Lending Rate Spread Shock and Monetary Policy Arrangements: A Small Open Economy Model for ASEAN Countries

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Abstract

We investigate the welfare implications of monetary policy arrangements in a small open economy, considering firms' bank-based finances widely observed in emerging ASEAN countries. The impact of unexpected change in the lending rate spread, or lending rate spread shock, depends on the presence of banking activity in the economy. This presence is important in Malaysia and Vietnam, where welfare effects of this type of shock are at least comparable to those of foreign monetary policy shocks. We also find that rigid exchange rate arrangement amplifies the effect of it.

JEL classification: E52; F33; F41

Keywords: Small Open Economy; Lending Rate Spread; Monetary Policy; ASEAN

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I have benefited from discussions with and the comments of Hiroshi Gunji, Kenji Iwata, Vu Tuan Khai, Shigeto Kitano, Chikafumi Nakamura, Eiji Okano, Eiji Ogawa, and Tsutomu Watanabe. I also would like to thank the seminar participants at Hitotsubashi University, the Research Institute of Capital Formation, the Development Bank of Japan, and Thailand Development Research Institute (TDRI), and the participants at the Regular Meeting of Nanzan Academic Society in December 2010 and October 2011, the Chubu area study group meeting of the Japan Society of Monetary Economics in March 2011, the Nagoya Macroeconomics Workshop in March 2011, the Nagoya International Economics Study Group in October 2011, the annual meeting of The Japan Society of International Economics in October 2011, the Fall Meeting of the Japanese Economic Association in October 2011, and the DSGE Conference in December 2011. All remaining errors are mine. This work was supported by the Japan Society for the Promotion of Science (JSPS), Grant-in-Aid for Young Scientists (B) (24730280).

1 Introduction

It is widely recognized that monetary transmissions crucially depend on the state of financial market development and the ways firms handle their external finances. In countries which lack well-functioning securities markets, so-called credit channels become important. This tendency is observed in the vast majority of emerging countries, and the Association of Southeast Asian Nations, ASEAN thereafter, is well known as a good example of it. For instance, Subhanij (2010) finds that firms' external finances in ASEAN countries are still bank-based, although the roles of capital markets and non-bank financial institutions have become increasingly important. Furthermore, studies such as Chua (2003), Cull and Pería (2007), and Rajan and Gopalan (2009) find that the share of assets held by foreign banks is around 10% of total banking sector assets on average in emerging Asian economies. Moreover, shares have not increased remarkably, although the restrictions on foreign bankers' participation were eliminated in most countries after the Asian financial crisis of the late 1990s. This contrasts with the averages of other emerging nations, such as Central and Eastern European Countries, known as CEECs, and Latin American countries, which are around 40%. This implies that most firms in ASEAN countries rely especially on domestic banks for their external finances. In this research, we investigate the welfare implications of monetary policy arrangements in a small open economy where firms depend on domestic bankers for their external finances in order to draw a direct parallel with emerging ASEAN countries.

Many researchers have previously dealt with monetary policy issues in emerging ASEAN economies. Devereux et al. (2006) is one of the most influential works in the literature on this topic. They examine monetary policy in a small open economy with lending constraints on investment financing and incomplete exchange rate pass-through, and find that the degree of pass-through affects the welfare dominance of alternative monetary policy rules. Elekdag et al. (2006) construct a model considering financial accelerator and external finances denominated in foreign currency to discuss policy issues in emerging economies. Tanboon (2008) constructs a model which can replicate the economic situation in Thailand.

The difference between these works and ours is the consideration for firms' bank-based finances. Agénor and Montiel (2008) also suppose firms' bank-based finances in a small open economy, and obtain several analytical insights for monetary policy issues. Our approach is more of a basic DSGE numerical investigation, such as in Gali and Monacelli (2005) and Faia and Monacelli (2008). We introduce bank-based finances in simplest way into a standard small economy model, and investigate

welfare implications for each ASEAN country. There are huge varieties of models which take into account firms' external finances. To understand monetary transmissions through so-called cost channels, Ravenna and Walsh (2006) assume that firms borrow labor costs from intermediaries at the gross nominal interest rate and find a significant quantitative role of this channel. We follow Goodfriend and McCallum (2007) and Cúrdia and Woodford (2010) and posit the simple production function pertaining to the management of lending activity by the commercial bank. As we suppose countries lacking well-functioning securities markets and focus just on bank-based external finances, we prefer their specification to ones suggested by the financial-accelerator literature such as Bernanke, Gertler and Gilchrist (1996).

Further, we refer to the data of emerging ASEAN countries to calibrate the financial parameters in our model. Additional to the consideration for bank-based financial behavior of firms, we focus on the effect of lending rate spread shock found to be important by researchers such as Agénor, Aizenman and Hoffmaister (2008). They examined Argentina and implied the importance of this type of shock for its business-cycle. Neumeyer and Perri (2005), Tchakarov and Elekdag (2006), and Uribe and Yue (2006) also suggest the significant effects of interest-rate disturbances on business cycles in emerging regions including ASEAN.

To examine monetary policy issues for those countries, we should take into account the large variety of preferences for exchange rate stabilization among them. According to the *de-facto* classification of exchange rate regimes and monetary policy framework by the International Monetary Fund, the Philippines is the only country which accepts independently-floating exchange rates among ASEAN members. In contrast, Vietnam is classified as a country which pegs the value of its currency, the Vietnamese dong, to the US dollar. Countries regimes which are classified as managed floating, such as Indonesia, Malaysia, and Thailand, are expected to have intermediate preferences for exchange rate stabilization. As suggested by the fear-of-floating literature including Calvo and Reinhart (2002), Lahiri and Végh (2002), Aizenman and Marion (2003), Hernández and Montiel (2003), and Fang et al. (2009), emerging countries tend to prefer exchange rate stability. To obtain policy implications for emerging ASEAN countries, we also consider welfare effects of changes in the degree of exchange-rate stabilization.

The remainder of this paper proceeds as follows. Section 2 presents the model. Section 3 shows the properties of the macroeconomic dynamics of our model. It also investigates the welfare implications with parameters calibrated based on the data for ASEAN countries, and presents some policy

implications. Finally, Section 4 concludes.

