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Capital Inflows, Asset Prices, and Financial Systems
in East Asia
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March 6, 2018

Capital Inflows, Asset Prices, and Financial Systems in East Asia[*]

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March 6, 2018

Abstract

The purpose of this paper is to examine the role of the compositions of capital inflows and financial structure in the effects of capital inflows on housing prices and household credit for 13 economies in Asia and Europe over 2000-2015. Our methodology is a panel VAR model estimation. We check the impulse responses of housing prices, household credit, and household credit share to various types of capital inflow shocks, identified by imposing sign restrictions. Our findings are as follows. FDI inflows have positive effects on household credit share. The other inflows, mainly bank loan inflows, have positive larger effects on housing prices, and household credit in market-based economies, where the household credit share is higher relative to bank-based economies.

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Title: Capital Inflows, Asset Prices, and Financial Systems in East Asia

1 Introduction

Credits to households in both advanced and emerging economies have increased in recent decades. Samarina and Bezemer (2016) find that domestic bank credits have been reallocated away from non-financial corporations and toward households for advanced and emerging economies over 1990-2011. How do the changes in credit allocation affect real economies? If the domestic bank credits tilt from non-financial corporations toward credit to households for consumption and mortgage, the domestic macroeconomy may become more vulnerable. Mian et al. (2015) show that a rise in the ratio of household debt to GDP is associated with consumption and housing booms and is further correlated with lower future GDP growth. Credit to non-financial corporations may lead to higher future GDP growth through capital investment, while credit to households may lead to lower future GDP growth through boom-bust cycles in consumption and the housing market.

In this paper, we focus on credits to households and asset prices, especially housing prices, in emerging economies in Asia and Europe over 2000-2015. The purpose of this paper is to investigate the drivers of credits to households and housing prices. Notably, we examine whether capital inflows play a driving role in this regard. The main questions posed by this paper are as follows: (1) How do capital inflows influence housing prices and household credits? (2) What types of capital inflows have significant effects on housing prices and household credits? (3) Does the effect of such capital inflows vary among economies, and if so, why?

Our hypotheses are as follows. Bank loan inflows may be associated with increases in household credit. The relationship may be stronger in a market-based economy than in a bank-based economy, because in the former, corporations tend to depend largely on the market, and banks tend to lend to households. Non-bank inflows, that is, foreign direct investment (FDI) and portfolio inflows, may have positive effects on household credit share. The effects may be stronger in a market-based economy than in a bank-based one because corporations substitute bank loans for FDI and portfolio inflows.

To answer these questions, we estimate a panel vector autoregression (VAR) model for a panel dataset consisting of 13 economies in Asia and Europe (Korea, Hong Kong, Singapore, Thailand, Malaysia, Indonesia, Hungary, Poland, Czech Republic, Sweden, Denmark, Norway, and Finland) over the period of 2000Q1-2015Q4. Our VAR model uses quarterly data on the following: net capital inflows relative to GDP, real GDP, consumer price index (CPI), real housing prices, real long-term interest rates, and real short-term interest rates. To assess the role of different types of capital inflows, we allow net capital inflows to represent FDI inflows, portfolio inflows, and other inflows. The major component of other inflows comprises bank loan inflows.

The contributions of this paper to the literature are as below. First, we study the effects of capital inflows on housing prices. A number of studies have examined the impacts of capital flows on asset prices, and many of them use the VAR approach (Kim and Yang, 2009, 2011; Tillmann, 2013a, b; Shinkai and Enya, 2015). Kim and Yang (2009) and Tillmann (2013a) examine the effects for Korea, while Kim and

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Yang (2011), Tillmann (2013b) and Shinkai and Enya (2015) do the same for some Asian economies. Kim and Yang (2011) and Tillmann (2013b) estimate a panel VAR model. The key difference between Kim and Yang (2011) and Tillmann (2013b) is the manner in which they identify a capital inflow shock. Kim and Yang (2011) use the Cholesky decomposition to identify the shock, while Tillmann (2013b) refers to sign restrictions. Our approach is similar to that of Tillmann (2013b).

Second, we consider cross-country differences while analyzing the sensitivity of housing prices to capital inflows. Tillmann (2013b) refers to cross-country differences to assess how asset prices respond to capital inflow shocks. He finds that the effects of inflow shocks on housing prices in Hong Kong, Korea, and Singapore are stronger than those in Malaysia, Thailand, and Taiwan. Moreover, he suggests that the heterogeneity in the response to capital inflows across countries is due to differences in monetary policies. Taguchi et al (2015) find the role of currency regimes, that is peg or floating, in the effects of portfolio inflows on stock prices. Our interest lies in the role of the domestic financial system with regard to the sensitivity of housing price to capital inflow shock. Specifically, we focus on the financial structure, that is, whether the financial system is market-based or bank-based. Corporations in a market-based economy may be more dependent on bank borrowings compared to a bank-based economy. Thus, banks in a market-based economy may lend to households rather than corporations. Therefore, bank loan inflows may have positive effects on household credits and housing prices in a market-based economy than in a bank-based one.

Third, we refer to the drivers of household credit and household credit share.

Some studies focus on the financial structure, others on capital inflows, and yet others on both. Beck et al. (2012) find that the share of household credit to total private credit is higher in countries possessing a financial system that veers toward a market-based one. Igan and Tan (2015) suggest that other inflows, that is, mainly bank loan inflows, are positively linked with household credit regardless of financial structure, and FDI and portfolio inflows are positively associated with credit to the corporate sector only in a bank-based economy. Samarina and Bezemer (2016) examine the association of capital inflows with the non-financial business loan share. They separate capital inflows according to their sectoral destination, as inflows to banks or to non-banking institutions. Then, they find that capital inflows to the non-banking sector are associated with lower share of business lending, namely, a higher share of household lending. We focus on the role of financial structure in both effects of on household credit and on household credit share.

The structure of this paper is as follows. Section 2 shows the recent trends of capital flows, credits to households and non-financial corporations, and housing prices in emerging economies in Asia and Europe. Section 3 introduces the analytical methodology employed in this paper, and Section 4 displays the estimation results. Finally, section 5 concludes.

2   Data: Financial systems, capital inflows, housing prices, and household credit

We examine the relationships between capital inflows and housing prices, and between capital inflows and household credit for emerging economies in Asia

and Europe and the periphery economies in the Euro area. Our sample economies depend on data availability. Specifically, the availability of housing prices and household credit series is limited. Our sample covers the periods from the first quarter of 2000 to the fourth quarter of 2015 for 13 emerging economies: Korea, Hong Kong, Singapore, Thailand, Malaysia, Indonesia, Hungary, Poland, Czech Republic, Sweden, Denmark, Norway, and Finland.

Our sample is divided into two subsamples, each with its own financial structure. Table 1 shows the index expressing the financial structure for each economy, which is the average ratio of stock market value traded to average bank credit to the private sector. Data on stock market value traded to GDP, private credit by deposit money banks (DMBs), and private credit by DMBs and other financial institutions (OFIs) are sourced from the Financial Development and Structure Dataset of Beck et al. (2016), which was updated in June 2016. These series are averaged over 2000-2015. Financial structure #1 is the ratio of average stock market value traded to average private credit by DMBs, while financial structure #2 is the ratio to average private credit by DMBs and OFIs. A higher (lower) index means that more corporations depend on the capital markets (bank borrowing) to raise funds, that is, the economy tends to be more market-based (more bank-based). Korea, Hong Kong, Singapore, Sweden, and Finland are classified as market-based economies, which means that their financial structure indexes exceed 1. Thailand, Malaysia, Indonesia, Hungary, Poland, Czech Republic, Denmark, and Norway are classified as bank-based economies; thus, their financial structure indexes are less than 1.

Figure 1 shows the trends of net capital inflows, housing prices, and household credit for our sample, which covers 13 economies for the period of 2000Q1-2015Q4. Household credit to GDP has increased since 2000 in most economies. Household credit share also rose in many economies until around 2010, but after around 2000, it remained at the same level in many economies. Exceptionally, household credit share in Hong Kong has decreased since around 2003. Real housing prices in market-based economies showed an upward trend over the sample period, while real housing prices in bank-based economies rose in recent years.[1] Net FDI inflows to GDP were outstanding in bank-based economies. Net portfolio and other inflows to GDP were outstanding in market-based economies. Notably, it seems that real housing prices rose (declined) when net other inflows to GDP increased (decreased).

3 Methodology

3-1. The panel VAR model

What are the effects of capital inflows on housing prices and household credit? We apply a VAR model estimation. We estimate the following VAR model for the panel dataset of our sample.

$$Y_{it} = c + \sum_{k=1}^{L} B_k Y_{it-k} + u_{it}, \, t = 1,\ldots,T, \, i = 1,\ldots,N, \, u_{it} \sim N(0, \, \Sigma)$$

where c is a constant term, L is the lag length, and Y_{it} is the m×1 vector of endogenous variables for country i at time t. B_k are m×m coefficient matrices, and u_{it} is the m×1 vector of one-step ahead prediction errors.

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[1] Real housing prices in Denmark and Hungary were high around the year 2007.

The prediction error u_{it} includes various unexpected innovations. We extract the economic innovations that we are interested in, that is, capital inflow innovations, from the prediction error u_{it}. Assuming the $m \times 1$ vectors v_{it} of economic innovations, which are mutually independent and normalized to unit variance, namely, $E[v_{it}v'_{it}]=I_m$, we need to find a matrix A such that $u_{it} = A \ v_{it}$, with $\Sigma = E[u_{it}u'_{it}] = A \ E[v_{it}v'_{it}] \ A' = A \ A'$. Further restrictions on matrix A are needed to identify A. Uhlig (2005) proposes to identify any innovation of A by imposing sign restriction on the impulse responses of endogenous variables to any economic innovation at any horizon. We follow the sign restriction method of Uhlig (2005) to identify a capital inflow shock. Following Uhlig (2005), we calculate impulse responses based on n_1 draws from the VAR posterior and, for each of these draws, n_2 draws from an independent uniform prior and check the sign restrictions are satisfied. We continue to calculate and check until we get n_3 impulse responses with the desired sign. Then, error bands are calculated using all the draws, which have been kept. We use $n_1=n_2=200$, and $n_3=1000$.

An alternative popular restriction is the Cholesky decomposition of Σ, which imposes a recursive ordering on endogenous variables. We consider that the sign restriction method is more useful for identification of a capital inflow shock.

3-2. Identification of capital inflow shocks

The variables included in the VAR model are related to the shock we identify and the variable affected by the shock. We identify 4 types of capital inflow shocks, that is, net (total) capital inflow, net FDI inflow, portfolio inflow, and other inflow

shocks. Furthermore, we check the impulse responses of the 4 variables, that is, housing prices, stock prices, household credit, and household credit share, to any shock. Therefore, we estimate the VAR model using 16 (4×4) VAR specifications.

The first VAR specification examines the effect of a net total capital inflow shock on real housing price. The set of sign restrictions used to identify the net total capital to GDP shock follows the restrictions imposed by Sa et al. (2011) and Tillmann (2013b). According to Sa et al. (2011), an expansionary net total capital inflow to GDP shock is supposed to increase capital inflows to GDP, spurs economic activities, lead to the appreciation of domestic currency, and lower long-term interest rates. Therefore, the variables in the first specification are the net total capital inflows to GDP (FN_TOTAL), log real GDP ($LRGDP$), log consumer price index ($LCPI$), log real effective exchange rate ($REER$), log real housing price (LHP), real long-term bond yield ($LONG\_R$), and real short-term money market rate ($SHORT\_R$). The capital inflow variable is the ratio to seasonally adjusted GDP, and real GDP and consumer price index are seasonally adjusted. The housing price and long-term and short-term interest rates are deflated by seasonally adjusted CPI. The definitions and sources of the variables are shown in Table 2. Data availability for each variable and economy are shown in Table 3. The set of sign restrictions for identifying the net total capital inflow to GDP shock is shown in column 1 of Table 4.

The second VAR specification examines the effect of a net FDI inflow shock on real housing prices. The set of sign restrictions for identifying the net FDI inflow to GDP shock is shown in column 2 of Table 4. This set of sign restrictions follows

the findings of Blanchard et al. (2015) in addition to the restrictions imposed by Sa et al. (2011) and Tillmann (2013b). Blanchard et al. (2015) find that the effects of non-bond inflows on credits vary by type. FDI inflows have a large negative and significant effect on credits.[2] An expansionary net FDI inflow to GDP shock is supposed to increase FDI inflows to GDP, spur economic activities, lead to appreciation of domestic currency, and decrease private credit. Therefore, the variables in the second specification are the net total capital inflows to GDP (FN_FDI), log real GDP ($LRGDP$), log CPI ($LCPI$), log real effective exchange rate ($REER$), log real housing price (LHP), log of real private credit (LCR), and real short-term money market rate ($SHORT\_R$).

The third and fourth VAR specifications examine the effects of a net portfolio inflow shock on real housing price and the other inflow shock to real housing price, respectively. The sets of sign restrictions for identifying the net portfolio inflow to GDP shock and the other inflow shocks are shown in columns 3 and 4 of Table 4. These sets of sign restrictions also follow Blanchard et al. (2015) as well as Sa et al. (2011) and Tillmann (2013b). Blanchard et al. (2015) find that portfolio equity inflows have a large positive, but statistically insignificant, effect on credits. Other inflows have a positive, large, and statistically significant effect on credits. An expansionary net portfolio inflow to GDP shock is supposed to increase portfolio inflows to GDP, boost economic activities, appreciate the domestic currency, and lower the long-term interest rate, while an expansionary net other inflow to GDP shock is supposed to increase other inflows to GDP, induce

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[2] Blanchard et al. (2015) examine the effects of the ratio of capital inflows on the growth rates of credit and output.

economic activities, lead to domestic currency appreciation, and increase private credit. Therefore, the variables in the third specification are net total capital inflows to GDP (*FN_PF*), log real GDP (*LRGDP*), log CPI (*LCPI*), log real effective exchange rate (*REER*), log real housing price (*LHP*), real long-term bond yield (*LONG_R*), and real short-term money market rate (*SHORT_R*). Furthermore, the variables in the third specification are the net total capital inflows to GDP (*FN_PF*), log real GDP (*LRGDP*), log CPI (*LCPI*), log real effective exchange rate (*REER*), log real housing price (*LHP*), log real private credit (*LCR*), and real short-term money market rate (*SHORT_R*).

The three extensions per VAR specification are considered to examine the effects of net total capital inflow shock on real stock price, household credit, and household credit share. *LHP* in the first VAR specification is replaced with log real stock price (*LSP*), log household credit (*LCRHH*), or household credit share to total private credit (*CRHH_SHARE*).

3-3. Data

Our sample is a panel dataset of quarterly data covering the period from the first quarter of 2000 to the fourth quarter of 2015 for 13 emerging economies: Korea, Hong Kong, Singapore, Thailand, Malaysia, Indonesia, Hungary, Poland, Czech Republic, Sweden, Denmark, Norway, and Finland. Our panel dataset is unbalanced owing to data availability (see Table 3). The number of lags of the VAR model is determined using the Schwarz information criterion (SIC). The number of lags is two. Following the Uhlig (2005),

4   Results

Figure A1 presents the impulse responses of the endogenous variables to net total capital inflow shock that is one standard deviation in size for the full sample of 13 economies. Figures A1-a, A1-b, A1-c, and A1-d present the impulse response of housing prices, stock prices, household credit, and household credit share, respectively. In each figure, the solid line represents the median response, while the surrounding confidence bands represent the 16th and 84th percentiles of the accepted responses. The shaded areas denote sign restrictions on the impulse responses. We do not find significant effects on housing prices, stock prices, household credit, and household credit share (upper right-hand panels of Figures A1-a to A1-d). Then, we examine the effects of net total capital inflows for each subsample. We do not find any significant effects for both market-based and bank-based economies (Figures A2-a to A2-d for market-based economies, and Figures A3-a to A3-d for bank-based economies).

