What does the Feldstein-Horioka coefficient with panel data really measure? A theoretical approach with the case of a monetary area

Samuel Maveyraud-Tricoire
GRAPE - University of Montesquieu-Bordeaux IV

Abstract

We base theoretically the fact that the "saving retention coefficient" with panel data measures the integration within a considered group of countries but also the integration between this group and the rest of the world, by using different levels of transaction costs according to whether the considered country belongs or not to a monetary union.

1 Introduction

The approach proposed by Feldstein and Horioka (hereafter FH) in 1980, which is based on the correlation between domestic saving and domestic investment, is frequently used for measuring economic integration. For that, these studies consider that "with perfect world capital mobility, there should be no relation between domestic saving and domestic investment: saving in each country responds to the worldwide opportunities for investment while investment in that country is financed by the worldwide pool of capital" (FH, 1980, p. 317).

Nevertheless, the interpretation of the saving-investment correlation seems to vary according to the econometrical method. With time series, the "saving retention ratio"[1] indicates in what extent the domestic investment of a country doesn't depend on its domestic saving. Following FH, it can be interpreted as the measure of the integration between the country and the rest of the world. With panel data (pooled data over time), and, by extension, with cross section data, the meaning of the FH coefficient appears to be more complex than the one proposed by time series. Indeed, economic integration within a group of countries but also integration between this group and the rest of the world appear to be measured at the same time. For example, the saving retention coefficient is about equal to one for 16 OECD countries during the period 1960-1974 (FH, 1980) and means, in a certain extent, that there is segmentation within the group of 16 countries and/or between this group and the rest of the world.

Thus, the FH coefficient with panel data must be interpreted with caution for measuring the integration within a group of countries. However, as the degree of integration within a monetary area constitutes one of the criteria necessary for judging its optimality (Kenen, 1969), numerous studies try to measure the integration within the Euro area by using the saving-investment correlations without explicitly considering the double interpretation of the FH coefficient with panel data (cf., inter alia, Kleinewefer Lehner (1998), Blanchard and Giavazzi (2002)). They obtain a saving retention ratio significatively different from 0 (even if this coefficient is smaller than those usually find for other groups of countries) which, contrary to their intrepretations, could mainly reflect the imperfect integration between the Euro area and the

---

[1]the "saving retention ratio" is the estimated coefficient β resulting from the following regression: $\frac{I}{Y} = \alpha + \beta \frac{S}{Y} + \epsilon$, where $\frac{I}{Y}$ is the rate of domestic investment and $\frac{S}{Y}$ the rate of domestic saving.

rest of the world as, inside this area, financial costs, which are associated with currency premia, have disappeared with the arrival of Euro and as PPP (or LOOP) seem to prevail inside the Euro area due to decrease of transaction costs in trade (Engel and Rogers (2004)).

In order to base theoretically the problem of using the FH coefficient with panel data for measuring the integration within an area, we consider a world where there are transaction costs in trade of goods which are supposed to vary between countries according to the membership of a monetary union. This modelisation constitutes an extension to those of Obstfeld and Rogoff (2000) (hereafter OR) and of Blanchard and Giavazzi (2002) (hereafter BG). It differs from the OR model in two ways: firstly, by the fact that we examine the dispersion of saving and investment rates whereas OR observe the consequences of transaction costs on the consumption level and secondly, because in our framework, there are n goods and n countries while in the OR framework, there are two goods (with very specific properties)[2] and two countries. Contrary to the study of BG, our model takes into account two groups of countries whereas BG consider only one group (Euro area). This choice allows to introduce different levels of transaction costs according to the considered group. Moreover, the transaction costs considered in our model can be more easily empirically evaluated than those proposed by BG. In accordance with studies, we consider that these costs are less important in the Euro area than in the rest of the world.

Our presentation is as follows: First, we present the general framework of the model, then we introduce transaction costs in international trade. Next, we proceed to the simulation of the model. Finally, in a last section, we conclude.

2   The general framework

We consider a group of n small countries which are endowed of a own single good at the first period. Among them, m countries form a monetary union $(m < n)$. These countries are called the "Inside the Monetary Union" countries (hereafter IMU countries) whereas the others are called the "Outside the Monetary Union" countries (hereafter OMU countries).

---

[2]One good can be exported and imported, the other can only be imported by the domestic country.

The representative agent of country j $(j \in [1, n])$ consumes the following composite good:

$$C_j = \left(\sum_{k=1}^{n} c_k^{\frac{\theta-1}{\theta}} \right)^{\frac{\theta}{\theta-1}} \tag{1}$$

where C_j is the level of consumption of the composite good by the representative agent of the country j, c_k represents the level of consumption of the good k and θ is the elasticity of substitution supposed to be constant among goods $(\theta > 0)$.

