



Expansive monetary policy in a portfolio model with endogenous asset supply[☆]



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ABSTRACT

This paper develops an open economy portfolio balance model with endogenous asset supply. Domestic producers choose an optimal capital structure and finance capital goods through credit, bonds and equity assets. Private households hold a portfolio of domestic and foreign assets, shift balances depending on risk–return considerations, and maximise real consumption in accordance with the law of one price.

Within this general equilibrium model, it will be shown that central bank interventions may promote an inefficient international allocation of real capital. The application of expansive monetary interventions throughout the course of economic crises maintains the domestic stock of real capital at the cost of inflation, currency devaluation, distortions of interest rates and asset prices, and risk clusters on the central bank's balance sheet.

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1. Introduction

Portfolio balance models have a long history in economic research and are widely used to explain the characteristics of exchange rates. The first significant models were developed, for example, by Grubel (1968), Dornbusch (1975), Girton and Henderson (1976), Branson (1977), Lucas (1982), Tobin (1983), Allen and Kenen (1983), and Branson and Henderson (1985). Within these models, private households choose an optimal portfolio based on risk–return considerations. This portfolio contains domestic and foreign assets, which are seen as imperfect substitutes. Other influential portfolio models, such as Tobin (1969) and Backus et al. (1980), only take domestic assets into account.

In the context of monetary policy, portfolio balance models are able to explain, through risk differences, why interest rate differentials may persist vis-à-vis the base country in the case of pegged floats and fixed exchange rate regimes (Frankel et al., 2004; Obstfeld et al., 2005; Shambaugh, 2004). However, Obstfeld (2004) remarks that further research is required as to date there is “no integrative general-equilibrium monetary model of international portfolio choice, although we need one”. Recent research has analysed the impact of different types of macroeconomic shocks on asset prices, the exchange rate and capital flows (Devereux and

Sutherland, 2007; Gourinchas and Rey, 2007; Hau and Rey, 2006; Pavlova and Rigobon, 2007; Tille, 2008; Tille and van Wincoop, 2010), and placed emphasis on trying to explain the home bias in asset holdings (Coeurdacier and Guibaud, 2011, and the references cited therein).

This paper considers the origin of financial assets and the implications this has for monetary policy transmission. To date, the amount of bonds and equity assets has rarely been treated as endogenous in the portfolio balance literature. Exceptions are Tobin (1983) and Devereux and Saito (2006), whose assumptions about asset supply still lack microeconomic foundation. Neither the determinants of producers' capital structure nor the special characteristics of equity assets are considered. The model developed here fills this gap. Looking at the economic literature, it is argued that producers maximise firm value and choose an optimal capital structure in accordance with the *static trade-off theory* (Jensen and Meckling, 1976; Modigliani and Miller, 1963), preferring the type of debt financing which requires the lowest capital costs (Bernanke and Blinder, 1988). Furthermore, equity assets contain call options on producers' real capital goods (Merton, 1974), and private households optimise their consumption of domestic and foreign goods through the *law of one price*. These relationships are integrated into a portfolio balance model of an open economy by strictly considering the balance sheet restrictions economic actors are facing in stock and flow figures, a requirement stressed by Brainard and Tobin (1968). Sims (1980) also sees this as necessary in order to avert a “bad system of restriction”. This approach reveals that portfolio adjustments have an impact on the international allocation of real capital and consequently affect real domestic production. Since the central bank is able to influence the portfolio composition of private households through monetary

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interventions, the central bank has an indirect impact on the real economy. This impact needs to be considered if monetary policy interventions are to be comprehensively analysed. Therefore, it is advisable to endogenise the domestic asset supply, as is done in this paper.

The paper is structured as follows; the general model framework is discussed in Section 2, followed by a definition of the model assumptions. Thereupon, the model is solved and the different transmission channels of exogenous shocks are presented in Section 3. In Section 4, the trade-offs involved with expansive monetary policy interventions are analysed. Reasons as to why simplifications do not reduce the general validity of the model are reconsidered in Section 5, and the results are summarised in Section 6.

2. Model structure

2.1. General framework

The architecture of the model is comparable to that of a Roman temple (see Fig. 1). It consists of one roof, that being the stock-flow consistent macroeconomic balance framework, which is sustained by three pillars. Each pillar represents an optimisation behaviour that is again based on a distinct microeconomic foundation.

Each actor in the open economy considered, those being the central bank, producers, and private households, faces a balance sheet restriction, which shows its stock figures in the form of assets and liabilities, and an income balance restriction, which incorporates its specific inflows and outflows. The central bank represents the banking sector supplying credit, as well as trading domestic bonds and foreign assets in return for domestic money. The producers generate real domestic production through the use of real capital. Real capital is the only factor of production and is financed by credit, bonds, and equity assets. Real domestic production consists of one single and homogenous good, which is also produced abroad. This good may either be used as real capital in the production process or be consumed by private households. Private households consume domestic and foreign goods and hold their wealth in the form of an asset portfolio. It is composed of the following gross substitutes; domestic money, domestic bonds, domestic equity, and foreign assets. The prices of domestic goods and financial assets are flexible. Domestic bonds and foreign assets are fixed interest bearing, whereas domestic equity assets pay out varying dividends. For the sake of simplicity, domestic actors are not able to influence the interest rate and the price level of the foreign country, while foreign actors neither hold domestic assets nor consume domestic goods.

