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Exchange rate determination and equity prices: Evidence from the UK

Ioannis Litsios

Division of Economics, University of Bradford, Pemberton Building, BD71DP, UK

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ABSTRACT

This paper develops a model of optimal choice over an array of different assets, including domestic and foreign bonds, domestic and foreign equities, and domestic and foreign real money balances, with a view to examine whether stock markets have an effect on the exchange rate in the long-run. The model is tested using data from the UK and the USA. Evidence suggests that the UK stock market has a significant effect on the value of the pound's sterling nominal effective exchange rate in the long-run over the period 1982 to 2011.

1. Introduction

Following the increasing flows of capital between international financial markets, in recent years, there has been considerable effort to investigate the effect that stock markets have on the exchange rates. This relationship has gained substantial interest following the deregulation of the financial markets and the abolition of capital controls especially during the 1980s. Over the following decades there have been many occasions when national stock market movements appear to have led the respective exchange rates. Evidence on such an effect was, for example, particularly apparent during the East Asian Financial crisis where causality was reported mainly from stock prices to the exchange rates (Granger, Huang, & Yang, 2000).

The aim of this paper is to investigate the statistical association between exchange rates and stock market prices (allowing for other relevant factors) with a view to examining whether stock markets have an effect on the exchange rate in the UK over the long-run.[1] The main vehicle adopted in the literature in order to examine this relationship has been the monetary approach to the exchange rate (M.A.ER). The conventional M.A.ER model has recently been augmented in order to incorporate explicitly stock price effects on the grounds that stock prices can have a direct effect on the demand for money balances. Such models, based on the inclusion of asset market effects in the money demand equation, have recently been applied to the UK economy as an attempt to further explore the stock price effect on the exchange rate.

As distinct from the augmented M.A.ER model, this paper contributes towards the portfolio balance approach by constructing a two country model with optimizing agents where wealth is assumed to be allocated optimally in an asset choice set that includes explicitly investment in an array of assets including domestic and foreign bonds, domestic and foreign equities and domestic and foreign real money balances. To date such intertemporal optimization models, incorporating the above array of assets, have been neglected in studies of the long-run relationship between stock market prices and nominal exchange rates. The model specification introduced here allows the construction of explicit equations for both domestic and foreign real money balances, which can further be utilized in order to generate a relationship that reflects the stock price effect (among other variables) on the nominal exchange rate in the long-run. For the sake of brevity the model is applied to the UK as characteristic of a small open economy, although clearly it could be applied more widely. Moreover, comparisons

E-mail address: ilitsios@bradford.ac.uk.

[1] The statistical analysis abstracts from short term fluctuations around the relevant trends.

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will be made with the predictions of the augmented M.A.ER model, an approach for which the microfoundations are at best implicit.

The rest of this paper is organized as follows: Section 2 briefly analyzes the conventional M.A.ER model with reference to relevant literature on the long-run relationship between stock prices and exchange rates. Section 3 presents the constructed intertemporal optimization model, as a contribution of understanding the stock market effect on the nominal exchange rate in the long-run. Section 4 analyzes an empirical methodology for examining the predicted relationship. Section 5 discusses the data employed and presents the long-run results of the constructed economic model. A comparison of the predictions of the model with those coming from the augmented M.A.ER is also attempted. Finally, Section 6 concludes.

2. The monetary approach of the nominal exchange rate and related literature

The formation of the flexible price monetary model for the determination of the exchange rates, as presented in the literature, stems from a variant of the log-linear Cagan (1956) model applied into conditions of moderate inflation. Real output is assumed to be exogenous and the demand for domestic real money balances is characterized by the following equations[2]:

$$m_t - p_t = -\eta i_{t+1} + \varphi y_t \tag{1}$$

$$m_t^* - p_t^* = -\eta i_{t+1}^* + \varphi y_t^* \tag{2}$$

where m_t is the log of nominal money supply at date t, p_t is the log of the price level, defined as the price of a specified basket of consumption goods in terms of money, $i_{t+1} \equiv \log(1 + i_{t+1})$ with i_{t+1} as the date t interest rate on bonds denominated in home currency, y_t the log of real output at date t and η, φ are parameters.

Assuming purchasing power parity (PPP), i.e. $p_t = e_t + p_t^*$, and uncovered interest rate parity, i.e. $i_{t+1} = i_{t+1}^* + E_t e_{t+1} - e_t$, both hold, where e_t is the log of the nominal exchange rate defined as the amount of domestic currency per unit of foreign currency, and $E_t(\cdot)$ the mathematical conditional expectation, Eqs. (1) and (2) imply that[3]:

$$e_t = \left(m_t - m_t^*\right) + \eta(E_t e_{t+1} - e_t) - \varphi\left(y_t - y_t^*\right) \tag{3}$$

Solving Eq. (3) forward, the dynamic exchange rate equation is given by[4]

$$e_t = \frac{1}{1+\eta} \sum_{s=t}^{\infty} \left(\frac{\eta}{1+\eta}\right)^{s-t} E_t z_s \tag{4}$$

where $z_t = (m_t - m_t^*) - \varphi(y_t - y_t^*)$.

Assuming that z_t follows an autoregressive process of order one, i.e. $z_t = \rho z_{t-1} + \epsilon_t$, where $0 \leqslant \rho \leqslant 1$, and ϵ_t is white noise, Eq. (4) implies that:

$$\begin{aligned} e_t &= \frac{1}{1+\eta} \sum_{s=t}^{\infty} \left(\frac{\eta\rho}{1+\eta}\right)^{s-t} z_t = \frac{1}{1+\eta-\eta\rho} z_t \\ &= \frac{1}{1+\eta-\eta\rho}\left[\left(m_t - m_t^*\right) - \varphi\left(y_t - y_t^*\right)\right] \end{aligned} \tag{5}$$

Eq. (5) reflects the conventional model of the Monetary Approach to the Exchange Rate determination (M.A.ER).[5] Over recent years there has been a considerable effort to test empirically the predictions of various versions of the conventional M.A.ER model. Some recent works include Cushman (2000) who studied the Canadian/US dollar exchange rate reporting no evidence in favor of the monetary exchange rate model. Tawadros (2001) examined the Australian dollar/US dollar exchange rate and found a single long-run relationship among the exchange rate, money supplies, industrial output and interest rates. Crespo-Cuaresma, Fifrmuc, and MacDonald (2005) followed panel co-integration procedures in order to estimate the M.A.ER model for Central and Eastern European countries and reported long-run exchange rate relationships under the presence of the Balassa–Samuelson effect.[6]

The conventional M.A.ER model has also been augmented in order to examine empirically the effect of equities on the nominal exchange rate after introducing stock price effects. Under this specification the demand for money is assumed to depend on the level of interest rates, real income, and equity prices. Among others, Friedman (1988) and Boyle (1990)

[2] The superscript $(*)$ denotes a foreign economic variable.

[3] The model assumes identical coefficients η and φ across countries.

[4] Given the non-bubble solution that $\lim_{T\to\infty}(\frac{\eta}{1+\eta})^T E_t e_{t+T} = 0$.

[5] Under appropriate rearrangements in Eq. (3) the conventional M.A.ER model can also be expressed in terms of the nominal domestic exchange rate, and the nominal money supply, the nominal interest rate and the real output differentials between the domestic and the foreign economy, i.e. $e_t = (m_t - m_t^*) + \eta(i_{t+1} - i_{t+1}^*) - \varphi(y_t - y_t^*)$.

[6] For an extended literature review behind the empirical validity of the conventional M.A.ER model see Wilson (2009).