

Real Exchange Rate Persistence, Imperfect Knowledge, and Structural Slumps

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The purpose is to discuss:

- The role of speculative behavior in currency markets as a potentially important cause to persistent fluctuations in aggregate activity (to long business cycle movements).
- The ability of REH (Rational Expectations Hypothesis) based versus IKE (Imperfect Knowledge Economics) based models to explain the observed nonstationary movements in basic parity conditions.
- How to combine the theory of IKE with the structural slumps theory in Phelps (1994) and its implication for the macro economy.

Background: the Cointegrated VAR Using persistence as a structuring device

- The CVAR model is inherently consistent with a world where unanticipated shocks cumulate over time to generate stochastic trends which move the economic equilibria (the pushing forces) and where the deviations from these equilibria are corrected by means of the dynamics of the adjustment mechanism (the pulling forces).
- A theory consistent CVAR scenario translates all basic assumptions about the model's shock structure, equilibrium relations and steady-state behavior into *testable* hypotheses on common stochastic trends, cointegration, long-run impact and dynamic adjustment.

We find that there is more persistence and breaks in the data than standard (REH based) models can explain.

Two theories address this persistence

- The theory of Imperfect Knowledge Economics (IKE) developed in 2007 by Roman Frydman and Michael Goldberg addresses speculation in the foreign currency market.
- Edmund Phelps "Structural Slumps" 1994 book proposes a unified theory for booms and busts in a global economy.
- Phelps theory is based on REH and does not fully incorporate financial market persistence, whereas the IKE theory does.

To combine Structural Slumps with IKE seems a promising avenue.

Illustration: Real exchange persistence

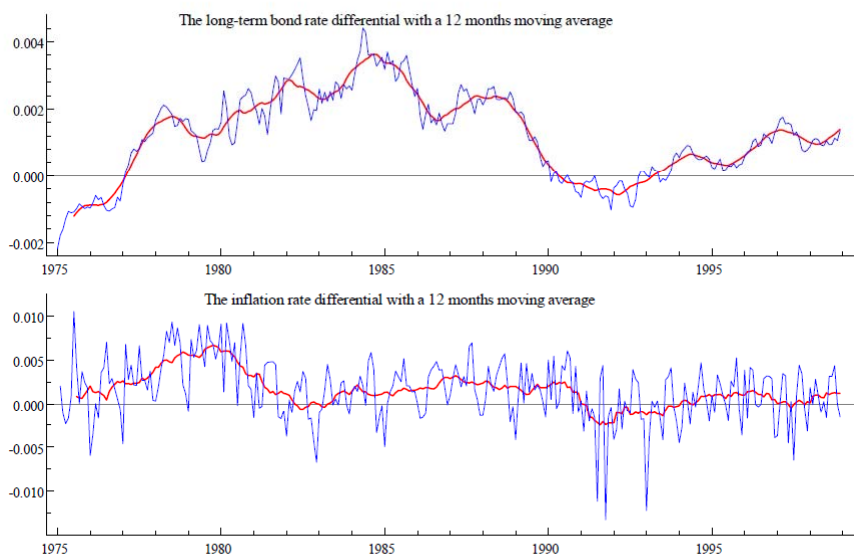
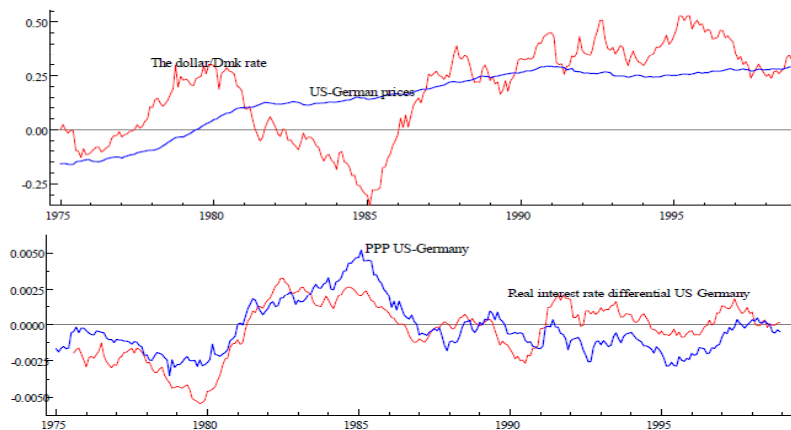
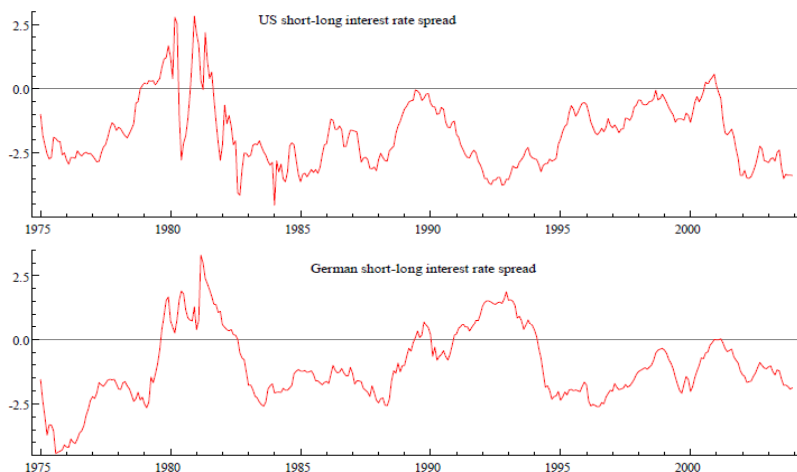
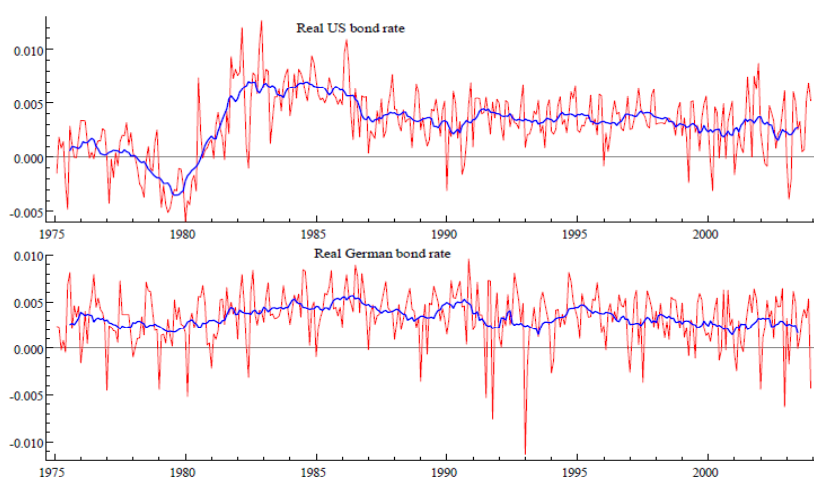