Then, we focus on the roles of composition of capital inflows and financial structure in the effects of capital inflows on housing prices and household credit. Figures 2-a to 2-d show the impulse responses of endogenous variables to net portfolio inflow shock for market-based economies. We do not observe significant effects on housing prices, household credit, and household credit share (upper right-hand panels). However, we do find that stock prices have a positive effect. A large part of portfolio inflows comprises equity inflows to emerging economies. It seems that equity inflows raise stock prices directly in order to increase their demand.

Figures 3-a to 3-d show the impulse responses of endogenous variables to net portfolio inflow shock for bank-based economies. None of the effects are significant.

Next, Figures 4-a to 4-d show the impulse responses of endogenous variables to net FDI inflow shock for market-based economies. Although we do not find significant effects on housing, stock prices, and household credit, we do identify the positive effect on household credit share (upper right-hand panel of Figure 4-d). Moreover, we also find the positive effect on household credit share for bank-based economies (upper right-hand panel of Figure 5-d). Regardless of the financial structure, net FDI inflows increase household credit share. The increases in household credit share may be caused by the decreases in corporate credit, which corporations substitute for FDI inflows.

Finally, Figures 6-a to 6-d show the impulse responses of endogenous variables to net other inflow, mainly bank loans, shock for market-based economies. We identify significant effects on housing, stock prices, and household credit (upper right-hand panels). Bank loans, which flow into banks, may be lent to households, so that housing and stock prices may increase owing to increase in the demand for housings and stocks. The household credit share does not change because banks increase not only household credit but also corporate credit. On the other hand, we do not find significant effects on housing and stock prices for bank-based economies. We do identify the significant effect on household credit, but this is the case for bank-based economies only. Furthermore, the positive effects on real GDP, which is caused by imposing sign restriction until 2 quarters after shock, continue longer even after removing the restrictions in market-based economies than their bank-

based counterparts. What are the causes of the differences in the effects of other inflows on housing prices between market-based economies and bank-based economies? Banks tend to lend to households more than to corporations in market-based economies because the corporations tend to raise funds not from bank loans but from capital markets. Even after removing the restrictions, the effects of bank loan inflows on real GDP are liable to be more persistent in market-based economies because the housing collateral effects are liable to be larger in such economies than in bank-based economies.

5 Conclusions

We examine the role of the compositions of capital inflows and financial structure in the effects of capital inflows on housing prices and household credit. Our methodology is a panel VAR model estimation. We check the impulse responses of housing prices, household credit, and household credit share to various types of capital inflow shocks, identified by imposing sign restrictions. Our findings are as follows. FDI inflows have positive effects on household credit share. The other inflows, mainly bank loan inflows, have positive larger and longer effects on housing prices, household credit, and real GDP in market-based economies, where the household credit share is higher relative to bank-based economies. The regional integration through FDI and production networks has developed in emerging economies in East Asia. Therefore, the household credit share in the economies in East Asia has increased. The policy makers must pay heed to inflows and outflows

of bank loans in market based economies and regional integrated economies though FDI.

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Figure 1. Net Capital Inflows, Housing Price, HH Credit
Market-Based Economies (5 economies)
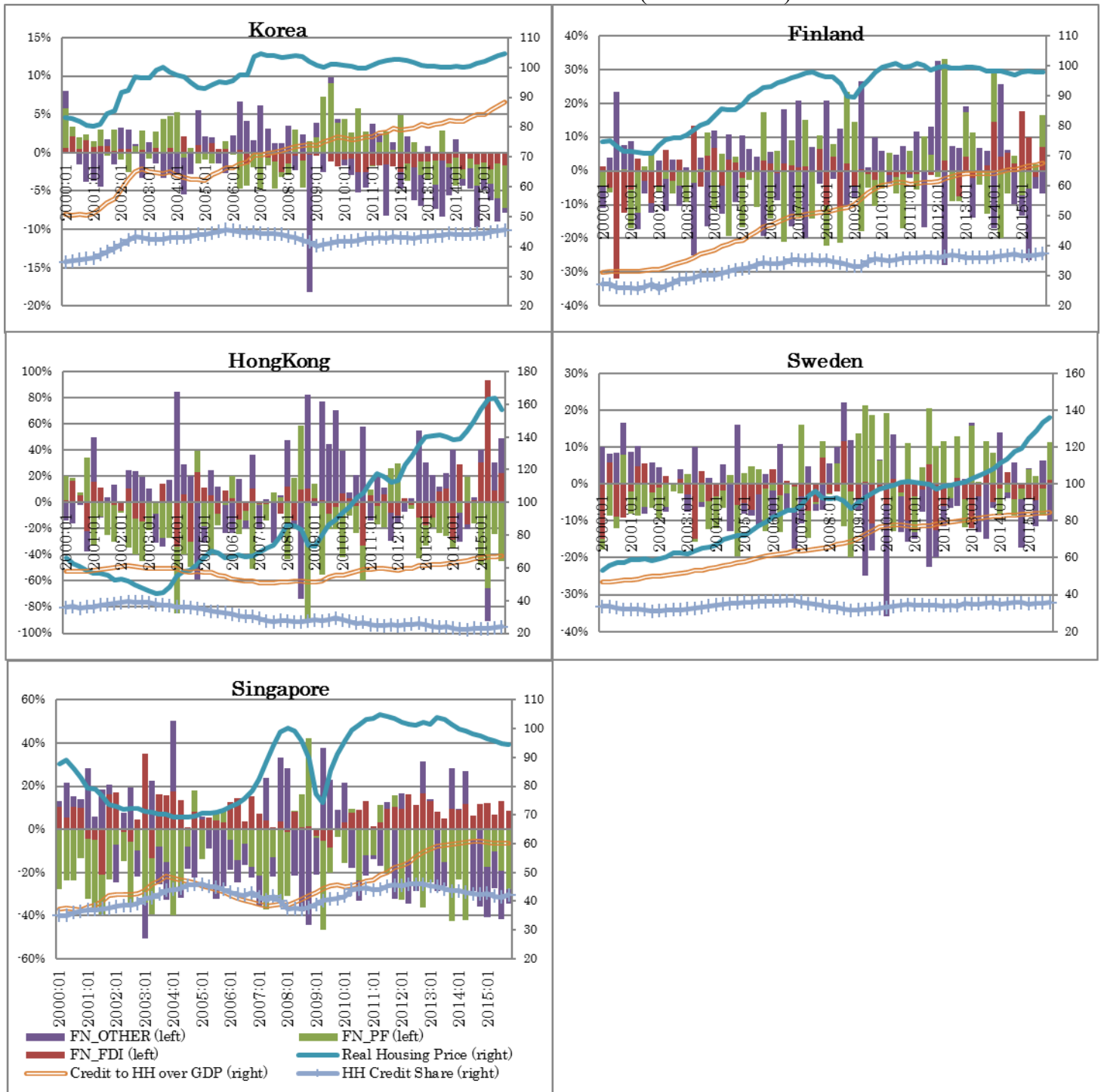
FN_FDI, FN_PF, and FN_OTHER are the ratio of net FDI inflows to GDP, the ratio of net portfolio inflows to GDP, and the ratio of other inflows to GDP, respectively.

Bank-Based Economies (8 economies)
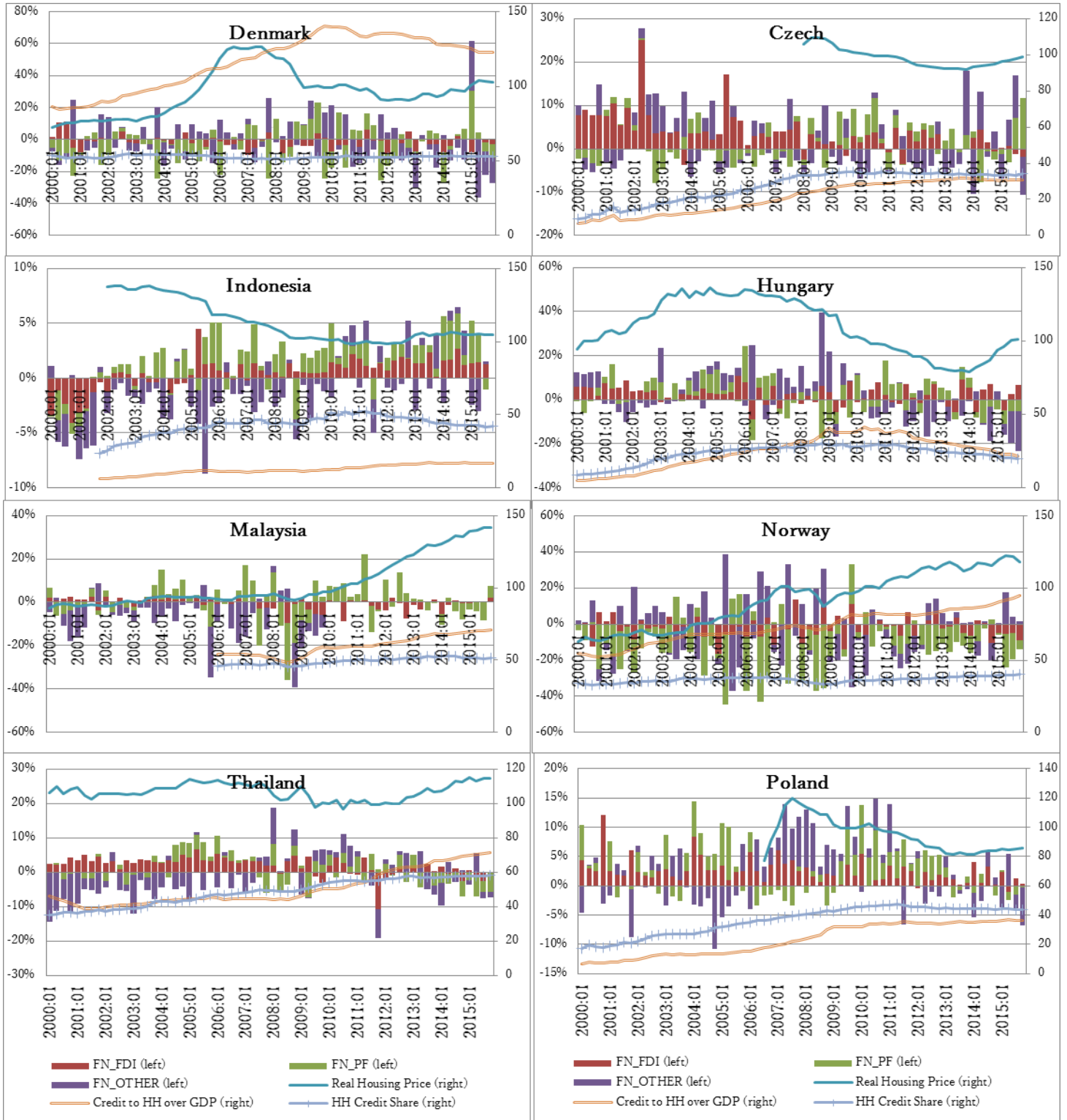
FN_FDI, FN_PF, and FN_OTHER are the ratio of net FDI inflows to GDP, the ratio of net portfolio inflows to GDP, and the ratio of other inflows to GDP, respectively.

