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THEORETICAL ISSUES PERTAINING TO MONETARY UNIONS

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ABSTRACT

The optimal currency area (OCA) concept is central to the economic analysis of monetary unions, as it clearly identifies the relevant optimizing tradeoff: extension of the area over which a single currency is used enhances allocative efficiency but reduces the possibility of tailoring monetary policy to the needs of different areas. Empirical work has verified the importance of various features of economies that make them strong or weak candidates for a common currency arrangement, but existing studies do not permit actual quantification of costs and benefits. Thus the OCA concept remains less than fully operational. A second relevant body of theory is that pertaining to currency crises. Formal models clarify various points concerning speculative attacks on fixed exchange rates, and show how abrupt reserve losses and depreciations can occur rationally at times when no major shocks are hitting the system. These models support the notion that a fixed (but adjustable) exchange-rate regime is not a viable option for most nations, given high mobility of financial capital. Also discussed is the recently-developed fiscal theory of price level determination, which if valid would have major implications for monetary-fiscal arrangements in currency unions. This theory does not contend that fiscal behavior drives an accommodative monetary authority, but rather that the price level roughly mimics the pattern of the government bond stock rather than base money when their paths differ drastically. An example is exposited in which there are two rational expectations solutions for an economy with a constant money supply: a traditional solution in which the price level is also constant and a fiscalist solution in which the price level and bond stock both explode as time passes. These solutions represent competing hypotheses about the behavior of actual economies; the paper suggests that the former is more likely to prevail in actuality.

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1. Introduction

The purpose of this paper is to review the economic theory relevant to the subject of monetary unions, in principle to provide a background for the remainder of the conference. This is a difficult assignment, for there is only a small bit of theory that is directly and strongly relevant to the topic, whereas the amount of theory that is of possibly significant relevance is huge—too large to cover in a single paper of moderate length. Accordingly, I have had to make some difficult and debatable choices regarding content.

The one theoretical topic that is of clear and direct relevance is the theory of optimal currency areas, since the basic purpose of that analysis is to specify conditions under which it is (or is not) economically advantageous for a group of economies to adopt a single currency. But direct relevance does not imply that an extensive discussion of this topic is appropriate because, on the one hand, its central propositions are well known and, on the other hand, the essential concepts involved are perhaps so difficult to measure as to render the theory virtually non-operational. Accordingly, just one section of the paper, Section 2, will be devoted to the subject of optimal currency areas.

A second topic that seems worthy of some review is the recently-prominent theory of exchange-rate (and other financial) crises. This topic is relevant because one of its main practical messages is, as I understand it, that with unregulated international financial flows the relevant choice for a group of economies is between currency union and floating exchange rates. In other words, the apparent intermediate option of a fixed but possibly adjustable exchange rate is actually close to infeasible. Accordingly, a short review of this literature is in order and will be attempted in Section 3.

Third, the topic of monetary union envisions a single currency for economies that have distinct governments and thus, to some extent, potentially distinct fiscal authorities. Consequently, the subject of the relationship between fiscal and monetary policies arises. As a whole, this subject is too extensive to be reviewed here. A particular issue that has quite recently been the subject of considerable theoretical attention, however, is the so-called "fiscal theory of price level determination." This is a topic of fundamental importance that has been developed in a number of writings that are theoretically sophisticated and rather difficult to comprehend without extensive study. It is also a topic in which I have taken some prior interest. An exposition of the issues is therefore provided in Section 4 of the paper. It should be clearly stated at the outset that, due to my previous involvement, this presentation does not pretend to be a balanced, unbiased overview but is instead a partisan attempt to justify a particular position regarding this theory—the position that I consider to be most appropriate.

Finally, a short summary of the paper is included as Section 5.

2. Optimal Currency Areas

The optimal currency area concept was introduced, as is well known, by Mundell (1961). Despite appearances, the foregoing should be regarded as a striking statement because it is surprising that such a basic idea would not have been developed previously. Nevertheless, the statement is, as well as I have been able to determine, correct. I will return to this point below, and will offer an explanation for the reason that the concept had not been developed previously, but for the moment let us continue the substantive theoretical discussion. The crucial tradeoff identified by Mundell is, according to my own textbook,[1] that “an extension of the area over which a single currency prevails enhances [microeconomic] efficiency but reduces the possibility of monetary policy responses to shocks [or conditions] that affect various subareas differently” (1996, p. 258). The wider the area, that is, the greater are the efficiency benefits of possessing a single medium of exchange and medium of account,[2] but the smaller the area, the greater are the possibilities of tailoring monetary policy to (temporary) local needs. Somewhere between one currency for the entire world and one for each country (or for each city, or neighborhood, …) lies the optimum. The plot of net benefits versus number of currencies might be quite flat, of course, over a wide range that includes the optimum.

In a sense, the foregoing is all there is to be said in terms of pure theory, but most authors would discuss the topic at somewhat greater length. The recent and highly-regarded graduate level textbook by Obstfeld and Rogoff (1996, pp. 632-4) sustains the discussion for approximately two full pages by listing four main benefits and four main costs to a pair of countries from having a common currency. These are, in the words of Obstfeld and Rogoff, as follows, with benefits listed first.

