Debt Denominated in Foreign Versus Domestic Currencies

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Abstract

In this paper two types of borrowing schemes are compared: borrowing denominated in term of the domestic currency and borrowing denominated in term of the foreign currencies. I show in the absence of financial friction, the domestic denominated borrowing scheme brings about less volatile consumption path for the domestic agents. The key assumption which derives this result is that risk-averse domestic agents borrow from and lend to risk-neutral foreign lenders.

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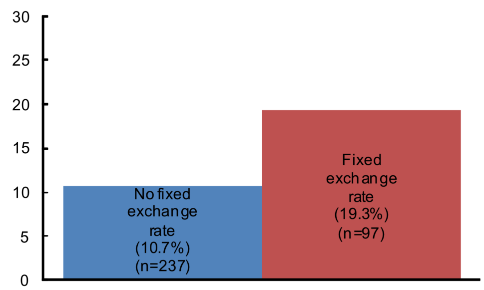
1 Introduction

Lack of confidence in the domestic financial and political stability in addition to the absence of credibility for monetary authority makes foreign currency borrowing a common feature in several emerging market economies (Dollarization). There is a trade-off between borrowing denominated in units of foreign and domestic currency. On the one hand, liabilities in terms of foreign currency reduce the interest that borrowers in emerging markets should pay on their loans [1] and on the other hand they increase exchange rate risk. If domestic agents' borrowings are in foreign currency and their domestic currency experiences a sharp depreciation it would be very difficult for them to honor their liabilities which results in bankruptcies. Foreign currency borrowing and lending are more common in economies with fixed exchange rate policy; figure 1 shows foreign currency bonds issuing is more common in countries with fixed exchange rate regimes. Figure 2 shows the share of dollar debt in total liabilities of publicly traded firms in five Latin American countries.

Rosenberg and Tirpak (2009) show that the Eastern Europe countries with rigid pegs (such as



Notes: The red (blue) bar denotes the average percentage of foreign currency lending to nominal GDP across country-year observations over the period 1970-2010 during which the country did (not) have a fixed exchange rate regime. Data on classification of exchange rate regimes from Reinhart, Carmen and Kenneth Rogoff, 2004, "The Modern History of Exchange Rate Arrangements: A Reinterpretation," Quarterly Journal of Economics 119(1): 1-48, and data on percentage of foreign currency lending to nominal GDP from the IMF's Vulnerability Exercise Database. We define fixed exchange rate regimes as exchange rate regimes with preannounced or de facto pegs (classification codes 2, 3 or 4 in Reinhart and Rogoff). Data on exchange rate regimes are averaged over the period 1970-2007. Number of country-year observations (n) between brackets.

Figure 1: Exchange Rate Regimes and Foreign Currency Lending, Source: Dell'Ariccia, Laeven and Marquez (2011)

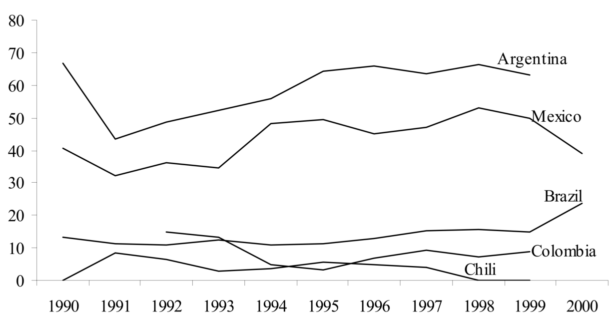


Figure 2: Share of dollar debt in total liabilities for a sample of publicly traded firms. Source: Bleakley and Cowan (2002)

Bulgaria, Estonia, or Latvia) had a much larger share of credit to the private sector denominated in foreign currency than exchange rate floaters (such as the Czech Republic, Poland, and Slovakia). Ranciere, Tornell, and Vamvakadis (2010) also study a representative sample of firms in Eastern Europe and focus on foreign currency borrowing by firms with no foreign currency income. They find

[1] Dell'Ariccia, Laeven, Marquez (2011)

that currency mismatches reduce interest rates and enhance growth of small firms in non-tradable sectors, thereby contributing to growth in tranquil times, while at the same time increasing the probability of crises. Beckmann and Stix (2015) studied whether the demand for foreign currency loans is driven by a lack of knowledge about the exchange rate risk emanating from such loans. They employ individual-level survey data from eight Central and Eastern European countries that provides information on agents' knowledge about exchange rate risk. Their findings show that a majority of respondents is aware that depreciations increase loan installments and the knowledge about the exchange rate risk exerts a strong impact on the choice of the loan currency.

Several models, developed in the aftermath of financial crises of the late 1990's, suggest that the expansion in the "peso" value of "dollar" liabilities resulting from a devaluation could, via a net-worth effect, offset the expansionary competitiveness effect. Bleakley and Cowan (2002) estimate, at the firm level, the effect on investment of holding foreign-currency-denominated debt during an exchange-rate realignment. They find that the competitiveness effect is positive and the this effect dominates the net-worth effect.