Source: IFS of IMF, CEIC database, and BIS database
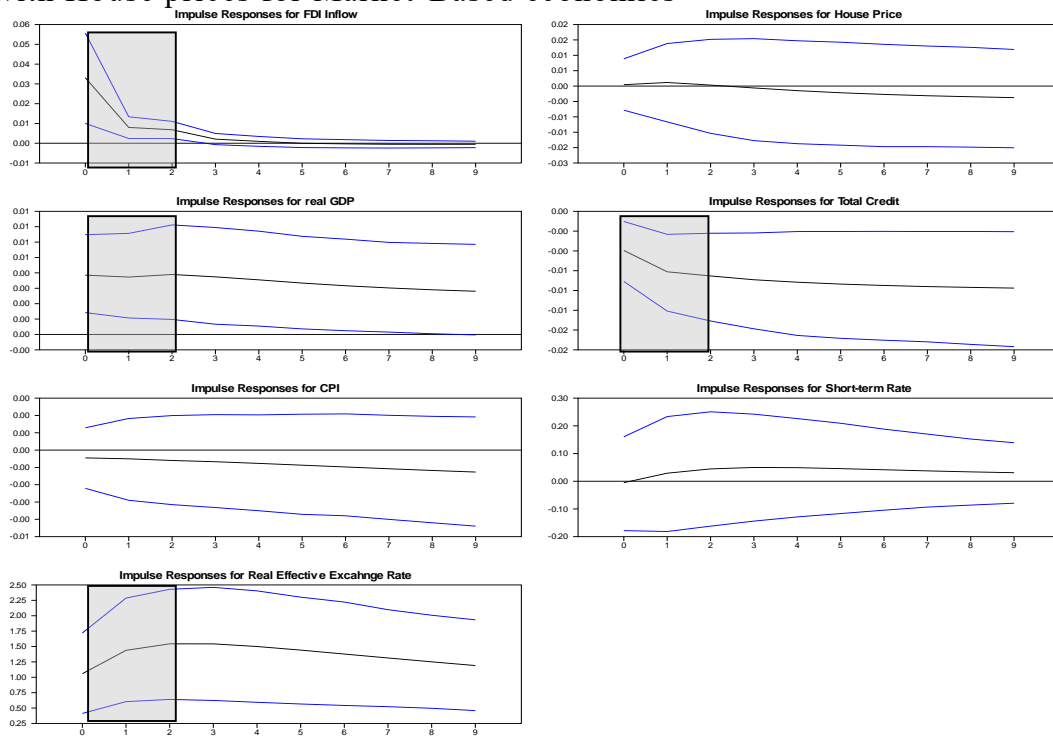
Figure 2-a. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with House prices for Market-Based economies
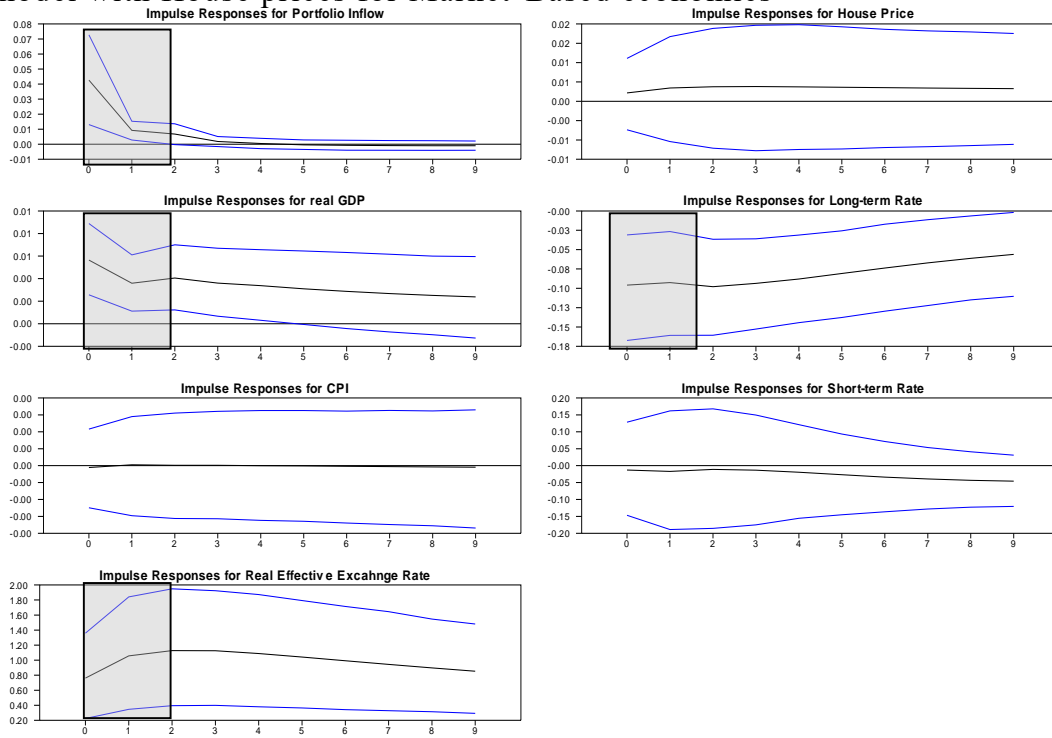
Figure 2-b. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Stock prices for Market-Based economies
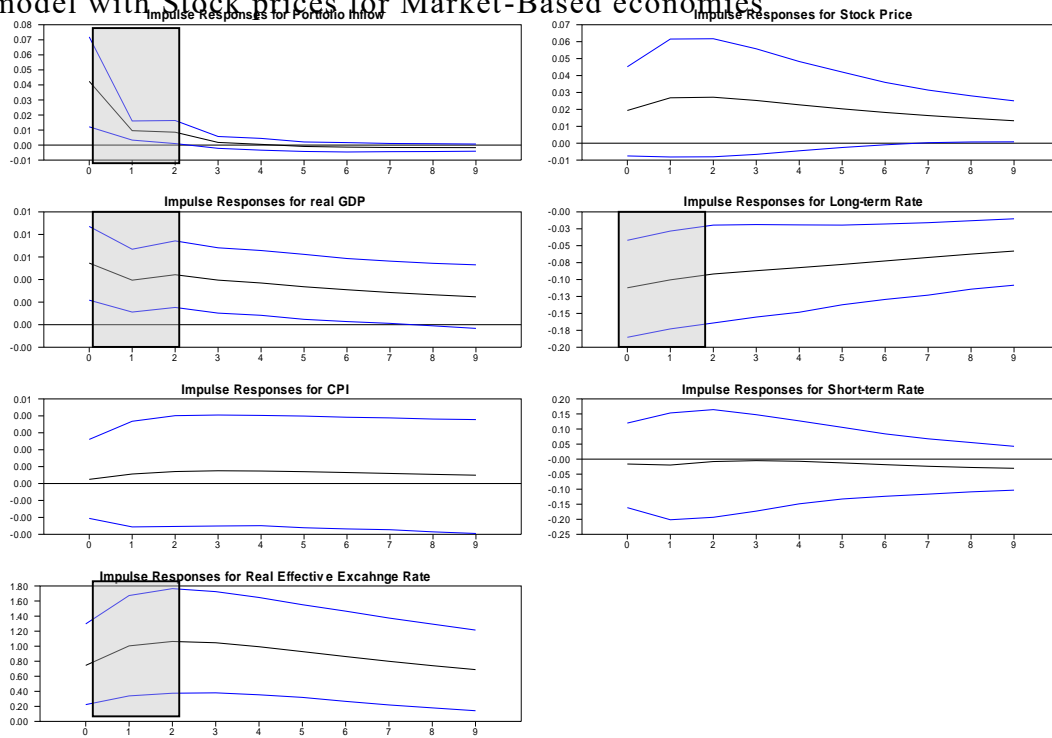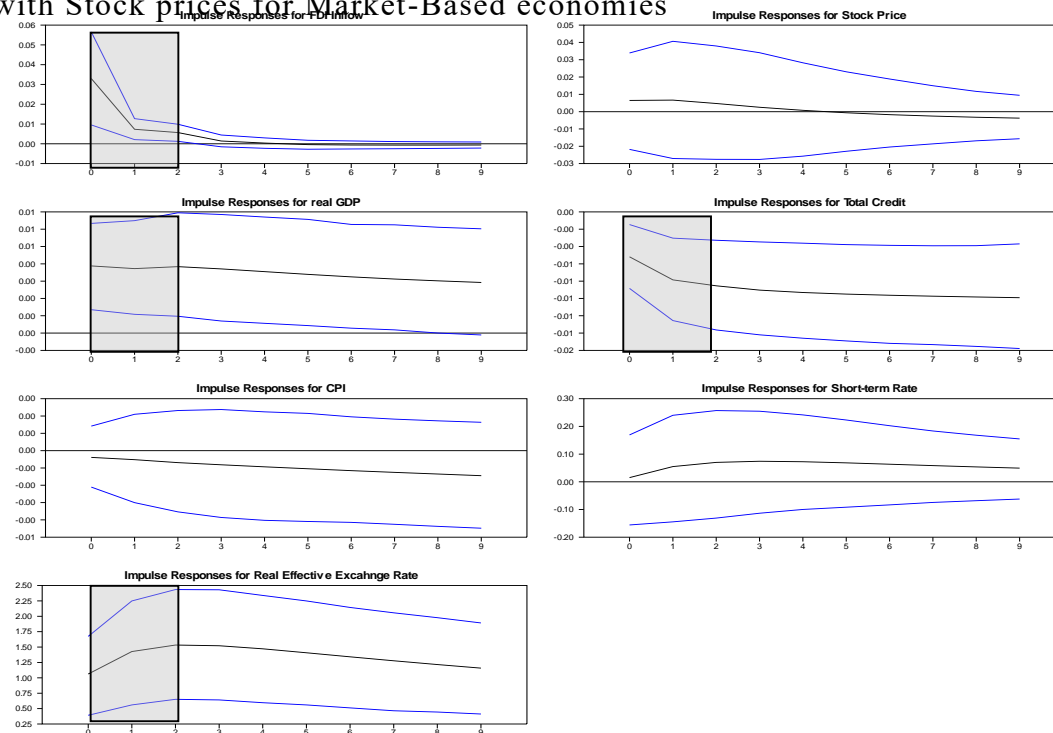
Figure 2-c. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Credits to Household for Market-Based economies
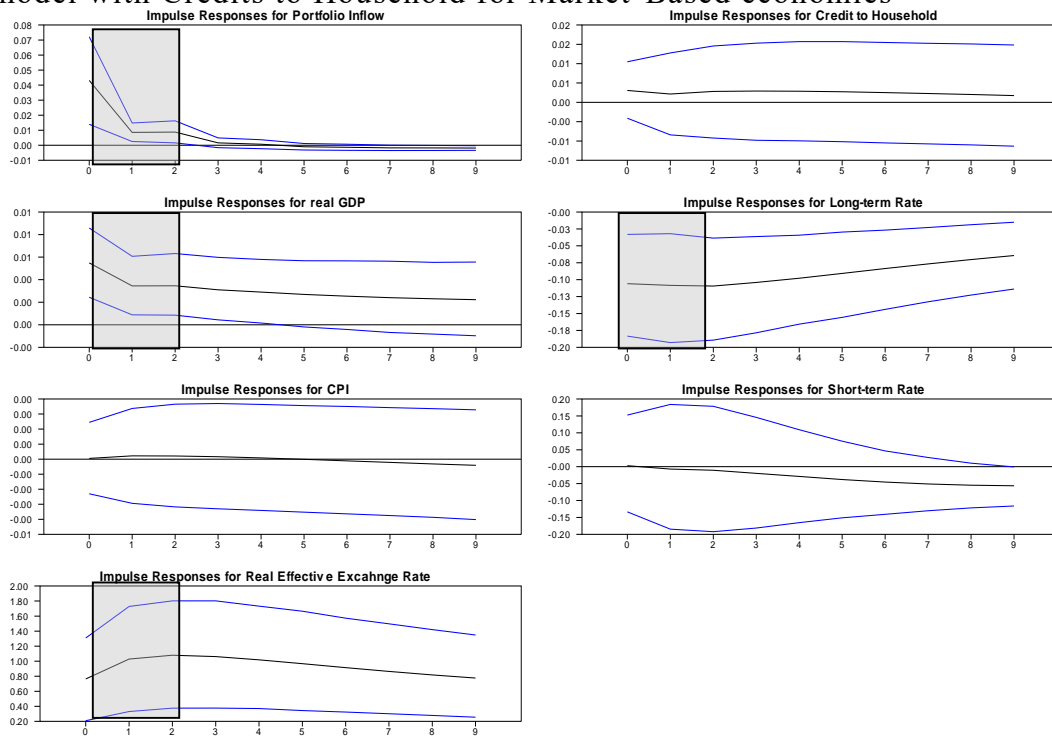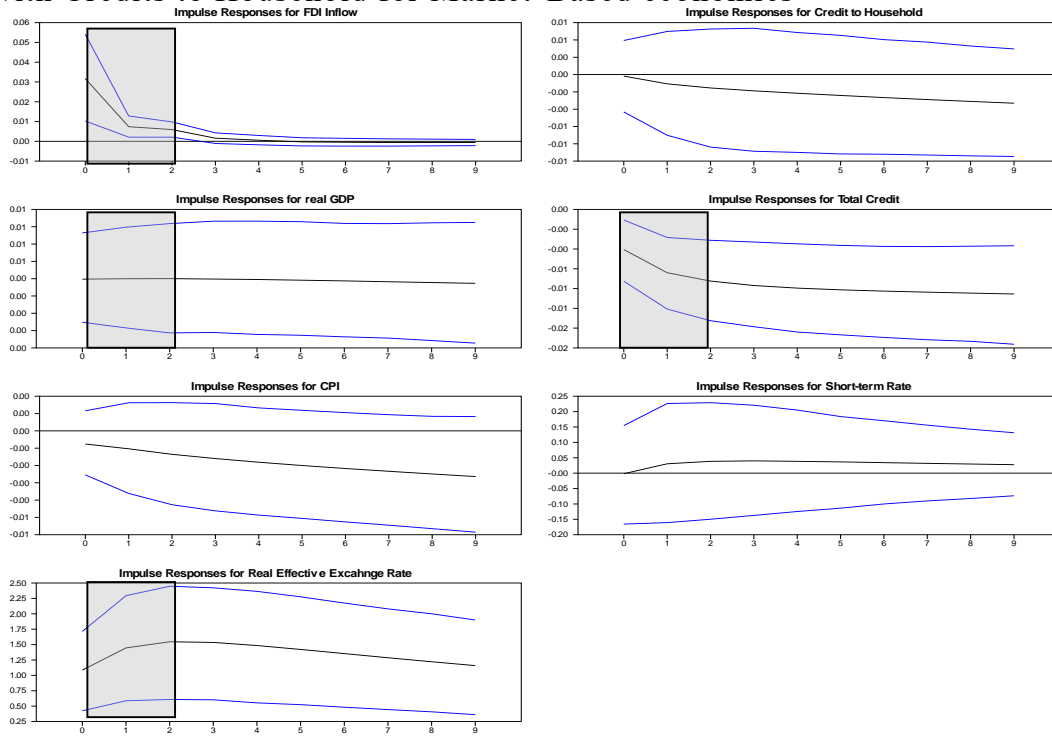

Figure 2-d. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Household Credit Share for Market-Based economies
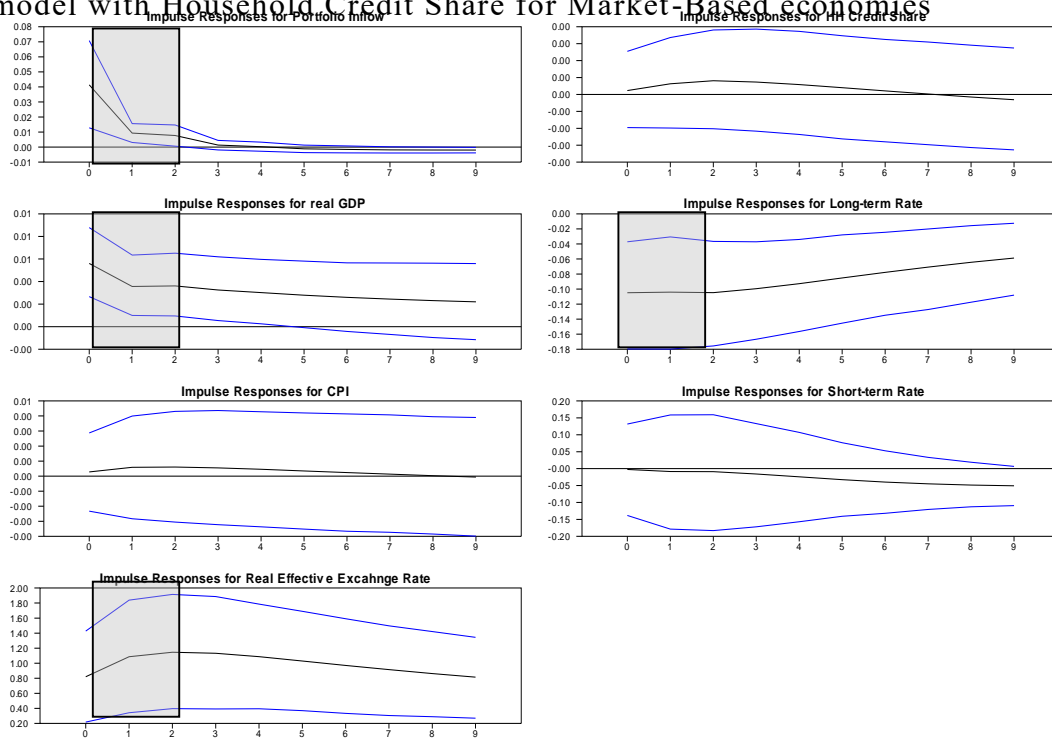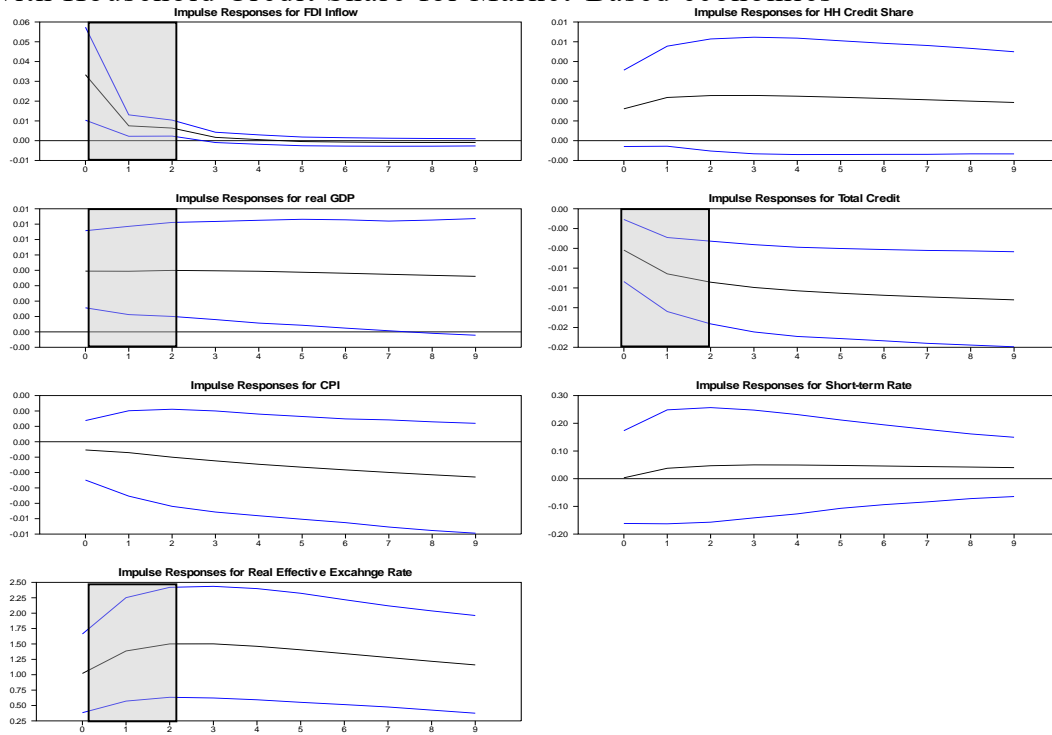
Figure 3-a. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with House prices for Bank-Based economies
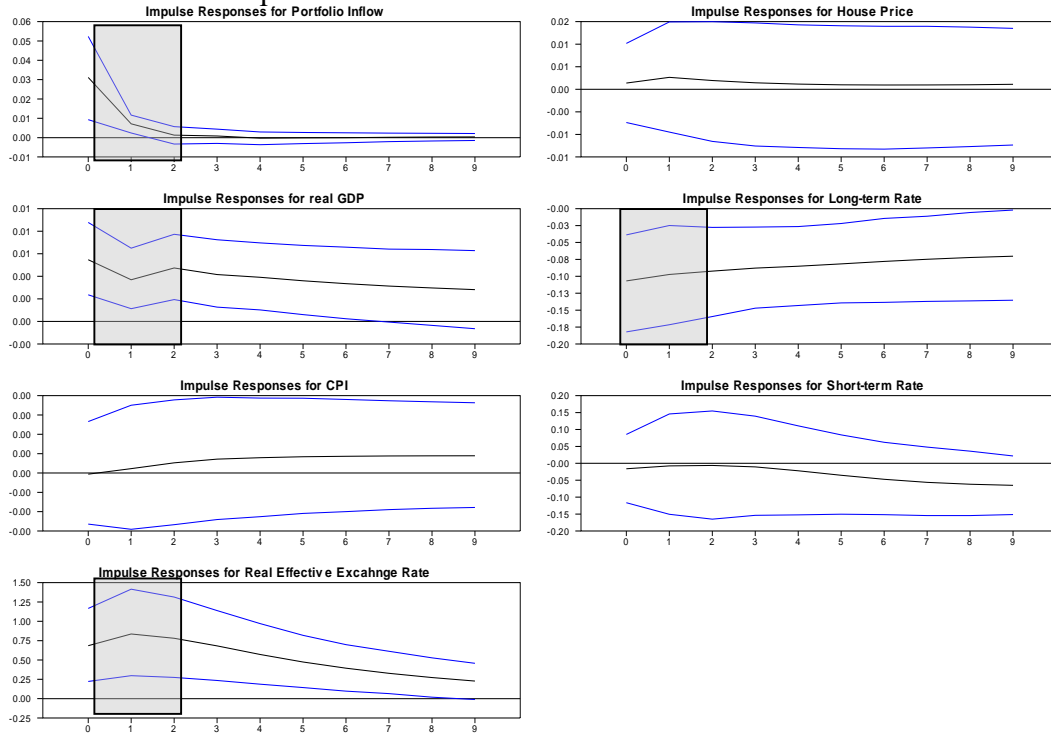
Figure 3-b. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Stock prices for Bank-Based economies