> B1. Reduced transaction costs from currency conversion ….
>
> B2. Reduced accounting costs and greater predictability of relative prices for firms doing business in both countries.
>
> B3. Insulation from monetary disturbances and speculative bubbles that might otherwise lead to temporary unnecessary fluctuations in real exchange rates ….

[1] See McCallum (1996, pp. 258-9 and 209-214).

[2] For simplicity, I here assume that the two are the same. This is of course not logically necessary, but will usually be the case except in environments of very high inflation.

B4. Less political pressure for trade protection because of sharp shifts in real exchange rates.

C1. Individual regions in a currency union forgo the ability to use monetary policy to respond to region-specific macroeconomic disturbances ….

C2. Regions in a currency union give up the option to use inflation to reduce the real burden of public debt ….

C3. … [Political and strategic problems arise in determining how member countries split seignorage revenues ….

C4. Avoiding speculative attacks in the transition from individual currencies to a common currency can be a major problem ….

Here it would appear that B1, B2, B3, C1, and C2 accord nicely with the simple statement expressed above whereas C4 represents only a transitional difficulty[3] and B4 and C3 are basically political rather than economic in nature. If I were making a list of the Obstfeld-Rogoff type, however, I would add another distinct benefit as follows: the existence of a common currency tends to bring a greater degree of integration to financial and non-financial markets in the two countries.

Merely stating that this optimization problem exists does nothing, obviously, to solve it for any two actual countries such as the U.K. and Germany. The relevant issue for the present paper is what theoretical writings have to say about the way in which the optimization problem should be handled in practice. In his original paper, Mundell

[3] If transitional costs are to be considered, one should certainly count the resource and educational costs of conversion by one or more regions to the new common currency.

(1961) emphasized factor mobility, especially labor mobility, as a crucial consideration. Subsequent contributions by McKinnon (1963), Kenen (1969), and others have proposed other criteria for consideration. In particular, McKinnon emphasized openness, measured by the share of tradable goods in a country's output, whereas Kenen focussed on the extent of product diversification in production. For an extensive review of this literature, including references to many additional authors, see Ishiyama (1975) or Tower and Willett (1976).

After reflecting on some of these writings, my own impression was that there is significant merit to several of the proposed criteria, in other words, that no one of them is itself sufficient. Furthermore, each of the criteria is extremely difficult to implement quantitatively. So when I began this paper, I found it difficult to avoid the conclusion that the optimal currency area (OCA) concept is, in practice, non-operational. Consequently, my first draft expressed the opinion that, although the concept reflects an important and interesting tradeoff, in actual practice one can not go far beyond the rather limp conclusion that currency unions "will be relatively more attractive for small, open economies that engage in a large volume of international trade (relative to their size)" whereas "floating rates … are more suitable for large and relatively self-contained economies" (McCallum, 1996, p. 225).

Since writing the first draft, I have seen a pair of papers by Bayoumi and Eichengreen (1996, 1997) whose purpose is to operationalize the OCA concept. Their approach in the 1997 paper is to develop quantitative measures or proxies pertaining to size, trade linkages, and dissimilarity of aggregate shocks for different European countries each considered relative to Germany.[4] An index of unsuitability for membership in the contemplated currency area is constructed (for each country except Germany) by using coefficients obtained in a cross-section regression whose dependent variable is the variability of bilateral exchange rates with Germany. This index indicates that Austria, Belgium, Ireland, the Netherlands, and Switzerland would be relatively suitable for inclusion in the union, whereas Denmark, Finland, Norway, Portugal, Spain, Sweden, and the United Kingdom would be relatively unsuitable. These groupings seem sensible enough that I would have to agree that Bayoumi and Eichengreen have made notable progress toward operationalization of the OCA theory.[5]

Nevertheless, it must be recognized that their approach yields only rankings of suitability, not actual cost-benefit measures that would indicate where the line separating included vs. excluded currencies should be drawn. Accordingly, one could still argue that true operationality of the OCA concept has not been achieved. To emphasize this point, it might be argued that if there was ever a situation that cried out for application of the OCA calculus, it was the January 1999 creation of the European Monetary Union. But Bayoumi and Eichengreen's (1996) review of numerous studies indicates that they do not actually provide estimates indicating which countries should, and which should not, be members of the Euro area. The European Union publication One Market, One Money presented some worthwhile analysis—especially in its attempt to estimate the resource

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[4] Some earlier work of this general type is reviewed and evaluated by Edison and Melvin (1990).