Brauning et al. (2018) showed foreign banks' lending to firms in emerging market economies is large and denominated predominantly in U.S. dollars. This creates a direct connection between U.S. monetary policy and emerging market economies credit cycles. They estimate that over a typical U.S. monetary easing cycle, emerging market economies borrowers experience a 32-percentage-point greater increase in the volume of loans issued by foreign banks than do borrowers from developed markets, followed by a fast credit contraction of a similar magnitude upon reversal of the U.S. monetary policy stance. Therefore, borrowing more in terms of foreign currencies makes borrower countries more vulnerable to foreign countries' policies.

Bianchi (2011) presents a formal welfare-based analysis of how optimal borrowing decisions at the individual level can lead to over-borrowing at the social level in a dynamic stochastic general equilibrium model, where financial constraints give rise to amplification effects. His model's key feature is an occasionally binding credit constraint that limits borrowing, denominated in units of tradable goods, to the value of collateral in the form of output from the tradable and nontradable sector, as in Mendoza (2002).

In this project based on the model developed in Bianchi (2011) I compare the effect of bonds' denomination on business cycles. In particular, I consider two models: in the first one bonds are denominated in term of non-tradable goods and in the second one bonds are denominated in term of tradable goods. By assuming small open economy, risk neutral foreign lenders, and the no-arbitrage condition for the lenders I compare these two models' outcome. The comparison is done for the both perfect foresight model with an unexpected shock to the tradable endowments and the stochastic model. In the absence of financial constraint the volatility of the consumption in the case in which bonds are denominated in terms of non-tradable goods; which can be interpreted as domestic currency, is lower because of the different channels that are going to be discussed later.

The thesis is structured as follows: in the section (2) the perfect foresight models are developed. As you will see in this case there is not any precautionary saving channel and the consumption smoothing in the non-tradable denomination takes place due to the feedback effect of the consumption on the contemporaneous consumption through the pricing channel. In the section (3) the stochastic models are developed. In this case we have additional precautionary saving channel in the case of tradable denomination. Finally, in the section (4) you will see the conclusion and future steps for extending this project.

2 Perfect Foresight Model

2.1 Model

Consider a representative-agent, T periods model of a small open economy with a tradable goods sector and a non-tradable goods sector. Only tradable goods can be traded internationally; non-tradable goods have to be consumed in the domestic economy. The economy is populated by a continuum of identical, T periods living households of measure unity with preferences given by:

$$\sum_{t=0}^{T} \beta^t u(c_t) \tag{1}$$

β is the discount factor. The period utility function is $u(c_t) = log(c_t)$. The consumption basket c_t, $t \in \{0, 1, .., T\}$ is in the following form:

$$log(c_t) = \omega log(c_t^T) + (1 - \omega) log(c_t^N)$$

where c_t^T and c_t^N are the consumption of the tradable and non-tradable goods respectively and ω is the weight on tradables. In each period t, households receive an endowment of tradable goods; y_t^T, and an endowment of non-tradable goods; y_t^N. In this section both of the endowment process are deterministic. I assume the non-tradable endowment process is constant over time.

2.1.1 Bonds Denominated in units of Non-Tradables

In this subsection I assume the borrowings are in terms of non-tradable goods. The menu of foreign assets available is restricted to a one period, non–state contingent bond denominated in units of non-tradables that pays a interest rate r_{t+1}^N, determined from no-arbitrage condition which is going to be explained in the next part. Normalizing the price of tradables to 1 and denoting the price of non-tradable goods by p_t^N the budget constraint is:

$$p_t^N b_{t+1} + c_t^T + p_t^N c_t^N = y_t^T + p_t^N y_t^N + p_t^N (1 + r_t^N) b_t \tag{2}$$

where b_{t+1} denotes bond holdings that households choose at the beginning of time t. There is an initial and a terminal condition for the bond holdings.

2.1.2 Bonds Denominated in units of Tradables

In this subsection I assume the borrowings are in terms of tradable goods. All the settings are same as the previous subsection and the only difference is that the the menu of foreign assets available is restricted to a one period, non–state contingent bond denominated in units of tradables that pays a fixed interest rate r, determined exogenously in the world market. Therefore, in this case the budget constraint of the agent is given by:

$$b_{t+1} + c_t^T + p_t^N c_t^N = y_t^T + p_t^N y_t^N + (1 + r) b_t \tag{3}$$

We have risk-neutral foreign lenders. No arbitrage condition implies indifference between lending denominated in units of non-tradables and lending denominated in units of tradables for the foreign lenders:

$$1 + r = \left[\frac{(1 + r_{t+1}^N) p_{t+1}^N}{p_t^N} \right] \tag{4}$$

or

$$1 + r_{t+1}^N = \frac{(1+r)p_t^N}{p_{t+1}^N}$$

2.2 Equilibrium

2.2.1 Bonds Denominated in units of Non-Tradables

The competitive equilibrium is derived by maximizing:

$$\max_{c_t^T, c_t^N, b_{t+1}} \sum_{t=0}^{T} \beta^t u(c_t)$$

subject to the budget constraint (2) and boundary conditions. Please note in the competitive equilibrium agents take prices as given. The first order conditions yield (Price Eq.):

$$p_t^N = \frac{\frac{\partial u(c_t)}{\partial c_t^N}}{\frac{\partial u(c_t)}{\partial c_t^T}} = \left(\frac{1-\omega}{\omega}\right)\left(\frac{c_t^T}{c_t^N}\right)$$

and (Euler Eq.):

$$\frac{\partial u(c_t)}{\partial c_t^T} = \beta\left[(1 + r_{t+1}^N)\left(\frac{p_{t+1}^N}{p_t^N}\right)\left(\frac{\partial u(c_{t+1})}{\partial c_{t+1}^T}\right)\right]$$

Taking into account the consumption aggregator, the log utility function and by replacing the prices and the no-arbitrage condition in the Euler equation we will have:

$$c_{t+1}^T = \beta(1+r)c_t^T$$

Market clearing conditions in the tradable and non-tradable sectors imply:

$$c_t^T = y_t^T + p_t^N[(1 + r_t^N)b_t - b_{t+1}] \tag{5}$$
$$c_t^N = y_t^N = 1$$

By replacing the price equation and the Euler equation in the no arbitrage condition we will have:

$$1 + r_{t+1}^N = \frac{(1+r)p_t^N}{p_{t+1}^N} = \frac{(1+r)c_t^T}{c_{t+1}^T} = \frac{1}{\beta}$$

Therefore, the market clearing condition in the tradable sector can be rewritten in the following form:

$$c_t^T = \frac{y_t^T}{1 - \left(\frac{1-\omega}{\omega}\right)\left[\frac{b_t}{\beta} - b_{t+1}\right]}$$

2.2.2 Bonds Denominated in units of Tradables

Again we have the same objective function to maximize but now subject to the budget constraints (3) and boundary conditions. In this case the price equation will be same as before. The Euler equation is given by:

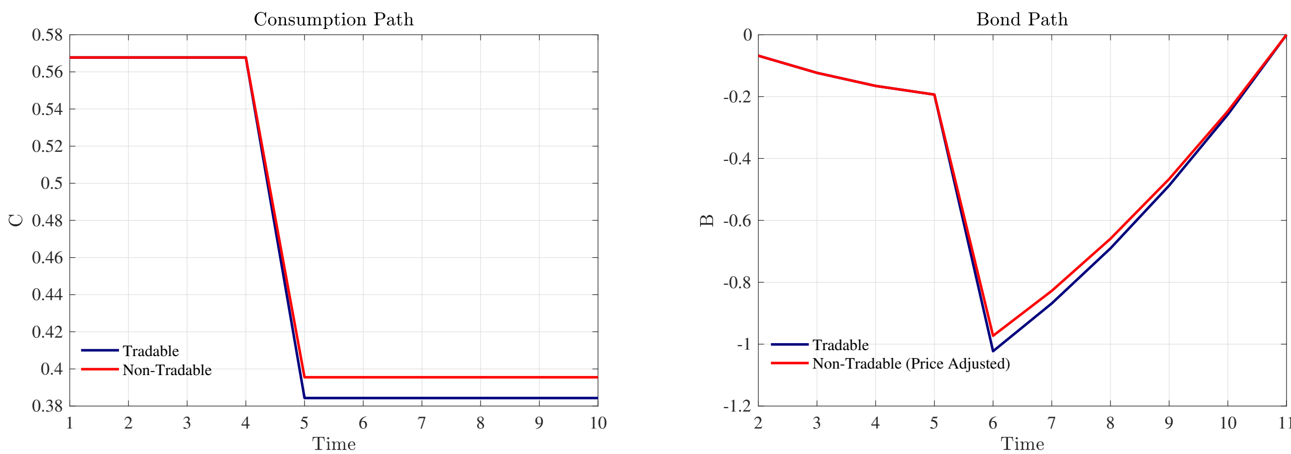
$$\frac{\partial u(c_t)}{\partial c_t^T} = \beta(1+r)\left[\frac{\partial u(c_{t+1})}{\partial c_{t+1}^T}\right]$$