Illustration: short-long interest rate spreads



Illustrations: real interest rates



Rational expectations based models

The REH-based monetary model assumes that PPP holds as an equilibrium condition so that the real exchange rate, q_t , is a stationary process, i.e.

$$q_t = \rho q_{t-1} + \varepsilon_{1,t} \quad (1)$$

where $\rho < 1.0$. The stationarity of the real exchange rate is consistent with UIP as a market clearing mechanism:

$$i_{1,t} - i_{2,t} = \Delta s_{t+1}^e + rp_t \quad (2)$$

where rp_t is a stationary risk premium. Provided (1) and (2) holds, the Fisher parity holds as a stationary condition:

$$i_t = \bar{r} + \Delta p^e \quad (3)$$

where \bar{r} is an average real interest rate. Similarly, under the above conditions the term spread is stationary and the term structure of interest rates is well described by the expectations hypothesis.

Imperfect Knowledge Based Models:

Risk adjusted UIP is replaced by Uncertainty Adjusted UIP:

$$(i_{d,t} - i_{f,t}) = s_{t+1}^e - s_t + up_t$$

where up is an uncertainty premium measuring individuals risk averseness.

It is based on heterogenous, risk averse, and myopic agents.

The IKE equilibrium relation

A cointegration relation between the real exchange rate, the nominal interest rate differential, and the inflation rate differential:

$$(p_{1,t} - p_{2,t} - s_{12,t}) = \omega \{ (i_{1,t} - i_{2,t}) - (\Delta p_{1,t} - \Delta p_{2,t}) \} + e_t$$

Real exchange rate persistence

Under IKE, the real exchange rate is a near I(2) process:

$$\Delta q_t = \zeta_t + \varepsilon_{1,t}$$

and

$$\zeta_t = \bar{\rho} \zeta_{t-1} + \varepsilon_{2,t}$$

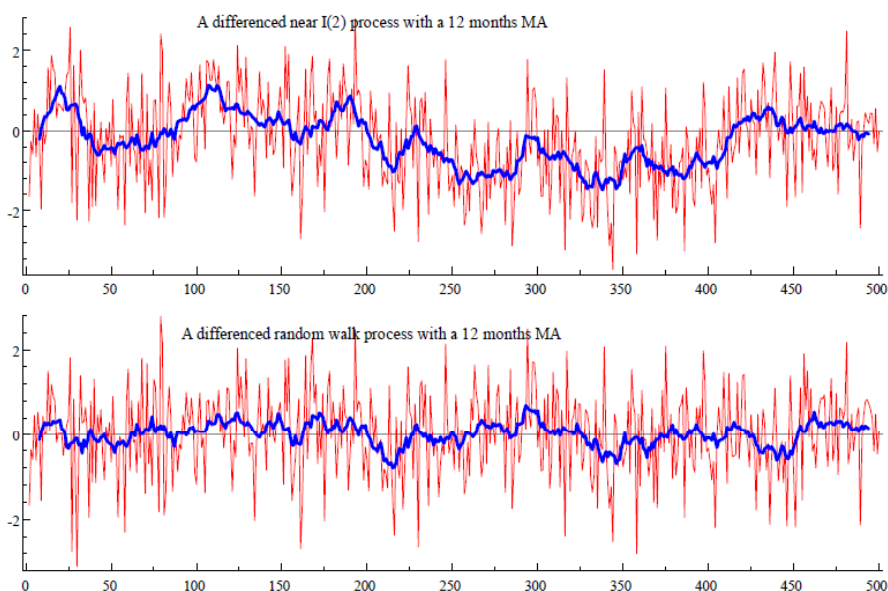
Difference between IKE and REH in simulated data