[5] In my textbook, one end-of-chapter problem asks the student to consider "would it be more advantageous for Portugal or France to have fixed exchange rates with Spain?" (1996, p. 226). The Bayoumi and Eichengreen (1997, p. 768) results for selected bilateral comparisons indicate that "Portugal" is the correct answer, which is certainly what the textbook intended.

savings of a single currency rather than truly fixed exchange rates among national currencies—but all in all it too seems not to pass the test.[6]

Let us now return to questions relating to the history of the optimum currency area's crucial tradeoff concept. Was Mundell (1961) actually the first to express it clearly? Yeager (1976) mentions another publication of the same year, namely Balassa (1961, pp. 263-8). But examination indicates that the latter gives consideration to the type of costs and benefits implied by the tradeoff, without ever posing the issue in terms of an "optimal area" concept. Indeed, the same can be said for an earlier publication by Yeager himself (1959a). In addition, some other earlier writings of relevance are cited by Ishiyama (1975) and by Tower and Willett (1976). But even if one were to conclude that the concept had been clearly formulated by someone prior to Mundell, which is debatable, it would nevertheless be striking that its formulation did not occur until some date not long before 1961. So let us move on to the more interesting question, why did this recognition not come sooner?

To the latter question there is, I believe, a rather clear-cut (although conjectural) answer. It is that prior to the 1950s, the predominant position among international and monetary economists was that some metallic monetary standard should be adopted by all countries. The most common position was that the same monetary standard, typically the gold standard, should prevail everywhere.[7] Then, in the absence of restrictions on gold

[6] Certainly, actual decisions whether to participate were not based on optimal-currency-area analyses, but that is another matter. The issue here is whether there are any convincing economic studies.
[7] Mill (1848) puts the matter very nicely, as he does so often, as follows: "Let us suppose that all countries had the same currency, as in the progress of political improvement they one day will have…" (Book III, Ch. XX, § 2).

flows, there would be a unified monetary system; the fact that different units of account would be used in different countries would not negate the existence of a unified medium of exchange and medium of account.[8] Furthermore, even if different metals were used by some countries, there would be no scope for floating exchange rates or for the associated possibility of tailoring monetary policy to different conditions in different regions.

The great break with this orthodoxy came, of course, with the publication of Friedman's "The Case for Flexible Exchange Rates" (1953). This, together with other pro-floating rate writings, including Lutz (1954), Sohmen (1957), and Yeager (1959b), altered the intellectual climate enough to permit the relevant issues to arise. In Friedman's essay there is no attempt to balance off the benefits and costs of floating rates, but that is so because the paper's task was to persuade analysts of the existence of benefits. But in this task the paper was successful enough that within a few years Mundell could take a more balanced perspective and look for an optimizing tradeoff.

Another development was necessary, furthermore, before Friedman's. Since the main benefit of a floating exchange rate is that it permits monetary policy to be different in different regions, and therefore to be usable for offsetting demand shocks that would have undesirable (albeit temporary) effects on output and employment, there needed to be professional recognition that monetary policy could be useful in this way. In other words, there needed to be recognition of the possibility of monetary stabilization policy of the type that we now call Keynesian. It is my own belief that Keynes's General Theory (1936) was largely unsuccessful as an undertaking in economic theory, but it

[8] If gold is the standard metal in various countries that have different coinage systems, one might regard gold as the common medium of account even though units of account would differ with different coinage systems.

succeeded spectacularly in calling the profession's attention to the importance of considering short-run issues. The point, from the perspective of the present discussion, is that the recognition of some role for monetary stabilization policy provides one potential benefit for floating exchange rates, i.e., for the possible optimality of more than a single worldwide currency. This particular role is not strictly necessary, for different countries could have different preferences regarding long-run average inflation rates—perhaps for public finance reasons—but the stabilization role is more prominent and would remain relevant even if average inflation preferences were the same everywhere.[9]

The discussion to this point has proceeded as if floating rates and currency unions were the only possibilities. In other words, we have not mentioned the possibility of countries with fixed but potentially adjustable exchange rates. Experiences during recent years—most prominently in Europe in 1992 and 1993, Mexico in 1994-95, and Asia in 1997-98—have strengthened the belief that the fixed-but-adjustable arrangement is illusory for the reason that was spelled out so effectively by Friedman (1953). This reason, of course, is that fixed (but adjustable) rates tend to invite speculative attacks. In Friedman's words:

> Because the exchange rate is changed infrequently and only to meet substantial difficulties, a change tends to come well after the onset of difficulty, to be postponed as long as possible, and to be made only after substantial pressure on the exchange rate has accumulated. In consequence,

[9] For quite a few years, especially during the 1960s and 1970s, it was widely believed that different countries might desire different average inflation rates because of different preferences regarding output and employment relative to inflation, but in more recent time professional opinion has moved strongly toward the Friedman (1966)-Phelps (1967) position that there exists no long-run tradeoff.

> there is seldom any doubt about the direction in which an exchange rate will be changed, if it is changed. In the interim between the suspicion of a possible change in the rate and its actual change, there is every incentive to sell the country's currency if a devaluation is expected… or to buy it if an appreciation is expected. (1953, p. 164)

Friedman's argument is rather compelling and may seem more convincing now than ever before. Nevertheless, a more formal literature concerning speculative attacks on exchange rates has built up over the past 20 years, and deserves some attention in any review of theory relevant to the topic of monetary unification. To provide a brief review is the purpose of the next section of the paper. Comments on the currency-board possibility will be included toward the end of this next section.