Which gives the same Euler equation as in the non-tradable denomination. The market clearing conditions in tradable and non-tradable sectors are given by:

$$c_t^T = y_t^T + (1+r)b_t - b_{t+1} \tag{6}$$
$$c_t^N = y_t^N = 1$$

2.3 Comparing Schemes

As you noticed in the previous subsections both tradable and non-tradable denominations have the identical Euler equations in the perfect foresight models (You will see this is not the case in the stochastic environment). In the deterministic environment the differences are in the market clearing conditions and the interest rates. In the non-tradable denomination case there is a feedback effect from the consumption to the contemporaneous consumption through the pricing channel.
In order to compare outcomes in the perfect foresight models I assume the endowment process y_t^T and y_t^N (which is constant) are known at time 0. In particular, $y_t^N = 1$ and $y_{t+1}^T = (1+g)y_t^T$ where $y_0^T = 0.5$ and $g = 0.03$. I assume there is an initial and a terminal conditions on the bond holdings; $b_1 = 0$ and $b_{T+1} = 0$. I also assume $\beta(1+r) = 1$ in order to have a constant consumption path. The simulation time is 10. At the time 5 an unexpected negative temporary shock will be applied to y_5^T. The consumption path and the bond holding path in the tradable and non-tradable are illustrated in the figure 3.



(a) Consumption (b) Bond

Figure 3: Perfect Foresight Model with Unexpected Negative Temporary Shock

As you notice, the consumption path and the bond holding path before the unexpected negative temporary shock are identical. However, at the time of the shock the response in the tradable case is more severe and agents in the non-tradable environment enjoy the higher consumption path afterward. The intuition is based on the fact that when the shock applies in the non-tradable case part of the impact of the shock is mitigated by means of the pricing channel and the effect of the consumption on the contemporaneous price.

3 Stochastic Model

3.1 Model

Consider a representative-agent DSGE model of a small open economy with a tradable goods sector and a non-tradable goods sector. Only tradable goods can be traded internationally; non-tradable goods have to be consumed in the domestic economy. The economy is populated by a continuum of identical, infinitely-lived households of measure unity with preferences given by:

$$\mathbb{E}_0\left\{\sum_{t=0}^{\infty}\beta^t u(c_t)\right\} \tag{7}$$

β is the discount factor. The period utility function $u(.)$ has the *log* form. The consumption basket c_t is given by:

$$log(c_t) = \omega log(c_t^T) + (1-\omega)log(c_t^N)$$

where c_t^T and c_t^N are the consumption of the tradable and non-tradable goods respectively and ω is the weight on tradables. In each period t, households receive an endowment of tradable goods y_t^T and an endowment of non-tradable goods y_t^N. I assume that the y_t^T follows an AR(1) process and y_t^N is constant over time. The tradable endowment shocks are the only source of uncertainty in the model.

3.1.1 Bonds Denominated in units of Non-Tradables

In this subsection I assume the borrowings are in term of domestic non-tradable goods. The menu of foreign assets available is restricted to a one period, non–state contingent bond denominated in units of non-tradables that pays a interest rate r_{t+1}^N, determined from the no-arbitrage condition which is going to be explained in the next part. Normalizing the price of tradables to 1 and denoting the price of non-tradable goods by p_t^N the budget constraint is:

$$p_t^N b_{t+1} + c_t^T + p_t^N c_t^N = p_t^N b_t(1+r_t^N) + y_t^T + p_t^N y_t^N \tag{8}$$

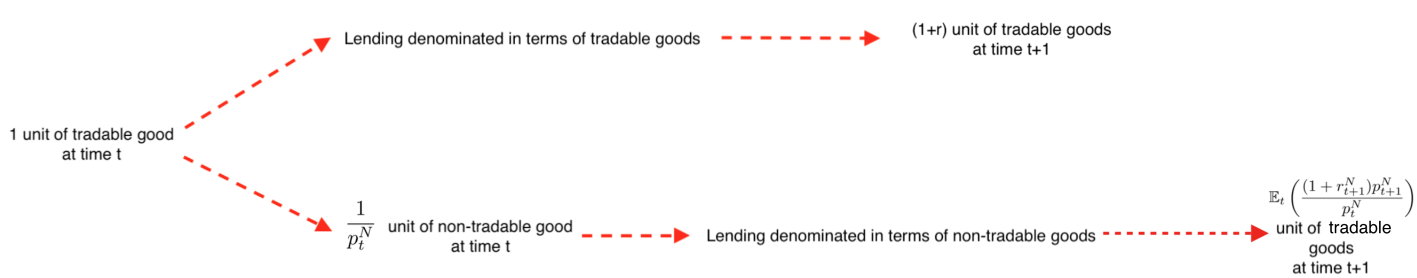
where b_{t+1} denotes bond holdings that households choose at the beginning of time t. I maintain the convention that positive values of b_t denote assets.