2 The Model

We model the world economy using Home and Foreign countries. The Foreign country is so large that we ignore the effects of the Home country's volatility on it. The Home country contains a household, a commercial bank, a central bank, and firms that produce tradable goods.

2.1 The Household

The household consumes a Cobb-Douglas composite of Home and Foreign goods, defined as

$$C_t \equiv \left(\frac{C_t^h}{1-\gamma}\right)^{1-\gamma}\left(\frac{C_t^f}{\gamma}\right)^{\gamma},$$

with $1 > \gamma > 0$. Here, C_t^h and C_t^f are the respective indexes of consumption of domestic and imported goods given by CES functions

$$C_t^h \equiv \left[\int_0^1 (C_{jt}^h)^{\frac{\theta-1}{\theta}} dj\right]^{\frac{\theta}{\theta-1}}, \quad C_t^f \equiv \left[\int_0^1 (C_{jt}^f)^{\frac{\theta-1}{\theta}} dj\right]^{\frac{\theta}{\theta-1}},$$

with $\theta > 1$, respectively. $j \in [0,1]$ denotes the good variety. γ represents the degree of trade openness, and θ denotes the elasticity of substitution between varieties. The optimal allocation of any given expenditure within each category of goods yields the following demand functions:

$$C_{j,t}^h = \left[\frac{P_{jt}^h}{P_t^h}\right]^{-\theta} C_t^h, \quad C_{j,t}^f = \left[\frac{P_{jt}^f}{P_t^f}\right]^{-\theta} C_t^f$$

for all j. P_{jt}^h and P_{jt}^f are prices of variety j denominated in the Home currency, and the price indexes are defined as

$$P_t^h \equiv \left[\int_0^1 (P_{jt}^h)^{1-\theta} dj\right]^{\frac{1}{1-\theta}}, \quad P_t^f \equiv \left[\int_0^1 (P_{jt}^f)^{1-\theta} dj\right]^{\frac{1}{1-\theta}}.$$

We posit the law of one price conditions to be $P_{jt}^h = S_t P_{jt}^{h*}$ and $P_{jt}^f = S_t P_{jt}^{f*}$. S_t is the nominal exchange rate and P_{jt}^{h*} and P_{jt}^{f*} are the prices of Home and Foreign goods denominated in the Foreign currency, respectively. It follows that $\int_0^1 P_{jt}^h C_{jt}^h dj = P_t^h C_t^h$ and $\int_0^1 P_{jt}^f C_{jt}^f dj = P_t^f C_t^f$. Furthermore,

the optimal allocation of expenditures on domestic and imported goods is given by

$$C_t^h = (1-\gamma)\left[\frac{P_t^h}{P_t}\right]^{-1} C_t, \quad C_t^f = \gamma\left[\frac{P_t^f}{P_t}\right]^{-1} C_t$$

where P_t is the consumer price index (CPI) and defined by $P_t = (P_t^h)^{1-\gamma}(P_t^f)^{\gamma}$. Note that total consumption expenditures by the household are given by $P_t^h C_t^h + P_t^f C_t^f = P_t C_t$.

The household maximizes its expected lifetime utility by:

$$E_0 \sum_{t=0}^{\infty} \beta^t U\left(C_t, \frac{D_t}{P_t}, N_t, M_t\right).$$

Here, β is the constant discount factor, and D_t represents the nominal holdings of deposits at the beginning of period t. N_t is the total labor input to firms' production and is defined by $N_t \equiv \int_0^1 N_{jt} dj$, where N_{jt} is the input to the production of variety j. M_t is the labor input to lending activity by the bank, such as monitoring. $U(\cdot)$ is the utility function, and is defined as

$$U\left(C_t, \frac{D_t}{P_t}, N_t, M_t\right) \equiv \ln C_t + \zeta \ln\left(\frac{D_t}{P_t}\right) - N_t - M_t,$$

where ζ is a weight for the marginal utility of the real amounts of deposits. We assume that the household obtains utility from the liquidity services of holding deposits based on the similar spirit to a "money in the utility" specification[1] .

In each and every period, the household faces a budget constraint of the form

$$P_t C_t + E_t(Q_{t,t+1} B_t) + D_t = B_{t-1} + R_{t-1}^D D_{t-1} + W_t(N_t + M_t) - T_t,$$

where E_t denotes the expectation based on the information in period t, and B_t is the nominal payoff in period $t+1$ of the portfolio of the domestic and foreign contingent claims held at the end of period t. $Q_{t,t+1}$ represents the stochastic discount factor for one-period-ahead nominal payoffs relevant to the Home household. Deposits carry a gross rate of return of R_{t-1}^D. W_t and T_t are the nominal wage and the nominal lump-sum transfer, respectively. We can write the optimality conditions for the household's problem as

$$C_t = \frac{W_t}{P_t},$$

which is a standard intratemporal optimality condition, and as

$$\beta E_t \left\{ \frac{P_t C_t}{P_{t+1} C_{t+1}} \right\} = E_t Q_{t,t+1}.$$

Rearranging terms, we obtain a conventional stochastic Euler equation:

$$\beta R_t E_t \left\{ \frac{P_t C_t}{P_{t+1} C_{t+1}} \right\} = 1,$$

where

$$R_t \equiv \frac{1}{E_t(\mathrm{Q}_{t,t+1})}$$

is the gross return on a riskless one-period discount bond paying off one unit of the Home currency in $t+1$, the Home bond rate. Thus, we obtain the condition that defines the spread between the bond and deposit rates, which can be defined as

$$R_t^D = \left(1 - \frac{\zeta C_t}{D_t / P_t} \right) R_t.$$

The fixed parameter ζ will be calibrated so that the spread between R_t^D and R_t corresponds to that of each ASEAN country and will take a very small value. Accordingly, the deposit rate is always less than the bond rate both in the steady state and the dynamic paths. The bond rate spread is high when the real deposits D_t/P_t are large or consumption is small. Larger amounts of real deposits imply a fall in their marginal utility, and, accordingly, a lower liquidity premium. The larger consumption becomes, the lower the marginal utility of consumption will be. This implies upward pressure on the bond rate and, given the deposit rate, implies decreases in the bond rate spread.