REH: Real exchange rate at most I(1)

$$x_{1,t} - x_{1,t-1} = \varepsilon_t, \quad \varepsilon_t \sim N(0, 1), \quad t = 1, \dots, 500$$

IKE: real exchange rate near I(2)

$$\begin{aligned} x_{2,t} - x_{2,t-1} &= \zeta_t + \varepsilon_{1,t}, & \varepsilon_{1,t} &\sim N(0, 1) & t = 1, \dots, 500 \\ \zeta_t &= 0.95\zeta_{t-1} + \varepsilon_{2,t}, & \varepsilon_{2,t} &\sim N(0, 0.15^2) \end{aligned}$$



The assumption of uncertainty (imperfect knowledge) has important implications

- A tendency to generate more persistence than otherwise in nominal interest rates and nominal exchange rates, but not in goods prices. The latter are not in general affected by currency speculation.
- The result is real exchange rate persistence
- Empirically this is manifested in error-increasing financial behavior over the medium run while error-correcting behavior over the longer run.

Why is IKE based speculation potentially so important for the macro economy?

1. IKE predicts persistent swings in the real exchange rate and similar persistent swings in the real interest rate differential.
2. IKE predicts that the Fisher parity (international as well as domestic) does not hold as a stationary condition.
3. As a consequence the term structure of interest rates is no longer well described by the expectations hypothesis.
4. Persistent swings in real exchange rates, real interest rates and the term spreads are likely to generate persistent fluctuations in the macro economy.

The intuition behind a nonstationary Fisher Parity

- Under IKE, nominal interest rates and nominal exchange rates exhibit a pronounced persistence due to the uncertainty premium.
- Prices of tradable goods are essentially determined by supply and demand in a very competitive global world and, therefore, less susceptible to speculative currency movements
- When the nominal long-term interest rate increases but CPI inflation does not, the real interest rate will increase.
- Increasing real interest rates are likely to increase the speculative demand for the domestic currency, hence increasing its price.
- Thus, as predicted by IKE, there will be a tendency for the domestic real interest rate to increase and the real exchange rate to appreciate at the same time, aggravating domestic competitiveness.
- As the competitiveness of the economy worsens and the macroeconomic imbalances grow, this is likely to generate a reflexive process between changes in the real interest rates and the real exchange rate (Soros 1987).

The long-lasting swings

- As long as the real interest rate differential moves in a compensating way, the deviations from long-run PPP benchmark values can be very persistent.
- Because a persistent movement away from a long-run benchmark is counteracted by another similar movement, an IKE economy is still characterized by equilibrating forces but in a dynamic rather than a static set-up.
- The I(2) model is formulated precisely to describe an economy where persistent deviations from long-run static equilibrium values are compensated by similar deviations in other variables.

Fluctuations in the real economy

- When speculative behavior drives nominal exchange rates away from fundamental PPP values, enterprises cannot use constant mark-up pricing without losing market shares.
- In the struggle for market shares, enterprises will be forced to adjust profits rather than prices: profits are likely to be squeezed in periods of persistent appreciation and increased during periods of depreciation.
- Thus, Phelps customer market pricing is likely to replace constant mark-up pricing in an IKE economy.

Implications for unemployment

- As enterprises struggle to survive in a period of real appreciation and increasing real long-term interest rates, they will tend to improve labor productivity by laying off the least productive part of the labor force.
- Thus, unemployment will tend to rise/decrease in periods of appreciation/depreciation while prices stay reasonably unchanged.
- The long-term real interest rate, unemployment rate and inflation rate would be co-moving in a relationship that Phelps (1994) calls an augmented Phillips Curve: $\Delta p = -b_1(u-u^*)$ where $u^* = f(r)$ describes a nonstationary natural rate as a function of the (long-term) real interest rate level.
- However, this relationship would no longer hold in the present post crisis period due to large scale financial consolidation behavior (Koo, 2010).

Discussion

- Macroeconomic data have a reputation for not being sufficiently informative, thereby justifying the use of 'mild force' to make them tell an economically relevant story.
- However, macroeconomic data are surprisingly informative, but only if you let them tell the story they want to tell.

Which stories do the data tell if they are allowed to speak freely?

- There is more persistence in the data than standard REH based theories can explain.
- In particular, basic parity conditions such as purchasing power parity, real interest rates, uncovered interest rate parity, and the term spread seem to exhibit a pronounced persistence untenable with $I(0)$ type stationarity.
- This persistence seems to originate from complex interactions between speculative financial markets and the real economy.
- A synthesis between the theory of structural slumps by Phelps and the IKE theory by Frydman and Goldberg' (2007) is likely to improve our understanding of the long recurrent spells of high unemployment in our economies.