Each of the three optimisation behaviours implies that domestic actors maximise their utility with regard to one of three distinct economic areas, i. e., wealth management, consumption composition, and corporate financing. In accordance with Markowitz's (1952) portfolio selection, private households optimise their wealth structure in line with their risk–return objectives. Private households have direct access to the financial market and are therefore able to adjust their portfolio composition immediately. Furthermore, private households optimise their consumption composition and maximise real consumption of domestic

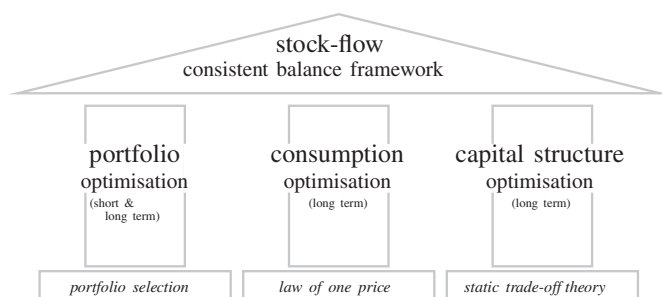


Fig. 1. Model structure.

and foreign goods following the law of one price. Producers optimise their capital structure and maximise firm value in accordance with the static trade-off theory (Jensen and Meckling, 1976; Modigliani and Miller, 1963). However, consumption optimisation and capital structure optimisation are connected to changes in the amounts of domestic and foreign assets and in the amounts of domestic and foreign real capital. These adjustments are time consuming and therefore not possible in the short term. Consequently, purchasing power parity and an optimal capital structure only persist in the long term.

Through these assumptions, four general equilibrium conditions for the money, domestic bond, domestic dividend, and foreign asset markets are obtained. These can be simultaneously solved for the reactions of the endogenous variables in the short term and the long term, respectively. An overview of all exogenous (roof-headed) and constant (line-headed) variables can be found in Table A.4, and of all endogenous variables in Table A.5, of the appendix. In the following sections, the assumptions are specified in detail.

2.2. Actors and balance restrictions

2.2.1. Central bank

The central bank is the actor capable of conducting monetary policy operations. Its main policy target may be either price stability or the stability of other variables like the real domestic production, domestic interest rates, or the exchange rate. It is assumed that the central bank completely controls three variables which it uses independently to fulfil its mandate. First, it may change the volume of credit it supplies to producers (\hat{K}).¹ Second, it is able to buy or sell domestic bonds (\widehat{n}_{CB}^B), and third, it can trade foreign bonds it holds as currency reserves (\widehat{n}_{CB}^F) in return for domestic money (M).

In total, the central bank holds assets in domestic currency to the value of the credit amount (\hat{K}), the central bank's domestic bonds (B_{CB}), and foreign assets (sF_{CB}). Given that p^B denotes the price of one domestic bond, s the exchange rate in direct quotation, and p^F the price of one foreign asset in foreign currency, it holds that:

$$B_{CB} = \widehat{n}_{CB}^B \cdot p^B \tag{1}$$

$$sF_{CB} = \widehat{n}_{CB}^F \cdot s \cdot p^F \tag{2}$$

In terms of liabilities, the central bank holds money (M) and net assets ($NetA$). Consequently, the balance sheet restriction of the central bank is:

$$\hat{K} + B_{CB} + sF_{CB} = M + NetA. \tag{3}$$

While the amount of money changes with the amount of credit, the amount of domestic bonds, or the amount of foreign assets, the net assets change if profits or losses occur due to a change in the valuation of domestic bonds or foreign assets:

$$dM = d\hat{K} + d\widehat{n}_{CB}^B \cdot p^B + d\widehat{n}_{CB}^F \cdot s \cdot p^F \tag{4}$$

$$dNetA = dp^B \cdot \widehat{n}_{CB}^B + dp^F \cdot s \cdot \widehat{n}_{CB}^F + ds \cdot p^F \cdot \widehat{n}_{CB}^F. \tag{5}$$

¹ Naturally, commercial banks supply credit to the producers within an economy. However, the central bank has a key impact on the amount of lending because it supplies credit to the commercial banks and influences in particular short term interest rates (Belke et al., 2013). Since the commercial banks are not considered in the model for the sake of simplicity, it is reasonable to assume that the central bank determines the credit supply. Thereby, it is implied that the central bank represents the economy's aggregated banking sector within the model. For further discussion of this, see Section 5.

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