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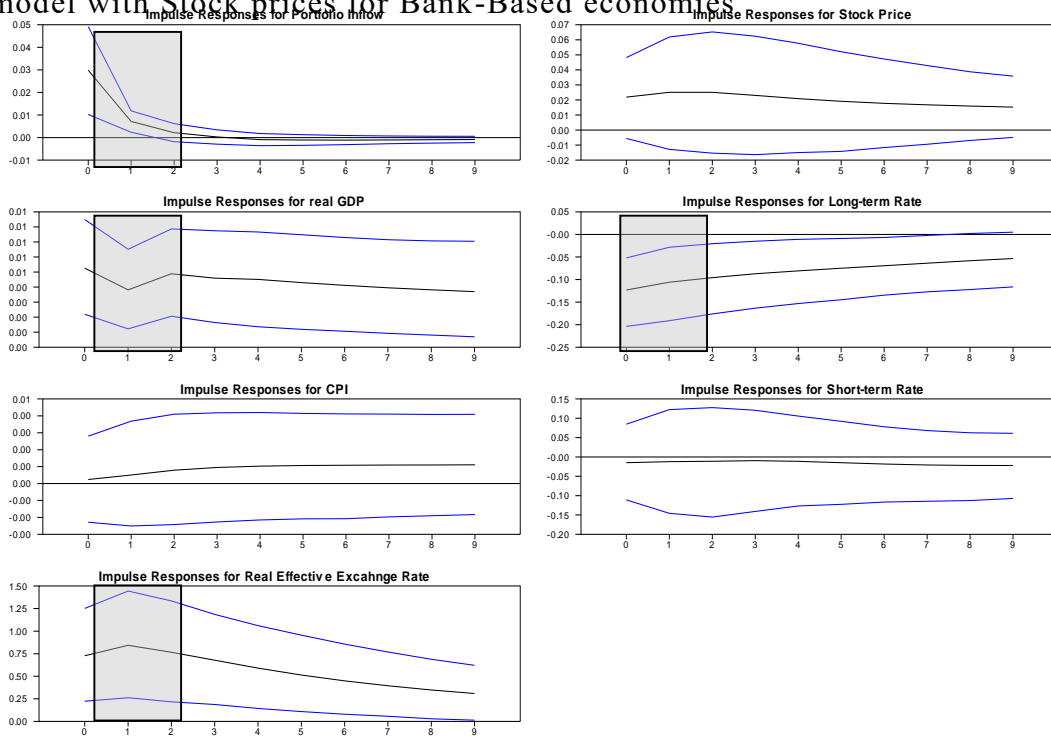
Figure 3-c. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Credits to Household for Bank-Based economies
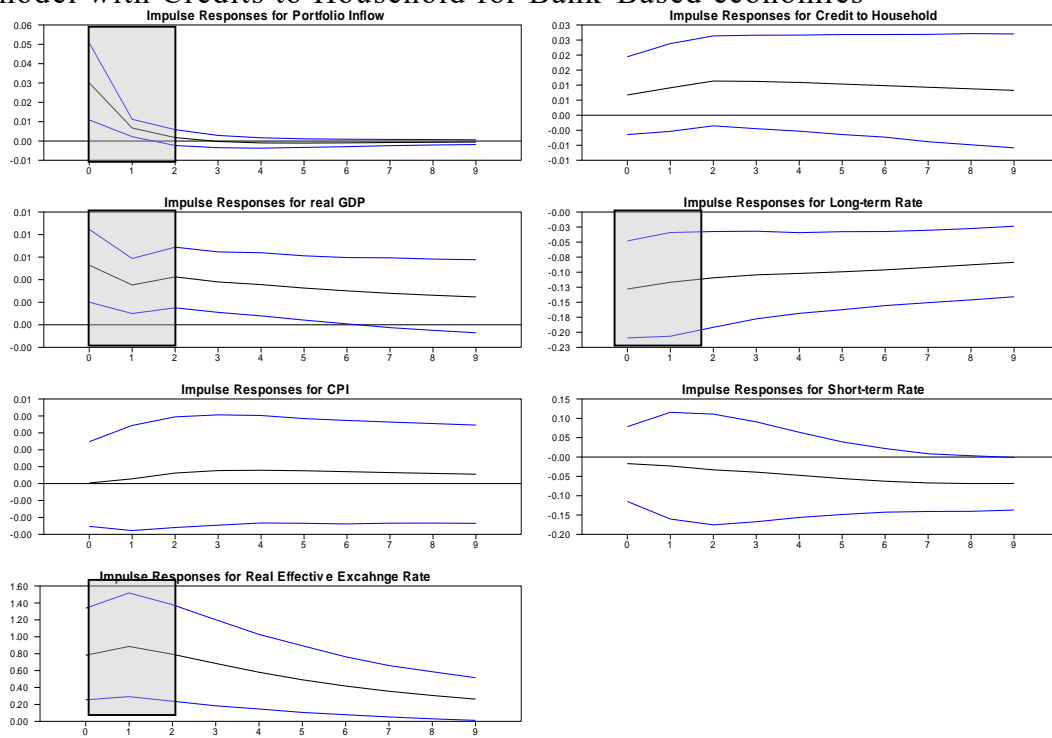
Figure 3-d. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Household Credit Share for Bank-Based economies
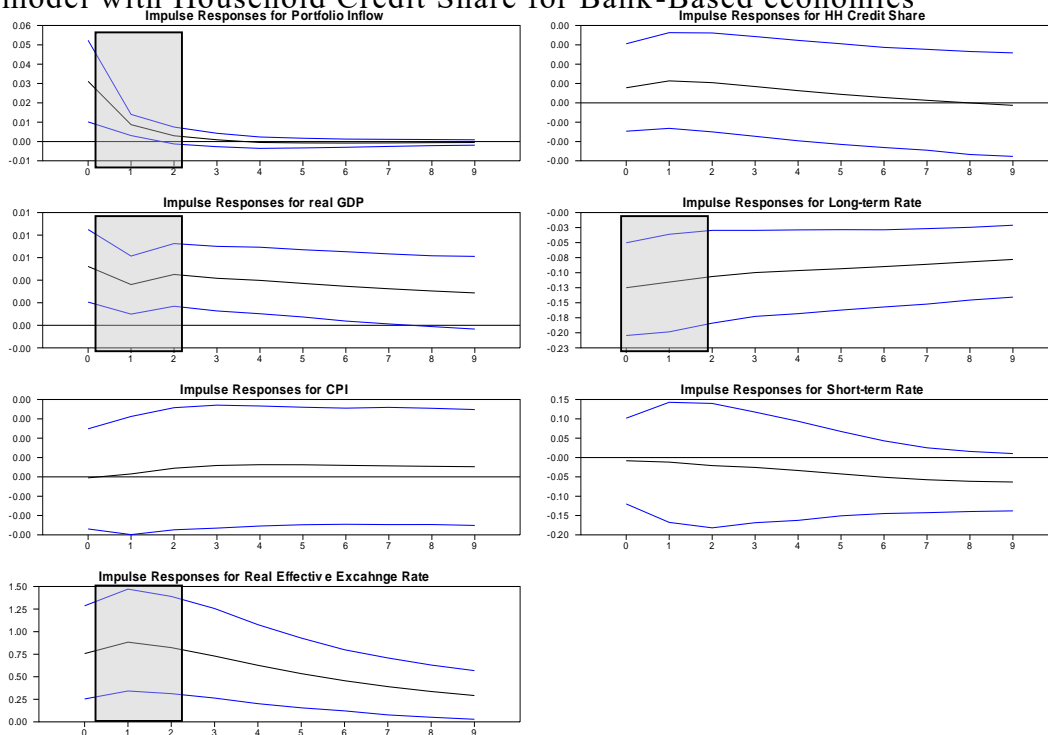
Figure 4-a. Impulse Responses to Net FDI Inflow shock obtained from VAR model with House prices for Market-Based economies
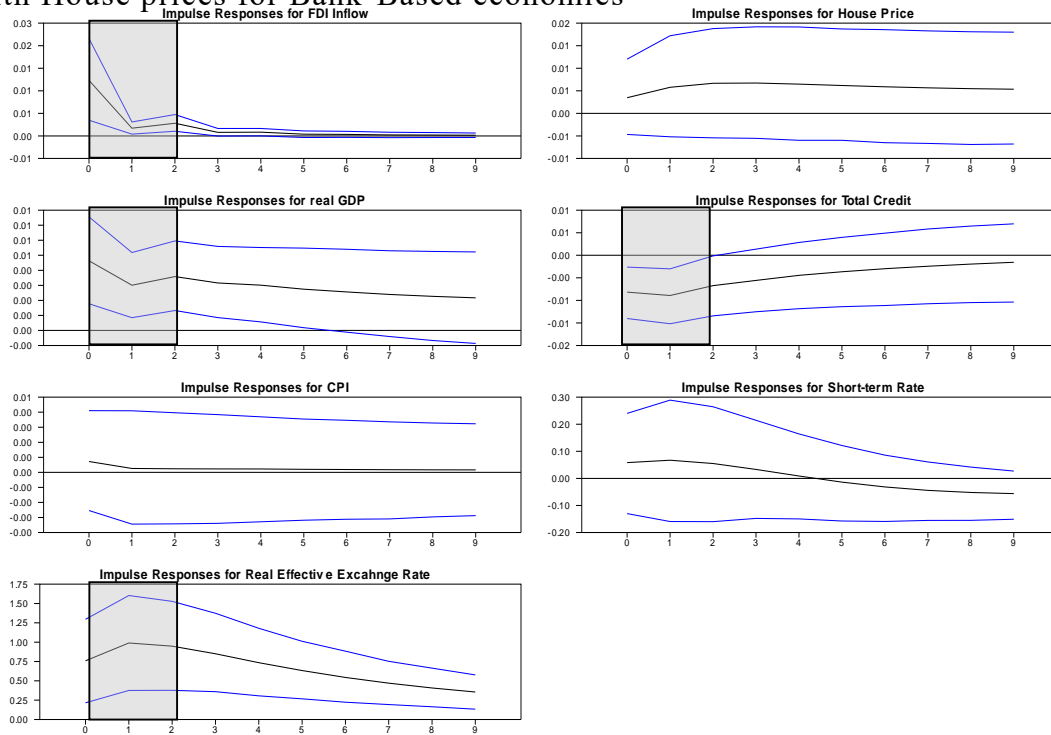

Figure 4-b. Impulse Responses to Net FDI Inflow shock obtained from VAR model with Stock prices for Market-Based economies
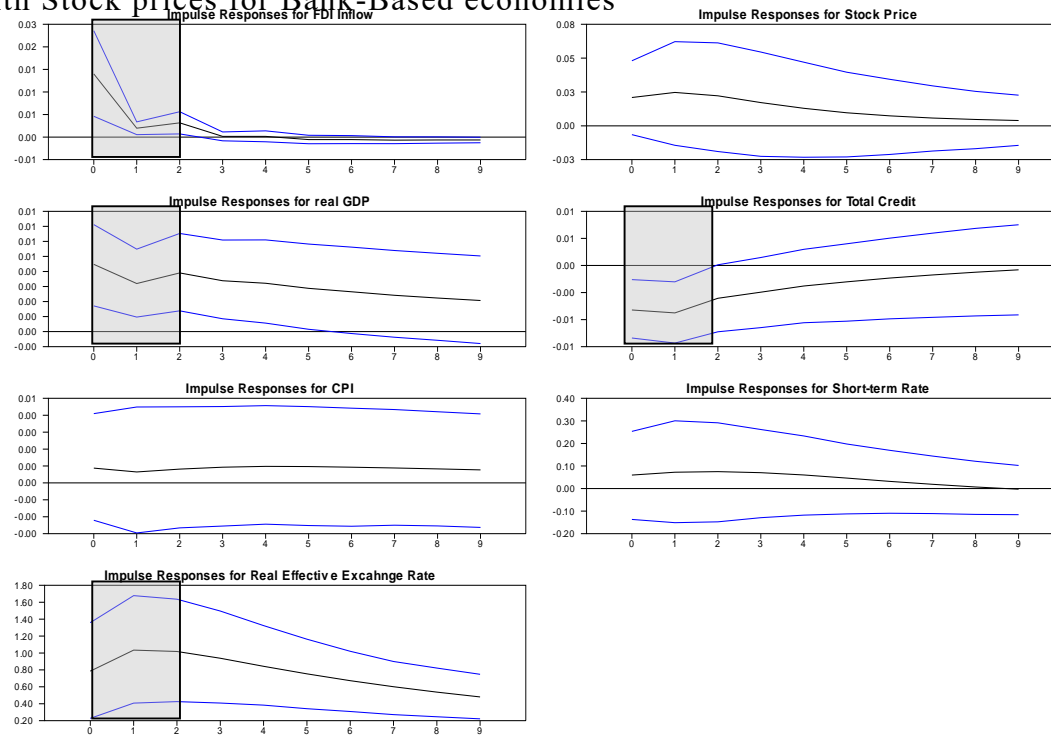
Figure 4-c. Impulse Responses to Net FDI Inflow shock obtained from VAR model
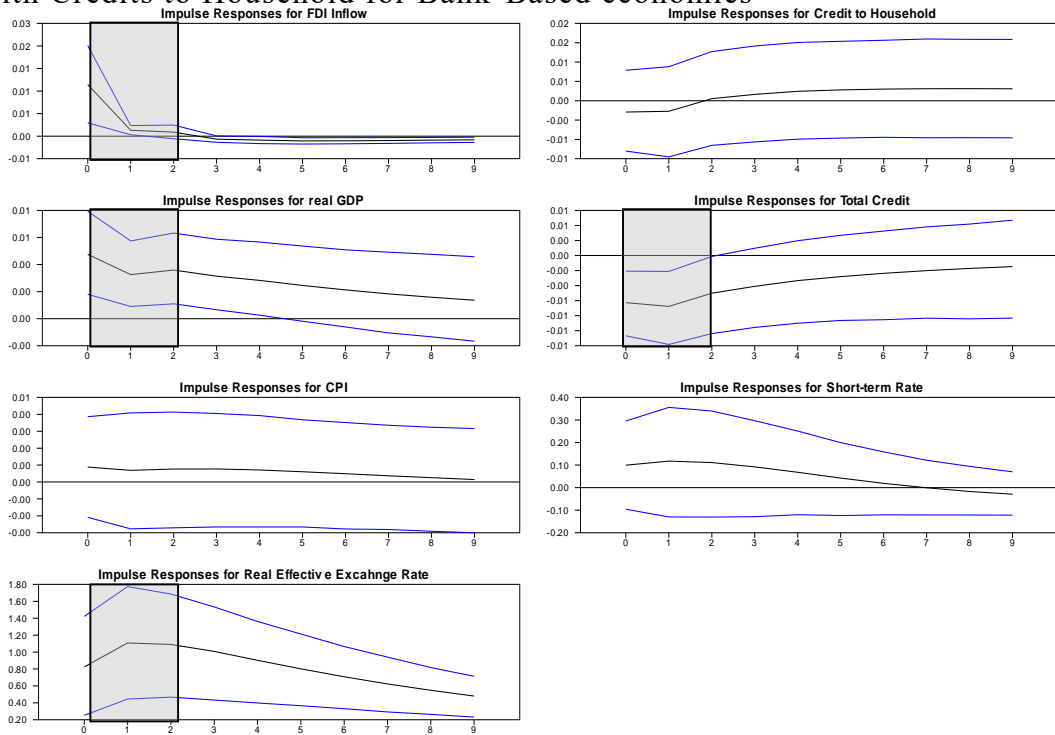with Credits to Household for Market-Based economies