Log-linearizing the first order conditions, we obtain

$$w_t - p_t = c_t, \tag{1}$$

$$c_t = E_t c_{t+1} - (r_t - E_t \pi_{t+1}), \tag{2}$$

$$r_t^D = \frac{1 - X}{X} (\tilde{d}_t - c_t) + r_t, \tag{3}$$

where lowercase letters denote log deviations of the respective variables from the steady state. The log deviation of real deposits, $\tilde{d}_t$, is defined by $\tilde{d}_t \equiv \log(D_t/P_t) - \log(D/P)$, and the CPI inflation rate,

π_t, is defined by $\pi_t = \log P_t - \log P_{t-1}$. X is the measure of the steady-state bond rate spread, and is defined as $X \equiv R^D/R$.

2.2 The Law of One Price

The law of one price implies a linkage between the price indexes $P_t^f = S_t P_t^{f*}$. P_t^{f*} is the index of foreign currency prices of foreign produced goods, and is defined analogously to the domestic goods price index. Given the law of one price and assuming the same preferences for consumption between Home and Foreign households, the price levels in both countries are linked by the purchasing power parity condition $P_t = S_t P_t^*$. For the Foreign country, the distinction between the CPI and the domestic price index is ignored, implying $P_t^* = P_t^{f*}$.

We define the terms of trade, G_t, and the real exchange rate, V_t, as $G_t \equiv P_t^f/P_t^h$ and $V_t \equiv S_t P_t^*/P_t$, respectively. G_t can be rearranged as $G_t = S_t P_t^*/P_t^h$ using the law of one price condition, and is accordingly linked with V_t by $V_t = P_t^h G_t/P_t$. Log-linearizing G_t, we obtain $g_t = s_t + p_t^* - p_t^h$, or, taking the difference from period $t-1$,

$$\Delta g_t = \Delta s_t + p_t^* - p_t^h, \tag{4}$$

where Δ represents the difference from the previous period. Further, log-linearizing the definitions of the CPI and the terms of trade and combining them, we obtain

$$p_t = p_t^h + \gamma g_t, \tag{5}$$

or,

$$\pi_t = \pi_t^h + \gamma \Delta g_t, \tag{6}$$

which indicates the linkage between the inflation rates of the domestic price and the CPI in the Home country.

2.3 International Risk Sharing

Given that the Foreign household has the same preference as the Home household and they have access to the same contingent securities, intertemporal optimization implies

$$\beta E_t \left\{ \frac{P_t^*}{P_{t+1}^*} \frac{S_t}{S_{t+1}} \frac{C_t^*}{C_{t+1}^*} \right\} = \frac{1}{R_t}. \tag{7}$$

We define the gross return on a riskless one-period discount bond paying off one unit of Foreign currency, the Foreign bond rate, as $R_t^* = \frac{1}{E_t(\mathrm{Q}_{t,t+1}^*)}$, where $\mathrm{Q}_{t,t+1}^*$ represents the stochastic discount factor of the Foreign household. Further, by combining the Home Euler equation and (7) and log-linearizing, the uncovered interest rate parity condition is derived as

$$r_t = r_t^* + E_t \Delta s_{t+1}. \tag{8}$$

Furthermore, we obtain the risk sharing condition $C_t = \phi C_t^* V_t$, where ϕ is a constant defined as $\phi = \frac{C_0}{C_0^* \mathcal{Q}_0}$ and which depends on initial conditions regarding net asset positions. Without a loss of generality, we assume zero net foreign asset holdings in the initial state and an ex-ante identical environment, in which case we have $\phi = 1$. Thus, $C_t = C_t^* V_t$, or, by log-linearizing,

$$c_t = y_t^* + v_t. \tag{9}$$

Here, we use the fact that the output is equal to the consumption in the Foreign country, namely $Y_t^* = C_t^*$.

2.4 The Commercial Bank

We posit the simple production function pertaining to the management of lending to be

$$\frac{L_t}{P_t} = \xi M_t,$$

where L_t is the amount of loans to Home firms and ξ denotes the productivity of the bank. We assume Home firms rely only on the domestic commercial bank for external finances in order to replicate the financial environment that firms in ASEAN countries face. ξ will be calibrated so that the spread between the lending rate and the bond rate corresponds to that of each ASEAN country. We add the

relation

$$L_t = D_t$$

as the simplest balance sheet constraint.

The loan market is perfectly competitive in each country. Thus, the commercial bank determines its labor inputs, M_t, given the deposit and the lending rates, to maximize its profit $R_t^L L_t - [R_t^D D_t + W_t M_t]$, subject to its technology and the balance sheet constraint. By rearranging the first order condition, we obtain the relation

$$R_t^L = R_t^D + \frac{W_t}{P_t \xi}, \tag{10}$$

which defines the lending rate spread from the deposit rate. It is clear that the lending rate always exceeds the deposit rate because of the existence of monitoring costs. Real wage, $\frac{W_t}{P_t}$, and loan technology, ξ, directly affect the lending rate spread. Log-linearizing (10), we obtain

$$r_t^L = R^D R^L r_t^D + \frac{1}{R^L}\left[R^L - R^D\right](w_t - p_t). \tag{11}$$

2.5 Firms

2.5.1 Technology and Market Clearing

A typical firm in the Home economy produces differentiated goods with a linear technology represented by the production function

$$Y_{jt} = A_t N_{jt},$$

where A_t is the production technology. We assume that firms must borrow a fraction, ι, of their labor costs from the commercial bank, implying

$$L_t = \iota W_t N_t. \tag{12}$$

ι will be calibrated to be consistent with the data for ASEAN economies. Thus, the real marginal cost is the same for all firms and equal to

$$MC_t = \frac{\tilde{R}_t W_t}{A_t P_t^h}, \tag{13}$$

where $\tilde{R}_t$ is defined as $\tilde{R}_t \equiv 1 + \iota R_t^L$. We find that the nominal borrowing rate directly affects firms' marginal costs. This is the well-known cost channel that studies, such as Gaiotti and Secchi (2006), Ravenna and Walsh (2006), Tillmann (2008), and Tillmann (2009), emphasize. The higher ι is, the more strongly the cost channel works. Log-linearizing (12) and (13), we obtain

$$l_t = w_t + n_t, \tag{14}$$

$$mc_t = \tilde{r}_t + w_t - a_t - p_t^h, \tag{15}$$

where

$$\tilde{r}_t = \frac{\iota R^L}{1 + \iota R^L} r_t^L. \tag{16}$$

We define the total output in the Home country as $Y_t \equiv \left[\int_0^1 Y_{jt}^{\frac{\theta-1}{\theta}} dj\right]^{\frac{\theta}{\theta-1}}$. Accordingly, from the definition of firms' total labor inputs, N_t, $N_t = \frac{Y_t}{A_t} Z_t$, where $Z_t = \int_0^1 \frac{Y_{jt}}{Y_t} dj$. As shown in Gali (2008), the variation of Z_t around the steady state is second order. Thus, we derive the relation between the total output and firms' total labor inputs as $y_t = a_t + n_t$, where a_t is defined as $a_t \equiv \log A_t$ and follows the AR(1) process

$$a_t = \rho_a a_{t-1} + \epsilon_t^a. \tag{17}$$

ϵ_t^a is a white noise process with zero mean and the standard deviation σ^a.

