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FISCAL POLICY AND MACROECONOMIC FLUCTUATIONS IN A FIXED EXCHANGE RATE REGIME

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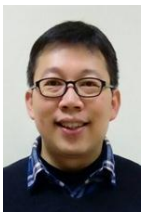

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ABSTRACT

This paper develops a model with imperfect competition and micro-foundation based on the framework of New Open Economy Macroeconomics in order to discuss government spending shock on macroeconomic fluctuations (for example, consumption, output, price, and terms of trade, etc.) under the fixed exchange rate regime and try to explain the role of consumption home bias. By way of theoretical derivation and simulation analysis, this paper discovers that without consideration of consumption home bias under the fixed exchange rate regime in the long term, government spending is positively related to domestic output but is negatively related to private sector consumption, price and terms of trade. Once you take consumption home bias into consideration like that consumers in two countries both are in favor of home goods, the relationship among government spending, consumption, output, and price will be reversed. And, in the short term government spending only will have an influence on interest rate and both of them are positive correlative.

Contribution/ Originality: This study provides a detailed account of how government spending shock on macroeconomic fluctuations under the fixed exchange rate regime. We found that the role of consumption home bias affects the effects of government spending shock on macroeconomics variables in the long and short term.

1. INTRODUCTION

Traditional Keynesian economics believes in fiscal policy is an effective means for counter-business cycle. However, in fact the government wants to show its prominent position in economic regulation, so its fiscal operation is very aggressive. Every school of thought has a different point of view on the effect of fiscal policy on output, consumption, interest rate and price. As far as public spending is concerned, Keynesian economics thought expansion of public spending will increase output and then increase private investment. On the one hand the increased price and interest rate will crowd out private investment, thus the effect of private investment is not certain. As to private consumption, it has to be decided by the marginal consumption propensity and its response to the interest rate. In the opinion of Classical School, fiscal policy only influenced nominal variables but not real variables. The increased government spending just raised the price. Moreover, New Classical School stressed that the provisional and permanent government spending would have different effects on macroeconomic. In addition,

Supply-side economics was in a favor of tax cuts policy, it thought an incentive would be given and had an increased saving and investment in order to stimulate total supply and decrease inflation rate and reduce unemployment rate. Whatever in the theoretical or empirical aspect, fiscal policy on the effect of macroeconomic variable both shows a lot of difference.

Besides, the exchange rate represents the relative price of domestic currency and foreign currency, which assumes the responsibility of association with home economics and foreign economics and facilitation for internal and external equilibrium. In these literatures, the effect of fiscal policy on floating exchange rate regime has widely discussed (for instance, (Pitterle and Steffen, 2004a;2004b; Tervala, 2008; ANYANWU *et al.*, 2017; Hsiao *et al.*, 2017; Liu *et al.*, 2017)). However, under the fixed exchange rate system, the exchange rate cannot provide the function of transmission, then what effect fiscal policy will have on the macroeconomic variables lacks a complete discussion. In addition, consumption home bias is a common phenomenon in the society, which explains consumers usually are inclined to have a preference for domestic goods. Therefore, this paper tries to analyze the fiscal expenditure shock on macroeconomic variables under the fixed exchange rate system and make a statement of the role of consumption home bias.

Many literatures focused on the effect of fiscal policy on macroeconomic in closed economy (for example, (Barro, 1981;1990; Futagami *et al.*, 1993; Devereux and Love, 1995; Greiner, 1998; Greiner and Hanusch, 1998; Dasgupta, 1999; Xie *et al.*, 1999; Sa'idu, 2014; Cieslak and Povala, 2015; Shiamptanis, 2015; Musti, 2016; Nakata, 2017)). The analysis of fiscal policy on open economy does not have many talks. Until in recent years "New Open Economy Macroeconomic (hereinafter referred to as NOEM)" rises suddenly, for instance, Corsetti and Pesenti (2001); Ganelli (2003) and Pitterle and Steffen (2004a;2004b) in succession extended their research to fiscal policy on the effect of open economy. However, in a traditional NOEM model the main cause of exchange rate volatility is private sector consumption, hence the interested topic turns to be under the fixed exchange rate system if government spending is included in consumption and both private and government consumption have a home bias in consumption, then what effect on macroeconomic will have. Therefore, the purpose of this paper is to discuss the relationship among government spending, consumption home bias and macroeconomic variable. Tervala (2008) talked about the effect of fiscal policy under the framework of NOEM and got a result that the marginal rate of substitution of private consumption and government spending are the most important reason which affects fiscal spending on the effect of welfare but it also ignores a popular issue, namely, consumption home bias. Besides, Chang and Liu (2018) construct a simple dynamic general equilibrium model to examine how the active monetary and passive fiscal policy affect interest rates and inflation rates. Cebi and Culha (2014) investigate the effects of government spending shocks on the real exchange rate and foreign trade balance in Turkey within a structural VAR framework.

Initial Open economy analysis development is extended from Mundell-Fleming Model see (Fleming, 1962; Mundell, 1963) and Dornbusch (1976) based on Keynesian doctrine. In spite that these open macroeconomic models explain the relationship among some macroeconomic variables, but all of them have one shortcoming, that is, lack of micro-foundation. Lucas (1976) had a view that macroeconomic variable change will affect individual's decision in micro economy and such makes a change in the relationship among macroeconomic variables which produces deviation from macroeconomic analysis with the lack of micro-foundation. In the end the birth of NOEM starts a new development phase for open macroeconomic. NOEM is a new generation research method for open economy, it features both micro-foundation and the framework of monopolistic competition and it is suitable for the analysis of external shock on macroeconomic. Accordingly, this research builds its foundation on NOEM.

