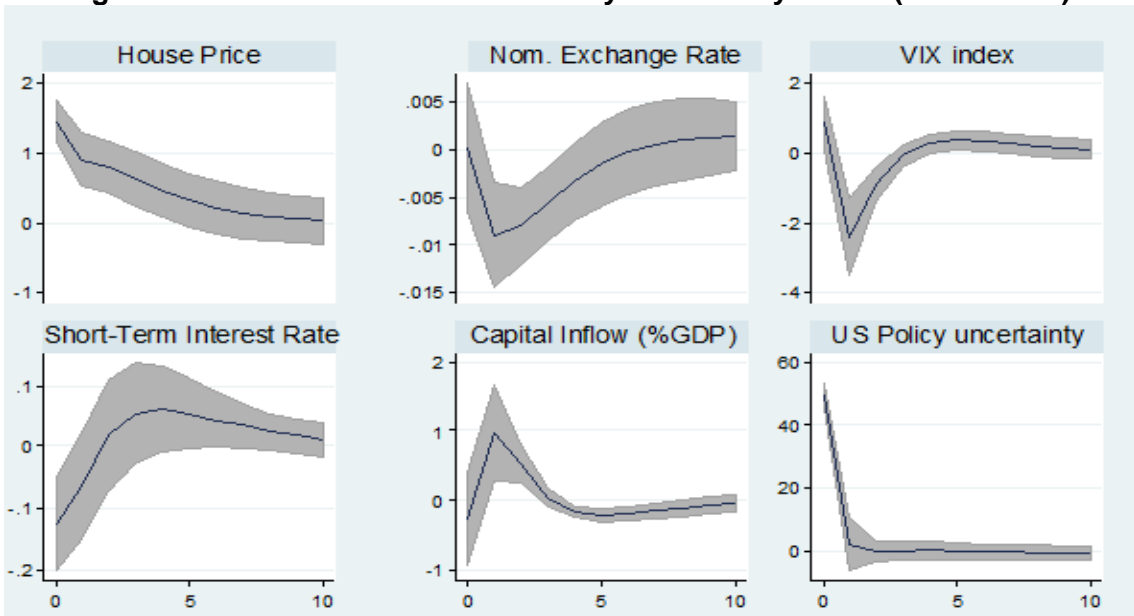
Figure 15a-15b shows that US policy uncertainty has a stronger impact on housing prices, compared to a model which includes equity prices. House price bubbles after the crisis were more critical than equity prices, especially in Hong Kong and Singapore, which introduced series of macro prudential measures to curb the house price bubble. Increasing volatility due to higher VIX index leads to a negative impact on both asset prices, but house prices recover faster and become positive after 5 quarters. However, when the Panel VAR includes house prices, the VIX index shock leads to a looser monetary policy, while the response is not significant when the VAR includes equities. See Figures 116a-16b.

Figure 15a: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



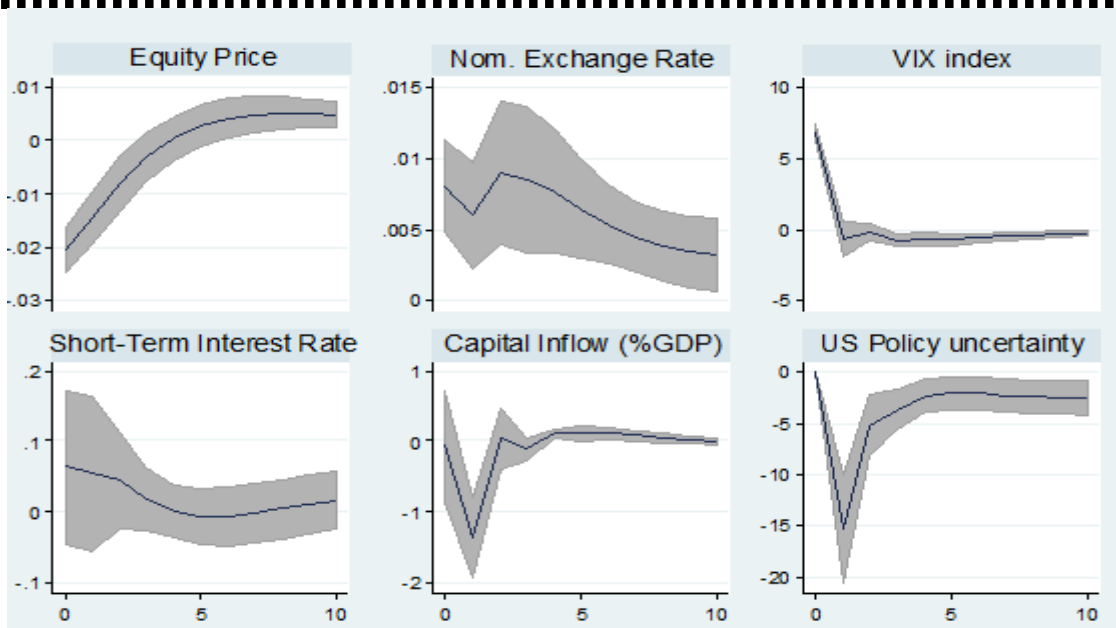
Confidence Interval 95%.