The consumption-based price index P_j is as follows:

$$P_j = \left(\sum_{k=1}^{n} \left(p_k^j \right)^{1-\theta} \right)^{\frac{1}{1-\theta}} \tag{2}$$

where p_k^j is the price of the good k expressed in the currency of country j.

We consider two periods and a log utility function:

$$\log(C_t) + \log(C_{t+1}) \tag{3}$$

The representative household maximises its consumption level of composite good at period t and at period $t + 1$ and determines the optimal level of investment with respect to the lifetime budget constraint:

$$P_{j,t}C_{j,t} + p_{j,t}^j I_{j,t} + \frac{1}{1+i} \left(P_{j,t+1}C_{j,t+1} + p_{j,t+1}^j I_{j,t+1} \right) = p_{j,t}^j Y_{j,t} + \frac{1}{1+i} p_{j,t+1}^j Y_{j,t+1} \tag{4}$$

where i is the nominal interest rate the representative household has to face, p_j^j is the price of the good j expressed in the currency of country j and P_j is the consumption-based price index. The output function is equal to:

$$Y_{j,t} = A K_{j,t}^{\alpha} \tag{5}$$

where $K_{j,t}$ is the quantity of capital in the country j. A is positive parameter and α is the elasticity of output to capital $(\alpha < 1)$.

The level of investment is equal to:

$$I_{j,t} = K_{j,t+1} - K_{j,t} \tag{6}$$

We consider that $K_{j,t}$ is exogenous and that all the capital is used at the end of the second period $(K_{j,t+2} = 0)$.

As aggregate consumption is equal to aggregate production (Y^*), we have:

$$1 + r = \frac{Y_{t+1}^*}{Y_t^*} \qquad (7)$$

Thus, the optimal rate of investment is equal to:

$$inv_{j,t} = (1 + \pi_j) \frac{1}{AK_{j,t}^\alpha} \left(\frac{\alpha A}{(1 + k^*)^\alpha (1 + \Pi) - 1} \right)^{\frac{1}{1-\alpha}} - \frac{K_{j,t}^{1-\alpha}}{A} \qquad (8)$$

and the saving rate to:

$$s_t = \frac{1}{2} \left(1 - \left(\frac{1 + k_j}{1 + k^*} \right)^\alpha \frac{1 + \pi_j}{1 + \Pi} \right) \qquad (9)$$

where π_j is the inflation rate of domestic good and Π is the inflation rate of composite good.

We now introduce transaction costs in the trade of goods by differentiating the IMU case from the other cases.

3   The incidence of transaction costs in the goods market

We suppose that there are transaction costs in the trade of domestic goods. Transaction costs reflect the border effect and are in this way an aggregate of the tariff and nontariff barriers, the transport costs, the preferences for the national good and various other risks (OR, 2000); we suppose "iceberg" transaction costs: When the local good is traded, a part τ ($0 \leq \tau \leq 1$) of it, which constitutes the transaction costs, disappears before its incorporation in the composite good.

Moreover, for simplification reasons, we suppose that the exchange rate between countries is constant over time and is equal to one.

Two different cases must be considered:

- Case 1: Trade inside the monetary union

  When a country, which belongs to the monetary area, trades with another country of the monetary union $((j, k) \in [1, m]^2$, with $j \neq k)$, we suppose that there are no transaction costs in the trade of goods. So,

as these countries share the same currency, the price in the domestic country of an imported good coming from the monetary union is equal to:

$$p_{k,t}^{j} = p_{k,t}^{k} \tag{10}$$

- Case 2: Other cases

  When a country, which belongs to the monetary area, trades with a country situated outside the area ($j \in [1, m]$ and $k \in [m + 1, n]$, with $j \neq k$) or when two countries, which don't belong to the union, trade together ($(j, k) \in [m + 1, n]^2$, with $j \neq k$), the price in local currency of an imported good is equal to:

$$p_{k,t}^{j} = \frac{1}{1 - \tau_t} p_{k,t}^{k} \tag{11}$$

We suppose, with the aim of simplification, that the price of a good k is equal to 1 in its currency[3].

The consumption-based price index appears to be different according to the kind of country. For an IMU country ($j = IMU \in [1, m]$) we have:

$$P_{IMU,t} = \left(m + (n - m) \left(\frac{1}{1 - \tau_t} \right)^{1-\theta} \right)^{\frac{1}{1-\theta}} \tag{12}$$

and for an OMU country ($j = OMU \in [m + 1, n]$):

$$P_{OMU,t} = \left(1 + (n - 1) \left(\frac{1}{1 - \tau_t} \right)^{1-\theta} \right)^{\frac{1}{1-\theta}} \tag{13}$$

By modifying the consumption-based price index of an IMU country, the transactions costs in trade of goods have an impact on its investment and saving rates.