3. The Theory of Currency Crises

The currency crisis or speculative attack literature came to prominence with writings by Krugman (1979) and Flood and Garber (1984a). Extensive recent reviews of the theory by Flood and Marion (1998), Marion (1999), and Garber and Svensson (1995) indicate clearly, however, that the crucial ideas were present somewhat earlier in a comparatively neglected paper by Salant and Henderson (1978).[10]

The simplest and cleanest model is one developed by Flood and Garber (1984a). As a preliminary step, let us consider how a floating exchange rate would behave in a small open economy in which prices are highly flexible, so that employment and output are always close to their "natural rate" levels. The analytical framework typically utilized in the literature is normally described as also requiring uncovered interest parity,

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[10] On this, see especially Flood and Marion (1998, fn. 1).

purchasing power parity, and constant values for output and the real interest rate in the home economy. The following presentation indicates how the latter three requirements can be dispensed with.

Let M_t be the stock of base money, P_t the price level, S_t the price of foreign exchange, Q_t the real exchange rate, Y_t the rate of output, and R_t the nominal interest rate. For all of these except the last, let lower case letters denote logarithms, e.g., $s_t = \log S_t$; for the last we have $r_t = R_t - E_t \Delta p_{t+1}$, the real interest rate. Also, let "*" denote a foreign or rest-of-world variable. Then we write the model as follows.

(1a) $y_t = b_0 + E_t y_{t+1} + b_1 r_t + b_2(x_t - E_t x_{t+1}) + \eta_t$ $\qquad b_1 < 0,\ b_2 > 0$

(1b) $m_t - p_t = c_0 + c_1 y_t + c_2 R_t + \varepsilon_t$ $\qquad c_1 > 0,\ c_2 < 0$

(1c) $x_t = a_0 + a_1 q_t + a_2 y_t + a_3 y^*_t + \xi_t$ $\qquad a_1, a_3 > 0,\ a_2 < 0$

(1d) $q_t = s_t - p_t + p^*_t$

(1e) $R_t = R^*_t + E_t \Delta s_{t+1} + \zeta_t$

(1f) $y_t = \bar{y}_t$.

Here (1a) and (1b) reflect dynamic optimizing versions of relations of the IS and LM type that have been justified by McCallum and Nelson (1999), among others, with the former augmented by trade flows, x_t representing the log of exports minus the log of imports. The value of x_t is modelled in (1c) as depending on the real exchange rate and income levels at home and abroad. Equation (1d) is an identity; (1e) represents uncovered interest parity with a random, time-variable risk premium, and (1f) assumes that, with price flexibility, output equals its (exogenous) market-clearing natural rate value.

Of course, we also have the identities

(2) $r_t = R_t - E_t \Delta p_{t+1}$

(3) $r^*_t = R^*_t - E_t\Delta p^*_{t+1}$,

so these plus (1d) permit us to rewrite (1e) as

(4) $r_t = r^*_t + E_t q_{t+1} - q_t + \zeta_t$.

Then it can be seen that relations (1a), (1c), (1f), and (4) comprise a subsystem that determines the dynamic behavior of y_t, q_t, x_t, and r_t given exogenous processes for η_t, ξ_t, ζ_t, $\bar{y}_t$, and all foreign variables. Consequently, we can substitute (1d) and (1e) into (1b) to obtain

(5) $m_t - (s_t + p^*_t - q_t) = c_0 + \bar{y}_t + c_2(R^*_t + E_t\Delta s_{t+1} + \zeta_t) + \varepsilon_t$,

and the latter can be expressed as

(6) $m_t - s_t = \gamma + \alpha(E_t s_{t+1} - s_t) + v_t$ $\alpha < 0$,

where v_t is a highly composite stochastic term, with $Ev_t = 0$, that reflects the behavior of numerous variables, all of which are exogenous to s_t and m_t.

Thus we end up with equation (6) to describe the behavior of the exchange rate in a flexible-price economy. Because it is of the same form as the Cagan (1956) formula for money demand, except with s_t appearing where p_t usually appears, the behavior of the exchange rate in this setting is quite familiar. In particular we know that, on average over an extended period of time, the exchange rate will depreciate at the rate of growth of the money stock: if the money stock grows at the rate μ, then the exchange rate will depreciate at the rate μ. Crucially, we also know that the desired level of $m_t - s_t$ at any time will be negatively related to μ, since smaller real money holdings are desired when their expected depreciation rate is high. This simple and familiar model provides a convenient vehicle for the analysis in the currency crisis literature. To keep matters as simple as possible, while still making the basic points, the stochastic disturbance term v_t

is often neglected, i.e., the case of perfect foresight is utilized. In what follows, we shall follow that common practice. Then we find, via simple rational expectations (RE) analysis, that with $m_t = m_{t-1} + \mu$ the exchange rate behaves as

(7) $s_t = - \gamma - \alpha\mu + m_t$.