The market clearing condition for Home goods is $Y_{jt} = C_{jt}^h + C_{jt}^{h*}$. The demand of the Foreign household on domestic goods is derived as $C_{jt}^{h*} = (\gamma P_t^* / P_t^{h*}) C_t^*$ from the symmetric assumption about the preferences. By combining the definitions of GDP, Home and Foreign demand functions on Home goods, and the risk sharing condition, we obtain $Y_t = P_t C_t / P_t^h$. According to the log-linearization,

$$y_t = c_t + \gamma g_t \tag{18}$$

Combining this with the risk sharing condition (9), we obtain

$$y_t = y_t^* + g_t. \tag{19}$$

Equations (2), (6), and (18) are rewritten as

$$y_t = E_t y_{t+1} - (r_t - E_t \pi_{t+1}^h), \tag{20}$$

which presents the standard intertemporal IS equation.

2.5.2 Price Setting

We follow the specification proposed in Calvo (1983) for a staggered price setting. The fraction $1 - o$ of firms can adjust their prices in each period, while the others keep their prices unchanged. Thus, o naturally becomes the degree of price stickiness. When firms can adjust, they do so to maximize the expected discount value of their profits. Accordingly, the inflation rate for the domestic price index in the small open economy is

$$\pi_t^h = \beta E_t \pi_{t+1}^h + \kappa m c_t, \tag{21}$$

where $\kappa \equiv \frac{(1-o)(1-\beta o)}{o}$, and the domestic price inflation rate, π_t^h, is defined as $\pi_t^h \equiv p_t^h - p_{t-1}^h$. Equations (1), (5), (15), and (21) are rewritten as

$$\pi_t^h = \beta E_t \pi_{t+1}^h + \kappa(\tilde{r}_t + y_t - a_t). \tag{22}$$

2.6 Lending Rate Spread Shock

We now turn our attention to the interest spread. From equations (1), (14), and (3), we obtain the following relation defining the spread between the bond and deposit rates:

$$r_t^D = r_t + \frac{1 - X}{X}(y_t - a_t). \tag{23}$$

Furthermore, equations (1), (11), (18), and (19) can be written as follows:

$$R^L r_t^L = R^D r_t^D + \left[R^L - R^D\right] [(1-\gamma)y_t + \gamma y_t^*],$$

which defines the spread between the lending and deposit rates. We add exogenous disturbance on lending rate spreads in an ad-hoc way as

$$R^L r_t^L = R^D r_t^D + \left[R^L - R^D\right] [(1-\gamma)y_t + \gamma y_t^*] + \epsilon_t^l. \tag{24}$$

Here, ϵ_t^l is a white noise process with zero mean and standard deviation σ^l. The standard deviation will be calibrated consistent with the estimations by Agénor, Aizenman and Hoffmaister (2008). We will return to this point and introduce the details of our parameterization in the next section.

2.7 Monetary Policy Rules

Following standard studies on monetary policy arrangements in a small open economy, we posit the simple rule under which the nominal interest rate is set as a function of inflation and of real GDP suggested by Taylor (1999). We also include exchange rate return, Δs_t, as an argument in the policy rule. Thus, the Home central bank is assumed to follow the simple rule with interest rate inertia:

$$r_t^D = \phi_r r_{t-1}^D + (1-\phi_r)(\phi_\pi \pi_t^h + \phi_y y_t + \phi_s \Delta s_t). \tag{25}$$

There is a significant variety of preferences for exchange rate stabilization among emerging ASEAN countries. To reflect this fact in our analyses, we will examine how the welfare loss changes depends on the change in the policy parameter ϕ_s.

2.8 The Foreign Country

Given the symmetry assumption between Home and Foreign agents, the intertemporal Euler equation can also be derived for the Foreign country as

$$y_t^* = E_t y_{t+1}^* - (r_t^* - E_t \pi_{t+1}^*). \tag{26}$$

We also posit a simple monetary policy rule for the Foreign central bank:

$$r_t^* = \phi_r r_{t-1}^* + (1-\phi_r)(\phi_\pi \pi_t^* + \phi_y y_t^*) + \epsilon_t^*, \tag{27}$$

where ϵ_t^* denotes the foreign monetary policy shock, and is a white noise process with zero mean and standard deviation σ^*. Foreign price inflation is determined by following New Keynesian Phillips Curve:

$$\pi_t^* = \beta E_t \pi_{t+1}^* + \kappa y_t^*. \tag{28}$$

Our log-linearized system is constructed using equations (4), (6), (8), (16), (17), (20), (22), (23), (24), (25), (26), (27), and (28). The endogenous variables are y_t, $\tilde{r}_t$, π_t^h, r_t, r_t^L, r_t^D, y_t^*, a_t, π_t, Δg_t, Δs_t, π_t^*, and r_t^*. A total of 13 equations are constructed for 13 endogenous variables, and our system is closed. Disturbances are the domestic productivity shock ϵ_t^a, the lending rate spread shock ϵ_t^l, and the foreign monetary policy shock ϵ_t^*.

