Some Notes on Overshooting*

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Recent fluctuations in real exchange rates are frequently attributed to overshooting. In this note we argue that the relevance of overshooting is questionable and that the overshooting approach can at best account for relatively minor exchange rate variations. This is demonstrated by means of some simple stylized facts.

According to a widely shared view, the remarkable appreciation of the dollar over the 1980 - 85 period can at least partly be attributed to *overshooting*, a phenomenon first described by *Dornbusch* (1976). A number of important issues are intimately connected with this question:

– Has the uprise of the dollar in the early 1980s been due primarily to the FED's restriction of monetary policy?

– Are flexible exchange rates together with sluggish commodity prices apt to cause misallocations of ressources?

– And will, consequently, a deliberalization of international capital markets, referred to as "throwing sand in the wheels", enhance economic efficiency?

In this note, we argue that the answers to these three questions seem to be in the negative; and that the theory of overshooting is irrelevant to what happened during the last years. Though it is a catching approach (quickly adjusting exchange rates versus "sluggish" prices), this model cannot add much to our understanding of the rise and decline of the dollar.

In its simplest version, the theory of overshooting runs as follows: If home and foreign bonds are perfect substitutes, the interest differential must be (approximately) equal to the expected change in the exchange rate. Thus

$$(1) \qquad \hat{e}_{t+1}/e_t - 1 = i - i^*,$$

where e is the exchange rate, i the annual interest on home and i^* the interest on foreign bonds $\hat{e}_{t+1}$ is the exchange rate which is expected to prevail one year ahead. Now assume that purchasing power parity holds strictly in the long run, investors have perfect foresight (or rational expectations), interest rates are equal at the outset, and that a one-shot reduction in the domestic money supply takes place. With output given by assumption, mar-

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ket participants will expect the home currency to appreciate in the long run because prices at home will adjust gradually to the reduced quantity of money. Because $\hat{e}_{t+1}$ goes down, e_t must also decrease *immediately* if uncovered interest parity (equation (1)) is to hold with i and i^* constant. Thus the expected appreciation of the home currency will take place instantaneously because of perfect foresight. But tight monetary policy will also increase the domestic interest rate according to the standard LM-equation

$$(2) \qquad\qquad M/P = L(Y, i)$$

and the assumption that P and Y do not react immediately. Hence, e_t must decrease *more* than $\hat{e}_{t+1}$ because now an interest differential has come into being. Put differently, the home currency appreciates a bit more in order to bring about an expected *depreciation* which exactly counterbalances the interest advantage of domestic bonds. This second impact is referred to as *overshooting* because the exchange rate first appreciates and then depreciates until it has attained its long run (*PPP*) equilibrium value. The *size* of overshooting is equal to the emerging change in the interest differential. Recall also that any overshooting gives rise to changes in the *real exchange rate*. A 3 per cent reduction in the domestic quantity of money will ultimately cause a 3 per cent reduction in the price level and an equivalent appreciation of the home currency. In the intermediate run, however, only the exchange rate will appreciate (notably by more than 3 per cent) while prices will adjust only gradually to their new equilibrium levels. As a result, we would expect a real appreciation of the home currency.

This theory is correct but unimpressive. Suppose the FED to take fairly restrictive measures. By which amount will American nominal interest rates rise, other things being equal? By 3 per cent? Or 6 per cent? Even in the latter case, which seems to be unparalleled in contemporary monetary history[1], the above approach *could only explain just a 6 per cent overshooting of the dollar exchange rate*. Given the experience of the last years, this would be a less exciting occurrence.

Let us work out our criticism by means of some "stylized facts". As an example, we shall consider the development of the mark/dollar exchange rate in the early 1980s. We want to contrast the observed variations in the real exchange rate with those which could possibly be attributed to overshooting in order to show that the latter constitute but a tiny fraction of the former. In the following table, the real annual appreciation of the dollar against the mark ($RAA_{\$DM}$) and American and German nominal interest rates (3 months) are reported:[2]

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[1] To be sure, a change in the interest rate by 6 points is not an uncommon incident over longer periods but has not been observed in the United States as the immediate consequence of a monetary restriction.