Figure 4-d. Impulse Responses to Net FDI Inflow shock obtained from VAR model
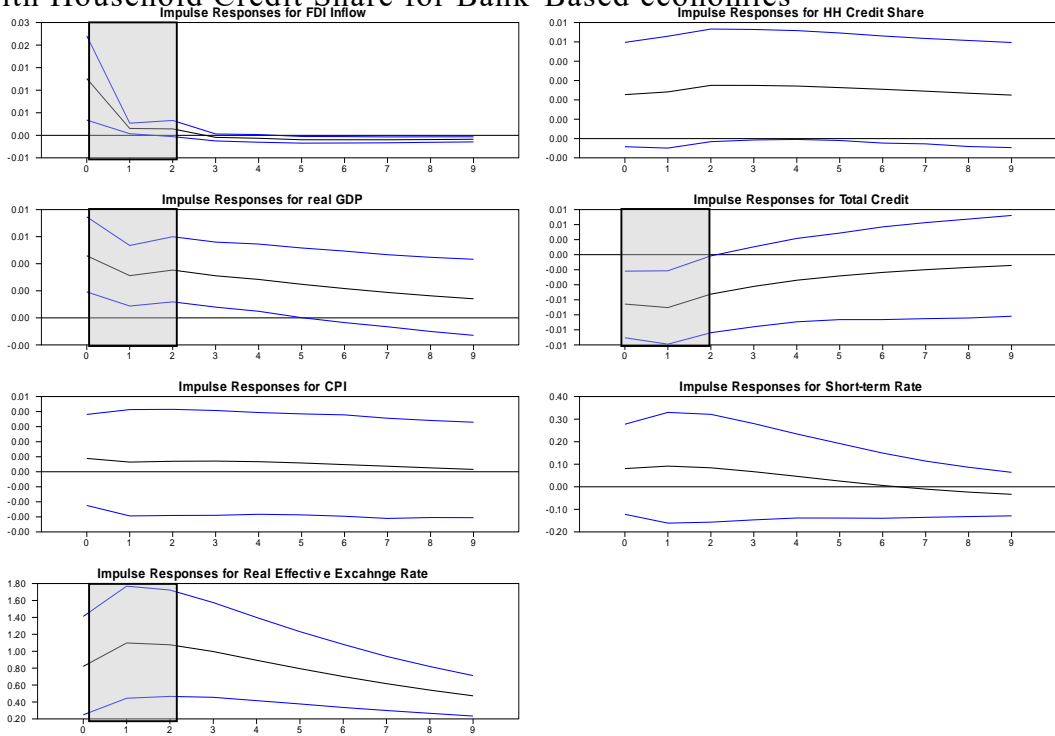with Household Credit Share for Market-Based economies

Figure 5-a. Impulse Responses to Net FDI Inflow shock obtained from VAR model with House prices for Bank-Based economies

Figure 5-b. Impulse Responses to Net FDI Inflow shock obtained from VAR model with Stock prices for Bank-Based economies

Figure 5-c. Impulse Responses to Net FDIo Inflow shock obtained from VAR model with Credits to Household for Bank-Based economies

Figure 5-d. Impulse Responses to Net FDI Inflow shock obtained from VAR model with Household Credit Share for Bank-Based economies

Figure 6-a. Impulse Responses to Net Other Inflow shock obtained from VAR model with House prices for Market-Based economies
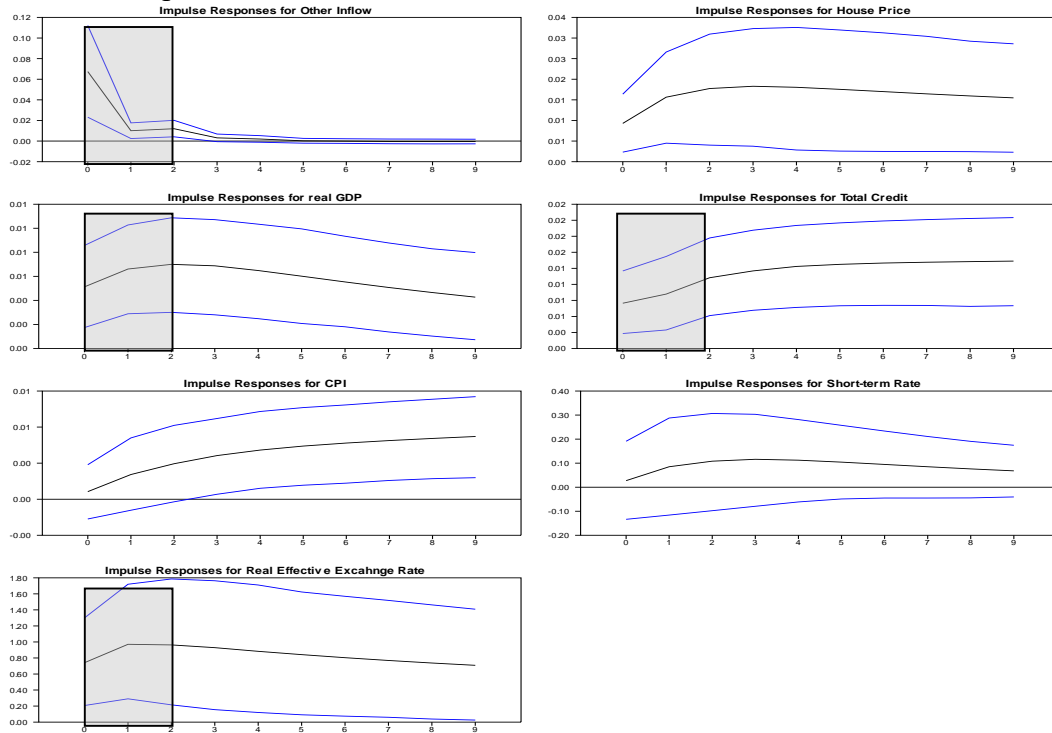

Figure 6-b. Impulse Responses to Net FDI Inflow shock obtained from VAR model with Stock prices for Bank-Based economies
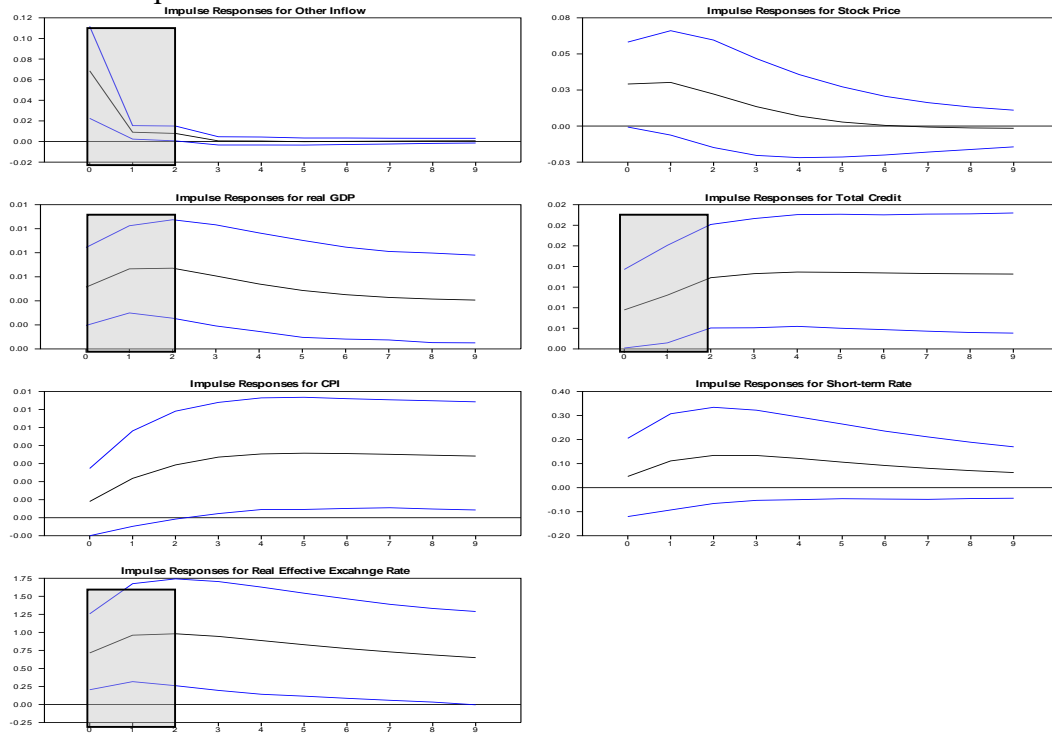
Figure 6-c. Impulse Responses to Net Other Inflow shock obtained from VAR model
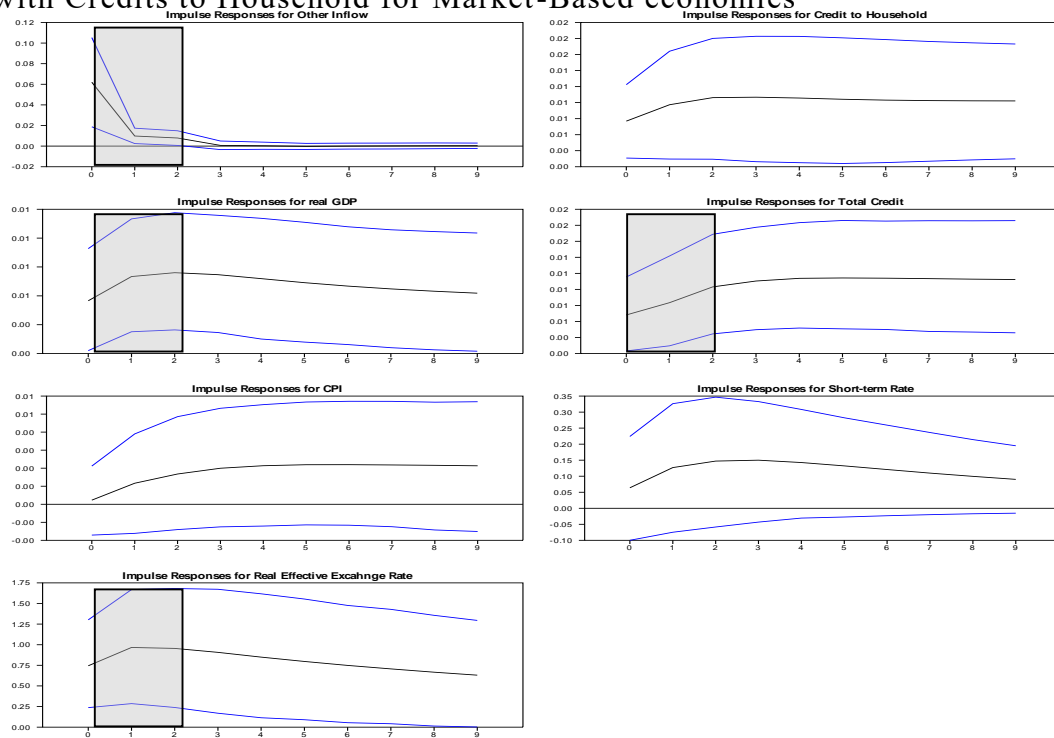with Credits to Household for Market-Based economies

Figure 6-d. Impulse Responses to Net Other Inflow shock obtained from VAR model
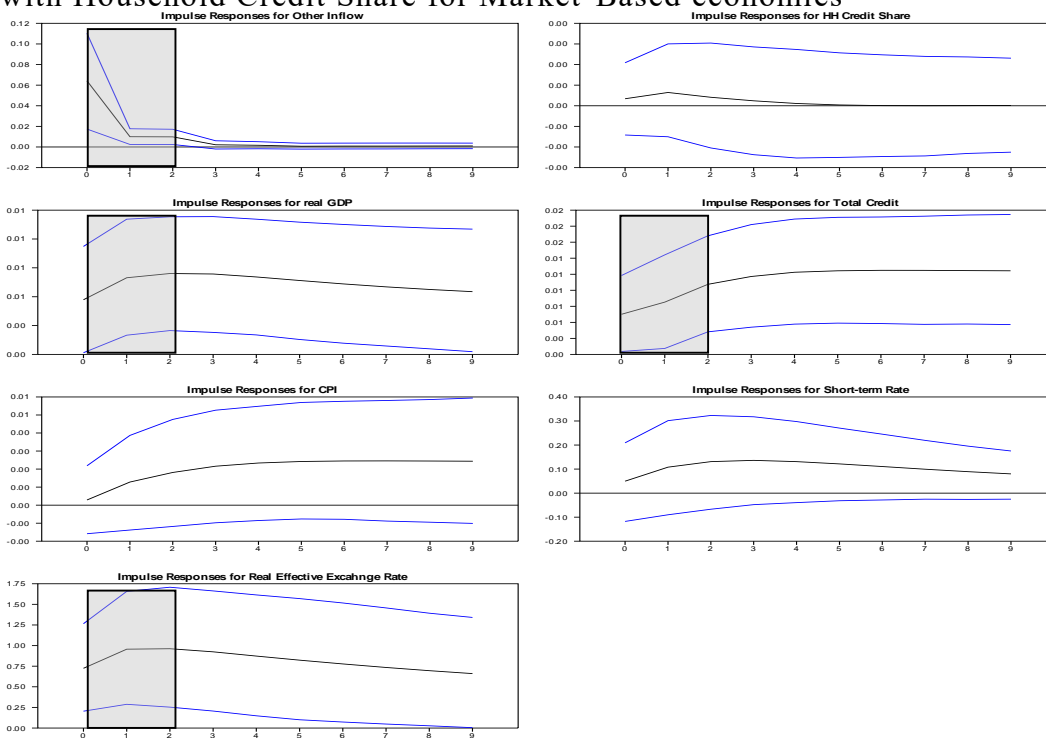with Household Credit Share for Market-Based economies

