Capital Flows, Financial Intermediation and Macroprudential Policies

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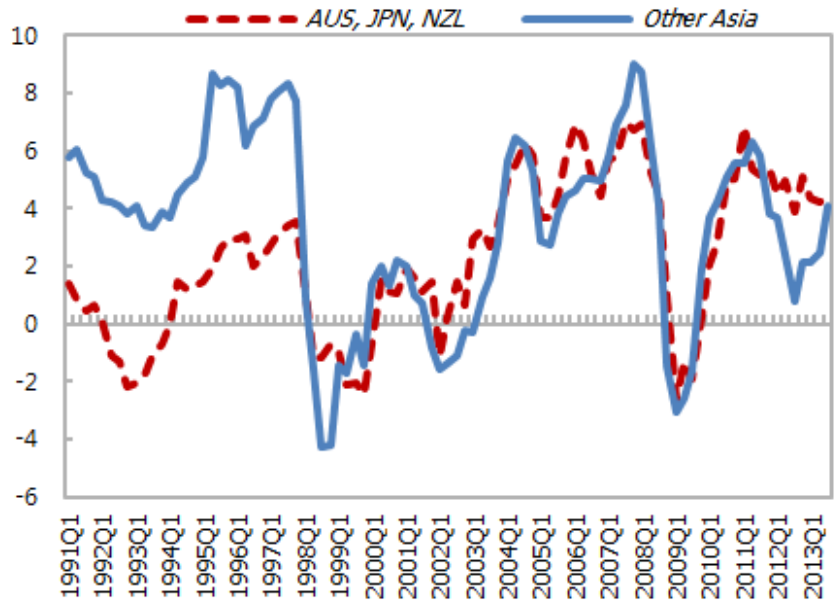
Introduction

- The crisis that started in 2007 has been the worst since the great depression of the 30s
- One of the most important features has been that shocks originating in the credit market result in costly output losses and large scale unemployment
- A key missing ingredient was a comprehensive policy framework responsible for systemic financial stability
- There is the need to develop a set of policies that can explicitly focus on systemic wide risks and macroprudential frameworks

Introduction

The Emerging Asia Experience

Managing the macroeconomic stability implications of volatile capital inflows and associated buildup of systemic risk is of great importance to Asia, especially in the context in which such flows are expected to remain volatile (see AP-REO April 2014)



Sources: *International Financial Statistics*; *World Economic Outlook*; and IMF staff calculations.
Other Asia includes China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan Province of China, Thailand, and Vietnam.

- Policymakers face a set of interrelated challenges:
  - Prevent capital flows from exacerbating macroeconomic overheating pressures
  - Minimize risks that prolonged periods of easy financing conditions undermine financial stability
  - Prevent the asset boom and bust cycle and costly losses of bank capital
- In this context, macroprudential measures can be particularly useful in reducing the procyclicality of financial systems and the amplitude of business cycles

Introduction

Highly Selected Literature Review

- Until the 2007 financial crisis most of the macro-financial literature focused on demand side of the credit market e.g. Kiyotaki and Moore (1997), BGG (1998), Iacoviello (2005)
- After 2007 the focus switched to the supply side of credit e.g. Gertler and Karadi (2011), Gertler and Kiyotaki (2011) Angelini et al. (2013)
- Macroprudential policy is at the top of the research agenda: Maino and Barnett (2013), Caruana (2011). In the DSGE literature see Angelini et al. (2014), Kannan et al (2012)
- The effects of macroprudential policy on capital flows in a relatively unexplored topic: Unsal (2013), Medina, Roldos (2014)

The Model

The economy is represented by a small open economy model along the lines of Gali and Monacelli (2002), Gertler et al. (2007) and Batini et al (2007) with financial frictions as in Faia (2007) Benigno (2009) and a banking sector a la Gertler and Karadi (2011) and Gertler and Kiyotaki (2010)

In the economy there are three players:

- Households: they consume, supply labor and borrow in the domestic and external market. Moreover, they supply funds to banks under the form of deposits
- Banks: they use deposits and net worth to make loans to firms
- Firms: they produce capital and a basket of differentiated goods for consumption

The Model

Households

- Each household consists of $1-\varpi$ workers and ϖ bankers
- Workers supply labour, bring wages back to the household and supply funds to the banking sector
- Each banker manages a bank, retains some earning and brings back the rest to the household
- Each period, bankers exit to become workers and bring back the retained earning with probability $(1-\theta)$
- $(1-\theta)\varpi$ workers becomes banker with a fraction of total assets of the households as start-up fund