After these preliminaries, let us now consider an economy with a fixed exchange rate. We have specified that s_t is the log of the exchange rate and now we suppose that its value is fixed at the value $\bar{s}$; i.e., we have the fixed rate $s_t = \bar{s}$. To maintain this value, the log of M_t must be kept constant at (say) $\overline{m}$. But suppose that the government of the economy in question engages in another activity besides exchange-rate fixing that requires positive growth at the rate μ of the domestic credit portion of the monetary base. (Let M = DC + FR, where M is the base, FR is the stock of foreign exchange reserves, and DC is the domestic credit portion of M.) To keep M_t constant while expanding DC_t, FR_t must fall as time passes. If the growth rate of DC_t is maintained permanently at μ, and log M_t is kept at $\overline{m}$, then eventually FR_t will fall to zero, at which point it would become impossible to maintain the fixed exchange rate.[11]

But with rational expectations—i.e., perfect foresight in the absence of shocks—the fixed exchange rate regime will collapse <u>before</u> FR_t falls to zero. For by the time that FR_t reaches zero, the exchange rate that would prevail in the absence of official intervention—i.e., with a floating rate—would be higher than the previously fixed value. Thus there would occur a discrete, abrupt depreciation at this time, a fall in value of the home country currency. But with rational expectations, market participants would know

[11] Actually the situation is more complex in that the authorities could have a positive or negative level of reserves that they will maintain after collapse of the fixed rate. For expositional simplicity, that level is (as usual) taken to be zero.

that this is going to happen, and when it will happen, so before then they would become unwilling to hold the domestic currency, since to do so would be to incur a capital loss that is anticipated. So, instead, they sell off the domestic currency in exchange for foreign exchange reserves earlier.

In the basic Flood-Garber (1984a) model, it is assumed that when the fixed-rate regime breaks down, a floating-rate regime takes its place and is maintained indefinitely thereafter.[12] Let $\tilde{s}_t$ be the "shadow exchange rate" that would prevail at time t if a floating-rate regime were to go into effect at t with $FR_t = 0$;

(8) $\tilde{s}_t = -(\gamma + \alpha\mu) + d_t$,

where $d_t = \log DC_t$. Then according to the basic model, a currency crisis occurs when $\tilde{s}_t$ rises to the level $\bar{s}$. There is then no discontinuity in s_t and thus no anticipated capital gain or loss; instead there is an abrupt fall in FR as market participants use their holdings of domestic currency to purchase foreign exchange from the central bank. In addition, there is an upward jump (from zero to μ) in the expected inflation rate, and therefore an upward jump in the nominal rate of interest—a jump that makes asset holders satisfied with the reduced stock of money. What about the possibility of an earlier attack? Such would not occur because prior to the point in time at which $\tilde{s}_t = \bar{s}$, the former would be the smaller so there would be capital losses to participants in a speculative attack against

[12] Note that some assumption must be adopted regarding policy behavior after the breakdown, or the model will be incomplete. Various alternative assumptions are considered in the literature; one of these will be analysed below.

the currency if it were "successful." Thus there is no incentive for an earlier attack to occur.[13]

In sum, the basic model explains why there are abrupt losses of foreign exchange holdings by central banks, abrupt changes in interest rates, and a regime change to a floating rate at the time of a currency crisis, even though no major external triggering event happens at that time. It also explains (in principle) the time at which this collapse will occur, since the growth of m_t and therefore $\tilde{s}_t$ is a deterministic function of time.[14] In an important sense, however, the model does not actually explain the occurrence of a collapse, because the model begins with the assumption that the country's government is attempting to maintain a fixed exchange rate while conducting another policy activity that is incompatible with such maintenance of that fixed rate. In such a situation it is obvious that one of the two incompatible policy goals must eventually be given up, and the basic model just presumes that the other policy activity has precedence over keeping the exchange rate pegged at $\bar{s}$.

The literature contains several extensions of the basic model, however, that are more ambitious in this regard. Several notable examples have been developed and discussed by Obstfeld (1986, 1994, 1996), but we can outline the essential ingredients with a simple extension of the Flood-Garber model described above.[15] Accordingly, let us modify the basic model by assuming that (i) in the absence of a speculative attack, the

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[13] From the individual asset holder's viewpoint, there would be costs of holding more foreign exchange in their portfolio, costs that would outweigh the negligible effect to be had on the precipitation of a general speculative attack.

[14] With the assumption that the post-collapse level of FR is zero, then $\tilde{s}_t = -\gamma - \alpha\mu + d_0 + \mu t$, where d_0 is the log of "initial" DC. Thus t at collapse time is $(\bar{s} + \gamma + \alpha\mu - d_0)/\mu$. We see that a lower μ or higher $\bar{s}$ will extend the life of the fixed-rate regime.

[15] This extension was first proposed by Flood and Garber (1984b).

rate of growth of domestic credit is zero, i.e., $\mu_0 = 0$, but (ii) if an attack occurs then DC_t grows thereafter at the positive rate μ_1. In addition, it is assumed that this value satisfies $\mu_1 > \log (M_0/DC_0)/(-\alpha)$.