Figure 7-a. Impulse Responses to Net Other Inflow shock obtained from VAR model with House prices for Bank-Based economies
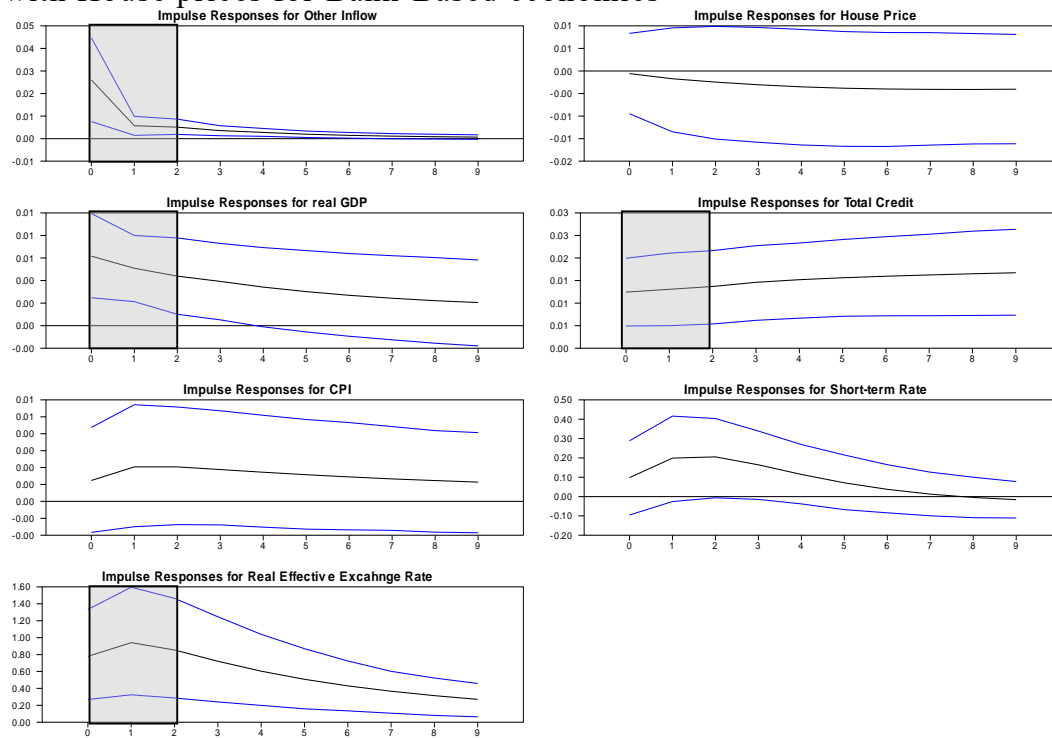

Figure 7-b. Impulse Responses to Net Other Inflow shock obtained from VAR model with Stock prices for Bank-Based economies
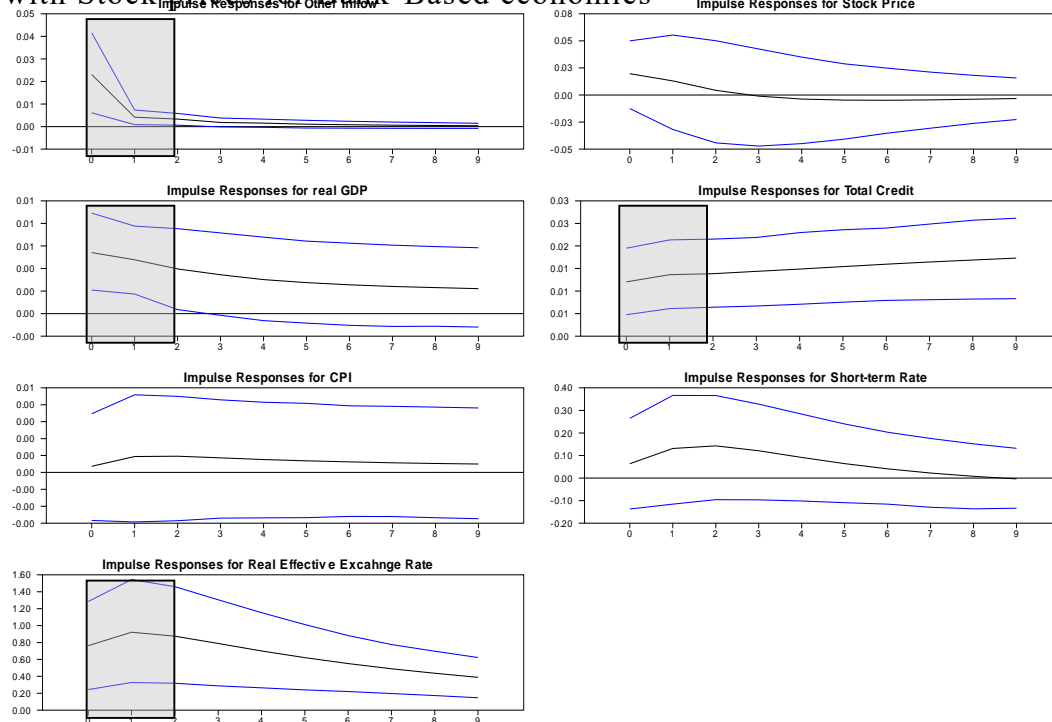
Figure 7-c. Impulse Responses to Net Other Inflow shock obtained from VAR model with Credits to Household for Bank-Based economies
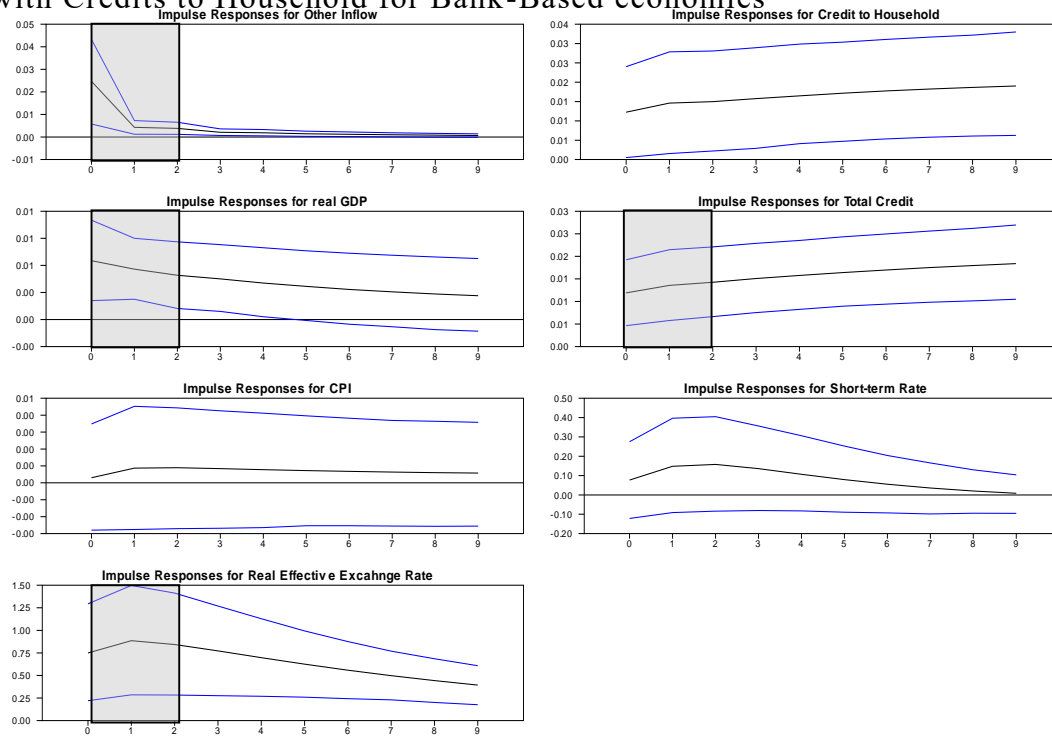

Figure 7-d. Impulse Responses to Net Other Inflow shock obtained from VAR model with Household Credit Share for Bank-Based economies
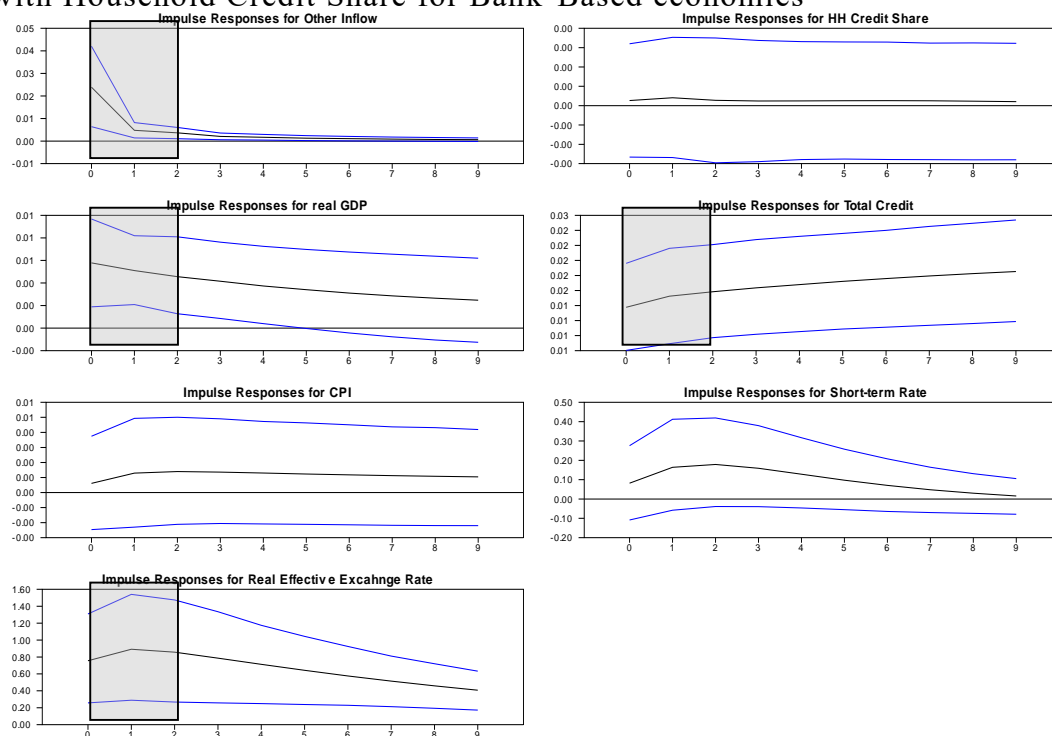
Table 1. Financial Structure (Average over 2000-2014)

	Financial Structure #1 (a)/(b)	Financial Structure #2 (a)/(c)	(a) Stock Market Total Value Traded to GDP (%)	(b) Private Credit by DMBs to GDP (%)	(c) Private Credit by DMBs and OFIs to GDP
Korea	1.312	1.265	116.801	89.052	92.305
Hong Kong	2.545	2.545	406.162	159.576	159.576
Singapore	1.069	1.024	106.104	99.273	103.595
Thailand	0.485	0.430	48.369	99.638	112.397
Malaysia	0.374	0.374	40.774	109.067	109.067
Indonesia	0.450	0.430	10.289	22.867	23.949
Hungary	0.345	0.345	16.549	48.025	48.025
Poland	0.275	0.275	10.390	37.778	37.778
Czech Republic	0.284	0.284	11.656	40.984	40.984
Sweden	1.049	1.032	109.155	104.051	105.809
Denmark	0.269	0.269	44.990	167.341	167.341
Norway	0.571	0.503	41.146	72.066	81.757
Finland	1.504	1.504	110.100	73.182	73.182

Source: Beck, Demirguc-Kunt, Levine, Cihak and Feyen (2016)

Table 2. Definitions and Sources of variables

Name		Definition and Data source
Capital Inflow variables		
FN_TOTAL	net Capital Inflows over GDP	IFS, - C. FINANCIAL ACCOUNT (- 542309NAZF)
FN_FDI	net Direct Investment over GDP	IFS, Liabilites(5423A9LAZF) - Assets (5423A9AAZF)
FN_PF	net Portfolio Inflows over GDP	IFS, Liabilites(5423B9LAZF) - Assets (5423B9AAZF)
FN_OTHER	net Other Inflows over GDP	IFS, Liabilites(5423D9LAZF) - Assets (5423D9AAZF)
Macroeconomic and financial variables		
LRGDP	log real GDP (2010 price)	IFS,
LCPI	log consumer price index	IFS,
REER	Real effective exchange rate	BIS for Thailand, Indonesia, and Norway. IFS for others.
SHORT_R	Real short-term interest rate	IFS, Money Market Rate (54260B..ZF...) deflated by CPI
LONG_R	Real long-term interest rate	IFS, , Government Bond Yield (54261...ZF...) deflated by CPI
Housing prices		
RHP	real housing price index (deflated by CPI)	
	Korea	*CEIC, Housing Price Index: Total (Kookmin Bank), Deflated by CPI*
	Hong Kong	*CEIC, Property Price Index: Qtr: Domestic Premise (DP) (Rating and Valuation Department), Deflated by CPI*
	Singapore	*CEIC, Property Price Index: Private Residential (PR): All (Urban Redevelopment Authority), Deflated by CPI*
	Thailand	*CEIC, Housing Price Index: Single Detached House (SDH): Including Land (Bank of Thailand), Deflated by CPI*
	Malaysia	*CEIC, House Price Index: Malaysia (Valuation and Property Services Department, Ministry of Finance), Deflated by CPI*
	Indonesia	*CEIC, Residential Property Price Index: BI: 16City(after 2012), 14City(before 2011) (Bank of Indonesia), Deflated by CPI*
	Hungary	*CEIC, House Price Index (FHB Mortgage Bank), Deflated by CPI*
	Poland	*CEIC, Hedonic House Price Index: Secondary Market: 7 Cities (National Bank of Poland), Deflated by CPI*
	Czech Republic	*BIS, RESID. PROPERTY PRICES,ALL OWNER OCCUP. DWELL, PURE PRICE,Q-ALL,NSA, Deflated by CPI*
	Sweden	*BIS, From 2005 Q1 onwards: All types of dwellings in the country as a whole; 1986 Q1-2004 Q4: Residential property prices, all owner-occupied houses, per dwelling, NSA, Deflated by CPI*
	Denmark	*BIS, From 2002 Q1 onwards All types of dwellings in the country as a whole; 1970 Q1-2002 Q3 : Residential property prices, single-family houses, pure price, NSA, Deflated by CPI*
	Norway	*BIS, From 1992 Q1 onwards: Residential property prices,all (only existing from 2012) dwellings, pure price, NSA, Deflated by CPI*
	Finland	*BIS, From 2010 Q1 onwards: : Residential property prices, all dwellings, pure prices, NSA; 2005 Q1-2009 Q4: Residential property prices, existing dwellings, per m2; 1983 Q1-2004 Q4: Residential property prices, existing flats and terraced houses, total, per m2, NSA, Deflated by CPI*
Stock prices		
RSP	real share price index	IFS, deflated by CPI
Household credit		
CRNFC	Credit to Non-financial corporations over GDP	BIS, Total Credit to Non-financial corporations
CRHH	Credit to Households over GDP	BIS, Total Credit to Households and NPISHs,
LCRHH	log credit to Households	Log{(CRHH) × nominal GDP}
CRHH_SHARE	Household credit share	CRHH / (CRHH+CRNFC)
LCR	log private credit	Log{(CRHH+CRNFC) × nominal GDP}