- Each household consume, save and provide labor
- Consumption index consists of home-produced and foreign goods
- Households have access to domestic and international financial markets. As in Gertler et al. (2007), Faia (2007) and Benigno (2009) we assume that they face financial frictions when they purchase foreign bonds. In particular, they are subject to a risk premium to hold foreign bonds

Banks use deposits D_t and net worth NW_t to make new loans $S_{B,t}$. This implies a balance sheet of the type:

$$Q_t S_{B,t} = NW_t + D_t$$

Banks exit with probability $1-\theta$ per period and therefore survive for $i-1$ periods and exit in the ith period with probability $(1-\theta)\theta^{i-1}$. Given the fact that bank pays dividends only when it exists, the banker's objective is to maximize expected discounted terminal wealth:

$$V_t = E_t \sum_{i=0}^{\infty} (1-\theta)\theta^{i-1} \Lambda_{t,t+i} NW_{t+1+i}$$

As in Gertler and Karadi (2011), to motivate an endogenous constraint on the bank's ability to obtain funds, we introduce an agency problem

After the intermediary obtains funds, the bank's manager may transfer a fraction of assets to her family. In the recognition of this possibility, households limit the amount of funds they lend to banks

In order to ensure that bankers do not divert funds the following incentive constraint must hold:

$$V_t \geq \Theta(Q_t S_{B,t})$$

V_t can be expressed as:

$$V_t = \mu_{s,t} Q_t S_{B,t} + \nu_{d,t} NW_t$$

The constraint becomes:

$$\mu_{s,t} Q_t S_{B,t} + \nu_{d,t} NW \geq \Theta(Q_t S_{B,t})$$

when it binds we have a measure of the leverage ratio:

$$\phi_t = \frac{Q_t S_{B,t}}{NW_t} = \frac{\nu_{d,t}}{\Theta - \mu_{s,t}}$$

Total worth accumulate according to:

$$NW_t = \left\{ \left(\theta + \xi^B \right) [Z_t + (1-\delta) Q_t] S_{b,t-1} - R_t D_{t-1} \right\} BC_t$$

There are three types of non-financial firms:

- Competitive *good producers* produce output according to a standard Cobb-Douglas production function with capital and labor as inputs
- *Capital producers* produce capital which is sold to good producers
- The monopolistically competitive *retail sector* uses a homogeneous wholesale good to produce a basket of differentiated goods for consumption. They face a probability to set the price optimally

Macroprudential policy affects the net worth of existing bankers. We assume that banks have to pay a penalty when their leverage ratio deviates from a regulatory given target. In such scenario the net worth of the bankers can be represented as:

$$NW_t = (\theta + \xi)\left[Z_t + (1-\delta)Q_t\right]S_{b,t} - R_t D_{t-1} - pen * f\left(\frac{NW_t}{Q_t S_{b,t}} - MP_t\right)$$

where $pen * f\left(\frac{NW_t}{Q_t S_t} - MP_t\right)$ represent the penalty of deviating from a given macroprudential target

MP_t is expressed as:

$$MP_t = (1 - \rho_{MP}) MP + (1 - \rho_{MP}) (X_t - X) + \rho_{MP} MP_{t-1}$$

where MP equal to the steady state level of the leverage ratio $\frac{NW_t}{Q_t S_t}$ and the variable X_t equal to the growth rate of output

A positive value of X_t corresponds to a countercyclical policy: capital requirements increase in good times (banks must hold more capital for a given amount of loans) and decrease in recessions