In this situation, there are two RE (perfect foresight) equilibria. If there is no speculative attack, then with zero growth in domestic credit there is no literal inconsistency with the fixed exchange rate $s_t = \bar{s}$, so it can survive indefinitely. Alternatively, if there is an attack, then there will be an abrupt fall in reserves, a depreciation of the exchange rate to the value $\tilde{s}_t = - \gamma - \alpha\mu_1 + d_t$, and $\tilde{s}_t$ will henceforth grow indefinitely at the rate μ_1. Thus the fact that policy is not unconditionally dedicated to maintaining the fixed rate, but would in the face of a major attack surrender to speculators and thereafter pursue an alternative goal, implies that the fixed-rate policy is subject to attack.[16] There are several other models, described by Obstfeld (1996), that lead to similar conclusions.

What should one make of the foregoing, with regard to the feasibility of a fixed but potentially adjustable exchange rate? Garber and Svensson (1995) begin the relevant section of their prominent survey paper with the following statement: "A salient feature of fixed exchange rate regimes is their inevitable collapse into some other policy regime" (1995, p. 1891). Obstfeld and Rogoff (1995), by contrast, state that "…there are no insurmountable technical obstacles to fixing exchange rates. Most central banks have access to enough foreign exchange resources to beat down a speculative attack of any magnitude…" (1995, pp. 77-78). Despite these apparently conflicting statements,

[16] Note that in this variant of the model there is an abrupt depreciation at the time of attack, but in a manner that does not imply anticipated capital gains or losses.

however, there is actually no substantive disagreement between these two pairs of authors. In particular, Garber and Svensson (1995, p. 1892) recognize that "a central bank can always preserve a fixed exchange rate through a sustained high interest rate or, equivalently, through a sufficiently drastic contraction in [the] monetary base;" their inevitability of collapse stems from "…the presumption that the adherence to a fixed exchange rate is a secondary policy—it is to be maintained only as long as it is compatible with policies that have priority." And for their part, Obstfeld and Rogoff (1995, p. 78) finish the incomplete sentence quoted above with the proviso, '…provided they are willing to subordinate all the other goals of monetary policy." In fact, Obstfeld and Rogoff continue as follows: "If central banks virtually always have the resources to crush speculators, why do they suffer periodic humiliation by foreign exchange markets? The problem, of course, is that very few central banks will cling to an exchange-rate target without regard to what is happening in the rest of the economy. Domestic political realities simply will not allow it, even when agreements with foreign governments are at stake" (1995, p. 79). In sum, Obstfeld and Rogoff agree with the Garber-Svensson conclusion that, in practice, fixed (but adjustable) exchange rate regimes are not a viable option for most economies, basically for the reasons identified by Friedman and developed in the currency-crisis literature.

What about the notion that creation of a currency board provides one way, short of monetary union, for an economy to maintain a fixed exchange rate? From the foregoing discussion, the answer seems reasonably clear. The creation of a currency board gives rise to an institution that is more difficult and costly to dismantle, when it interferes with some other policy objective, than a more conventional fixed-rate arrangement. But unless maintenance of the currency board arrangement has priority over all other macroeconomic objectives, eventually the currency board, too, will break down. The same might even be said for membership in a currency union, but the costs of departing from a union are presumably even greater than those from the termination of a currency board. The other members of the union might conceivably even go to war to prevent its breakup.

4. The Fiscal Theory of Price Level Determination

During the past few years, a striking body of literature has appeared in which it is argued that general price level determination is essentially a fiscal, rather than monetary, phenomenon. The most prominent papers to date are those of Woodford (1994, 1995, 1998), Sims (1994, 1996), and Cochrane (1998), but there are several others of significance.[17] If the theory expounded in these papers were valid empirically, there would be major implications for the manner in which fiscal and monetary policies are related in a monetary union, as Woodford (1996), Sims (1997), and Bergin (1996) emphasize. The purpose of the present section is to describe this theory and explain why I believe that it is not empirically valid, but instead is basically misleading.[18] For simplicity, the argument will be conducted in terms of a single closed economy, but if the theory is misleading in that case it will also be misleading regarding the relationship between monetary and fiscal policies in the more complex setting of a monetary union.

[17] Some of these are Leeper (1991), Bergin (1996), Dupor (1997), and Schmitt-Grohe and Uribe (1997).

[18] My argument has been presented previously in McCallum (1998, 1999a); a somewhat similar and complementary position is taken by Buiter (1998), in a study that discusses several other issues as well.

At the outset it should be emphasized just how drastically unorthodox or counter-traditional the fiscal theory of price level determination is.[19] Specifically, it does not merely suggest that fiscal as well as monetary policy stances are significant for price level behavior; instead it virtually claims that only fiscal policy is relevant. In the prototype model to be sketched below, the price level moves over time in a manner that is very closely related to the path of government bonds outstanding and entirely unlike the path of the stock of high-powered money. Therefore it is not the case that the argument involves fiscal behavior that drives an accommodative monetary authority, as when rapid base money growth serves to finance a fiscal deficit.[20] Furthermore, the type of model typically utilized in the literature's analysis is not of the overlapping generations type, in which the Ricardian equivalence proposition is known to fail. Instead, the model is basically of the Sidrauski-Brock type, in which Ricardian equivalence results are normally obtained, i.e., results implying that bond-financial tax changes have no effect on the price level or other macroeconomic variables of primary interest.[21] In such a setting, fiscalist positions are truly startling.