Table 3. Data Availability

	FN_ TOTAL	FN_ FDI	FN_ PF	FN_ OTHER	LRGDP	LCPI	REER	LHP	LSP	LONG_R	SHORT_R	LCRHH CRHH_S LCR
Korea	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**1990Q2 -2015Q4**	**1990Q2 -2015Q4**	**2000Q1 -2015Q4**
Hong Kong	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**
Singapore	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**
Thailand	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4
Malaysia	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2009Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2006Q1 -2015Q4
Indonesia	2000Q1 -2015Q4	2000Q1 -2015Q3	2000Q1 -2015Q3	2000Q1 -2015Q3	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2002Q1 -2015Q4	2000Q1 -2015Q4	na	2000Q1 -2015Q4	2001Q4 -2015Q4
Hungary	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4
Poland	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2006Q3 -2015Q4	2000Q1 -2015Q4	2001Q1 -2015Q4	1991Q1 -2015Q4	2000Q1 -2015Q4
Czech Republic	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2008Q1 -2015Q4	2000Q1 -2015Q4	2000Q2 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4
Sweden	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**
Denmark	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4
Norway	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4	2000Q1 -2015Q4
Finland	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**	**2000Q1 -2015Q4**

Table 4. Sign Restrictions

Restriction on	(1) VAR with total capital inflows		(2) VAR with FDI inflows		(3) VAR with Portfolio inflows		(4) VAR with Other inflows (Loan inflows)	
	Sign	Horizon	Sign	Horizon	Sign	Horizon	Sign	Horizon
Capital Inflows	+	2	+	2	+	2	+	2
LRGDP	+	2	+	2	+	2	+	2
LCPI	Unrestricted		Unrestricted		Unrestricted		Unrestricted	
REER	+	2	+	2	+	2	+	2
LCR (Total Credit)	Not included		-	2	Not included		+	2
LHP / LCRHH LCRHH_SHARE	Unrestricted		Unrestricted		Unrestricted		Unrestricted	
LSP	Not included		Not included		Not included		Not included	
LONG_R	-	2	Not included		-	2	Not included	
SHORT_R	Unrestricted		Unrestricted		Unrestricted		Unrestricted	

Figure A1-a. Impulse Responses to a Net Total Capital Inflow shock obtained from VAR model with House Prices for the full sample
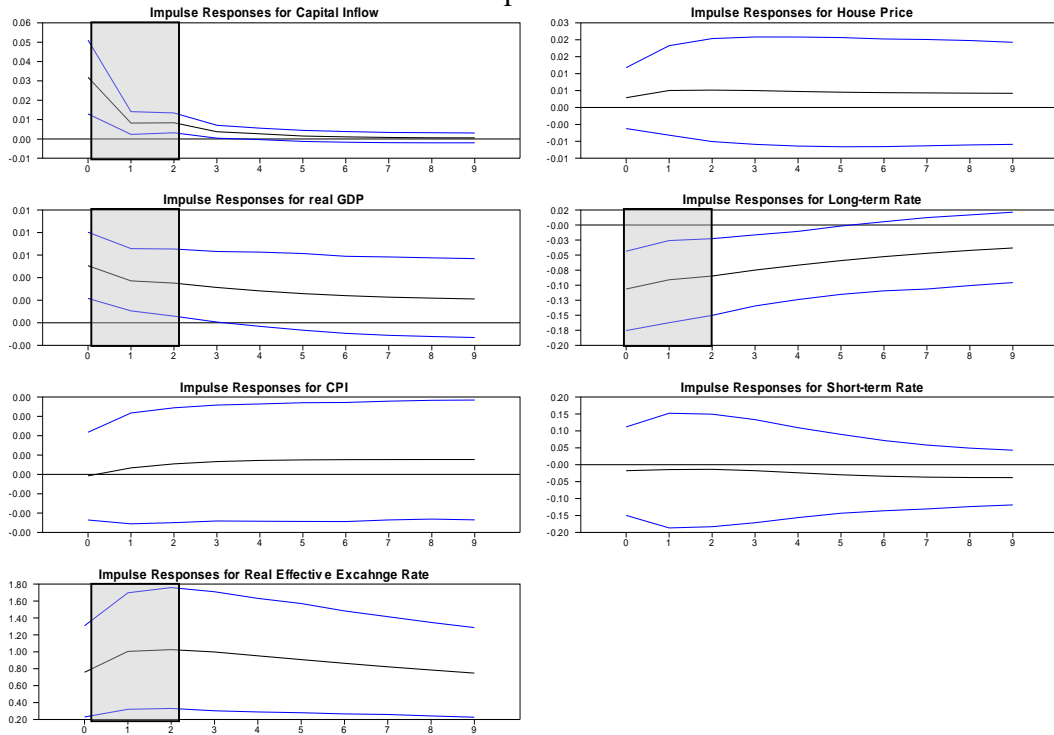
Figure A1-b. Impulse Responses to a Net Total Capital Inflow shock obtained from VAR model with Stock Prices for the full sample
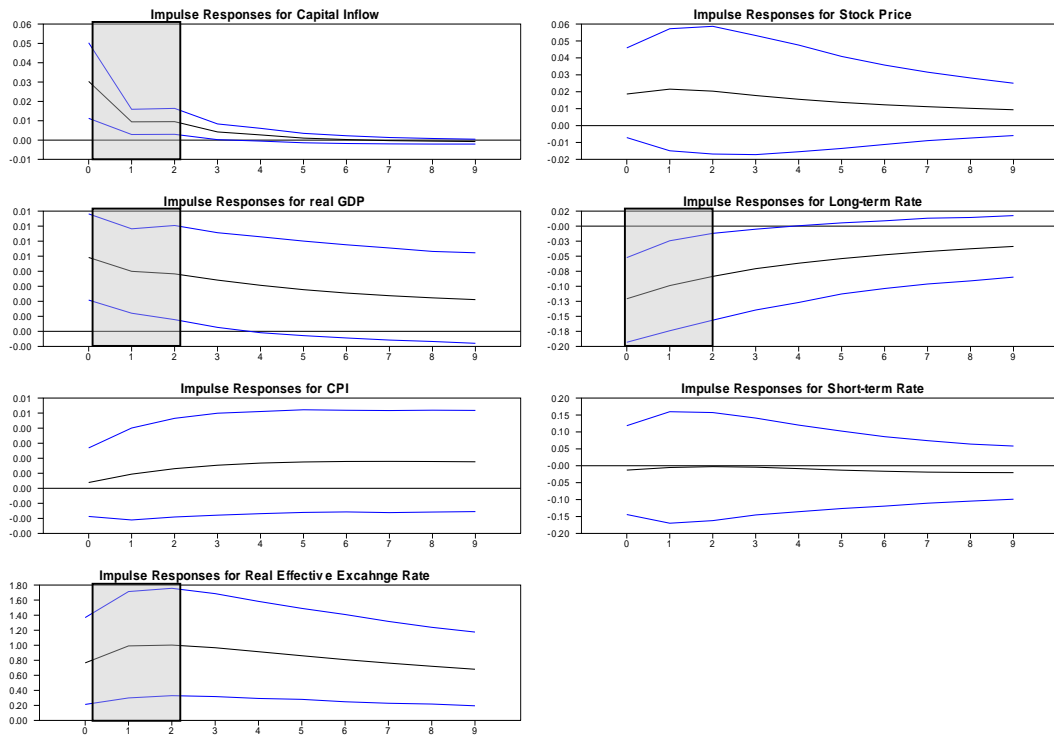
Figure A1-c. Impulse Responses to Net Total Capital Inflow shock obtained from VAR model with Credits to Household for the full sample
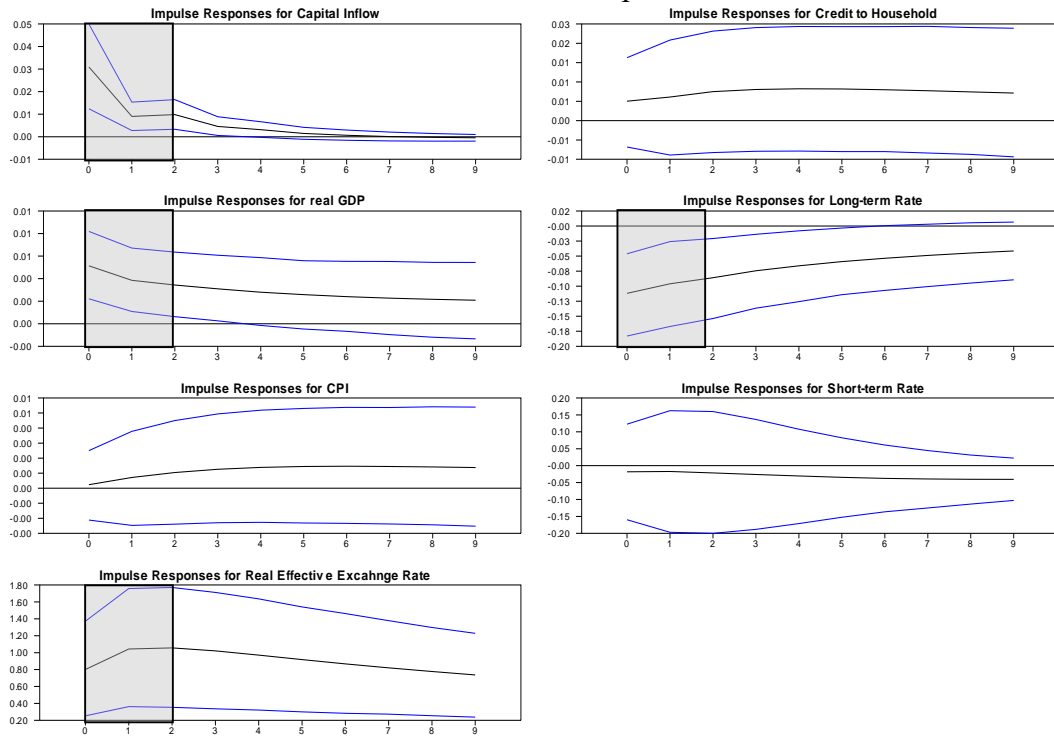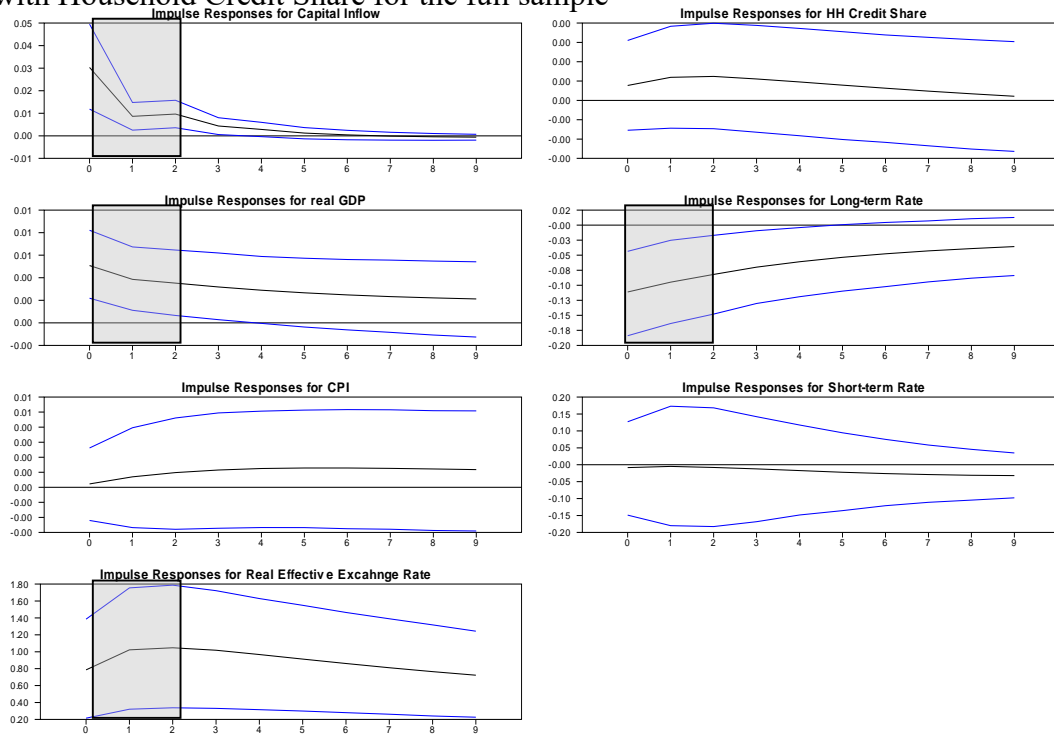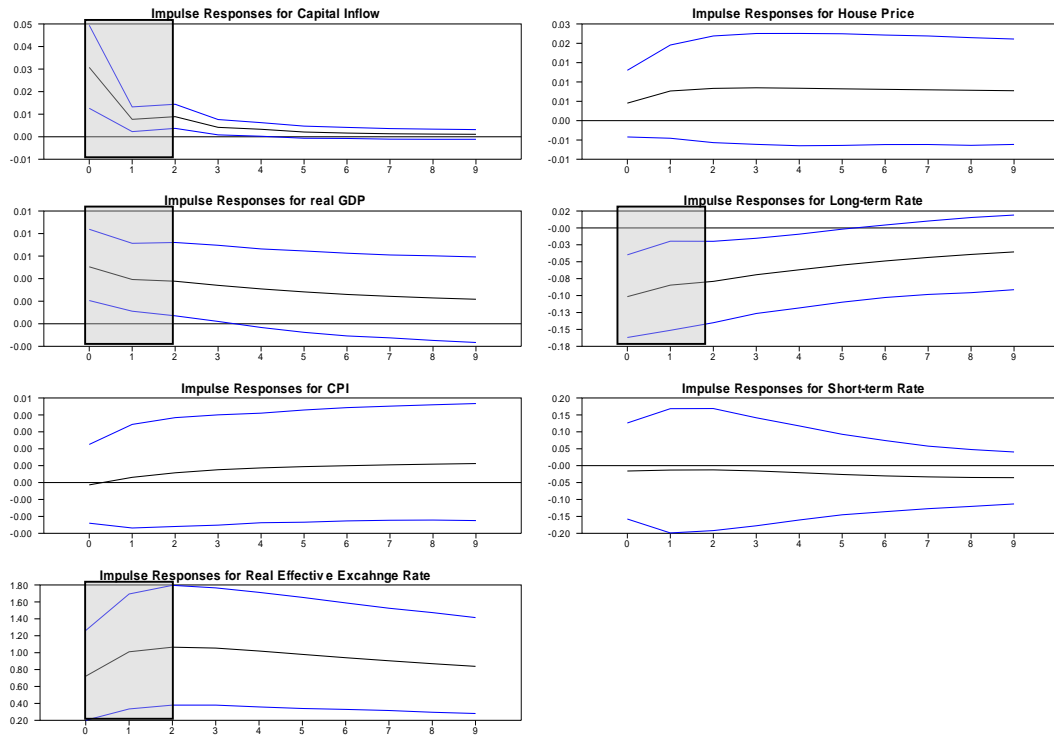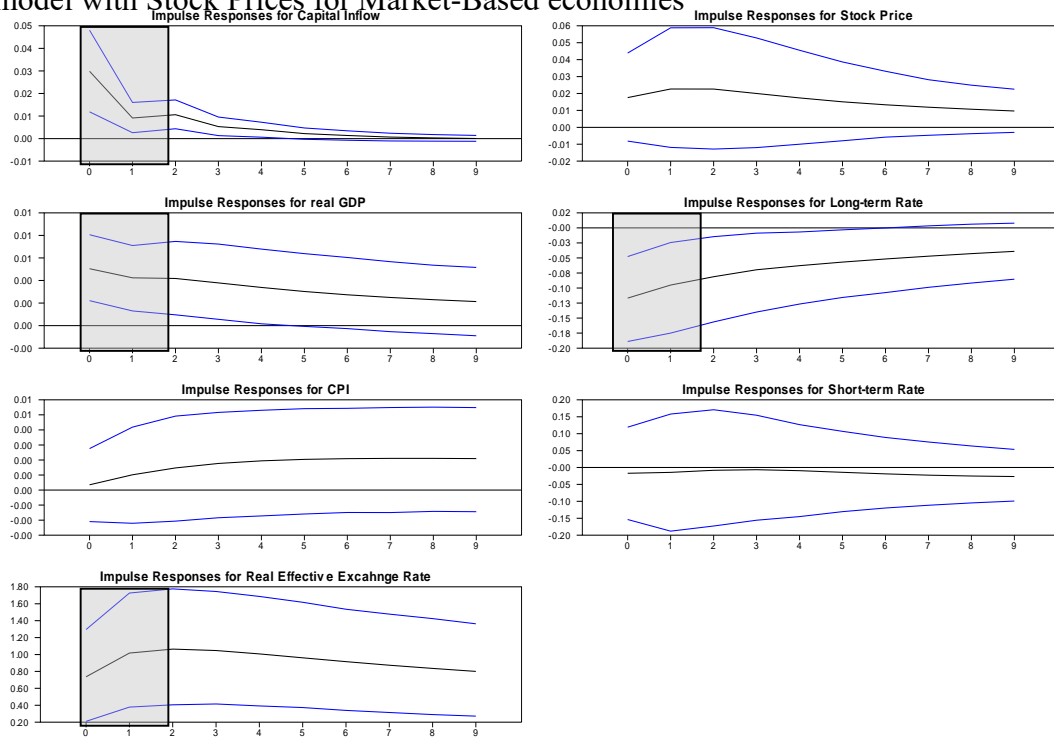

