The main take-aways from our study of exchange rate models:

1. The average real exchange rate for the US and other advanced countries is related to the difference between foreign and US real interest rates.
   a. This relationship is weaker on a currency-by-currency basis.

2. It is nearly impossible to forecast exchange rate changes using this model, or any other model.

3. “Technical analysis” is of dubious value.

4. Currency crises might be predictable.

How are exchange rates related to real interest rates?

I present here a somewhat simplified version of the discussion in Chapter 10. We start with the "approximate" versions of uncovered interest parity and relative purchasing power parity.

Approximate uncovered interest parity:
$E_t(\%\Delta S_{t+1}) = i_t^{US} - i_t^*$

Approximate relative purchasing power parity:
$E_t(\%\Delta S_{t+1}) = E_t(\pi_{t+1}^{US}) - E_t(\pi_{t+1}^*)$

Together, these imply: $E_t(\pi_{t+1}^{US}) - E_t(\pi_{t+1}^*) = i_t^{US} - i_t^*$, or
$i_t^{US} - E_t(\pi_{t+1}^{US}) = i_t^* - E_t(\pi_{t+1}^*)$.
Real US interest rates equal real foreign interest rates.

Do US real interest rates equal foreign real interest rates?

- It is difficult to answer definitively, because we do not directly observe real interest rates. They require the market's expectation of inflation.
- But most researchers who have tried to measure real interest rates have concluded there is not real interest rate equality.
    - This is especially true over short horizons.

- Indeed, monetary policy is understood to work by changing real interest rates.
  - o Federal Reserve follows an expansionary monetary policy by reducing i_t^{US}. An expansionary monetary policy may also increase inflation expectations, $E_t(\pi_{t+1}^{US})$. Both effects work toward reducing US real interest rates.
  - o Lower real interest rates stimulate investment spending and consumer purchases of durable goods.
  - o Foreign central banks follow their own independent monetary policies and can therefore change the foreign real interest rate.

What aspect of the model should we change? Let's modify relative PPP. We will acknowledge that sometimes the real exchange rate, RS_t is different from its long run level, $\overline{RS}$.

Here is our new model of expected changes:

$$E_t(\%\Delta S_{t+1}) = E_t(\pi^{US}_{t+1}) - E_t(\pi^{*}_{t+1}) - a\left(\frac{RS_t - \overline{RS}}{\overline{RS}}\right)$$

This model says that the exchange rate depreciation tends to reflect differences in expected inflation, $E_t(\pi^{US}_{t+1}) - E_t(\pi^{*}_{t+1})$.

But if RS_t exceeds $\overline{RS}$, there is some tendency for the exchange rate to fall. So the exchange rate also is expected to erase a fraction *a* of the percentage difference between RS_t and $\overline{RS}$.

Because adjustment is slow, *a* is small.

Combine with uncovered interest parity to get:

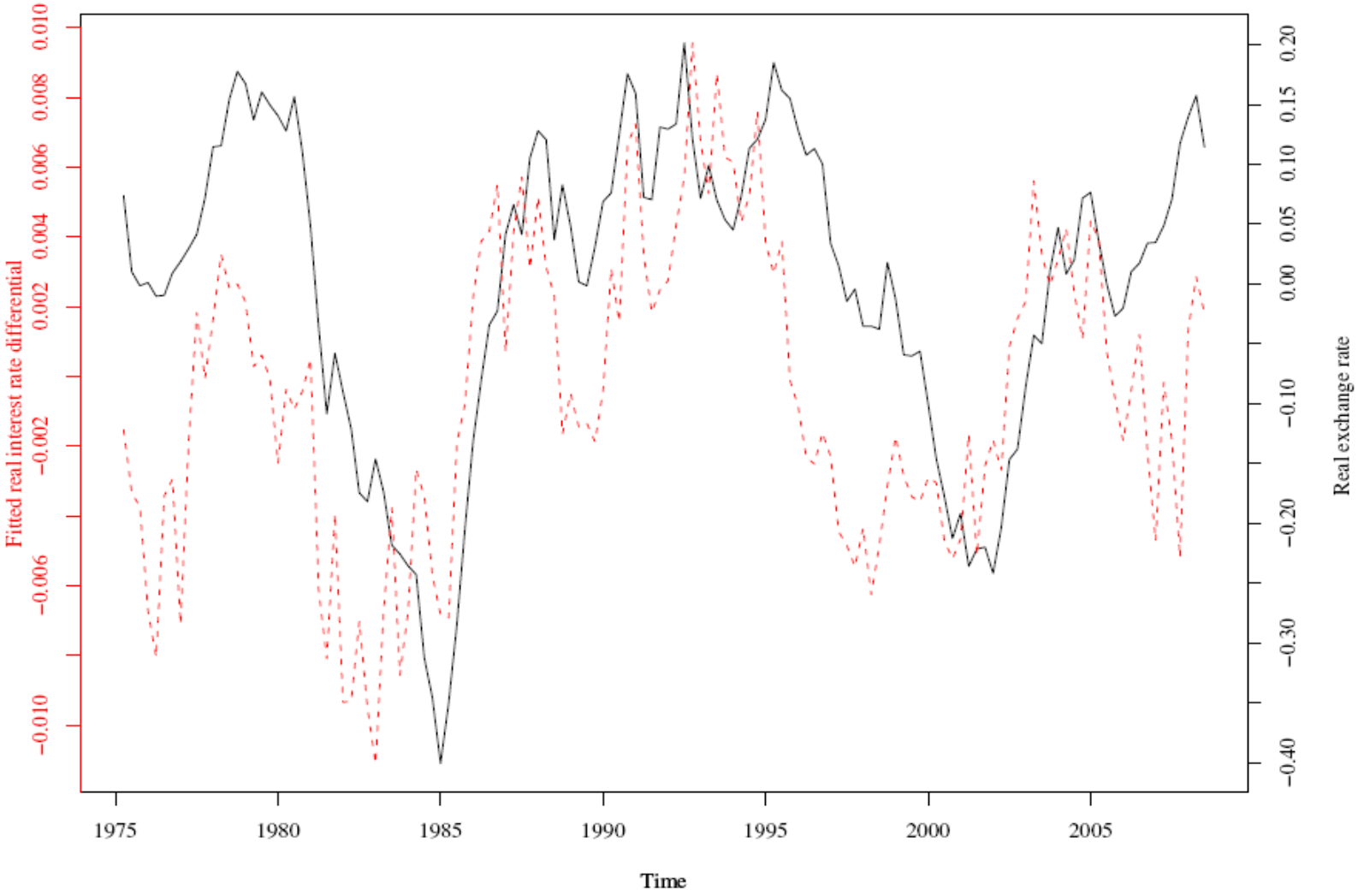
$$i_t^{US} - i_t^* = E_t(\pi_{t+1}^{US}) - E_t(\pi_{t+1}^*) - a\left(\frac{RS_t - \overline{RS}}{\overline{RS}}\right), \text{ or}$$

$$i_t^{US} - E_t(\pi_{t+1}^{US}) - (i_t^* - E_t(\pi_{t+1}^*)) = -a\left(\frac{RS_t}{\overline{RS}} - 1\right).$$

Solve this out to get:

$$\frac{RS_t}{\overline{RS}} = 1 - \frac{1}{a}\left(i_t^{US} - E_t(\pi_{t+1}^{US}) - (i_t^* - E_t(\pi_{t+1}^*))\right)$$

This says that when the US real interest rate rises above the foreign real interest rate, RS_t falls relative to $\overline{RS}$. There is a real dollar appreciation.


Fitted real interest rate differential
0.010
0.008
0.006
0.004
0.002
−0.002
−0.006
−0.010
Real exchange rate
0.20
0.15
0.10
0.05
0.00
−0.10
−0.20
−0.30
−0.40
1975
1980
1985
1990
1995
2000
2005
Time

- The previous graph is drawn for a weighted average of the US real exchange rate and real interest rate relative to nine other large countries.
- The expected inflation variable used to calculate the real interest rate is based on a statistical model to forecast real exchange rates.
- The correlation between the real exchange rate and the real interest differential is high.
- If we looked at the correlation using country-by-country real US exchange rates and interest differentials, the relationship would not be as strong.
- Can we use this relationship to forecast the US exchange rate?

In fact, the answer is “no”: rigorous studies have found that exchange rate models have little ability to forecast exchange rate changes consistently, at least at short horizons.

That should not be surprising. Our model actually says that real exchange rates are very sensitive to real interest differentials. A real interest differential has a “multiplier” effect of 1/*a* on the real exchange rate. We have said *a* is small because adjustment to PPP is slow.