Nevertheless, it should be noticed that although Obstfeld and Rogoff (2000) considered "home bias in consumption puzzle" as one of six puzzles in International Economics.[1] But under the framework of NOEM the discussion about asymmetry in the role of home bias in consumption still are not enough. The so called consumption home bias puzzle means in the society consumers are inclined to have a preference to home goods, but the phenomenon in the market cannot be explained by researchers. Some research about it mainly focus on its origin, for example trade cost (Obstfeld and Rogoff, 2000; Ried, 2009) the country size and openness (Sutherland, 2005; Paoli, 2009) non-traded goods (Stockman and Dellas, 1989; Pesenti and Wincoop, 2002) and trade in intermediate factors input (Hillberry and Hummels, 2002) which all result in consumption home bias. But recent research stress on discussion of its effect. For example, Pierdzioch (2004) studied the effects of monetary shock under consumption. Hau (2002); Kollmann (2004); Sutherland (2005); Leith and Lewis (2006) and Cooke (2010) explored home bias on the effect of exchange rate, Paoli (2009) discussed the welfare effect of monetary policy with consumption home bias. Another issue needs to mention about is home bias on the effect of formulation of the optimal monetary policy, related research including Faia and Monacelli (2006); Jondeau and Sahuc (2008); Gali and Monacelli (2008) and Wang (2010). Angrick (2018) examined the monetary policy constraints facing economies on a fixed peg or managed float regime, Bajo-Rubio and Diaz-Roldan (2016) presented a novel framework to include a monetary policy rule instead of the LM function together with an aggregate supply function derived from the Phillips curve, Ca'Zorzi *et al.* (2017) found that the root cause is its inability to predict domestic and foreign inflation, and Kolasa and Rubaszek (2015) compared the quality of forecasts from DSGE models with and without financial frictions. Obviously, there are plenty of related researches but at present no article can clarify its role in the effect on fiscal spending under the fixed exchange rate. Hence this paper wants to make a breakthrough

This paper separates into 4 sections. Except for introduction, other sections are as follows: Section 2 builds a theoretical model, Section 3 is simulation analysis which discusses the effect of fiscal spending on macroeconomic variables in the long run and short run under the fixed exchange rate regime, and the role of consumption home bias, and Section 4 is conclusion and suggestion.

2. THEORETICAL MODEL

2.1. Model Setting

This paper follows NOEM proposed by Obstfeld and Rogoff (1995) as a theoretical basis; the main assumptions are stated as follows:

(1). There are two countries in the world, "home country" and "foreign country", all of the following foreign economic variables are marked as "*" for identification.

(2). World population is distributed within the interval of $[0,1]$, where individuals of home country are distributed between $[0,n)$ and foreign individuals are distributed between $[n,1]$.

(3). Each individual is both consumer and producer, and he operates a monopoly competitor factory uses labor for production.

(4). Consumption home bias behavior exists in economic system and government spending is the only exogenous shock.

(5). Fixed exchange rate regime is implemented domestically.

(6). The price featured with stickiness and is not adjustable in the short term, but can be freely adjusted in the long term steady state.

[1]The six puzzles proposed by Obstfeld, M. and K. Rogoff, 2000. The six major puzzles in international mMacroeconomics: Is there a common cause? In B.S. Bernanke and K. Rogoff, Eds., NBER Macroeconomics Annual, 15: 339-390.) are consumption home bias puzzle, home bias in equity portfolios puzzle, purchasing power parity puzzle, exchange rate disconnect puzzle, the high investment-saving correlation puzzle, and the low international consumption correlation puzzle.

2.1.1. Household

Assuming that all individuals have the same preferences, utility (U) is a function to the consumption (C), real money balances (M/P) and output level (y), the lifetime utility function is set as follows:

$$U_t = \sum_{s=t}^{\infty} \beta^{s-t} \left[\log C_s + \frac{\chi}{1-\varepsilon} \left(\frac{M_s}{P_s} \right)^{1-\varepsilon} - \frac{\kappa}{2} y_s(z)^2 \right], \ \varepsilon > 0 \quad (1)$$

Where β is the discount factor ($0 < \beta < 1$), ε is the marginal elasticity of demand for real money balances,[2] χ and κ represent the degree of significance of real money balances and output on the utility function, z refers to a particular product.

In Eq. (1), the consumption index of the representative consumer is defined as the function of constant elasticity of substitution (CES):

$$C_t = \left[\int_0^n \alpha^{\frac{1}{\delta}} c_{h,t}(z)^{\frac{\delta-1}{\delta}} dz + \int_n^1 (1-\alpha)^{\frac{1}{\delta}} c_{f,t}(z)^{\frac{\delta-1}{\delta}} dz \right]^{\frac{\delta}{\delta-1}}, \ \delta > 1 \quad (2)$$

Where $c_h(z)$ is the consumption of domestic consumer for domestic specific products z, $c_f(z)$ is the consumption of domestic consumer for foreign specific product z, and δ is the elasticity of substitution of goods between two countries.

We can deduce domestic price index (P) from the definition of consumption index (Eq. (2)) by the problem of expenditure minimization as follows:

$$P_t = \left[\int_0^n \alpha p_{h,t}(z)^{1-\delta} dz + \int_n^1 (1-\alpha) p_{f,t}(z)^{1-\delta} dz \right]^{\frac{1}{1-\delta}} \quad (3)$$

Likewise, the foreign price index (P^*) is as follows:

$$P_t^* = \left[\int_0^n (1-\alpha^*) p_{h,t}^*(z)^{1-\delta} dz + \int_n^1 \alpha^* p_{f,t}^*(z)^{1-\delta} dz \right]^{\frac{1}{1-\delta}} \quad (4)$$

In the above two equations, $p_h(z)$ stands for the price of domestic product z in domestic currency, $p_f(z)$ stands for the price of foreign product z in domestic currency, $p_h^*(z)$ stands for the price of domestic product z in foreign currency, $p_f^*(z)$ stands for the price of foreign product z in foreign currency, α^* stands for foreign consumers' preference on foreign products.

For each product, the law of one price is held as follows:

$$p_{h,t}(z) = E_t p_{h,t}^*(z) \quad (5)$$

$$p_{f,t}(z) = E_t p_{f,t}^*(z) \quad (6)$$

[2] The elasticity of marginal utility of real money balance (ε) is defined as the response of the change in the marginal utility of real money balances under a change of real money balances.

Where E is the exchange rate.