Figure A1-d. Impulse Responses to Net Portfolio Inflow shock obtained from VAR model with Household Credit Share for the full sample

Figure A2-a. Impulse Responses to a Net Total Capital Inflow shock obtained from VAR model with House Prices for Market-Based economies

Figure A2-b. Impulse Responses to a Net Total Capital Inflow shock obtained from VAR model with Stock Prices for Market-Based economies

Figure A2-c. Impulse Responses to Net Total Capital Inflow shock obtained from VAR model with Credits to Household for Market-Based economies
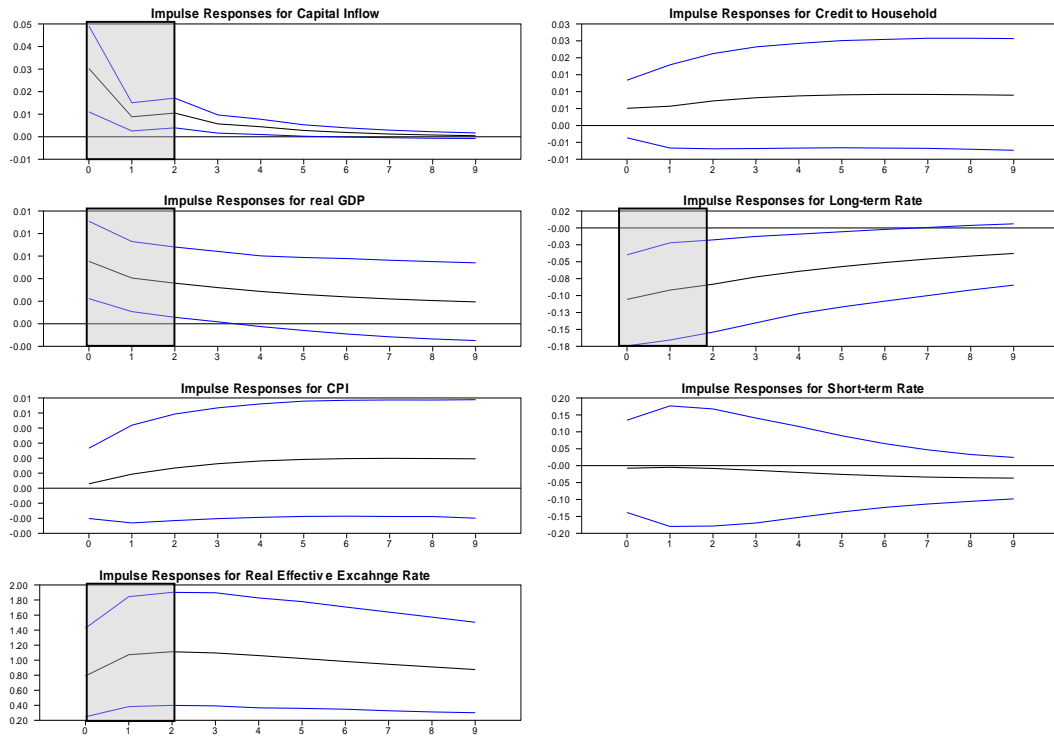

Figure A2-d. Impulse Responses to Net Total Capital Inflow shock obtained from VAR model with Household Credit Share for Market-Based economies
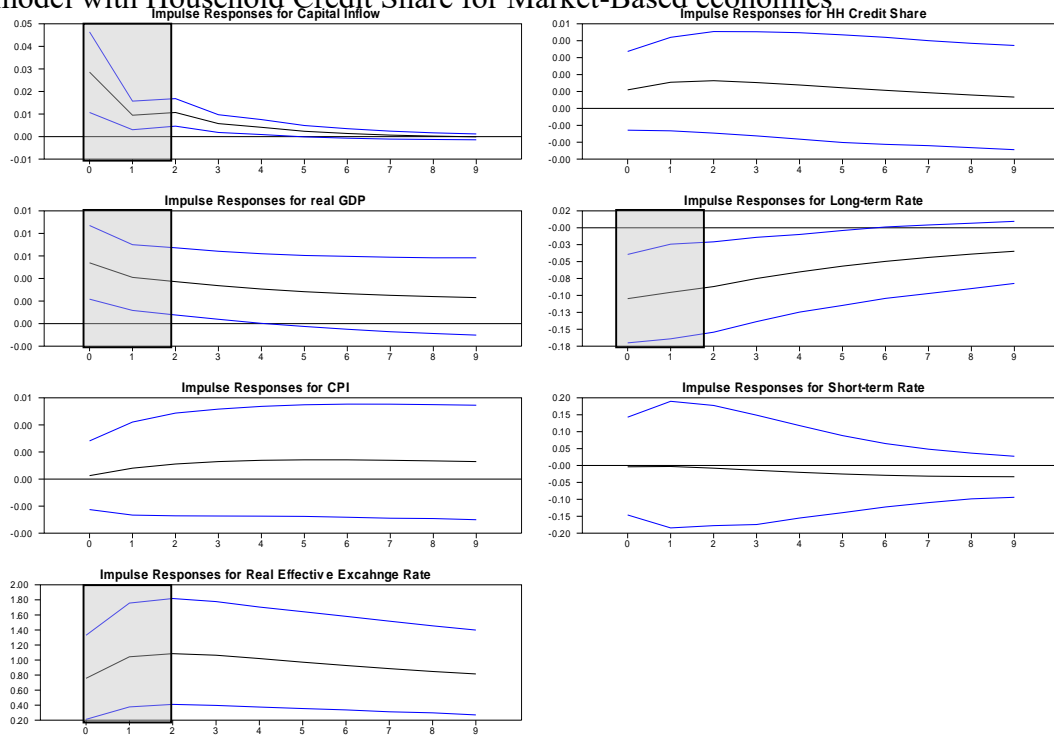
Figure A3-a. Impulse Responses to a Net Total Capital Inflow shock obtained from VAR model with House Prices for Bank-Based economies
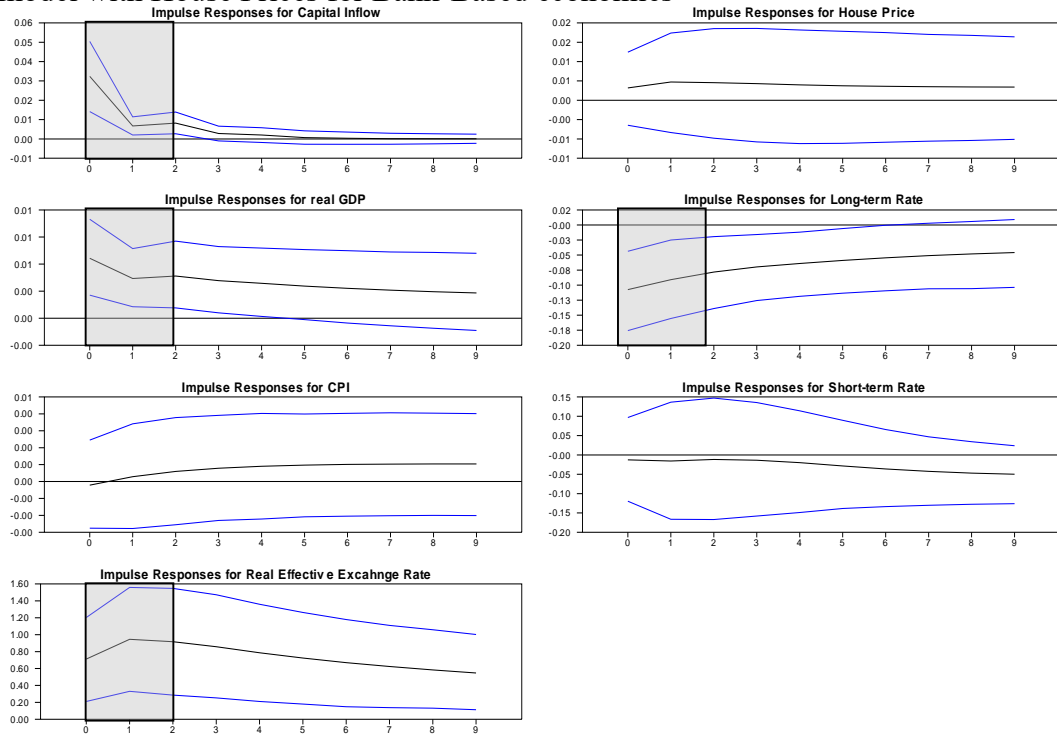

Figure A3-b. Impulse Responses to a Net Total Capital Inflow shock obtained from VAR model with Stock Prices for Bank-Based economies
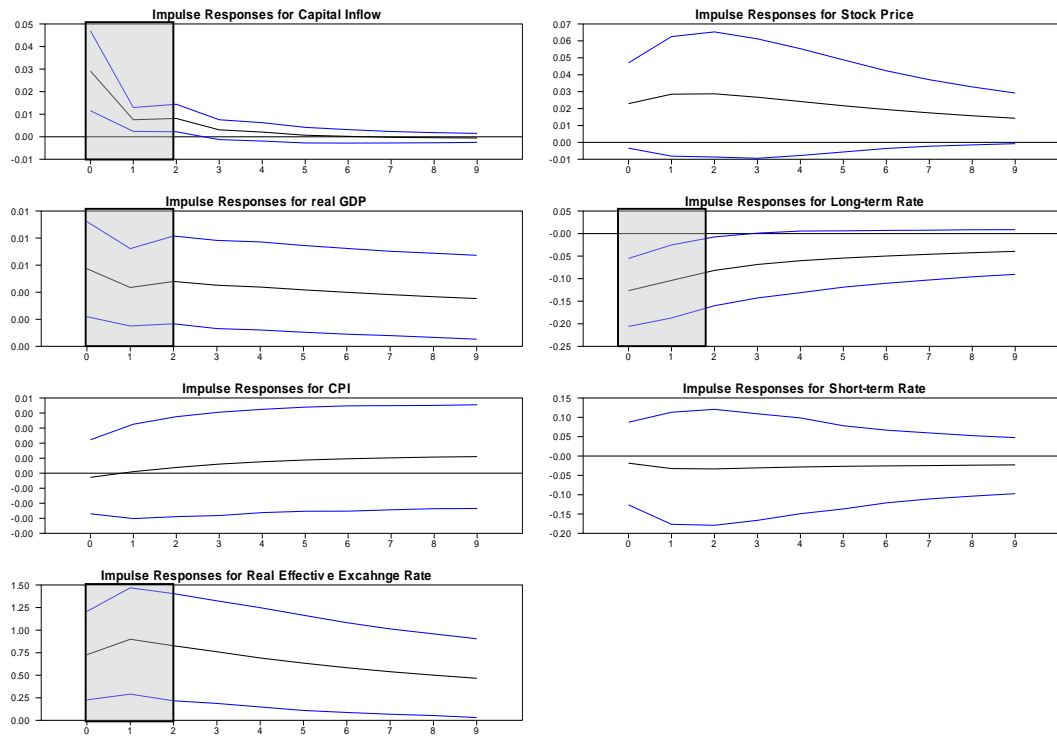
Figure A3-c. Impulse Responses to Net Total Capital Inflow shock obtained from VAR model with Credits to Household for Bank-Based economies
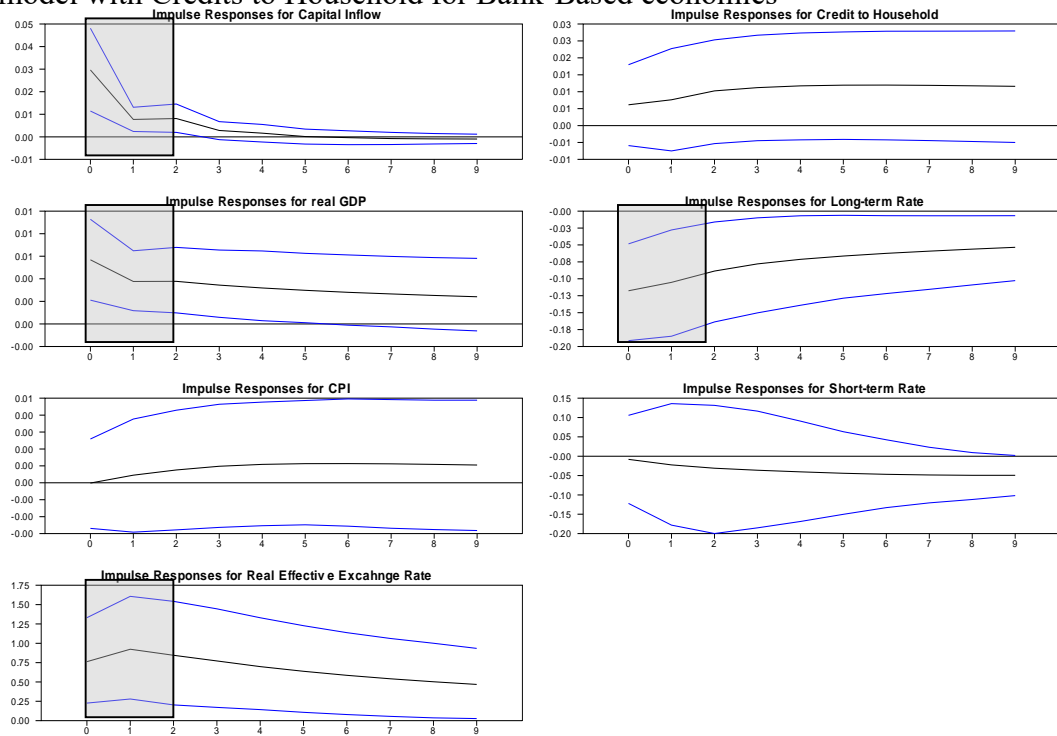

Figure A3-d. Impulse Responses to Net Total Capital Inflow shock obtained from VAR model with Household Credit Share for Bank-Based economies