We now propose a simulation with the aim of illustrating this result.

4   Simulation

To show how saving and investment rates of an IMU country are modified by the transaction costs associated to the trade with OMU countries, we

---

[3]In particular, it implies that $\pi_j = 0$.

estimate in different cases the level of saving and investment rates when the transaction costs diminish along the two periods (Figure 2).

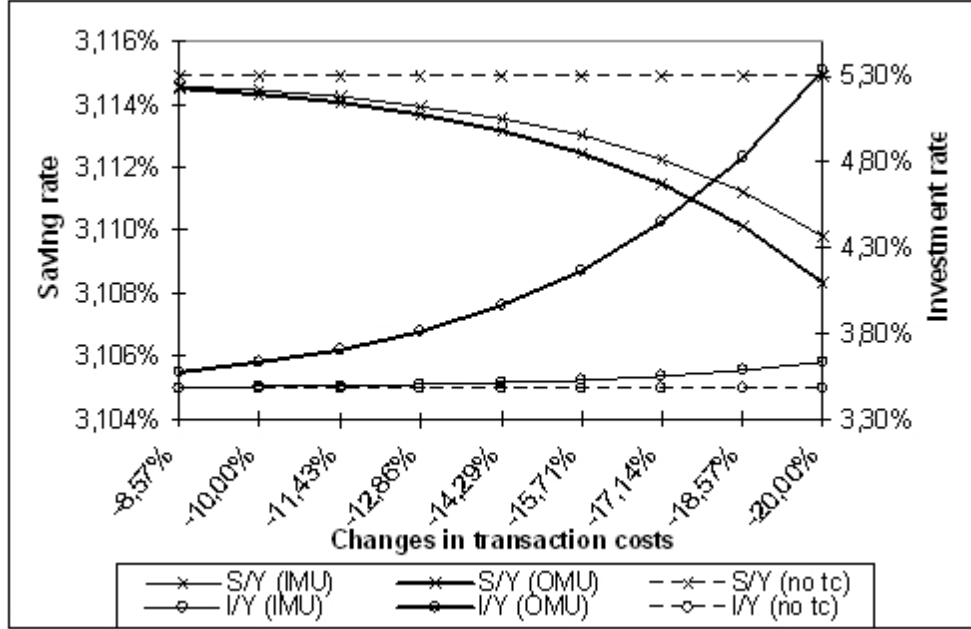Figure 1: Investment and saving rates in function of changes in transaction costs

Figure 2:

We consider three cases: the case of an IMU country, of an OMU country and the case where there are no transaction costs in the trade of goods (case called "no tc"). In this last case, we logically observe that the decrease of transaction costs has no impact on the saving and investment rates. For the IMU and OMU cases, a decrease of transaction costs implies a rise of investment rate and a decrease of saving rate at period t [4]: more precisely, a decrease in transaction costs implies weaker changes in saving rates than in investment rates and the variation of these rates is more important for an OMU country than for an IMU country. Thus, there is "retention" of saving in the IMU zone even with no transaction costs within the area, which can

---

[4]with $m = 10$, $n = 50$, $k^* = 0, 1$, $K_t = 1,0459$, $A = 0, 1$, $\alpha = 0, 7$, $\theta = 15$, $\tau_t = 0, 7$.

be explained by the transaction costs associated to the trade with OMU countries.

5   Conclusion

Our model shows that for a country belonging to a zone where there are no transaction costs, we can observe saving retention due to the trade with countries situated outside this area. Thus, with panel data, the saving-investment correlation appears to be an indicator of the integration within an area and between this area and the rest of the world.

According to these results, the saving retention coefficient obtained with panel data should be interpreted with cautiousness. In particular, the degree of integration within a monetary area cannot only be measured by the FH coefficient.

References

[1] Blanchard, O.J. and F. Giavazzi (2002) "Current Account Deficits in the Euro Area: The End of the Feldstein-Horioka Puzzle?" *Brookings Papers on Economic Activity*, 2/2002, 147-209.

[2] Engel, C. and J.H. Rogers (2004) "European Product Market Integration after the Euro" *Economic Policy* **19**, 347-384.

[3] Feldstein, M. and C. Horioka (1980) "Domestic Savings and International Capital Flows" *Economic Journal* **90**, 314-329.

[4] Kenen, P.B. (1969) *The Optimum Currency Area: An Eclectic View, Monetary Problems of the International Economy*. University of Chicago Press.

[5] Kleinewefers Lehner, A. (1998) "Mobility of Capital in the EU" Swiss National Bank Quarterly Bulletin 1, 48-54.

[6] Obstfeld, M. and K. Rogoff, (2000) "The Six Major Puzzles in International Macroeconomics: Is there a Common Cause?" *National Bureau of Economic Research Annual 2000*, 339-390.