2.9 The Welfare Measure

A second-order expansion of the household's utility function U around the steady state gives

$$\begin{aligned} &E_{t-1}[U(C_t, \tilde{D}_t, N_t, M_t)] \simeq U(C, \tilde{D}, N, M) + \tilde{\Phi}, \\ &\text{where } \tilde{\Phi} = E_{t-1}[c_t] + \zeta E_{t-1}[\tilde{d}_t] - N E_{t-1}[n_t] - M E_{t-1}[m_t] - \frac{1}{2}\left\{V_{t-1}[c_t] + \zeta V_{t-1}[\tilde{d}_t]\right\}. \end{aligned} \tag{29}$$

Here, $\tilde{D}_t$ is the real holdings of deposits, defined by $\tilde{D}_t = \frac{D_t}{P_t}$. $V[\cdot]$ is the variance of the respective variable. In effect, the expectation terms are zero for all real variables and only the volatility terms of $V_{t-1}[c_t]$ and $\zeta V_{t-1}[\tilde{d}_t]$ are important for the welfare. This is because we use the standard first-order log-linearization method and assume zero means for all disturbances. Following Kollmann (2004), the Home welfare loss of the small open economy is expressed as the permanent relative change in consumption compared to the steady state, Φ, that yields the expected utility $E_{t-1}[U(C_t, \tilde{D}_t, N_t, M_t)]$:

$$U((1-\Phi)C, \tilde{D}, N, M) = U(C, \tilde{D}, N, M) + \tilde{\Phi}.$$

From the equilibrium conditions, we obtain the dynamics of c_t and $\tilde{d}_t$ as $c_t = (1-\gamma)y_t + \gamma y_t^*$ and $\tilde{d}_t = c_t + y_t - a_t$, respectively.

3 Dynamics and Welfare Implications

3.1 Parameterization

We have four parameters related to the financial aspects of our model, namely, β, ι, ζ, and ξ. We calibrate these parameters using the data of deposit-consumption ratio, D/C, and three interest rates, R^D, R, and R^L, for emerging ASEAN countries. Because of the availability of data, we examine five countries from ASEAN members, namely, Indonesia, Malaysia, Philippines, Thailand, and Vietnam. We omit Singapore from our sample because it is a highly developed country and firms can borrow through well-functioning securities markets. Tables 1 and 2 show the data and implied financial parameters, respectively. For interest rates, we obtain most data from websites of monetary and fiscal authorities in each country. We also use the data from the World Bank and Trading Economics. For all countries, we obtain the data of consumption and demand deposits from the statistical database system of the Asian Development Bank. We take the time series averages and regard them as the steady-state values for the respective variables in our model[2] .

The fixed borrowing share ι crucially affects the impact of the lending rate spread shock. In the steady-state, it is derived by

$$\iota = \frac{D}{C}\frac{1}{MC - DR^L/C}.$$

Thus, larger D/C is directly conducive to a higher ι and larger impact of ϵ_t^l on business cycle. We find that the level of ι differs across countries, and is highest for Malaysia, reflecting the highest level of D/C. We also find that the weight on logged real deposit, ζ, is very low for all countries. This indicates that the contribution of volatility in the real deposit for the welfare loss, defined by (29), is much less than that of consumption. Accordingly, we can discuss welfare implications based mainly on the consumption volatility, although we will also refer deposit volatility in the next subsection.

For the standard deviation of the lending rate spread shock, we set the value consistent with the baseline estimate of Agénor, Aizenman and Hoffmaister (2008). They define the external and domestic spreads as spreads of interest rates on bank lending and domestically denominated assets

from the deposit rate, respectively. Further, they estimate the standard deviation of VAR innovation of the lending rate spread as 120 basis points on a monthly basis. In our model, one time period corresponds to a quarter. Thus, we set the value of the standard deviation of exogenous shock on this spread as 360 basis points, namely, $\sigma^l = 0.036$.

The parameterization shown in Table 3 is common for all analyses. In the calibration of the interest rate rules and the standard deviation of the foreign monetary policy shock, we follow the estimates in Collard and Dellas (2002): $\phi_s = 0.7916$, $\phi_\pi = 1.22$, $\phi_y = 0.0683$, $\sigma^* = 0.0001$. For the other parameterizations, we follow Gali and Monacelli (2005).

3.2 Impulse Responses

Figure 1 presents the impulse responses of selected variables to the positive lending rate spread shock ϵ_t^l under parameterization $\phi_s = 0$. As we noted in the previous subsection, its standard deviation is 360 basis points. To understand the difference of dynamics caused by the difference in the presence of banking activities in economies, we use Figure 1 to show the impulse responses in countries with the highest and lowest levels of deposit-consumption ratios, namely Malaysia and Thailand. $\bigcirc$ and $\triangle$ represent responses in Malaysia and Thailand, respectively. The vertical axis is in percentage units and the horizontal axis is the number of quarters. Dynamics do not differ across these two countries qualitatively. Positive spread shock is directly conducive to a rise in lending rate, implying rises in firms' marginal costs and prices. Deposit rate, or policy rate in our model, responds positively to rises in CPI inflation, and, accordingly, leads to an increase in the bond rate. Through the Euler equation, consumption declines as a result of increases of nominal deposit and bond holdings. Real deposit declines because CPI inflation rises more sharply than nominal deposit holdings decrease.

These trends of dynamics are common not only for these two countries, but also for the other three countries in our sample. However, we find clear quantitative differences across countries with different banking activities. Although an initial positive rise in lending rate is common for Malaysia and Thailand, responses of endogenous variables are much more moderate for the latter than the former. This is mainly because the deposit-consumption ratio, or presence of banking activity in the economy, is much higher for Malaysia, at 0.395, than Thailand, at 0.058. This difference results in different levels of ι. Higher levels of this parameter generally amplify the effects of lending rate spread shock, through larger responses of firms' marginal costs and CPI inflation. This is clearly observed in Figure 1, where larger responses of deposit and bond rates realize larger declines in consumption.

Furthermore, larger rises in CPI inflation conducts larger falls of real deposit holdings.

Now we consider how the policy parameter on exchange-rate change, ϕ_s, is related to macroeconomic dynamics. Figure 2 presents the impulse responses of selected variables to the positive lending rate spread shock, ϵ_t^l, under parameterization $\phi_s = 2.5$. This setting implies that the central bank follows a simple monetary policy rule with consideration for the last-period policy rate, domestic price inflation, and output together with exchange-rate changes. Direction of the responses and major differences between Malaysia and Thailand do not depend on this parameter. At the same time, we find that responses of consumption and real deposits are clearly larger than ones in the case with parameterization $\phi_s = 0$, shown by Figure 1, although nominal deposit and bond rates are less volatile.