From Eqs. (2) and (3), the domestic consumption on the specific domestic and foreign products are derived as follows:

$$c_{h,t}(z)=\left(\frac{\alpha p_{h,t}(z)}{P}\right)^{-\delta}C \tag{7}$$

$$c_{f,t}(z)=\left(\frac{(1-\alpha)p_{f,t}(z)}{P}\right)^{-\delta}C \tag{8}$$

Likewise, the foreign consumptions on the specific domestic and foreign products are derived as follows:

$$c^{*}_{h,t}(z)=\left(\frac{(1-\alpha^{*})p^{*}_{h,t}(z)}{P^{*}}\right)^{-\delta}C^{*} \tag{9}$$

$$c^{*}_{f,t}(z)=\left(\frac{\alpha^{*}p^{*}_{f,t}(z)}{P^{*}}\right)^{-\delta}C^{*} \tag{10}$$

Where $c^{*}_{h}(z)$ is foreign consumption on the specific domestic product z, and $c^{*}_{f}(z)$ is foreign consumption on the specific foreign product z.

2.1.2. Government

The government spending can be financed by seigniorage revenue and lump-sum tax, so the government budget constraint is:

$$G_t=T_t+\frac{M_t-M_{t-1}}{P_t} \tag{11}$$

Where the item at the left of the equation is real government spending; the first item at the right of the equation is real tax revenue and the second item at the right of the question is real seignorage revenue.

Assume that both the government sector and private sector have the same preferences, the government spending follows CES function as:

$$G_t=\left[\int_0^n \alpha^{\frac{1}{\delta}}g_{h,t}(z)^{\frac{\delta-1}{\delta}}dz+\int_n^1(1-\alpha)^{\frac{1}{\delta}}g_{f,t}(z)^{\frac{\delta-1}{\delta}}dz\right]^{\frac{\delta}{\delta-1}}$$

Where $g_h(z)$ is the consumption of the home-country specific product z by the domestic government sector; $g_f(z)$ is the consumption of the foreign country specific product z by the domestic government sector.

2.1.3. Asset Market

Assuming that there is an integrated international capital market between the two countries, either of which can trade real bonds (B) in the market, and the relationship between the bond maturity real interest rate (r) and nominal interest rate (i) is based on the Fisher equation, expressed as:

$$1+i_t=\frac{P_{t+1}}{P_t}(1+r_t) \qquad (12)$$

The possession of the bonds reflects the lending relationship between agents of the two countries, and therefore it satisfies the equation of $nB_t+(1-n)B_t^*=0$, or

$$B_t^*=-\frac{n}{1-n}B_t \qquad (13)$$

Where B stands for the bond possession volume of the representative domestic individual, while B^* stands for the bond possession volume of the representative foreign individual.

2.1.4. Budget Constraint

The budget constraint of representative individual is expressed as:

$$M_t+P_tC_t+P_tB_t=M_{t-1}+P_t(1+r_{t-1})B_{t-1}+p_{h,t}(z)y_{h,t}(z)-P_tT_t \qquad (14)$$

Where the income sources of the consumer in period t includes: money balances in period $t-1$ (M_{t-1}), the principal and interest of the bond from period $t-1$ ($P_t(1+r_{t-1})B_{t-1}$) and output revenue ($p_{h,t}(z)y_{h,t}(z)$) in period t. The consumers can use the income for money holding (M_t), consumption (P_tC_t) and bond purchases (P_tB_t) as well as tax payments (P_tT_t).

2.1.5. Aggregate Demand

From Eqs. (7) and (9), demand on the goods that domestic manufacturers face can be expressed as:

$$y_{h,t}(z)=n(c_{h,t}(z)+g_{h,t}(z))+(1-n)(c_{h,t}^*(z)+g_{h,t}^*(z))$$

$$=n\left(\frac{\alpha p_{h,t}(z)}{P}\right)^{-\delta}(C_t+G_t)+(1-n)\left(\frac{(1-\alpha^*)p_{h,t}^*(z)}{P^*}\right)^{-\delta}(C_t^*+G_t^*) \qquad (15)$$

Where G^* is the consumption of the foreign government sector.

Likewise, from Eqs. (8) and (10), demand on the goods that foreign manufacturers face can be expressed as:

$$y_{f,t}^*(z)=nc_{f,t}(z)+(1-n)c_{f,t}^*(z)$$

$$=n\left(\frac{(1-\alpha)p_{f,t}(z)}{P}\right)^{-\delta}(C_t+G_t)+(1-n)\left(\frac{\alpha^* p_{f,t}^*(z)}{P^*}\right)^{-\delta}(C_t^*+G_t^*) \qquad (16)$$

2.1.6. First Order Conditions

Under the budget constraint (Eq. (14)), the first-order conditions of utility (Eq. (1)) maximization is expressed as:

$$C_{t+1}=\beta(1+r_t)C_t \qquad (17)$$

$$\frac{M_t}{P_t} = \left(\frac{(1+i_t)\chi}{i_t} C_t \right)^{\frac{1}{\varepsilon}} \quad (18)$$

$$[y_t(z)]^{\frac{\delta+1}{\delta}} = \left(\frac{\delta-1}{k\delta} \right) C_t^{-1} (C_t^W + G_t^W)^{\frac{1}{\delta}} \quad (19)$$

Where Eq. (17) is the Euler Equation of consumption, which describes the intertemporal consumption behaviors, Eq. (18) is the equation of money demand for indicating the substitution relation between real money demand and consumption, Eq. (19) is the labor supply equation which stipulates the substitution relation between labor supply and consumption. In Eq. (19), C^W represents the world private consumption, $C_t^W \equiv nC_t + (1-n)C_t^*$; G^W represents the world government consumption, $G_t^W \equiv nG_t + (1-n)G_t^*$.

2.2. Derivation of Steady-State

Discussed in the following paragraphs are the effects of government spending shock on macroeconomic variables. To begin with, the initial state (0 steady state) is given, assuming that consumption home bias and government spending shock do not exist in the economic system. The initial state will then be used a baseline for comparison, so as to derive the economic system's long-term steady state. For analysis of long-term steady state, the symbols used are the subscript "$_t$"which indicates the macroeconomic variables under the long-term steady state, and subscript "$_0$" which indicates the macroeconomic variables under the initial state. For example, C_t and C_0 represent the consumption levels under the long-term steady state and initial state, respectively. For analysis of short-term steady state, however, the macroeconomic variables under the long-term steady state are denoted without the subscript symbols, while the subscript "$_t$" is used to distinguishingly denote the values of macroeconomic variables under the short-term steady state.

