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The Derivation of the Liquidity Ratio in the EMS

Reply to Arnold

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IN HIS COMMENT, Ivo Arnold makes some forceful statements about alleged departures from the "correct" procedure in our use of purchasing power parity (PPP) exchange rates to construct aggregate monetary data for the countries participating in the exchange rate mechanism (ERM) of the European Monetary System (EMS). The comment's clarity unfortunately does not match its forcefulness: most of the comment is in the form of claims that the author does not state precisely and makes little attempt to justify.

The waters are further muddied by an important misstatement by Arnold (1992) about the procedures that we follow in our paper: he states that we "convert into deutsche mark using the contemporaneous PPP rates, the national *real* income series, and the national *nominal* money series" (p. 199). This is not factual. Actually, we used base-period (1985) PPP rates to aggregate both real income and nominal money. Given Arnold's misapprehension about the procedures we followed, his claim that deviations between this reconstruction and our series are the result of errors on our part is obviously unfounded, and his empirical results based on these incorrectly reconstructed data have no bearing on our work.

In order to restore some clarity to the discussion, let us explain and justify the approach we used in aggregating using PPP exchange rates.

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I. Aggregation Using PPP Rates

A PPP exchange rate converts amounts expressed in different currencies to a common unit of measurement by weighting by these currencies' relative purchasing powers—that is, the reciprocal of the countries' price levels. The PPP rates that we use in our paper are derived from an Organization for Economic Cooperation and Development (OECD) survey for 1985, and are based on the price deflators for gross domestic product (GDP); our common unit of measurement is the deutsche mark. Consider PPP rates for country i with respect to Germany (defined as, for example, Dutch guilders per deutsche mark). Once PPP rates PPP^i_{85} have been determined for one year (1985), contemporaneous rates for year t can be constructed as

$$PPP^i_t = PPP^i_{85} * P^i_t / P^G_t, \tag{1}$$

where P^i_t and P^G_t are, respectively, the GDP deflator for country i and for Germany, also with base period 1985 (where, by definition, $PPP^G_t = 1$).

In aggregating *real* GDP across the ERM countries, it is appropriate to use *base-period* PPP rates, not the constructed contemporaneous rates.[1] This can be seen by noting that converting real magnitudes at contemporaneous rates would involve "double deflation," as is clear from equation (1), since the GDP deflator would then be used twice, once in deflating the countries' nominal GDPs and once in calculating contemporaneous PPP rates. Accordingly, aggregate real GDP for the ERM is

$$Y^{ERM}_t = \sum_i Y^i_t / PPP^i_{85}, \tag{2}$$

where Y^i_t is real GDP for country i, with base period 1985.

Another way of thinking about this aggregation can be seen by using equation (1) to write (2) in the equivalent form

$$Y^{ERM}_t = \left[\sum_i YN^i_t / PPP^i_t \right] / P^G_t, \tag{3}$$

where YN^i_t denotes country i's nominal GDP. Thus, the method we use to derive real GDP for the ERM is equivalent to aggregating nominal GDPs using contemporaneous PPP rates, and then deflating using the GDP deflator for Germany.[2]

[1] 1985 PPP rates are also used by the OECD to aggregate real variables; see OECD (1991, Part Two, "Main Aggregates: Zones").

[2] This is the equivalence that Arnold correctly describes in Section II of his comment; where he is incorrect is in failing to recognize that we also use this method to aggregate real GDP.

Now we turn to the aggregation of nominal magnitudes. Here, we use the same PPP rates:

$$YN_t^{ERM} = \sum_i YN_t^i / PPP_{85}^i. \tag{4}$$

This method, using the same rates for aggregating real and nominal variables, has the following important property. Equations (3) and (4) yield the following implicit GDP deflator for the ERM, as the ratio of aggregate nominal and real GDP:

$$P_t^{ERM} = YN_t^{ERM} / Y_t^{ERM} = \sum_i [(Y_t^i / PPP_{85}^i) / Y_t^{ERM}] P_t^i. \tag{5}$$

That is, the resulting aggregate GDP deflator has the desirable property that it is a weighted average of the national GDP deflators, where the weights (given by the expression in square brackets) are the shares of each country's real GDP in the ERM aggregate.[3]

Finally, as we state in our paper (Kremers and Lane (1990, p. 784)), "in order to maintain the national relativities between money and income in the ERM aggregate, the money stocks are added up at the same exchange rates as are the income variables." Thus, our procedure involves using base-period PPP rates to aggregate both nominal and real magnitudes, and using each country's share in aggregate GDP to construct ERM price indices.

An alternative would be to aggregate nominal GDP at current PPP rates, as suggested by Arnold in his Section II. This yields

$$\tilde{YN}_t^{ERM} = \sum_i YN_t^i / PPP_t^i,$$

giving rise to an implicit deflator of

$$\tilde{P}_t^{ERM} = \tilde{YN}_t^{ERM} / Y_t^{ERM} = \sum_i [(Y_t^i / PPP_{85}^i) / Y_t^{ERM}] P_t^G = P_t^G. \tag{6}$$

Thus, using contemporaneous PPP rates to aggregate nominal GDPs would imply that ERM inflation is the same as German inflation. This is an undesirable property in constructing an ERM-wide money demand function, especially when the object of the exercise is to illustrate the possibility of specifying a money demand equation that might be useful for monetary policy by a European central bank: a European central bank would clearly be concerned with the price level throughout the

[3] Price indices for country zones are calculated by the OECD on the same basis: see OECD (1991, Part Four, "Growth Triangles: Zones").

currency area, not just in Germany. Arnold makes much of the fact that although PPP rates behave much the same as current rates, the behavior of PPP aggregates depicted in the figures in our paper is rather similar to that of aggregates using base-period nominal exchange rates—a fact that we also note in our paper (Kremers and Lane (1990, p. 785)). He regards this as proof that "the PPP aggregates in the paper by Kremers and Lane must be incorrectly calculated" (Arnold (1992, p. 197)). In the light of the foregoing discussion, the similarity of base-period and PPP aggregates can be readily understood as resulting from a procedure that we have shown to be defensible.

II. Empirical Results

In Section III of his comment, Arnold seeks to compare empirical results derived with our data with those derived using his reconstruction of our series, and then with the series constructed using his own method. As mentioned in our opening paragraphs, his reconstruction—and therefore any empirical work based on this reconstruction—is of no direct interest, as it is based on a misapprehension as to the aggregation method we followed.

Two further points could be made in comparing Arnold's first and third specifications. First, it is not surprising that estimating *our* empirical specification with *Arnold's* data produces different results; there is simply no reason for two different data sets to produce identical regression results. Second, the fact that our aggregation procedure—contrary to Arnold's—yields an apparently well-specified money demand relationship would, if anything, provide *support* for our approach, in addition to the theoretical considerations advanced above.

III. Conclusion

In this reply, we have sought to clarify some issues involved in aggregating across countries, and to show that the procedure we used was an appropriate one. On the basis of our discussion, we argue that Arnold's comment misinterprets what we do in our paper and fails to justify the alternative he suggests. Thus, our evidence for the possibility of a stable ERM-wide money demand function stands. The past year's remarkable progress toward monetary union in Europe makes further scrutiny and investigation of the relationships among ERM-wide aggregates all the more worthwhile.[4]

[4]In a paper now in preparation, we consider the theoretical implications of aggregating across countries and analyze an extended data set.

REFERENCES

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