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Comment

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This important contribution to open-economy macroeconomics delivers significant insights in three areas: the empirical response of exchange rates to measures of uncertainty; the incorporation of an endogenous foreign exchange risk premium into a fully-specified New Keynesian dynamic model; and the implementation of a tractable method for solving models with shocks to volatility.

It is not uncommon in the literature to incorporate a time-varying deviation from uncovered interest parity (UIP) into sticky-price open-economy macro models.[1] These deviations help the models to account for real exchange rate volatility. However, to the best of my knowledge, this is the first paper that endogenizes the UIP deviation in a New Keynesian dynamic stochastic general equilibrium (DSGE) model. Assuming Epstein-Zin preferences and time-varying volatility of shocks, the UIP deviation arises as a foreign exchange risk premium in equilibrium. This contrasts to previous literature that takes the UIP deviation as an exogenous shock.

An original insight of the paper is that different types of "uncertainty" shocks—shocks to the variances of exogenous driving processes—can have different impacts on the behavior of exchange rates and interest rates. Because the paper does not treat the UIP deviation as a pure shock, but instead as an endogenous variable, the authors are led to investigate empirically the effects of different types of uncertainty shocks.

The paper applies the methods developed by the same authors for solving models with time-varying volatilities.[2] The neat insight is that when structural shocks are conditionally linear, a second-order approximation to the model is sufficient to incorporate the effects of volatility shocks on the levels of the endogenous variables.

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The paper emphasizes four empirical regularities that the model is designed to explain:

1. Volatility shocks influence the level of dollar exchange rates. An increase in the volatility of the inflation-target shock or the monetary policy shock appreciates the dollar, but an increase in the volatility of productivity shocks depreciates the dollar.
2. Shocks to the volatility of inflation or monetary policy lead to persistent deviations from UIP.
3. The well-known delayed overshooting result: A contractionary monetary policy shock leads to an appreciation on impact, but then a continued appreciation that implies a deviation from UIP.
4. The famous UIP puzzle: The change in the exchange rate is negatively related to the interest differential.

The paper shows how a New Keynesian DSGE model with an endogenous risk premium can account for these four regularities.

I have a couple of general comments of a critical nature, and then a specific comment on the model's ability to explain exchange-rate behavior.

First, the paper does not measure time-varying volatility by simultaneously extracting fundamental shocks implied by the model while incorporating a model of stochastic volatility for those shocks. Instead, it infers the variance of those shocks from financial market data.

Shocks to monetary policy are imputed using innovations in daily Fed funds futures rates. The volatility of those shocks is measured as a monthly average of the squared daily innovations. The volatility of inflation-target shocks is imputed from options on the term structure. The volatility index (VIX) is used as a measure of the volatility of productivity shocks.

What does the model imply about the behavior of these variables? I don't believe the model would say that these variables necessarily capture the volatility of the shocks they are supposed to measure. The paper promises in a footnote that future work will draw the link between the inflation-target variance and the measure derived from term-structure options. I am skeptical that VIX is a pure measure of the volatility of productivity shocks. Surely the volatility of nominal stock prices depends on nominal as well as real shocks, and is probably also influenced heavily by things not included in the model, such as default risk and liquidity risk.

In the case of monetary policy shocks, the problem with the measure produced here is that the innovations in the Fed funds futures rates might be measuring innovations in the risk premium instead of shocks to monetary policy. The paper mentions that this problem is minimized by the way the measure of volatility is constructed, but it would be helpful to characterize more fully the nature of this approximation. In the extreme, if the risk premium were highly volatile, it could account for almost all of the movement in the Fed funds futures rate. The risk premium itself must be driven by variances in all of the shocks in the model, so it is not clear what is being assumed about the relative size of the volatility of shocks so that we can approximately interpret innovations in the Fed funds rate as pure policy shocks.

These comments are specific examples of a more general issue—that the paper could do more to link the empirical work (the VAR) to the model. Similarly, further investigation is needed to see how plausibly the model can account for the data. The paper focuses almost entirely on the model's ability to account for the four empirical regularities mentioned earlier. Does the model do a reasonable job accounting for these facts but miss other empirical facts?

If we are really going to buy this as a model of the open economy, we need to know how well the model accounts for many other aspects of the macroeconomy—the volatility, comovement and time-series behavior of, for example, output, inflation, consumption, investment, and many other standard macro variables. Does it meet the same standards as the rest of the quantitative literature on monetary policy models, such as Christiano et. al. (2005)?