3.1.2 Bonds Denominated in units of Tradables

In this subsection I assume borrowings are in terms of tradable goods. All the settings are same as the previous subsection and the only difference is that the the menu of foreign assets available is restricted to a one period, non–state contingent bond denominated in units of tradables that pays a fixed interest rate r, determined exogenously in the world market. Therefore, in this case the budget constraint of the agents is given by:

$$b_{t+1} + c_t^T + p_t^N c_t^N = b_t(1+r) + y_t^T + p_t^N y_t^N \tag{9}$$

We have risk-neutral foreign lenders. No arbitrage condition implies indifference between lending denominated in units of non-tradables and lending denominated in units of tradables for the foreign lenders:



$$1+r=\mathbb{E}_t\left[\frac{(1+r^N_{t+1})p^N_{t+1}}{p^N_t}\right] \tag{10}$$

or

$$1+r^N_{t+1}=\frac{(1+r)p^N_t}{\mathbb{E}_t(p^N_{t+1})}$$

3.2 Equilibrium

3.2.1 Bonds Denominated in units of Non-Tradables

The household's problem is to choose processes $\{c^T_t, c^N_t, b_{t+1}\}_{t\geq 0}$ to maximize the expected present discounted value of utility (7) subject to (8) taking b_0, $\{p^N_t\}_{t\geq 0}$ and $\{r^N_t\}_{t\geq 0}$ as *given*. By replacing the budget constraint for c^T_t in the consumption basket c_t the household's first-order conditions requires:

- First order condition with respect to c^T_t (Price Eq.):

$$p^N_t=\frac{\frac{\partial u(c_t)}{\partial c^N_t}}{\frac{\partial u(c_t)}{\partial c^T_t}}=\left(\frac{1-\omega}{\omega}\right)\left(\frac{c^T_t}{c^N_t}\right)$$

- First order condition with respect to b_{t+1} (Euler Eq.):

$$\frac{\partial u(c_t)}{\partial c^T_t}=\beta\,\mathbb{E}_t\left[(1+r^N_{t+1})\left(\frac{p^N_{t+1}}{p^N_t}\right)\left(\frac{\partial u(c_{t+1})}{\partial c^T_{t+1}}\right)\right]$$

For the assumed utility function and the consumption aggregator and by replacing the price equation and the no-arbitrate condition in the Euler equation we can rewrite the Euler equation in the following form:

$$\mathbb{E}_t(c^T_{t+1})=\beta(1+r)c^T_t \tag{11}$$

Market clearing conditions are given by:

$$c^N_t=y^N_t=1 \tag{12}$$

$$c^T_t=y^T_t+p^N_t[(1+r^N_t)b_t-b_{t+1}]=y^T_t+p^N_t\left[\frac{(1+r)p^N_{t-1}}{\mathbb{E}_{t-1}(p^N_t)}b_t-b_{t+1}\right]$$

And by replacing the price equation and using the Euler equation we will have:

$$c^T_t=\frac{y^T_t}{1-\left(\frac{1-\omega}{\omega}\right)\left[\frac{b_t}{\beta}-b_{t+1}\right]}$$

3.2.2 Bonds Denominated in units of Tradables

Maximizing the expected present discounted value of utility (7) subject to (9) and taking b_0 and $\{p^N_t\}_{t\geq 0}$ as given requires:

- First order condition with respect to c^T_t (Price Eq.):

$$p^N_t=\left(\frac{1-\omega}{\omega}\right)\left(\frac{c^T_t}{c^N_t}\right)$$

- First order condition with respect to b_{t+1} (Euler Eq.):

$$\frac{\partial u(c_t)}{\partial c_t^T} = \beta(1+r)\,\mathbb{E}_t\left[\frac{\partial u(c_{t+1})}{\partial c_{t+1}^T}\right]$$

Using the assumed utility function and the aggregator we will have:

$$\frac{1}{c_t^T} = \beta(1+r)\,\mathbb{E}_t\left(\frac{1}{c_{t+1}^T}\right) \tag{13}$$

Market clearing conditions require:

$$c_t^N = y_t^N = 1 \tag{14}$$
$$c_t^T = y_t^T + b_t(1+r) - b_{t+1}$$

3.3 Comparing Schemes

Let us first start with deriving the interest rate in the non-tradable scheme. By replacing the price equation, the Euler equation (11) and the market clearing equation (12) in the no arbitrage condition (10) you can easily see:

$$1 + r_t^N = \frac{1}{\beta} \tag{15}$$

Which tells that if the interest rate in the financial market for the tradable denominated bonds is $1+r$ then the nominal interest rate on the non-tradable denominated bonds must be equal to $\frac{1}{\beta}$ in order to make the risk-neutral foreign lenders indifferent between two borrowing schemes and at the same time risk-averse domestic agents maximize their life time utility.
Let us now compare Euler equations (11) and (13).
Non-Tradable Denomination Euler:

$$\frac{1}{c_t^T} = \frac{\beta(1+r)}{\mathbb{E}_t(c_{t+1}^T)}$$

Tradable Denomination Euler:

$$\frac{1}{c_t^T} = \mathbb{E}_t\left(\frac{\beta(1+r)}{c_{t+1}^T}\right)$$

By using the Jensen's inequality for the convex functions one can easily show that the right hand side of the Euler equation for the non-tradable scheme is smaller than the tradable case. Therefore, if the market clearing conditions had been similar in the both cases we would have expected the consumption path in the non-tradable case to be higher than the tradable case. The intuition is exactly same as the precautionary saving literature and as long as we have an increasing and convex marginal utility the result holds. The reason for this result is based on the trading with risk-neutral foreigners. In the domestic denominated borrowing scheme domestic agents share part of the depreciation and appreciation risks with foreigners by issuing bonds denominated in the domestic currency. In the perfect foresight models we did not have this result.
Now let us compare the market clearing conditions (12) and (14).
Non-Tradable Denomination Market Clearing for Tradable Sectors:

$$c_t^T = \frac{y_t^T}{1 - \left(\frac{1-\omega}{\omega}\right)\left[\frac{b_t}{\beta} - b_{t+1}\right]}$$

Tradable Denomination Market Clearing for Tradable Sectors:

$$c_t^T = y_t^T + b_t(1+r) - b_{t+1}$$

In the non-tradable scheme the interest rate paid on the bonds denominated in units of non-tradable goods is $\frac{1}{\beta}$. Moreover, there is a feedback effect of the consumption on the contemporaneous consumption through the pricing channel.

3.4 Simulation

In this subsection the simulation for the both models are provided for the comparison illustration. In the table 1 you can find the calibrated values for parameters for the simulation. Most of them are adapted from Bianchi (2011).

	Parameter	**Value**
β	Discount Factor	0.96
r	Risk-less Interest Rate	0.04
ω	Weight on Tradables	0.31
σ_{y^T}	Standard Deviation of Tradables	0.063
ρ_{y^T}	AR(1) Coefficient for the Tradables Process	0.87

Table 1: Parameter Values that are Used in the Simulation

Before running the simulation I first solved both models by using the policy function iteration method. I used 600 grid points totally. In the figure 4 you can see the policy function for the bond holdings in the both tradable and non-tradable schemes for the highest output realization on the grid. Bond in the non-tradable denomination case is converted to the tradable equivalent. As you can see the policy function in the non-tradable scheme lies below the tradable scheme.
Then I simulated model. In the figure 5 you see the simulation result for the both tradable and non-tradable scenarios. As you observe the consumption is smoother and less volatile in the non-tradable scheme as it was expected from the comparison in the previous subsection. Tables 2 and 3 summarize the standard deviation of the variables and the correlation of them with GDP for the tradable and non-tradable denomination schemes respectively. As you can see the standard deviation of consumption is lower in the non-tradable denomination case.

Variables	**Std.**	**Corr. with GDP**
y^T	0.126	0.780
c^T	0.144	0.965
GDP	0.128	1
TB/GDP	0.037	-0.300