To figure out the reasons for these qualitative differences across alternative parameterizations for ϕ_s, we focus on the case of Malaysia shown by Table 4. It presents standard deviations, in percentage units, of selected variables for each type of shocks in alternative settings of ϕ_s. It also presents welfare losses and variance decomposition. As impulse responses suggest, the standard deviations of consumption and real deposit holdings for lending rate spread shock, ϵ_t^l, are larger for the case with $\phi_s = 2.5$ than with $\phi_s = 0$. Those of interest rates for nominal deposits, bonds, and loans are smaller as we expected. Further, CPI inflation is found to be less volatile when $\phi_s = 2.5$ than when $\phi_s = 0$. In the case of $\phi_s = 2.5$, exchange rate and, accordingly, import prices become more stable, and CPI inflation becomes less volatile. Further, the central bank responds less, and deposit and bond rates are found to be more stable. In real terms, bond rates move more in this case given the magnitude relation between nominal bond rate and CPI inflation. As a result, consumption becomes more volatile. Real deposit holdings are found to be more volatile given the larger volatility of the real deposit rate.

For the shock on the total factor productivity, ϵ_t^a, CPI inflation is found to be less volatile in the case of higher ϕ_s, again, as a result of import price stability. Nominal interest rates are also more stable than the case of $\phi_s = 0$, although consumption is more volatile because of larger volatility of real bond rate. For the foreign monetary policy shock, ϵ_t^*, a policy rule with heavier weight on exchange-rate changes helps better stabilize consumption. Remember that the domestic bond rate is equalized to the foreign one when the economy prefers perfect stability of exchange rate, namely fixed exchange rate arrangement. It is straightforward that the nominal bond rate becomes more volatile in the case of $\phi_s = 2.5$ than $\phi_s = 0$. On the other hand, import prices become more volatile in the latter case. Given the typical trade openness of a small open economy, this results in larger volatilities of CPI inflation and real bond rate, which determines consumption volatility.

3.3 Exchange Rate Stability and Welfare Implications

Figure 3 represents the standard deviation of consumption caused by each type of shocks for all sample countries. The vertical axis is the level of standard deviation which corresponds to the value of ϕ_s, indicated by the horizontal axis. Trend changes of standard deviations are common for all countries. Rise in ϕ_s linearly amplifies the standard deviation of consumption for shocks on TFP and lending rate spread. We find nonlinearity in the case of foreign monetary policy shock. As we noted in the last subsection, it declines because of stabilization of import prices realized by stable exchange rate. However, domestic prices become volatile when ϕ_s rises high enough, as the relative weight on inflation of those prices becomes lighter. As a result, putting heavy weight, such as over 1.5, on exchange rate changes can amplify consumption volatility for foreign monetary policy shocks. Figure 4 shows the relation between the welfare loss and this policy parameter. As shown in Table 2, the weight on real deposits in household's utility, ζ, is lowly calibrated. Accordingly, Figures 3 and 4 become similar to each other, and we can discuss welfare implications just based on consumption volatility.

We find here that the effects of lending rate spread shock on the welfare loss are derived to be nearly three times larger for Malaysia and Vietnam than the other three sample countries. This is directly implied by the difference in the calibrated levels of ι. For Malaysia and Vietnam, this parameter is estimated to be much higher than other countries, given the more important role of banking activities implied by higher levels of the deposit-consumption ratio, D/C. Higher ι is directly conducive to larger importance of ϵ_t^l for the business cycle of the economy and resulting welfare loss. For Vietnam, the magnitude of welfare loss coupled with this type of shock is comparable to that with foreign monetary policy shock. Further, when ϕ_s is high enough, the loss caused by the former shock becomes much larger than the loss with the latter shock. As Vietnam employs a *de-facto* pegging regime to the US dollar, potential loss coupled with unexpected changes in the lending rate spread can be large. In the case of Malaysia, this loss is estimated to be larger than in Vietnam, and it reaches around one third of the loss caused by TFP shock. In contrast, this loss is found to be moderate for the case of countries with low deposit-consumption ratios such as Thailand.

3.4 Policy Implication

As the shock on lending rate spread transmits to the economy through domestic firms' marginal costs and domestic prices, a monetary policy which stabilizes domestic price inflation well stabilizes its effect on the economy. As the weight on exchange rate variability in the monetary policy rule rises, the

welfare loss coupled with this type of shock becomes larger. Given our results, how can we interpret the desirability of the prevailing choices of exchange rate arrangements by ASEAN countries?

We found that the deposit-consumption ratio, or the proxy of the presence of banking activity in the economy, is higher for Malaysia and Vietnam than for the other three countries, and the welfare effect of the lending rate spread shock is more than comparable to that of foreign monetary policy shock. Given that Vietnam employs a *de-facto* fixed exchange rate arrangement, there can be potential welfare loss implied by our result. In the case of Malaysia, this potential loss is moderate as it allows some degree of exchange rate variability. In contrast, this type of loss is considered to be small for countries with low deposit-consumption ratios, including the Philippines, Indonesia and Thailand. Central banks of these three countries have announced that they follow CPI-based inflation target arrangements for monetary policy, although the IMF classifies Indonesia and Thailand as countries which adopt managed floating arrangement and points out their preferences for exchange rate stability. The IMF also classifies the Philippines as an independent floating country for exchange rate arrangement. Based on our analysis, the welfare effects of the lending rate spread shock are estimated to be small. This implies that the choice of exchange rate arrangement is a relatively small problem for them, at least to offset the effect of the lending rate spread shock.

It should be noted that the welfare loss coupled with foreign monetary policy shock becomes smaller when the weight on exchange rate variation in the monetary policy rule, ϕ_s, rises. As impacts of the lending rate spread shock and foreign monetary policy shock on the welfare are comparable for some of our sample countries, there is a trade off between stabilizing the effects of these two types of shocks. A country which employs rigid exchange rate arrangement, such as Vietnam, can face this trade off.

4 Conclusion

In this paper, we investigated the welfare implications of monetary policy arrangements in a small open economy by considering the widely observed bank-based finances of firms in emerging ASEAN countries. Our simulation with parameterization based on ASEAN data implies that the welfare effects of the lending rate spread shock become at least comparable to those of foreign monetary policy shock for Malaysia and Vietnam. Welfare losses coupled with the former and latter shocks become larger and smaller, respectively, when the weight given to exchange rate variability in the monetary policy rule rises. This implies trade off between stabilization of the effects of these two types of shocks for countries which prefer exchange rate stabilization.