By substituting the government budget constraint (Eq. (11)) to the private budget constraint (Eq. (14)), and assuming that $B_{t-1} = 0$, the following equation is obtained:

$$C_t = -\hat{B}_t + \frac{p_{h,t}(z) y_{h,t}(z))}{P_t} - \hat{G}_t \quad (20)$$

Likewise, the following equation is obtained for the foreign country:

$$C_t^* = -\hat{B}_t^* + \frac{p_{f,t}^*(z) y_{f,t}^*(z)}{P_t^*} - \hat{G}_t^* \quad (21)$$

2.3. Log-Linearization

To get a closed-form solution, this paper has used the approach suggested by Uhlig (1995). The model was first given the log-linearization process and then its parameters are given values for simulation analysis.[3] The variables are then given the log-linearization process near the initial state to obtain their volatility. The superscript symbol "∧" is used to denote the variables going through the log-linearization process.

For example, given $\hat{X}_t$ is the result of variable X_t going through the log-linearization process near initial state (X_0), then:

$$\hat{X}_t \equiv \ln \frac{X_t}{X_0} \cong \frac{X_t - X_0}{X_0} \cong \frac{dX_t}{X_0}$$

2.3.1. Log-linearization of Price Index

Substitute Eqs. (5) and (6) into Eqs. (3) and (4), respectively, and process the log-linearization under fixed exchange rate regime ($\hat{E}_t = 0$), then the following equations are obtained:

$$\hat{P}_t = n\alpha\hat{p}_{h,t}(z) + (1-n)(1-\alpha)\hat{p}^*_{f,t}(z) \quad (22)$$

$$\hat{P}^*_t = n(1-\alpha^*)\hat{p}_{h,t}(z) + (1-n)\alpha^*\hat{p}^*_{f,t}(z) \quad (23)$$

Subtract Eq. (23) from Eq. (22) to get the difference of price index changes of the two countries:

$$\hat{P}_t - \hat{P}^*_t = n(\alpha - (1-\alpha^*))p_{h,t}(z) + (1-n)((1-\alpha) - \alpha^*)p^*_{f,t}(z) \quad (24)$$

2.3.2. Log-linearization of the Law of One Price

Under the fixed exchange rate regime ($\hat{E}_t = 0$), give Eqs. (5) and (6) the process of log-linearization, and get the following equations:

$$\hat{p}_{h,t}(z) = \hat{p}^*_{h,t}(z) \quad (25)$$

$$\hat{p}_{f,t}(z) = \hat{p}^*_{f,t}(z) \quad (26)$$

2.3.3. Log-Linearization of World Budget Constraint

Based on Eqs. (20) and (21), the world budget constraint is obtained as follows:

$$C^W_t = nC_t + (1-n)C^*_t$$

$$= n\left(-\hat{B}_t + \frac{p_{h,t}(z)y_{h,t}(z)}{P_t}\right) + (1-n)\left(-\hat{B}^*_t + \frac{p^*_{f,t}(z)y^*_{f,t}(z)}{P^*_t}\right) - G^W_t \quad (27)$$

[3] In consideration of the complexity of model setting, to obtain a specific closed-form solution between exogenous and endogenous variables, two commonly used approaches seen in literatures are log-linearization and numerical simulation. The model used in this research is the log-linearization collocated with the numerical simulation.

And then, based on Eqs. (25) and (26), give Eq. (27) the log-linearization process to obtain the following equation:

$$\hat{C}_t^W = n(-\hat{B}_t + \hat{p}_{h,t}(z) + \hat{y}_{h,t}(z) - \hat{P}_t) + (1-n)(-\hat{B}_t^* + \hat{p}_{f,t}^*(z) + \hat{y}_{f,t}^*(z) - \hat{P}_t^*) - \hat{G}_t^W \quad (28)$$

2.3.4. Log-Linearization of Demand Function

Give Eqs. (15) and (16) the process of log-linearization, and the following equations are obtained:

$$\hat{y}_{h,t}(z) = -\delta(n\alpha(\hat{p}_{h,t}(z) - \hat{P}_t) + (1-n)(1-\alpha^*)(\hat{p}_{h,t}^*(z) - \hat{P}_t^*)) + \hat{C}_t^W + \hat{G}_t^W \quad (29)$$

$$\hat{y}_{f,t}^*(z) = -\delta(n(1-\alpha)(\hat{p}_{f,t}(z) - \hat{P}_t) + (1-n)\alpha^*(\hat{p}_{f,t}^*(z) - \hat{P}_t^*)) + \hat{C}_t^W + \hat{G}_t^W \quad (30)$$

2.3.5. Log-Linearization of Labor Supply Function

Give Eq. (19) the log-linearization process to obtain the following equation:

$$(1+\delta)\hat{y}_{h,t}(z) = -\delta\hat{C}_t + \hat{C}_t^W + \hat{G}_t^W \quad (31)$$

Likewise, the foreign labor supply function is processed to obtain the following equation:

$$(1+\delta)\hat{y}_{f,t}^*(z) = -\delta\hat{C}_t^* + \hat{C}_t^W + \hat{G}_t^W \quad (32)$$