Table 2: Simulation Result - Tradable Denomination

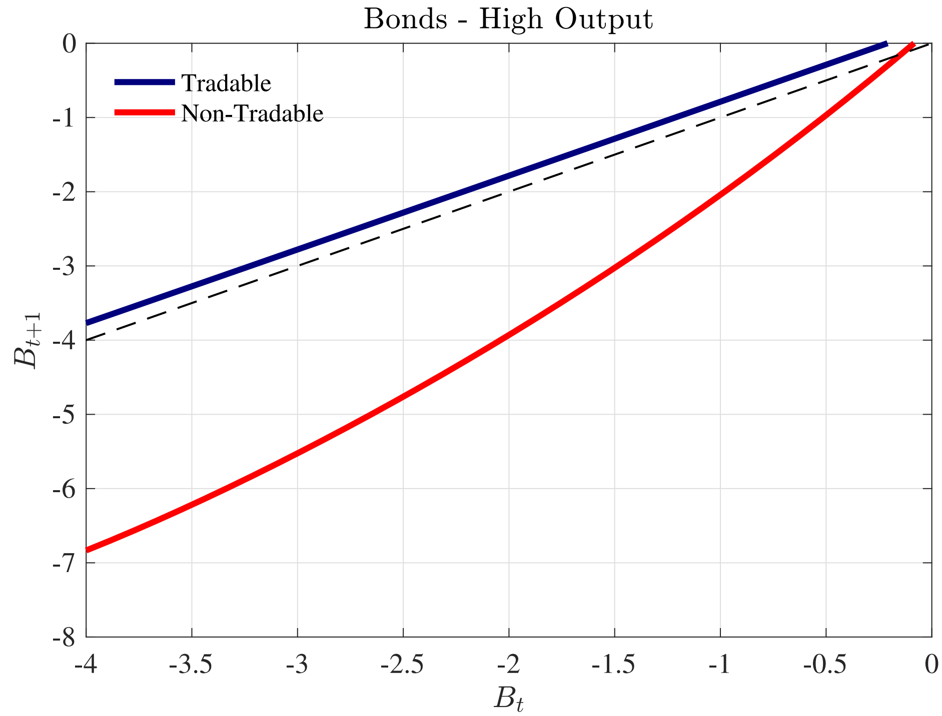


Figure 4: Policy Function for the Bonds

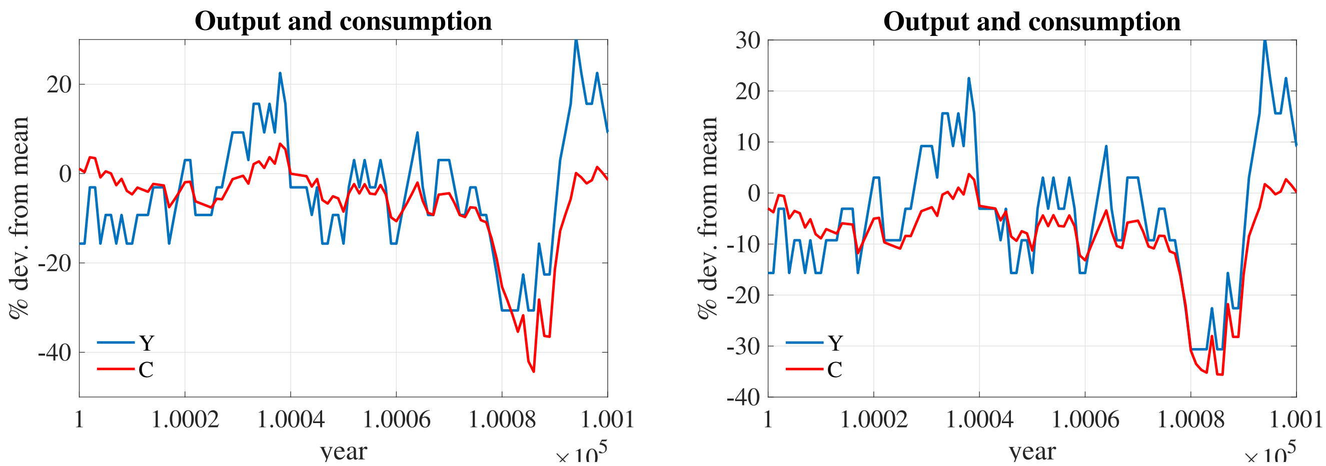
Variables	**Std.**	**Corr. with GDP**
y^T	0.126	0.854
c^T	0.121	0.941
GDP	0.112	1
TB/GDP	0.036	-0.057

Table 3: Simulation Result - Non Tradable Denomination

3.5 Impulse Responses

In this subsection the impulse response functions (IRFs) for the both models to a temporary negative endowment shocks are illustrated.
In order to derive the impulse responses, I simulated both models for a long time with the endowment process equal to the mean of the endowment process. Then at time 0 a temporary negative shock equal to the standard deviation of the tradable endowments is applied. You can see the mentioned shock in the figure 6a. The schemes with tradable denominated bonds and non-tradable denominated bonds respond differently to this temporary shock. The impulse responses are illustrated in the figure 6 where the deviations of the variables from the steady state before and after the shock are depicted.

By comparing the results in the figure 6 we observe the non-tradable denomination scheme is more stable and less volatile after the shock; again in line with what we expected. The consumption's impulse response to the temporary endowment shock in the tradable denomination case is more severe and more persistent. As you can see the impact of the shock in the tradable denominated case lasts about 100 years longer than non-tradable case. The impulse responses of the bonds show that the effect of the shock in the tradable denominated scheme is around two times larger than the non-



(a) Tradable Denomination

(b) Non-Tradable Denomination

Figure 5: Output and Consumption Path from the Simulation

tradable denominated scheme and also more persistent. Trade balance impulse responses illustrate the same feature. All together impulse response analysis reassure the stability of the non-tradable denominated model in comparison to the tradable one.

4 Conclusion

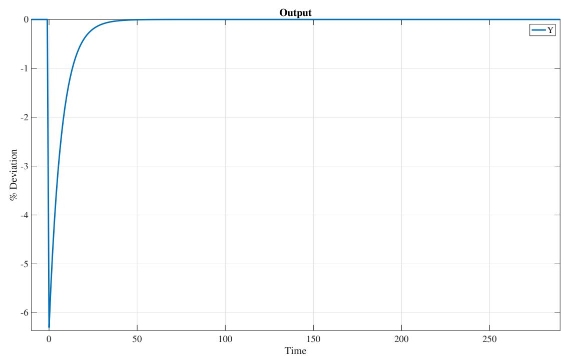
In this project I compared two borrowing schemes in the international financial markets: borrowing in term of foreign and domestic currencies. Throughout, I assumed domestic agents borrow from risk neutral foreign lenders and this assumption derives the main result for the comparison. One can argue assuming risk-neutral foreign lenders might not be a realistic assumption. The mentioned comparison was performed by means of a perfect foresight model with an unanticipated temporary shock and a standard DSGE model.

