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A Portfolio Balance Model of the Risk Premium And the Implications of Autonomous Dollar Reserve Accumulation

1. Theory

Define the risk premium as the additional return necessary to induce the holding of a particular asset. This means one drops explicitly the uncovered interest rate parity condition. Hence:

$$rp_t \equiv i_t^{US} - i_t^{Eu} - \Delta s_{t+1}^e \qquad (1)$$

where depreciation expected between time t and t+1, based on time t information, is expressed as:

$$\Delta s_{t+1}^e \equiv \varepsilon_t(s_{t+1}) - s_t \qquad (2)$$

Notice that if UIP holds, then the risk premium, *rp*, is zero. What determines the risk premium? Arbitrarily define *x* as the share of wealth allocated to $ assets.

$$x = \alpha + \beta rp \qquad (3)$$

Rearranging and assuming asset supply equals asset demand,

$$rp = -\beta^{-1}\alpha + \beta^{-1}x \qquad (4)$$

One then obtains the following diagram:

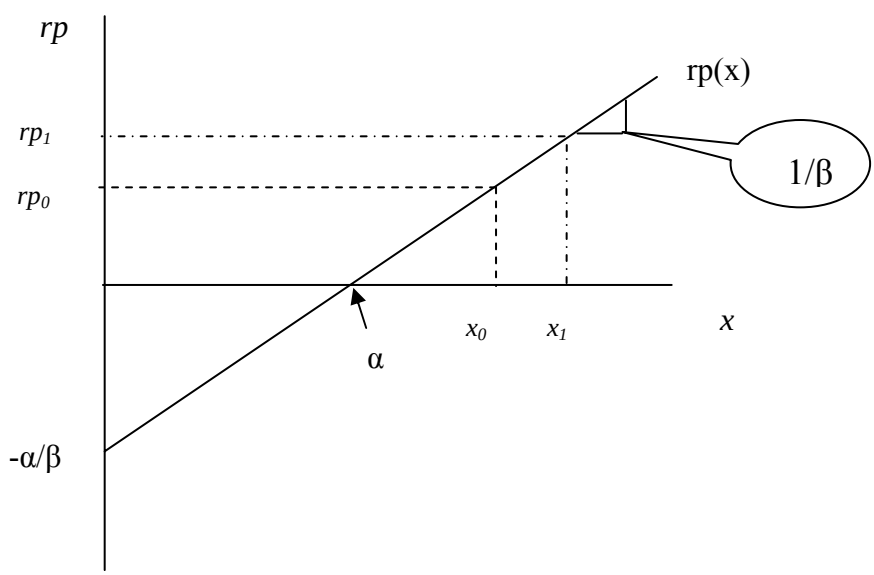

Figure 1: The exchange risk premium and asset shares

If $x=\alpha$, then the risk premium is zero. However, if $x=x_0 > \alpha$ then in some sense, the interest rates on US assets must be higher in order to compensate individuals for the fact that they are holding greater amounts of US assets than they would like (consistent with no risk premium). What does α equal? In a mean-variance framework (familiar to those of you who know the capital asset pricing model, or CAPM, for stock returns), α is a function of variability of the risk premium, and the extent to which relative returns (i.e., the risk premium) on US assets are correlated with the dollar returns.

What about the slope? When the slope is flat, then $\beta^{-1} = 0$, and $\beta = \infty$, and assets are perfectly substitutable. Graphically, this means that with perfect substitutability, there is a zero slope and intercept to this curve, and hence always a zero risk premium.

Notice if the share of US government debt rises to x_1, then the risk premium must rise. The extent of the rise depends upon the increase in US government debt share *and* the slope of the curve; the steeper the curve (i.e., the less substitutable the government debt stocks or the more risk averse investors are), the larger the increase in the risk premium.

2. Modifications to the standard model

What about central banks? The preceding discussion treats the demand for dollar versus euro assets as fully determined by private agents. Yet we know that a substantial amount of the demand for dollar versus other assets is coming from the official sector (central banks) and other entities that are state-related (but not included in the "official sector" in the statistics). Without further knowledge about the preferences of these state and quasi-state actors, one cannot really know how to modify the model. However, one *could* interpret the (proportionate) increase in purchases of dollar assets by central banks as an autonomous shift in α (call this new value α_2). This can be depicted in a new version of Figure 1, shown as Figure 2 below.

In this interpretation, the "optimal" (or zero risk premium share of dollar holdings) shifts outward. The shift depicted is one where the degree of risk aversion does not change, i.e., the rp schedule shifts in a parallel fashion. Holding the extant share of dollar assets constant, the risk premium on dollar assets falls (so much in this example that it becomes a negative risk premium).