Results

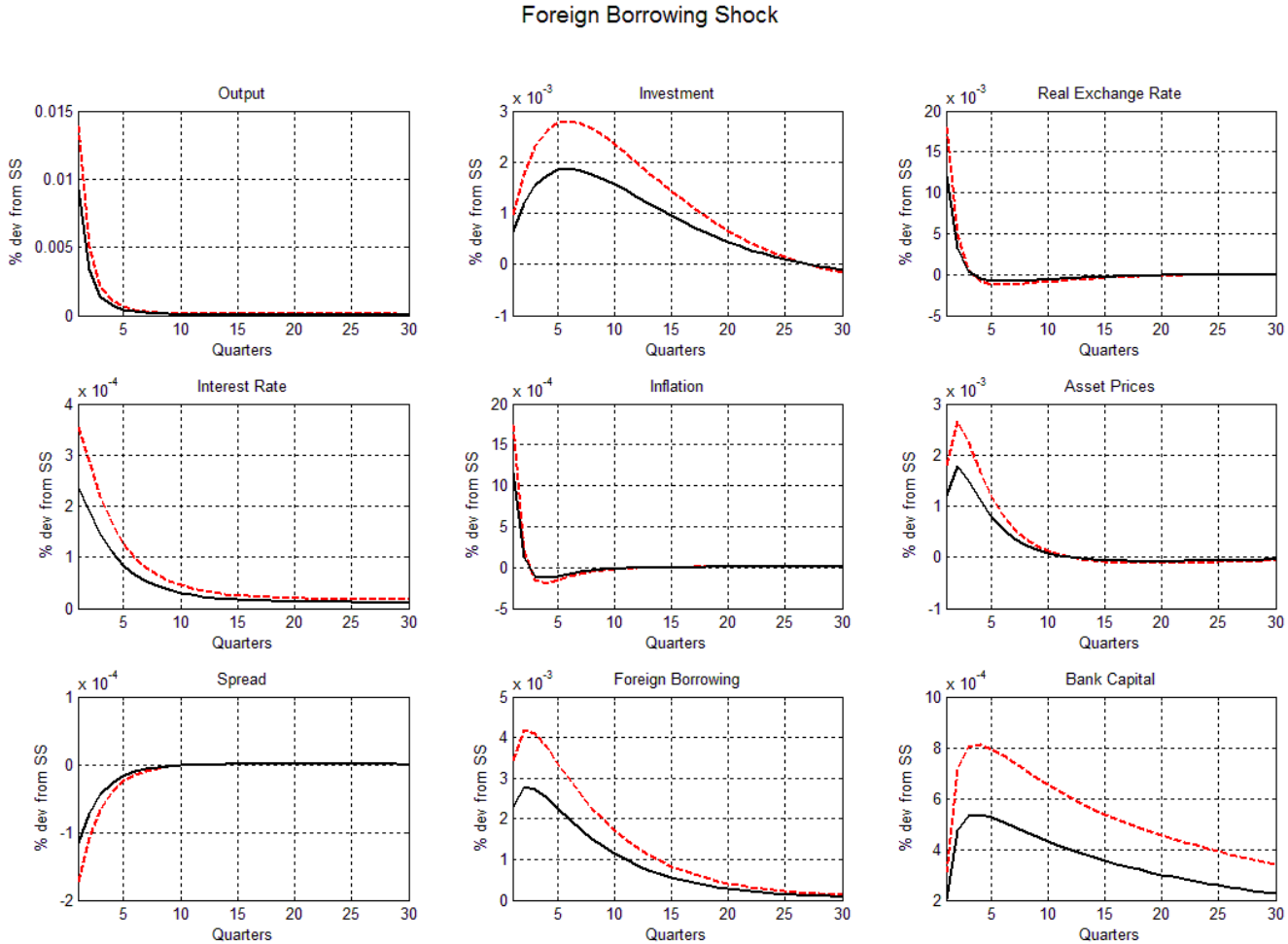
In order to illustrate the role of macroprudential policy in reducing procyclicality we compare the effects of several financial and non-financial shocks of an economy without macroprudential policy with an economy that has a set of active policies to reduce procyclicality

In order to study the interactions of macroprudential and monetary policy, we consider four types of shocks:

- Foreign borrowing shock
- Bank capital shock
- Technology shock
- Asset price

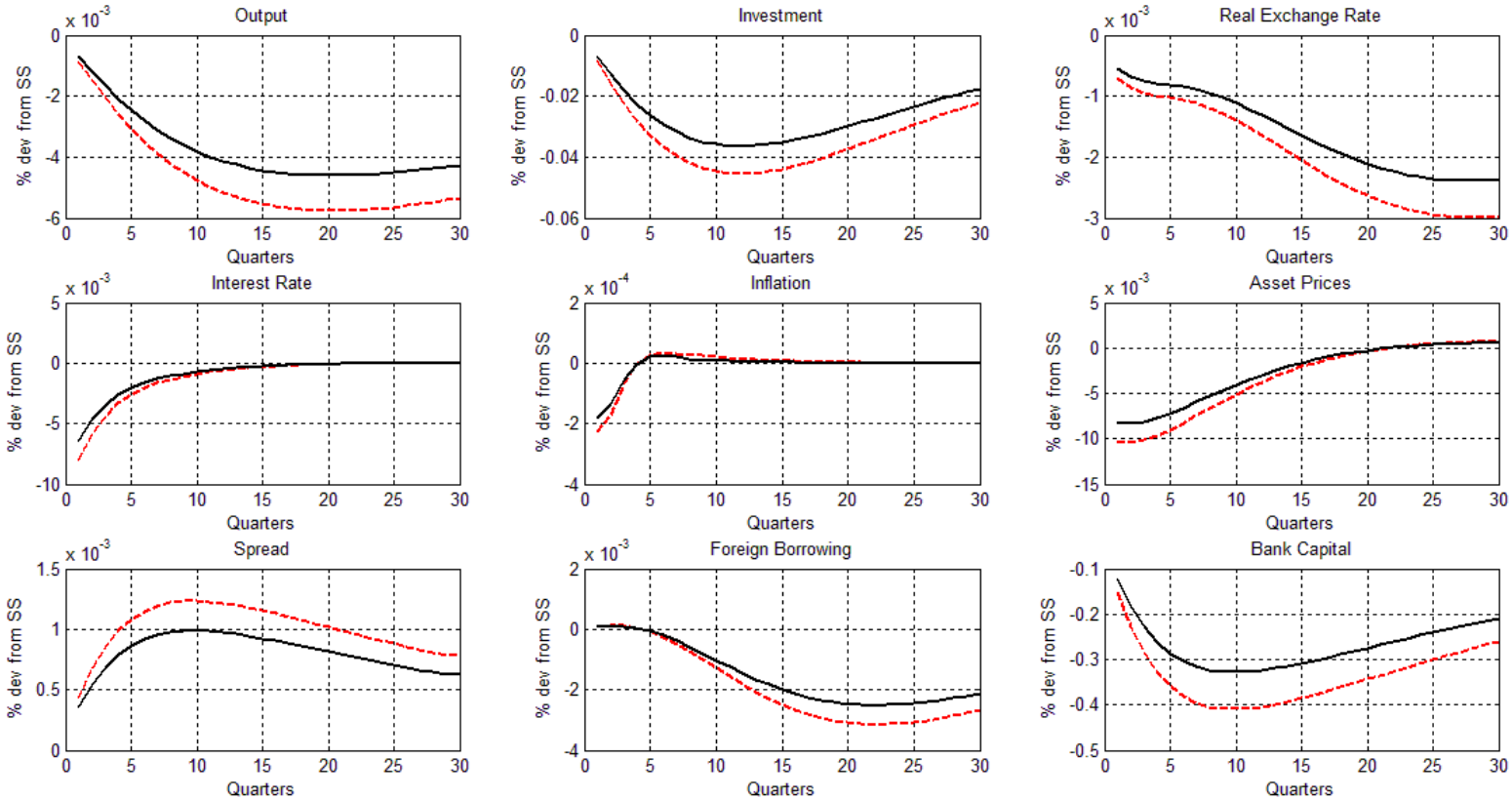
Impulse Response Function

Foreign Borrowing Shock



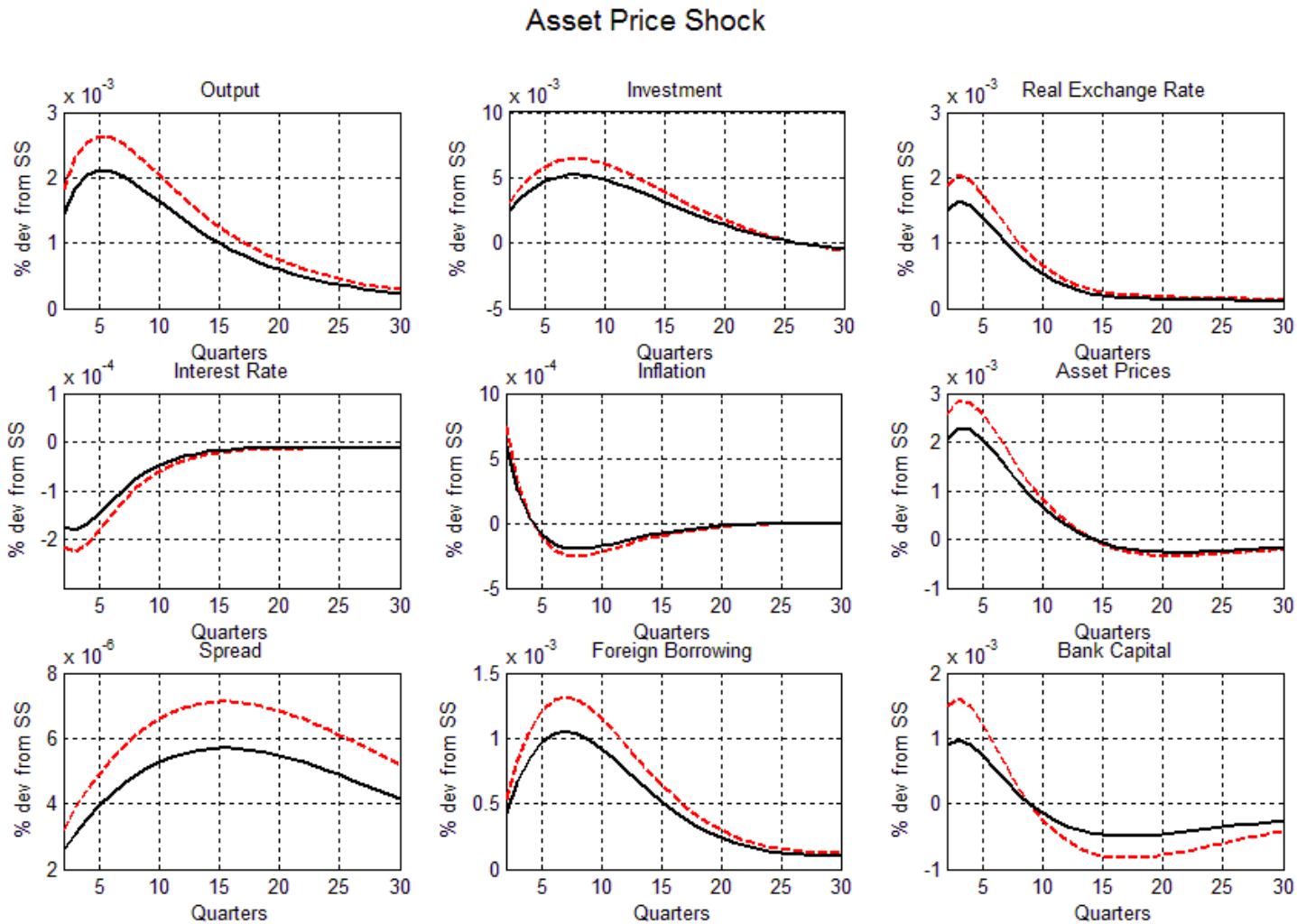
Impulse Response Function

Bank Capital Shock



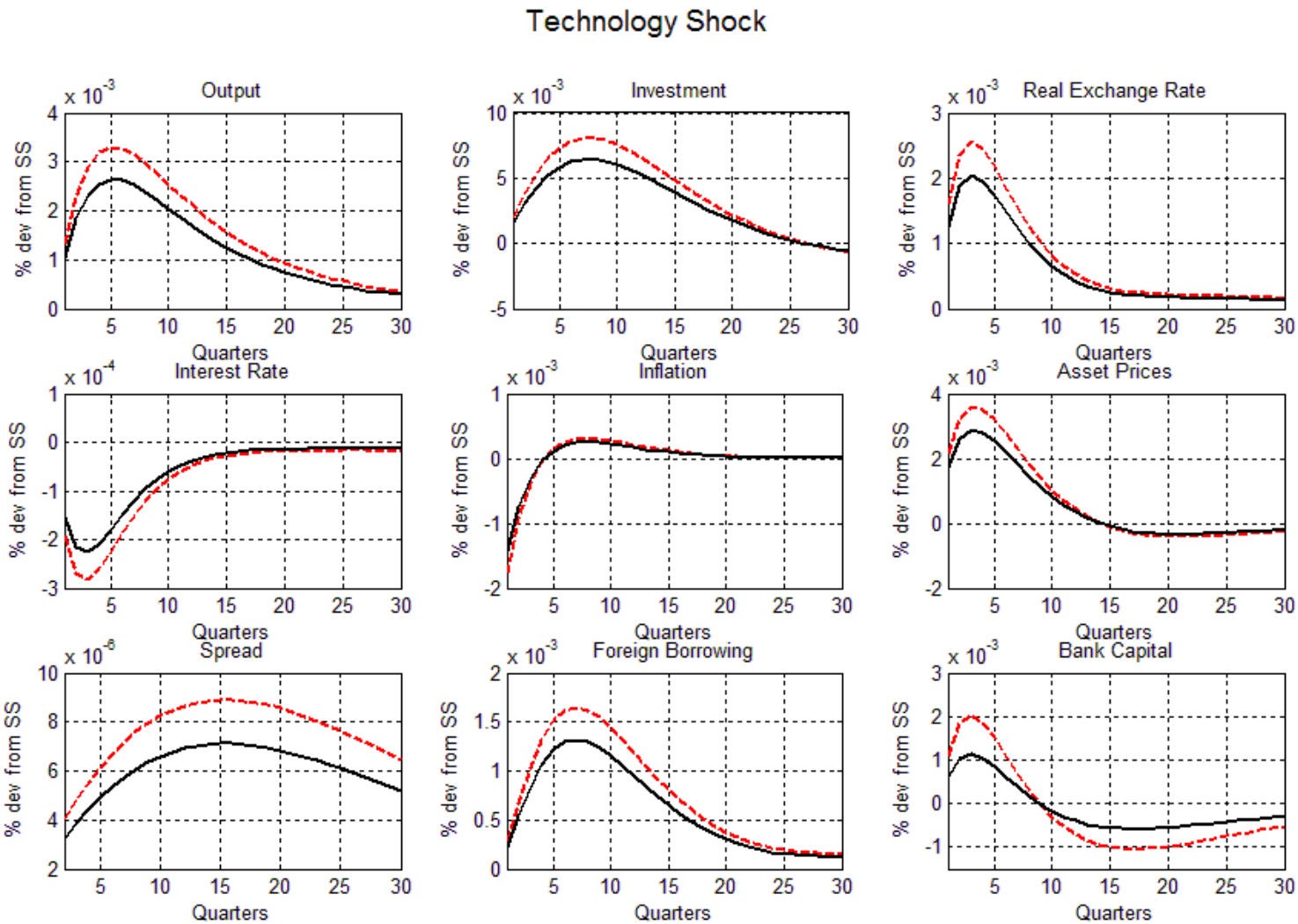
Impulse Response Function

Asset Prices Shock



Impulse Response Function

Technology Shock



Macroprudential and Monetary Policy Interactions

The interaction of monetary policy with macroprudential policies suggests scope to minimize macrofinancial instability by combining Taylor rules with a macroprudential overlay

We consider a standard Taylor rule and a Taylor rule augmented with credit growth with and without macroprudential policy. The four policy scenarios are thus:

- Taylor rule
- Taylor rule with credit growth
- Taylor rule and macroprudential policy
- Taylor rule with credit growth and macroprudential policy

To assess the efficiency of a certain policy scenario we measure the welfare loss in terms of steady state consumption

Macroprudential and Monetary Policy Interactions