We saw the no-arbitrage condition for the risk neutral foreign lenders in addition to the domestic agents optimization bring about the fact that if the risk free interest rate in the foreign financial market for the foreign currency denominated bonds is $1 + r$ then the interest rate for the domestic denominated bonds must be equal to $\frac{1}{\beta}$.

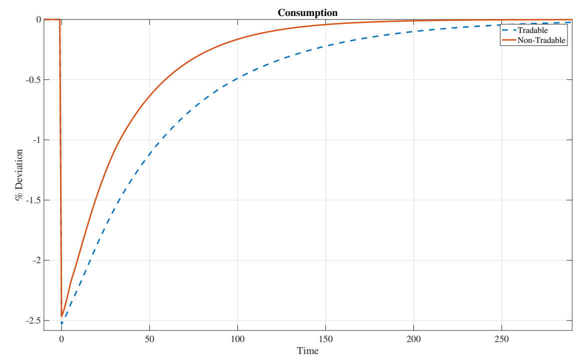
In the perfect foresight solution with an unanticipated negative temporary shock we saw the consumption path for the agents with domestic currency denominated bonds is on average above the the consumption path of the agents with foreign currency denominated bonds. The reason is that a part of the effect of the negative shock is transmitted to foreign lenders in domestic currency denominated scheme through the exchange rate channel which causes a feedback effect of the consumption to the contemporaneous consumption.

In the stochastic models in addition to the mentioned interest rate effect and feedback effect we also have the precautionary saving effect in the foreign currency denominated borrowing scheme in comparison to the domestic one. The combination of these effects bring about less volatile consumption path in the domestic currency denominated scenario. In particular, in the simulation of the models we observed the standard deviation of consumption path is lower in the domestic denomination scheme. Moreover, we saw that the impulse responses in the domestic denominated case is less severe and less persistent.

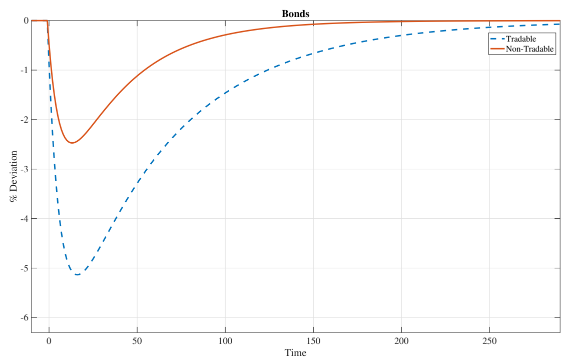
All together, from this study I conclude for the emerging market economies borrowing denominated



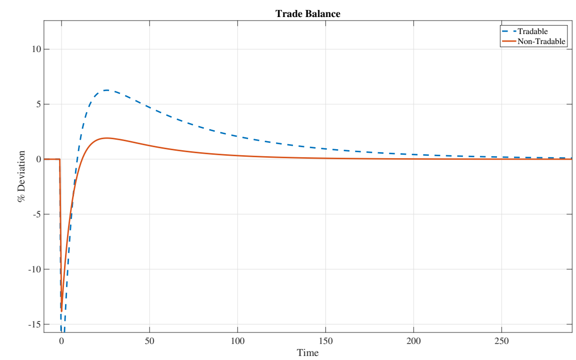
(a) Output



(b) Consumption



(c) Bond



(d) Trade Balance

Figure 6: Impulse Responses

in domestic currency causes less volatility in the consumption path. However, in reality we know that foreign lenders are aware of the exchange rate risk and because of that they usually prefer to lend in foreign currency denomination. That is why in the previous decades borrower countries in Latin America have traditionally faced significant difficulties in issuing debt denominated in local currency in international markets. Recently issuing debt denominated in the domestic currency has become more common.[2]

For the future steps, I would like to extend this model. In particular the introduction of financial constraints such as a collateral constraint to the model and its interaction with the stabilizer channels that were discussed will bring about a more realistic and interesting outcome.[3]

[2] Tovar (2005).

[3] Caballero and Krishnamurthy (2001) built a model in which two types of collateral constraints; foreign and domestic constraints, interacted in a 3 periods model. The proposed extension is different from their approach in the sense that in the proposed extension we will have only international collateral constraint; same as the one in Bianchi (2011), which interacts with the no-arbitrage condition and precautionary saving channel in an infinite horizon DSGE model.

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