Figure 15b: IRFs to a Positive US Policy Uncertainty Shock (After Crisis)



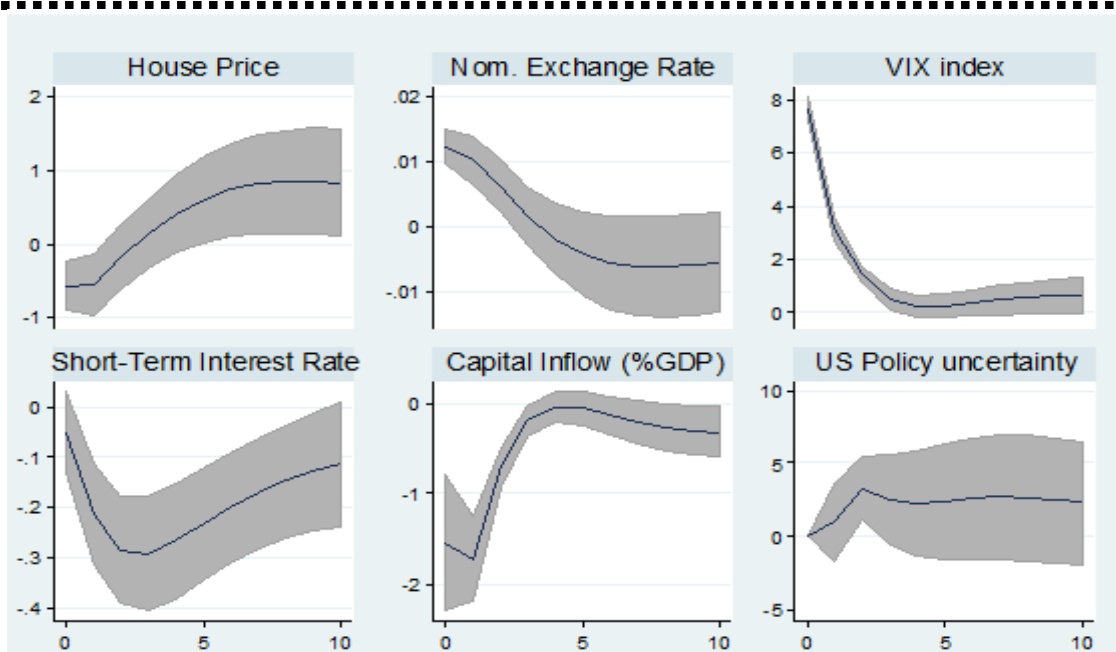
Confidence Interval 95%.

Figure 16a: IRFs to a Positive VIX Index (After Crisis)



Confidence Interval 95%.

Figure 16b: IRFs to a Positive VIX Index (After Crisis)



Confidence Interval 95%.

6. CONCLUSION

This article aims to estimate the impact of US uncertainty shocks on the Asia-Pacific region. We estimate a Panel VAR for a set of macroeconomic and financial variables with the purpose of distinguishing the international spillover effects before and after the 2007 crisis. The US policy uncertainty index and the global volatility VIX index sound both good proxies to evaluate global uncertainty due to the US economy. However, the US policy uncertainty index is a better indicator to replicate the stylized facts. Further, we find that unconventional US monetary policy, via large-scale assets acquisition by the Federal Reserve, is able to affect the policy uncertainty and VIX index.

Our results show that post crisis, a period where the US has reached its zero lower bound and implemented several measures of quantitative easing, global investors have raised a strong appetite for the Asia-Pacific assets, generating strong capital inflow into this region. As a consequence, Asia-Pacific region has responded with strong currency appreciation and asset price inflation. Central banks have responded to foreign monetary policy shocks by lowering their short-term interest rates to maintain macroeconomic stability. At the same time, interest rates were kept low so as not to create a higher interest rate spread with the US, which could attract further capital inflow. Capital inflow could put pressure on exchange rate appreciation, which could in turn hamper the price competitiveness of export products, especially during a time of global trade slowdown and the higher intensity of the currency war. Currency appreciation could also tighten financial conditions. Finally, we find a positive impact on house prices when the US policy increases uncertainty, opening questions of financial stability due to excess house price booms.

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