2.3.6. Log-Linearization of Money Demand Function

Give Eq. (18) the log-linearization process to obtain the following equation:

$$\hat{M}_t - \hat{P}_t = \frac{1}{\varepsilon}\hat{C}_t \quad (33)$$

Likewise, the foreign money demand function is processed to obtain the following equation:

$$\hat{M}_t^* - \hat{P}_t^* = \frac{1}{\varepsilon}\hat{C}_t^* \quad (34)$$

Subtract Eq. (34) from Eq. (33) and use Eq. (24) to obtain the following equation:

$$((1-n)(1-\alpha) + n(1-\alpha^*))\hat{E}_t = \hat{M}_t - \hat{M}_t^* - \frac{1}{\varepsilon}(\hat{C}_t - \hat{C}_t^*) - n(\alpha - (1-\alpha^*))p_{h,t}(z)$$

$$-(1-n)((1-\alpha) - \alpha^*)p_{f,t}^*(z) \quad (35)$$

2.3.7. Log-Linearization of Terms of Trade

The term of trade (referred to as *TOT*) is defined as the ratio of export good price to import good price, expressed as:

$$TOT = \frac{p_{h,t}(z)}{E_t p_{f,t}^*(z)}$$

Under the fixed exchange rate regime ($\hat{E}_t = 0$), the above equation is given a log-linearization process to obtain the following equation:

$$\hat{TOT} = \hat{p}_{h,t}(z) - \hat{p}^*_{f,t}(z) \qquad (36)$$

2.4. Steady-State Solution

Eqs. (20) and (21) are given the log-linearization process to obtain the following equations:

$$\hat{C}_t = -\hat{B}_t + \hat{p}_{h,t}(z) + \hat{y}_{h,t}(z) - \hat{P}_t - \hat{G}_t \qquad (37)$$

$$\hat{C}^*_t = -\hat{B}^*_t + \hat{p}^*_{f,t}(z) + \hat{y}^*_{f,t}(z) - \hat{P}^*_t - \hat{G}^*_t \qquad (38)$$

Under the fixed exchange rate regime ($\hat{E}_t = 0$), in the long term the price is flexible, and $\hat{B}_t = \hat{B}_{t+1} = 0$. We use the log linearized price index (Eqs. (22) and (23)), the log linearized law of one price (Eqs. (25) and (26)), the log linearized world consumption (Eq. (28)), the log linearized demand function (Eqs. (29) and (30)), the log linearized labor supply function (Eqs. (31) and (32)), the log linearized terms of trade (Eq. (36)), and log linearized private budget constraints (Eqs. (37) and (38)) to require a solution to get the equation expressing the relationship with 13 endogenous and exogenous variables, which are domestic consumption ($\hat{C}_t$), foreign consumption ($\hat{C}^*_t$), world consumption ($\hat{C}^W_t$), domestic output ($\hat{y}_{h,t}(z)$), foreign output ($\hat{y}^*_{f,t}(z)$), domestic price of domestic specified good ($\hat{p}_{h,t}(z)$), foreign price of domestic specified good, ($\hat{p}^*_{h,t}(z)$), foreign price of foreign specified good ($\hat{p}^*_{f,t}(z)$)), domestic price of foreign specified good($\hat{p}_{f,t}(z)$)), exchange rate ($\hat{E}_t$), domestic price index ($\hat{P}_t$), foreign price index ($\hat{P}^*_t$) and terms of trade ($\hat{TOT}_t$).

In the short term, there is a rigidity about the price ($\hat{p}_{h,t}(z) = 0$; $\hat{p}^*_{f,t}(z) = 0$), we then put domestic consumption Euler equation (Eq. (17)) into log linearization and with foreign consumption Euler equation, then world consumption equation can obtain as:

$$\hat{C}^W_t = \hat{C}^W - (1-\beta)\hat{r}_t \qquad (39)$$

Under the fixed exchange rate regime ($\hat{E}_t = 0$), and we can use the log linearized price index (Eq. (22)), the log linearized world consumption (Eq. (28)), the log linearized demand function (Eqs. (29) and (30)), the log linearized labor supply function (Eqs (31) and (32)), the log linearized private budget constraints (Eqs. (37) and (38)) and the log linearized equation which express the relationship of world consumption in the long term and short term (Eq. (39)) to require a solution to get the equation expressing the relationship of 9 endogenous variable and exogenous variable ($\hat{G}$), which are domestic consumption ($\hat{C}_t$) , foreign consumption($\hat{C}^*_t$), world

consumption ($\hat{C}_t^W$), domestic output ($\hat{y}_{h,t}(z)$), foreign output ($\hat{y}_{f,t}^*(z)$), domestic price index ($\hat{P}_t$), domestic current account ($\hat{B}_t$)、foreign current account ($\hat{B}_t^*$) and interest rate ($\hat{r}_t$)

3. THE EFFECTS OF FISCAL POLICY ON MACROECONOMIC FLUCTUATIONS

In order to get the change of consumption home bias parameter on the effect of fiscal expenditure, this paper goes on simulation analysis.

3.1. Parameterisation

For the purpose of simplification, this paper based on NOEM selects two economics of equal size as subjects (see Lubik and Schorfheide (2005)). Therefore, in the selection of parameter, we try to introduce some empirical evidence of US and other countries of equal size (for example, OECD countries, European Union) to analyze the effect of fiscal expenditure in US and other countries. We follow assumptions of Bergin *et al.* (2007) that had given the elasticity of substitution of product between countries (δ) is 5; then make reference to Mankiw and Summers (1986) and Schmidt (2006) related research to give the value of 1 to the elasticity of marginal utility of the real money balances (ε); then use the assumption of Wang (2010) consumption home bias parameter is set to 0.85($\alpha = 0.85$), and the condition of no consumption home bias ($\alpha = 0.5$) and preference to foreign goods ($\alpha = 0.15$) is adopted, the parameter of foreign country's preference to domestic and foreign good is the same as that of consumption home bias in home country; with regard to other effects of domestic and foreign policy, for instance, money supply in home country ($\hat{M}$), money supply in foreign country ($\hat{M}^*$), foreign fiscal expenditure ($\hat{G}^*$),because they are not points here then we suppose their rates of change are 0. The parameters are listed as follows.

Table-1. Selection of Parameters

Symbol	Meaning	Value	Source
n	Country size	0.5	Lubik and Schorfheide (2005)
δ	Elasticity of substitution of product between countries	5	Bergin *et al.* (2007)
ε	Elasticity of marginal utility of the real money balances	1	Mankiw and Summers (1986); Schmidt (2006)
α	Consumption bias of the home country	0.15; 0.5; 0.85	Wang (2010)
α^*	Consumption bias of the foreign country	0.15; 0.5; 0.85	Wang (2010)

3.2. Simulation and Comparative Static Analysis

This section use the above parameter to go on simulation in order to discuss the effects of fiscal expenditure on exchange rate, price, consumption, output, and terms of trade. The result is stated in Table 2.