Year	$RAA_{\$DM}$	$i_\$$	i_{DM}	$i_\$ - i_{DM}$
1980	+ 6.8%	11.6	9.5	+ 2.1
1981	+ 29.1%	14.0	12.1	+ 1.9
1982	+ 8.2%	10.6	8.9	+ 1.7
1983	+ 5.2%	8.7	5.8	+ 2.9
1984	+ 13.5%	10.1	6.7	+ 3.4
1985	+ 4.8%	10.1	6.7	+ 3.4

The picture which emerges from the table shows clearly that the over-shooting paradigm cannot be considered as an important explanation for what happened with the real dollar/mark rate in the 1980s. In 1979, it is true, the FED took restrictive measures and thereby pushed up the US inter-est rate considerably. But, and this point is frequently overlooked, the Ger-man Bundesbank did also! And so did, more or less willingly, the other European central banks. In the right column of the table you see that the interest differential during 1980 - 1982 *decreased* – a fact which is com-pletely inconsistent with a dollar's overshooting in the sense of the above model. According to the latter, we would have expected a real *depreciation* of the dollar during that period whereas, actually, a compound appreciation of some 50 per cent took place.

Using reduced form estimates of Dornbusch's model (Swiss franc/dollar exchange rate during 1973 - 1977), Driskill (1981) concludes that a one-unit unanticipated monetary increase was followed by a 2.30-units change in the exchange rate what amounts to a 130%-overshooting. We think that using the interest differential instead is a more straight forward and reliable way of assessing the relevance of overshooting. This is because interest rates can be observed directly and their difference is identical to the amount of over-shooting. Adopting this approach, things look differently: Over the period 1973 - 1975 the dollar nominally lost some 20 per cent of its value in terms of the Swiss franc whereas the interest differentials were 3.0%, 2.0%, and 2.3%, respectively.[3] Hence at best a tiny fraction of the exchange rate move-ment could be attributed to overshooting.

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[2] Sources: The real exchange rate is calculated from items "Market Rate (rf)" and "Consumer Prices (64)" of IMF, International Financial Statistics, Washington, vari-ous issues. Interest rates are taken from OECD, Main Economic Indicators, Paris, various issues. All data are annual averages. It should be noted that the above results remain essentially unchanged if long-term interest rates, nominal exchange rates, or monthly data are used instead.

[3] Source: OECD. Exchange rates and interest rates are annual averages from monthly data.

The following conclusions thus emerge:

First, variations in the dollar/mark exchange rate cannot be attributed to monetary events because monetary policy in the United States and Germany were both restrictive and the interest differential did not change considerably. For overshooting to occur, monetary policies must adopt essentially different courses, and this precondition was not fulfilled during the early 1980s.

Second and on a more fundamental level, Dornbusch's model can only account for relatively minor changes in the exchange rates because the impact of a monetary expansion or restriction on the domestic interest rate is normally small. If that impact amounts to 3 per cent, for instance, the exchange rate would overshoot its fundamental (*PPP*) value by just 3 per cent. This fact is obscured in the merely *qualitative* textbook pictures and has, to my knowledge, never been pointed out.

Third, it has not yet been established that the volatility of exchange rates has anything to do with sluggish prices. If you consider a one-good model without transport costs, for example, it is clear that the exchange rate can *never* deviate from purchasing power parity even if capital markets react a million times faster than commodity prices. Sticky prices do not rule out commodity arbitrage. The exchange rate problem is therefore essentially a problem of transport costs and/or the microeconomic structure.[4]

And finally, with the analytical groundwork of "overshooting" found lacking, there is no theoretical reason to deliberalize international capital markets. The advocates of such measures have not really shown that the present regime entails inefficiencies. And because of the great practical problems of capital controls, the burden of proof is on them.

Summary

Using two examples we have shown that large fluctuations in real exchange rates cannot normally be attributed to "overshooting" in the Dornbusch sense. We proposed to use the interest differential between to countries as a direct and reliable measure of the extend of overshooting. Observing that differential immediately reveals that the past appreciation of the dollar against the mark has hardly anything to do with overshooting.

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[4] In an interesting paper, *Stockman* (1980) has offered some research along these lines. He analyzes variations in the real exchange rate within a framework of perfectly *flexible* commodity prices.

Zusammenfassung

Anhand zweier Beispiele wurde argumentiert, daß größere Änderungen des realen Wechselkurses kaum einem "overshooting" im Sinne von Dornbusch zugeschrieben werden können. Es wurde vorgeschlagen, das Zinsdifferential zwischen zwei Ländern als direktes und verläßliches Maß für das overshooting zu verwenden. Durch Betrachtung dieses Zinsdifferentials wird sofort klar, daß die Dollaraufwertung von 1980 - 85 unmöglich auf ein overshooting zurückgeführt werden kann.

References

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