This means that real exchange rates are very volatile because they are so sensitive to changes in the real interest differential. It is difficult to forecast real interest rate changes, but any small change can have large effects on real exchange rates.

There is evidence that long-run relative PPP is useful for forecasting real exchange rates at long horizons (4 years).

But this finding is true for an “average” US real exchange rate. Forecasting individual currency exchange rates is more uncertain.

Bottom line: Economic models are not useful for forecasting US exchange rates of individual currencies.

The text discusses “technical analysis” as a means of forecasting exchange rates. These forecasts are based on statistical rules of thumb.

There is little rigorous evidence that these models are useful for forecasting.

The evidence that is favorable toward these models is subject to “reporting bias” or “publication bias”.

- Indeed, models that report success in forecasting generally no longer exhibit success after publication.

Currency crises:

A currency crisis occurs when a fixed exchange rate system breaks down. Then the country's currency may depreciate by a large amount.

Examples:
- Europe in 1992
- Mexico 1994-1995
- Southeast Asia 1997

Why might a currency collapse?
- Macroeconomic fundamentals
- Self-fulfilling expecations
- Contagion

In some cases, currency crises may be predictable

Europe in 1992

In 1991, countries of the EC signed the Maastricht treaty that mapped the road to monetary union. The countries were to transition from a system of essentially fixed exchange rates to a single currency.

But the early 1990s was also when Germany reunified. Policies adopted within Germany led to inflation. In turn, the Bundesbank raised interest rates within Germany by a lot.

This led to pressure for the German mark to gain in value relative to other European currencies such as the U.K. pound, the French franc, and the Italian lira.

These countries tried to resist the exchange rate change. The Maastricht treaty required exchange rates to remain fixed for a number of years before a single currency was adopted. Nobody wanted to breech the current system so soon after the Maastricht treaty.

However, Germany was not willing to change its contractionary monetary policy. The other countries were not willing to adopt contractionary monetary policies. Macroeconomic fundamentals then required that these currencies depreciate relative to the German mark.

In September of 1992, speculators began to bet on a depreciation of the pound, franc, and lira. It was a “one-way bet”. Ultimately on September 16, all three currencies depreciated by a large amount.

Mexico had been following a crawling peg against the US dollar. But in 1994, inflation was high in Mexico and the Mexican central bank found it difficult to keep the peso from depreciating outside the band. Speculators were betting on a large depreciation.

Mexico was following a policy of government borrowing in US dollars – tesobonos. The idea was that this would add credibility to their exchange rate policy.

But indeed credit markets lost faith in Mexico's ability to repay these loans. In the end, the tesobonos actually undermined the peso, because markets began to doubt the ability of the government to repay the loans if the peso did devalue.

There ultimately was a large depreciation in December 1994. To some extent at least the timing of the crisis was determined by self-fulfilling expectations.

The currencies of Indonesia, Malaysia, the Phillipines, Korea, and Thailand experienced very large depreciations in 1997.

These countries were running current account deficits, and building up dollar-denominated debt.

- For a long time it seemed like this path was sustainable.
- The borrowing of these countries did not arise from low private saving. (Recall that the current account equals (saving – investment).
- Instead, investment levels were high.

However, the markets began to question whether the growth in these countries really could sustain the level of borrowing. Was all of the investment productive?

This crisis exhibits features of all three causes of crises: fundamentals, self-fulfilling expectations, and contagion.

The underlying fundamental problem was excessive borrowing for investment.

As markets began to worry, the currencies depreciated. Depreciation made the problem worse because it increased the value of debt in local-currency terms.

As one country's currency depreciated, it put pressure on neighboring countries. Exports (to the U.S., for example) are cheaper when a currency depreciates. As Indonesia, for example, depreciates, its exports become cheaper relative to the other countries. This puts more pressure on the currencies of other countries to depreciate.

There is some evidence that currency crises are predictable.

Many firms put a lot of resources into understanding the economic fundamentals and the susceptibility to contagion of emerging market economies.

It is important to note that many emerging market countries have "controlled" exchange rates even if they are not literally fixed. The important question is whether these countries will be able to maintain control in the event of a crisis. (For example, many Eastern European countries are in that situation now.)

Consideration of hedging foreign exchange risk may be important for dealing with these countries.