Table-2. The Long-Term Effect of the Fiscal Policy on the Macroeconomic Variables

(a) Long-Term Effect of Fiscal Policy on Domestic Consumption				
$\partial\hat{C}_t / \partial\hat{G}$				
	α			
		0.15	0.5	0.85
α^*	0.15	-0.654	-0.573	8.75
	0.5	-0.696	-0.583	-0.538
	0.85	-75.25	-0.647	-0.573

(b) Long-Term Effect of Fiscal Policy on Foreign Consumption

$\partial \hat{C}_t^* / \partial \hat{G}$

	α		
α^*	0.15	0.5	0.85
0.15	0.154	0.196	74.75
0.5	0.073	0.083	0.147
0.85	-9.25	0.038	0.073

(c) Long-Term Effect of Fiscal Policy on World Consumption

$\partial \hat{C}_t^W / \partial \hat{G}$

	α		
α^*	0.15	0.5	0.85
0.15	-0.25	-0.189	41.75
0.5	-0.311	-0.25	-0.196
0.85	-42.25	-0.304	-0.25

(d) Long-Term Effect of Fiscal Policy on Domestic Output

$\partial y_{h,t}(z) / \partial \hat{G}$

	α		
α^*	0.15	0.5	0.85
0.15	0.587	0.530	-0.25
0.5	0.611	0.528	0.499
0.85	55.75	0.572	0.519

(e) Long-Term Effect of Fiscal Policy on Foreign Output

$\partial y_{f,t}^*(z) / \partial \hat{G}$

	α		
α^*	0.15	0.5	0.85
0.15	-0.087	-0.111	-55.25
0.5	-0.030	-0.028	-0.072
0.85	0.75	0.001	-0.019

(f) Long-Term Effect of Fiscal Policy on Domestic Price Index

$\partial \hat{P}_t / \partial \hat{G}$

	α		
α^*	0.15	0.5	0.85
0.15	0.062	0.071	28
0.5	-0.010	0	0.009
0.85	-28	-0.064	-0.050

(g) Long-Term Effect of Fiscal Policy on Foreign Price Index

$\partial \hat{P}_t^* / \partial \hat{G}$

	α		
		0.15	0.5	0.85
α^*	0.15	-0.062	0.010	28
	0.5	-0.071	0	0.064
	0.85	-28	-0.009	0.050

(h) Long-Term Effect of Fiscal Policy on the Price of Domestic Product z Denoted in Domestic Currency

$\partial \hat{p}_{h,t}(z) / \partial \hat{G}$

	α		
		0.15	0.5	0.85
α^*	0.15	-0.178	-0.032	38
	0.5	-0.317	-0.111	-0.029
	0.85	-158	-0.283	-0.143

(i) Long-Term Effect of Fiscal Policy on the Price of Domestic Product z Denoted in Foreign Currency

$\partial \hat{p}^*_{h,t}(z) / \partial \hat{G}$

	α		
		0.15	0.5	0.85
α^*	0.15	-0.178	-0.032	38
	0.5	-0.317	-0.111	-0.029
	0.85	-158	-0.283	-0.143

(j) Long-Term Effect of Fiscal Policy on the Price of Foreign Product z Denoted in Domestic Currency

$\partial \hat{p}_{f,t}(z) / \partial \hat{G}$

	α		
		0.15	0.5	0.85
α^*	0.15	0.178	0.317	158
	0.5	0.032	0.111	0.283
	0.85	-38	0.029	0.143

(k) Long-Term Effect of Fiscal Policy on the Price of Foreign Product z Denoted in Foreign Currency

$\partial \hat{p}^*_{f,t}(z) / \partial \hat{G}$

	α		
		0.15	0.5	0.85
α^*	0.15	0.178	0.317	158
	0.5	0.032	0.111	0.283
	0.85	-38	0.029	0.143

(l) Long-Term Effect of Fiscal Policy on Terms of Trade

(a) $\partial \hat{TOT}_t / \partial \hat{G}$

α^* \ α	0.15	0.5	0.85
0.15	-0.357	-0.349	-120
0.5	-0.349	-0.222	-0.311
0.85	-120	-0.311	-0.286

From Table 2 (a) to (l) we know that in the long term except that fiscal expenditure is negatively correlated with terms of trade and its relationship with other variables will be affected by asymmetry of consumers' preference to goods. Among them except for "consumers in both countries have a preference to domestic goods", the increase in fiscal expenditure will result in an increase in domestic consumption and a decrease in domestic output, in other conditions, an increase in fiscal expenditure will result in a decrease in domestic consumption and an increase in domestic output. The relationship of fiscal expenditure and price index, except for conditions such as "consumers in both countries have a preference to domestic goods", "domestic consumers have no consumption bias , but foreign consumers have a preference to domestic goods", and "foreign consumers have no consumption bias, but domestic consumers have a preference to domestic goods", an increase in fiscal expenditure will raise the domestic price, in other conditions, an increase in fiscal expenditure will result in a decrease in domestic price index.

The intuition behind the above conclusion can be explained as: without consideration of consumption bias, an increase in government expenditure will increase demand for domestic goods and so increase domestic output, but because of crowding out effect, which will decrease private consumption, and deteriorates terms of trade; in consideration of asymmetry of consumption bias, like the condition that "consumers in both countries have a preference to domestic good", the relationship of government expenditure, consumption, output and price will appear inverted.

In the short term equilibrium, the results of simulation and comparative static analysis are listed as Table 3. From Table 3, in the short term because there is a rigidity about the price ($\hat{p}_{h,t}(z)=0$; $\hat{p}^*_{f,t}(z)=0$). Therefore, under the fixed exchange rate regime ($\hat{E}_t=0$), price index and current account will not be affected by fiscal expenditure, and thus consumption and output are not affected. But an increase in fiscal spending will decrease public saving and capital supply and then cause an increase in interest rate.