As a background for illustrating these drastic results, let us begin with an orthodox analysis of price level determination in an extremely simple and transparent setting. Suppose that the (per capita) money demand function for a closed economy is of the textbook form

$$m_t - p_t = c_0 + c_1 y_t + c_2 R_t + v_t \qquad c_1 > 0,\ c_2 < 0, \tag{11}$$

[19] In what follows, I shall for brevity often refer to the latter as the "fiscal" or "fiscalist" theory.
[20] Thus the theory is quite different from that of Sargent and Wallace (1981).
[21] For an analysis of this model, see McCallum (1984).

where m_t, p_t, and y_t are logs of the (base) money stock, price level, and output (income) for period t, while R_t denotes a one-period nominal interest rate. The disturbance v_t is taken for simplicity to be white noise. It is well known that there are rigorous dynamic general equilibrium models with optimizing agents that will justify (11) as an approximation to a combination of implied Euler equations (first-order conditions).[22] The present exposition is intended to convey the essential features of a full optimizing analysis while ignoring some of the details.

Furthermore, let us assume that the economy is one in which output and the real rate of interest are constant over time. Then (11) collapses to

(12) $m_t - p_t = \gamma + \alpha\,(E_t p_{t+1} - p_t) + v_t \qquad \alpha = c_2,$

which is the familiar Cagan specification for money demand. And let us consider cases in which the growth rate of the (base) money stock is kept constant by the central bank, so that

(13) $m_t = m_{t-1} + \mu,$

where μ is the growth rate of the money stock. These relations plus rational expectations determine the behavior of p_t and m_t for time periods t = 1,2,…. It is possible that the structure was different prior to period 1.

In this setting, the orthodox bubble-free or "fundamentals" rational expectations (RE) solution for p_t can be found by conjecturing that it is of the form

(14) $p_t = \phi_0 + \phi_1 m_{t-1} + \phi_2 v_t,$

since m_{t-1} and v_t are evidently the system's only state variables. In that case we have $E_t p_{t+1} = \phi_0 + \phi_1(m_{t-1} + \mu)$ so substitution of the latter, (13), and (14) into (12) yields

[22] See, for example, Woodford (1995) or McCallum and Nelson (1999).

(15) $m_{t-1} + \mu = \gamma + \alpha [\phi_0 + \phi_1(m_{t-1} + \mu)] + (1-\alpha) [\phi_0 + \phi_1 m_{t-1} + \phi_2 v_t] + v_t$.

The latter implies that for (14) to be a solution, i.e., to hold for all realizations of v_t and m_{t-1}, we must have satisfaction of the undetermined-coefficient (UC) conditions

(16) $1 = \alpha\phi_1 + (1-\alpha) \phi_1$

$0 = (1-\alpha) \phi_2 + 1.$

$\mu = \gamma + \alpha\phi_1\mu + (1-\alpha) \phi_0 + \alpha\phi_0$

Thus we have that $\phi_1 = 1$, $\phi_2 = - 1/(1-\alpha)$ and $\phi_0 = \mu - \gamma - \alpha\mu$, i.e., the solution is

(17) $p_t = \mu (1-\alpha) - \gamma + m_{t-1} – 1/(1-\alpha)v_t$

$= m_t – (\gamma + \alpha\mu) – v_t/(1-\alpha).$

Here we see that p_t grows one-for-one with m_t, i.e., the price level P_t moves on average in proportion to the money stock M_t, but fluctuates around this average position in response to realizations of v_t, with p_t being temporarily reduced by positive money demand shocks ($v_t > 0$) or boosted by negative shocks ($v_t < 0$). This is clearly an entirely traditional—one might even say “monetarist”—analysis of price level behavior in the economy in question.

Now for an even simpler special case, let us suppose that the money growth rate is zero, i.e., that $\mu = 0$ so that $m_t = m$. Then the solution for p_t is

(18) $p_t = m - \gamma - v_t/(1-\alpha).$

And, finally, if money demand shocks were absent we would have $p_t = m - \gamma$.

It must be noted, however, that while (17) and its special case (18) give the well-behaved, orthodox, bubble-free RE solutions for this model, there are other expressions as well that satisfy the model (12)(13) with RE. For simplicity, let us consider the special case with constant $m_t = m$, but now conjecture a solution of the form

(19) $p_t = \psi_0 + \psi_1 p_{t-1} + \psi_2 v_t + \psi_3 v_{t-1}$,

instead of $p_t = \phi_0 + \phi_2 v_t$. Then working through the same type of analysis as before, one finds that the UC conditions analogous to (16) are

(20) $0 = \alpha \psi_1^2 + (1-\alpha) \psi_1$

$0 = \alpha \psi_1 \psi_2 + \alpha \psi_3 + (1-\alpha) \psi_2 + 1$

$0 = \alpha \psi_1 \psi_3 + (1-\alpha) \psi_3$

$m = \gamma + \alpha \psi_0 + \alpha \psi_1 \psi_0 + (1-\alpha) \psi_0$.