Our model has been constructed to analyze the ASEAN emerging economies. In other emerging regions, such as CEECs and Latin American countries, firms have alternative options for external finances. This aspect looks to be important for exchange rate arrangements in these regions. This can be addressed in future research.

1 There exists a variety of specifications for modeling deposit holdings by the household. Goodfriend and McCallum (2007) suppose that deposit holdings are required as the medium of exchange, and add a similar constraint to "cash in advance" for deposits. Cúrdia and Woodford (2010) assume heterogeneity in households' patience to introduce the relation between lenders and borrowers. Our concept is similar to Christiano, Motto and Rostagno (2008) although ours is much simpler than theirs.

2 The sample period differ across countries because of data availability. We obtain complete annual dataset during the period 2008-2011 for Indonesia, 1997-2010 for Malaysia, 2001-2011 for Philippines, 2001-2010 for Thailand, and 2007-2010 for Vietnam.

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Table 1: D/C Ratios and Interest Rates in Emerging ASEAN Countries

	D/C	Interbank Rate	Government Bond Yield (10Y)	Lending Rate
Indonesia	0.092	6.893	9.953	13.475
Malaysia	0.395	3.596	4.837	6.946
Philippines	0.102	6.533	10.108	9.218
Thailand	0.058	2.300	4.560	6.948
Vietnam	0.250	8.740	9.707	11.270

Notes: Interest rates are presented in % per annum.
Source: Governmental institutions in each country, World Bank, Asian Development Bank, and Trading Economics. The detail is shown in Subsection 3.1.

Table 2: Financial Parameters

	β	ι	ζ	ξ
Indonesia	0.9766	0.1246	0.0006	48.2487
Malaysia	0.9883	0.9151	0.0012	53.5612
Philippines	0.9762	0.1399	0.0008	114.9625
Thailand	0.9889	0.0749	0.0003	68.9300
Vietnam	0.9771	0.4336	0.0006	97.9124

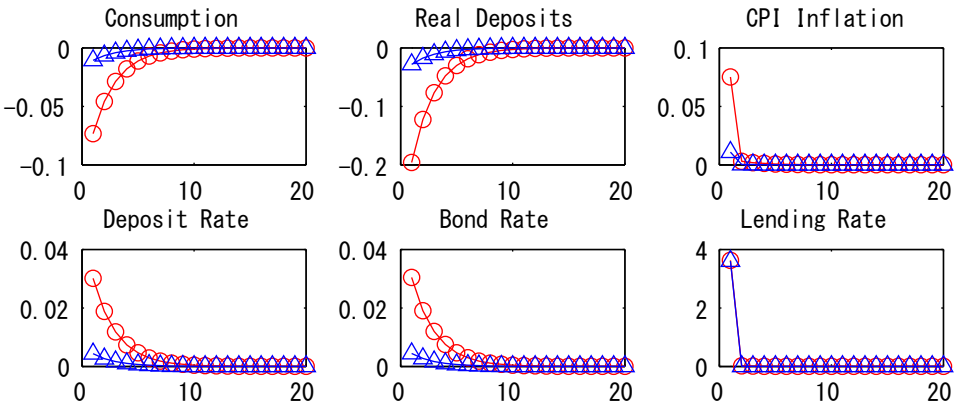
Table 3: Parameterization

θ	6	o	0.75	κ	0.0865	γ	0.4	ϕ_r	0.7916	ϕ_π	1.22
ϕ_y	0.0683	ρ_a	0.66	σ^a	0.0071	σ^l	0.036	σ^*	0.0008		

Table 4: Standard Deviations in % and Welfare Losses for Malaysia

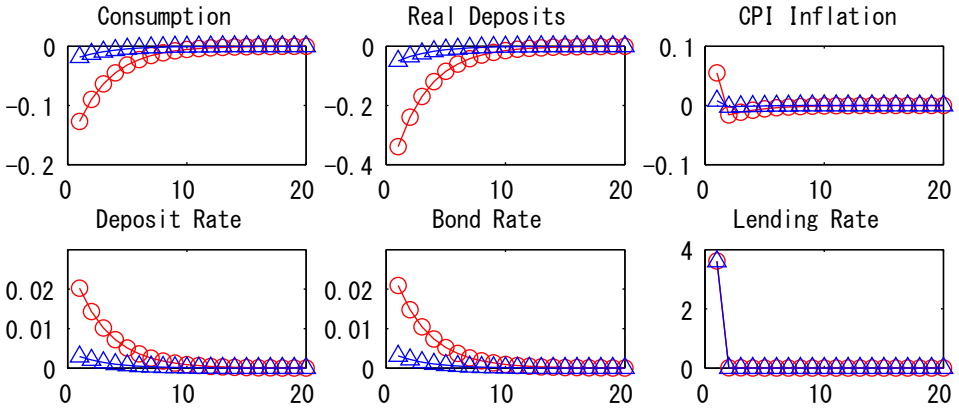
	$\phi_s = 0$				Variance Decomposition		
	ϵ_t^l	ϵ_t^a	ϵ_t^*	all	ϵ_t^l	ϵ_t^a	ϵ_t^*
y_t	0.16	0.29	0.00	0.33	23.21	76.79	0.00
c_t	0.09	0.17	0.13	0.23	16.26	53.79	29.95
$\tilde{d}_t$	0.25	0.61	0.13	0.67	13.91	82.49	3.60
π_t	0.08	0.09	0.05	0.13	32.29	51.14	16.56
r_t^D	0.04	0.07	0.00	0.08	21.83	78.17	0.00
r_t	0.04	0.07	0.00	0.08	22.99	77.01	0.00
r_t^L	3.63	0.07	0.00	3.63	99.96	0.04	0.00
$\Phi \times 10^{-6}$	0.41	1.47	0.85	2.67			
	$\phi_s = 2.5$				Variance Decomposition		
	ϵ_t^l	ϵ_t^a	ϵ_t^*	all	ϵ_t^l	ϵ_t^a	ϵ_t^*
y_t	0.30	0.48	0.30	0.64	21.91	56.55	21.54
c_t	0.18	0.29	0.07	0.35	26.80	69.19	4.01
$\tilde{d}_t$	0.48	0.43	0.36	0.74	42.38	34.20	23.42
π_t	0.06	0.04	0.02	0.07	64.00	28.51	7.48
r_t^D	0.03	0.04	0.02	0.05	32.18	48.56	19.26
r_t	0.03	0.03	0.02	0.05	34.69	46.92	18.39
r_t^L	3.62	0.03	0.02	3.62	99.99	0.01	0.00
$\Phi \times 10^{-6}$	1.63	4.22	0.25	6.16			