Table-3. The Short-Term Effect of the Fiscal Policy on the Interest Rates

α^* \ $\partial \hat{r}_t / \partial \hat{G}_t$	α		
	0.15	0.5	0.85
0.15	25.0	31.1	42.2
0.5	38.9	25.0	30.4
0.85	41.7	19.6	25.0

4. CONCLUSION AND SUGGESTIONS

It has been 23 years since NOEM is found, however compared to the universal research in monetary shock, research in connection with the effect of fiscal expenditure is not enough. In view of the aforementioned reason, this paper under the framework of NOEM model by Obstfeld and Rogoff (1995) brings consumption home bias into the model to discuss under the fixed exchange rate system, when a country faces a fiscal expenditure shock, how the role of consumption home bias plays on the effect of macroeconomic variables.

By way of theoretical derivation and simulation analysis, this paper discovers an increase in fiscal expenditure will deteriorate terms of trade, as to the relationship of fiscal expenditure and other variables (for instance, consumption, output, price) will be affected by asymmetry in consumers' preference to goods in both countries, in the short term an increase in fiscal expenditure will raise the interest rate, but with the rigidity of the price, fiscal expenditure will not have a effect on consumption, output, price, terms of trade and current account.

At last, we want to stress the point that the framework of NOEM model exerts itself on lots if economic issues, but in fact for the purpose of simplification, it is usually build on many assumptions. If we want to release one of assumption, we will have a different result. This shortcoming is included in the limitation of this paper.

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REFERENCES

Angrick, S., 2018. Global liquidity and monetary policy autonomy: An examination of open-economy policy constraints. Cambridge Journal of Economics, 42(1): 117-135. Available at: https://doi.org/10.1093/cje/bew059.

ANYANWU, F.A., A.C. ANANWUDE and N.T. OKOYE, 2017. Exchange rate policy and Nigeria's economic growth: A granger causality impact assessment. International Journal of Applied Economics, Finance and Accounting, 1(1): 1-13.

Bajo-Rubio, O. and C. Diaz-Roldan, 2016. Open economy Keynesian macroeconomics without the LM Curve. Journal of Economics and Economic Education Research, 17(2): 1-16.

Barro, R.J., 1981. Output effects of government purchases. Journal of Political Economy, 89(6): 1086-1121. Available at: https://doi.org/10.1086/261024.

Barro, R.J., 1990. Government spending in a simple model of endogeneous growth. Journal of Political Economy, 98(5, Part 2): S103-S125. Available at: https://doi.org/10.1086/261726.

Bergin, P.R., H.-C. Shin and I. Tchakarov, 2007. Does exchange rate variability matter for welfare? A quantitative investigation of stabilization policies. European Economic Review, 51(4): 1041-1058. Available at: https://doi.org/10.1016/j.euroecorev.2006.05.002.

Ca'Zorzi, M., M. Kolasa and M. Rubaszek, 2017. Exchange rate forecasting with DSGE models. Journal of International Economics, 107(C): 127-146. Available at: https://doi.org/10.1016/j.jinteco.2017.03.011.

Cebi, C. and A.A. Culha, 2014. The effects of government spending shocks on the real exchange rate and trade balance in Turkey. Applied Economics, 46(26): 3151-3162. Available at: https://doi.org/10.1080/00036846.2014.922673.

Chang, M.-J. and M.-C. Liu, 2018. Accounting for monetary and fiscal policy effects in a simple dynamic general equilibrium model. Economic Research-Ekonomska Istraživanja, 31(1): 778-795. Available at: https://doi.org/10.1080/1331677x.2018.1442233.

Cieslak, A. and P. Povala, 2015. Expected returns in treasury bonds. The Review of Financial Studies, 28(10): 2859-2901. Available at: https://doi.org/10.1093/rfs/hhv032.

Cooke, D., 2010. Consumption home bias and exchange rate behavior. Journal of Macroeconomics, 32(1): 415-425. Available at: https://doi.org/10.1016/j.jmacro.2009.08.001.

Corsetti, G. and P. Pesenti, 2001. Welfare and macroeconomic interdependence. The Quarterly Journal of Economics, 116(2): 421-445. Available at: https://doi.org/10.1162/00335530151144069.

Dasgupta, D., 1999. Growth versus welfare in a model of nonrival infrastructure. Journal of Development Economics, 58(2): 359-385. Available at: https://doi.org/10.1016/s0304-3878(98)00127-8.

Devereux, M.B. and D.R. Love, 1995. The dynamic effects of government spending policies in a two-sector endogenous growth model. Journal of Money, Credit & Banking, 27(1): 232-257. Available at: https://doi.org/10.2307/2077861.

Dornbusch, R., 1976. Expectations and exchange rate dynamics. Journal of Political Economy, 84(6): 1161-1176.

Faia, E. and T. Monacelli, 2006. Optimal monetary policy in a small open economy with home bias. CEPR Discussion Papers, No. 5522.

Fleming, J.M., 1962. Domestic financial policies under fixed and under floating exchange rates. Staff Papers, 9(3): 369-380.

Futagami, K., Y. Morita and A. Shibata, 1993. Dynamic analysis of an endogenous growth model with public capital. Scandinavian Journal of Economics, 95(4): 607-625. Available at: https://doi.org/10.2307/3440914.

Gali, J. and T. Monacelli, 2008. Optimal monetary and fiscal policy in a currency union. Journal of International Economics, 76(1): 116-132. Available at: https://doi.org/10.1016/j.jinteco.2008.02.007.

Ganelli, G., 2003. Useful government spending, direct crowding-out and fiscal policy interdependence. Journal of International Money and Finance, 22(1): 87-103. Available at: https://doi.org/10.1016/s0261-5606(02)00050-5.

Greiner, A., 1998. Fiscal policy in an endogenous-growth model with public investment: A note. Journal of Economics, 68(2): 193-198. Available at: https://doi.org/10.1007/bf01237191.

Greiner, A. and H. Hanusch, 1998. Growth and welfare effects of fiscal policy in an endogenous growth model with public investment. International Tax and Public Finance, 5(3): 249-261.

Hau, H., 2002. Real exchange rate volatility and economic openness: Theory and evidence. Journal of Money, Credit and Banking, 34(3a): 611-630. Available at: https://doi.org/10.1353/mcb.2002.0002.