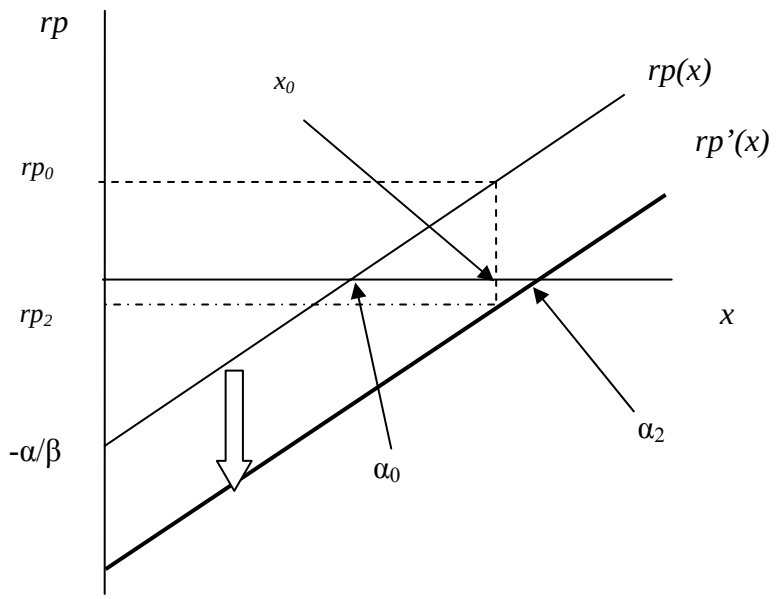

Figure 2: Exogenous shift in the zero-risk premium dollar share.

3. Evidence on central bank holdings of foreign exchange reserves

What is the empirical evidence regarding central bank reserves. Keeping in mind that the IMF statistics cover only a portion of total holdings held by state authorities (investment funds for instance are omitted). Some data is depicted in Figure 3.

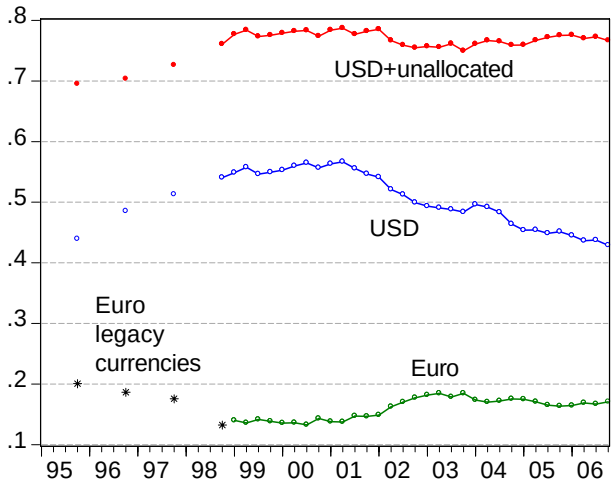

Figure 3: Share of total reserves accounted for by US dollar, US dollar plus un-allocated currencies, euro, and major currencies associated with euro. Source: IMF, COFER. http://www.imf.org/external/np/sta/cofer/eng/index.htm

The blue line shows the US dollar share of total recorded reserves. However, there is a large un-allocated component of reserves (i.e., where the reserve currency is not described). Most observers conjecture that most of the un-allocated reserves are actually in dollars. Assuming this is true, the red line shows the relevant US dollar share. In this case, there does not seem to be much movement in the dollar share – least not the value.

However, it is of some interest that the maintenance of the US dollar share has occurred even as the value of the dollar – on a trade weighted basis – has declined. This is shown in Figure 4.

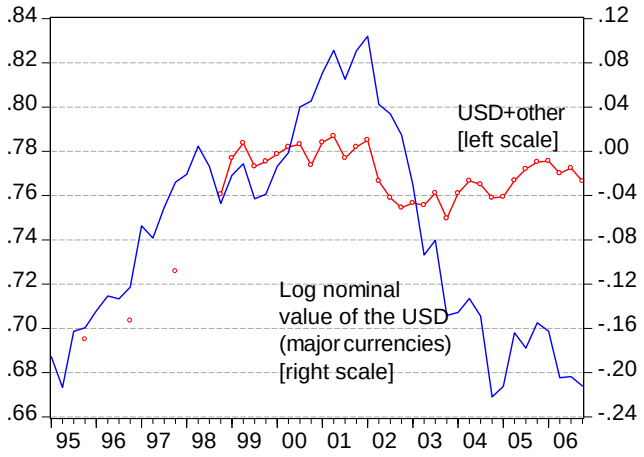

Figure 4: Share of total reserves accounted for by US dollar plus un-allocated currencies (red) and log nominal value of the US dollar against major currencies (blue). Sources: IMF, COFER at http://www.imf.org/external/np/sta/cofer/eng/index.htm , and Federal Reserve Board at http://research.stlouisfed.org/fred2/ .

In other words, there has been a tremendous increase in the *quantity* of dollars held in reserves, given that the dollar's value has declined since 2002.

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