Figure 1: Impulse Responses to the Lending Rate Spread Shock ϵ_t^l: $\phi_s = 0$



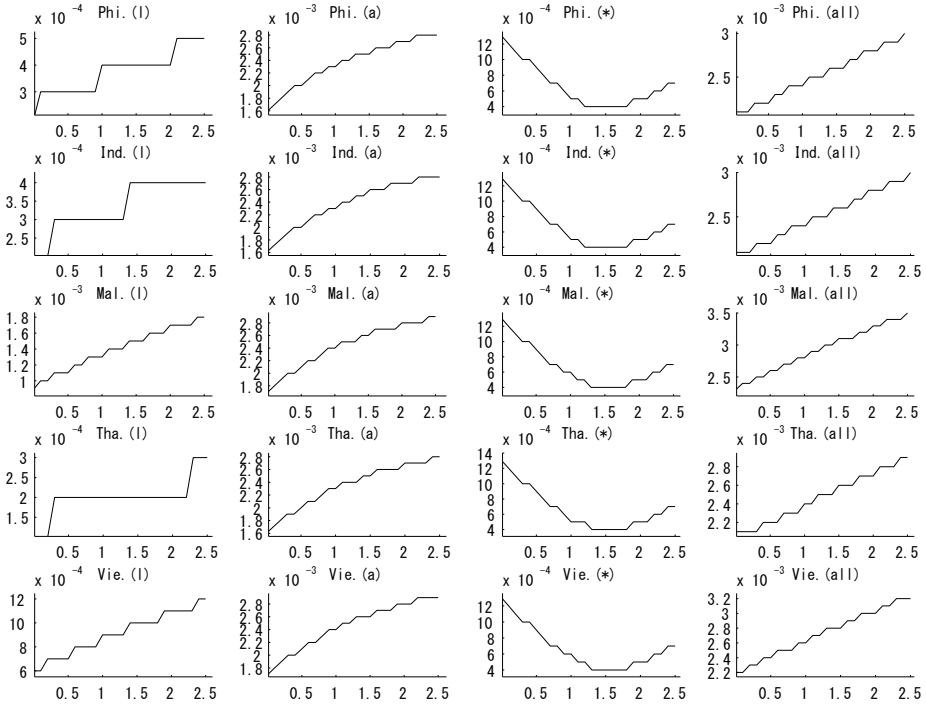
Notes: ◯ and △ represent responses in Malaysia and Thailand, respectively. The vertical axis is in percent and the horizontal axis is the number of quarters. The shock to the lending rate spread equals 360 basis points.

Figure 2: Impulse Responses to the Lending Rate Spread Shock ϵ_t^l: $\phi_s = 2.5$



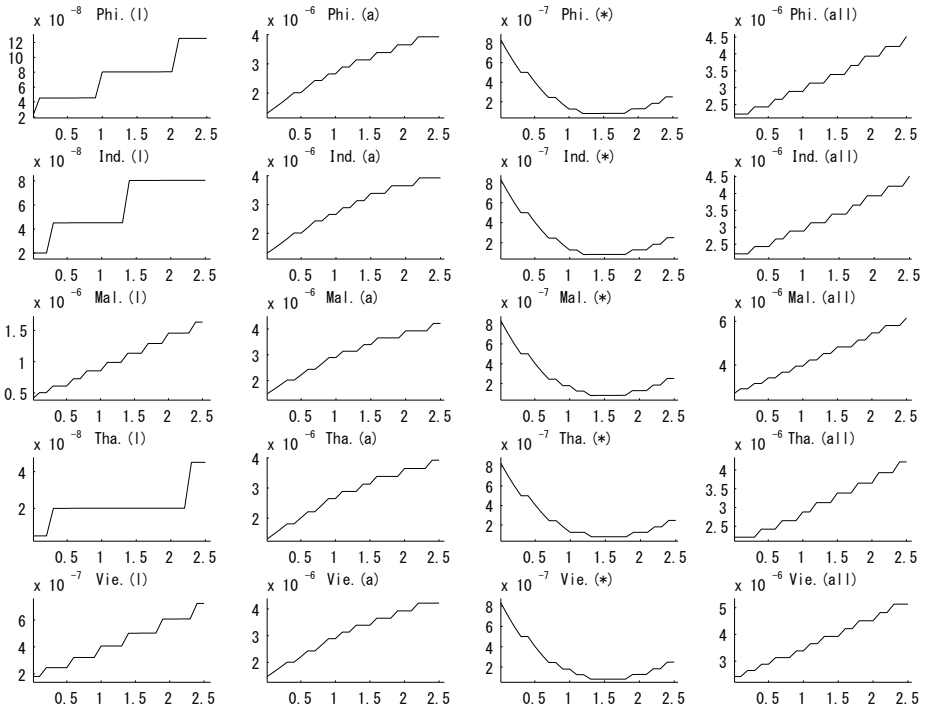
Notes: ◯ and △ represent responses in Malaysia and Thailand, respectively. The vertical axis is in percent and the horizontal axis is the number of quarters. The shock to the lending rate spread equals 360 basis points.

Figure 3: Exchange Rate Coefficient and Consumption Volatility for All Countries



Notes: (l), (a) and (∗) represent standard deviation of consumption for shocks ϵ_t^l, ϵ_t^a and ϵ_t^*, respectively. The horizontal axis is the level of policy parameter ϕ_s.

Figure 4: Exchange Rate Coefficient and Welfare Loss for All Countries



Notes: (l), (a) and (∗) represent welfare losses for shocks ϵ_t^l, ϵ_t^a and ϵ_t^*, respectively. The horizontal axis is the level of policy parameter ϕ_s.