Hillberry, R. and D. Hummels, 2002. Explaining home bias in consumption: The role of intermediate input trade (No. w9020). National Bureau of Economic Research.

Hsiao, C.-M., W.-F. Zhang, C.-C. Chiu, J.-C. Huang and Y.-L. Huang, 2017. The enterprise risk management of foreign exchange exposures: Evidence from Taiwanese hospitality industry. Asian Journal of Economics and Empirical Research, 4(1): 32-48. Available at: https://doi.org/10.20448/journal.501.2017.41.32.48.

Jondeau, E. and J.-G. Sahuc, 2008. Optimal monetary policy in an estimated DSGE model of the euro area with cross-country heterogeneity. International Journal of Central Banking, 4(2): 23-72.

Kolasa, M. and M. Rubaszek, 2015. Forecasting using DSGE models with financial frictions. International Journal of Forecasting, 31(1): 1-19. Available at: https://doi.org/10.1016/j.ijforecast.2014.05.001.

Kollmann, R., 2004. Welfare effects of a monetary union: The role of trade openness. Journal of the European Economic Association, 2(2-3): 289-301. Available at: https://doi.org/10.1162/154247604323067998.

Leith, C. and S.W. Lewis, 2006. The optimal monetary policy response to exchange rate misalignment. Center for Dynamic Macroeconomic Analysis Conference Papers.

Liu, R., Z. Shao, G. Wei and W. Wang, 2017. GARCH model with fat-tailed distributions and bitcoin exchange rate returns. Journal of Accounting, Business and Finance Research, 1(1): 71-75. Available at: https://doi.org/10.20448/2002.11.71.75.

Lubik, T. and F. Schorfheide, 2005. A Bayesian look at the new open economy macroeconomics. NBER Macroeconomics Annual, 20: 313-366. Available at: https://doi.org/10.1086/ma.20.3585427.

Lucas, R.E., 1976. Econometric policy evaluation: A critique. Carnegie-Rochester Conference Series on Public Policy, 1: 19-46.

Mankiw, N.G. and L.H. Summers, 1986. Money demand and the effects of fiscal policies. Journal of Money, Credit and Banking, 18(4): 415-429. Available at: https://doi.org/10.2307/1992462.

Mundell, R.A., 1963. Capital mobility and stabilization policy under fixed and flexible exchange rates. Canadian Journal of Economics and Political Science, 29(4): 475-485. Available at: https://doi.org/10.2307/139336.

Musti, B.M., 2016. The effect of exchange rate changes on consumer prices in Nigeria: Evidence from VECM model. The Economics and Finance Letters, 3(3): 30-38. Available at: https://doi.org/10.18488/journal.29/2016.3.3/29.3.30.38.

Nakata, T., 2017. Uncertainty at the zero lower bound. American Economic Journal: Macroeconomics, 9(3): 186-221.

Obstfeld, M. and K. Rogoff, 1995. Exchange rate dynamics redux. Journal of Political Economy, 103(3): 624-660. Available at: https://doi.org/10.1086/261997.

Obstfeld, M. and K. Rogoff, 2000. The six major puzzles in international mMacroeconomics: Is there a common cause? In B.S. Bernanke and K. Rogoff, Eds., NBER Macroeconomics Annual, 15: 339-390.

Paoli, D.B., 2009. Monetary policy and welfare in a small open economy. Journal of International Economics, 77(1): 11-22.

Pesenti, P.A. and V.E. Wincoop, 2002. Can nontradables generate substantial home bias? Journal of Money, Credit, and Banking, 34(1): 25-50. Available at: https://doi.org/10.1353/mcb.2002.0034.

Pierdzioch, C., 2004. Home-product bias, capital mobility, and the efects of monetary policy shocks in open economies. Kiel Working Paper, No. 1141.

Pitterle, I. and D. Steffen, 2004a. Fiscal policy in a monetary union model with home bias in consumption. Mimeo: University of Frankfurt.

Pitterle, I. and D. Steffen, 2004b. Spillover effects of fiscal policy under flexible exchange rate. Working Paper, University of Frankfurt.

Ried, S., 2009. Putting up a good fight: The Galí-Monacelli model versus The six major puzzles in international macroeconomics. SFB 649 Discussion Papers. Berlin, Germany: , Humboldt University.

Sa'idu, B.M., 2014. Effect of exchange rate volatility on exports in Nigeria: A test of Cochrane-Orcutt technique. International Journal of Management and Sustainability, 3(12): 684-696.

Schmidt, C., 2006. International transmission effects of monetary policy shocks: Can asymmetric price setting explain the stylized facts? International Journal of Finance & Economics, 11(3): 205-218. Available at: https://doi.org/10.1002/ijfe.293.

Shiamptanis, C., 2015. Risk assessment under a nonlinear fiscal policy rule. Economic Inquiry, 53(3): 1539-1555. Available at: https://doi.org/10.1111/ecin.12199.

Stockman, A.C. and H. Dellas, 1989. International portfolio nondiversification and exchange rate variability. Journal of International Economics, 26(3-4): 271-289. Available at: https://doi.org/10.1016/0022-1996(89)90004-4.

Sutherland, A., 2005. Incomplete pass-through and the welfare effects of exchange rate variability. Journal of International Economics, 65(2): 375-399. Available at: https://doi.org/10.1016/j.jinteco.2004.01.005.

Tervala, J., 2008. Productive government spending, welfare and exchange rate dynamics. Financial Theory and Practice, 32(2): 97-114.

Uhlig, H., 1995. A toolkit for analyzing nonlinear dynamic stochastic models easily. Center for Economic Research Discussion Paper, No. 97, Tilburg University.

Wang, J., 2010. Home bias, exchange rate disconnect, and optimal exchange rate policy. Journal of International Money and Finance, 29(1): 55-78. Available at: https://doi.org/10.1016/j.jimonfin.2008.12.010.

Xie, D., H.F. Zou and H. Davoodi, 1999. Fiscal decentralization and economic growth in the United States. Journal of Urban Economics, 45(2): 228-239. Available at: https://doi.org/10.1006/juec.1998.2095.