To compute the welfare loss in terms of consumption equivalence we employ the methodology as in Schmitt-Grohé and Uribe (2007) and we calculate the welfare loss using a second order approximation of the utility function

This represents the fraction of consumption (in percentage terms) that is required to equate welfare under a given policy rule to the one given by the reference scenario in the face of a shock of one percent

A higher value of welfare loss indicates that a certain policy is less desirable

Macroprudential and Monetary Policy Interactions

Table 3 - Performance of Different Taylor Rules	
	Welfare Loss
Foreign Borrowing Shock	
Taylor Rule	0.352
Taylor Rule with Credit Growth	0.268
Taylor Rule and Macroprudential Policy	0.082
Taylor Rule with Credit Growth and Macroprudential Policy	—
Bank Capital Shock	
Taylor Rule	0.434
Taylor Rule with Credit Growth	0.310
Taylor Rule and Macroprudential Policy	0.104
Taylor Rule with Credit Growth and Macroprudential Policy	—
Technology Shock	
Taylor Rule	0.268
Taylor Rule with Credit Growth	0.224
Taylor Rule and Macroprudential Policy	0.072
Taylor Rule with Credit Growth and Macroprudential Policy	—
Asset Price Shock	
Taylor Rule	0.396
Taylor Rule with Credit Growth	0.274
Taylor Rule and Macroprudential Policy	0.094
Taylor Rule with Credit Growth and Macroprudential Policy	—

Macroprudential and Monetary Policy Interactions

Three lessons:

- The augmented Taylor rule in the macroprudential policy framework is more effective as the welfare loss is positive in all the remaining cases
- The welfare loss is higher when financial shocks hit the economy. This suggests an important role for policies that stabilize such events
- Macroprudential policy is more effective than the standard Taylor rule and the augmented Taylor rule

Conclusions

- Macroprudential measures can usefully complement monetary policy
- Countercyclical macroprudential polices can help reduce macroeconomic volatility and enhance welfare in combination with a modified Taylor rule
- The results also demonstrate the importance of capital flows and financial stability for business cycle fluctuations as well as the role of supply-side financial accelerator effects in the amplification and propagation of shocks