One particular concern is whether the model of the paper really can even account for some of the most important empirical regularities of exchange rates. Recently (Engel 2011), I have been trying to understand what it takes to reconcile three well-known empirical exchange-rate regularities: (1) The UIP puzzle (empirical regularity number four in the Benigno, Benigno, and Nisticò paper). This puzzle dates at least as far back as Bilson (1981). (2) An increase in real interest rates tends to appreciate the currency (see, for example, Frankel 1979). (3) Exchange rates are excessively volatile, in the sense that their volatility is greater than would be implied by the variance of interest differentials under UIP (see, for example, Frankel and Meese 1988.)

My paper explores the implications of prominent partial equilibrium models of the foreign exchange risk premium for accounting for these facts (e.g., Verdelhan's 2010 model based on Campbell-Cochrane preferences and Bansal and Shaliastovich's 2010 exploration of the "long-run risks" model that uses Epstein-Zin preferences). These models cannot explain all three regularities. In my paper, I note conditions on a model of the risk premium that must be met to account for all of these facts. A necessary condition is that there may be more than one factor driving the risk premium. On that score, the model in this paper is promising—there are three factors (the variances of monetary-policy shocks, inflation-target shocks, and productivity shocks), and each has different effects on interest rates and exchange rates.

The Benigno et al. paper discusses these empirical regularities, but does not explore directly whether the model can account for them. Explaining these facts is not only a challenge for models but also a challenge to (my) intuition. Here is how my paper puts it. Define the risk premium as $\lambda_t = i_t^* - i_t + E_t s_{t+1} - s_t$. The sum of current and expected future risk premiums is given by $\Lambda_t = E_t \sum_{j=0}^{\infty} \lambda_{t+j}$. The home and foreign real interest rates are r_t and r_t^*, respectively. Engel (2011) shows that the three familiar empirical regularities mentioned before imply $\text{cov}(\lambda_t, r_t - r_t^*) < 0$, but $\text{cov}(\Lambda_t, r_t - r_t^*) > 0$. The first inequality follows from empirical fact A (the UIP puzzle), the second inequality from the next two empirical facts, B and C (currency strengthens when real interest rate rises, but is excessively volatile).

Clearly if $\text{cov}(\Lambda_t, r_t - r_t^*) > 0$, we need $\text{cov}(E_t\lambda_{t+j}, r_t - r_t^*) > 0$ for at least some time horizons j. If we are to account for $\text{cov}(\lambda_t, r_t - r_t^*) < 0$ and $\text{cov}(\Lambda_t, r_t - r_t^*) > 0$ with a model of an endogenous foreign exchange risk premium, we need a plausible story that has two potentially conflicting implications. First, when $r_t - r_t^*$ is high, the home bond is riskier in the short run (λ_t is low), so that $\text{cov}(\lambda_t, r_t - r_t^*) < 0$. At the same time, when $r_t - r_t^*$ is high, the home bond in the future must be considered less risky (Λ_t is low), so that $\text{cov}(\Lambda_t, r_t - r_t^*) > 0$. That is, when $r_t - r_t^*$ rises, the risk premium model requires λ_t to fall but Λ_t to rise.

Maybe this model can generate that behavior. Most convincing would be a model that can not only reproduce these moments mechanically, but also one that has a good story. It is tempting otherwise to look for an alternative mechanism.

The model in Benigno et al. is built on the complete markets assumption with representative agents in each country. There are distortions in goods markets—monopolistic producers and sticky nominal prices—but not in financial markets. It may turn out that a convincing story of interest rate and exchange rate behavior requires a model with financial market distortions as well—liquidity constraints, enforceability problems, or deviations from rational expectations in the form of herding and overreaction.

The types of market inefficiencies matter, and not just for understanding the response of exchange rates to shocks. The monetary DSGE models are constructed to guide monetary policy. The monetary policy implications of a model with financial market distortions may be substantially different than one with only goods-market distortions.

While my opinion is that ultimately we need to incorporate some financial market distortions in open-economy models to make progress both positively and normatively, this does not diminish the contribution of this paper. Surely this paper will play a big role in the field's progress in understanding and modeling exchange rates.

Endnotes

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1. Kollmann (2002) is an early prominent example.
2. Benigno, Benigno, and Nisticò (2010).

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