We see, now, that the first of these has two roots $\psi_1^{(1)} = 0$ and $\psi_1^{(2)} = (\alpha-1)/\alpha$. If the former is the relevant root, then we find that $\psi_3 = 0$, $\psi_2 = -1/(1-\alpha)$, and $\psi_0 = m - \gamma$ so that the same expression as in (18) is obtained. But if $\psi_1^{(2)}$ is relevant, then $\psi_3 = -1/\alpha$ and $\psi_0 = (m - \gamma)/\alpha$ while any value of ψ_2 is possible. So an infinity of solution paths is consistent with the model. Note, however, that $\psi_1^{(2)} = (\alpha-1)/\alpha > 1.0$, so most of these solution paths are explosive.

Of course there are other variables and conditions besides those discussed thus far in a fully articulated model of the economy under discussion. As for conditions, it is typically true that a fully-specified optimizing analysis would require that

(21) $\lim_{j\to\infty} E_t \beta^j M_{t+j}/P_{t+j} = 0$,

i.e., that a transversality condition pertaining to real money balances must be satisfied. Here β is a typical agent's discount factor, $\beta = 1/(1+\rho)$, with $\rho > 0$ and therefore $0 < \beta < 1$. Similarly, if one of the economy's assets is government bonds, then another condition necessary for individual optimality would be

$$(22) \quad \lim_{j\to\infty} E_t \beta^j B_{t+j}/P_{t+j} = 0,$$

B_{t+1} being the number of bonds purchased by an agent at t for the price $1/(1+R_t)$ and redeemed for one unit of money in t + 1.

We are now at last prepared to turn to the fiscalist theory. With government bonds recognized, we could write the consolidated[23] government budget constraint in per capita terms as

$$(23) \quad P_t (g_t - tx_t) = M_{t+1} - M_t + (1 + R_t)^{-1} B_{t+1} - B_t,$$

where g_t and tx_t are real government purchases and (lump sum) tax collections, respectively, in per-capita terms. In real terms, this constraint could then be written as

$$(24) \quad g_t - tx_t = (M_{t+1} - M_t)/P_t + (1 + R_t)^{-1} (P_{t+1}/P_t) b_{t+1} - b_t,$$

where $b_t = B_t/P_t$. Please note the mixed notation being utilized: $b_t = B_t/P_t$ whereas $m_t = \log M_t$ and $p_t = \log P_t$. Condition (24) obtains for t = 1,2,….

Now consider the special case of the economy discussed above in which m_t and M_t are constant. Also let the random shock v_t be absent so that P_{t+1} is correctly anticipated in t. Then with the real rate of interest r_t defined by $1 + r_t = (1 + R_t)/(1 + \pi_t)$ where $\pi_t = (P_{t+1} - P_t)/P_t$, and with $r_t = \rho$ as would be implied by optimizing behavior in the absence of shocks,[24] the government budget constraint becomes

$$(25) \quad b_{t+1} = (1 + \rho) b_t + (1 + \rho) (g_t - tx_t) \qquad t = 1,2,\ldots.$$

But since $1 + \rho > 1.0$, if $g_t - tx_t$ is stationary (e.g., constant), the latter reveals a strong tendency for b_t to explode as time passes. As t grows without limit, b_t grows at the rate ρ,

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[23] The government consists of a fiscal authority and a central bank.

[24] See, e.g., McCallum (1998).

i.e., behaves like $(1+\rho)^t$. Thus the transversality condition (22) tends not to be satisfied since growth of b_t just precisely offsets the shrinkage of $\beta^t = 1/(1 + \rho)^t$, yielding a limit that is a positive constant.

In fact, in this case there are just two paths for b_t that, with $g_t - tx_t$ constant, will satisfy (25) and also (22) for t = 1,2,…. One of these obtains if the value b_1 equals $-(1 + \rho) (g - tx)/\rho$, for then (25) implies that

(26) $$b_2 = (1 + \rho) [-(1 + \rho) (g\text{-}tx)/\rho] + (1 + \rho) (g - tx)$$

$$= (1 + \rho) (g - tx) [-(1+\rho)/\rho + 1] = (1 + \rho) (tx - g) /\rho$$

and that same value prevails in all succeeding periods. But $b_1 = B_1/P_1$, and B_1 is the number of nominal government bonds outstanding at the beginning of the initial period, t = 1. Thus if the price level in this first period, P_1, adjusts to equal the value $P_1 = B_1\rho/(1 + \rho) (tx - g)$, then condition (22) as well as (25) will be satisfied. Indeed, this is precisely what the fiscalist theory predicts: P_1 adjusts relative to B_1 and $g - tx$ so as to satisfy the individual agents' optimality condition (22).

But what about the necessary condition for money holdings, equation (12)? Well, the fiscalist answer is that although the path just described will not conform to the $p_t = m - \gamma$ fundamentals solution implied by (18), it can and will satisfy the alternative solution $p_t = [(\alpha - 1)/\alpha]\, p_{t-1} + (m - \gamma)/\alpha$ for all t = 2,3,….[25] The price level P_1, and thus p_1, is determined by B_1 and the b_1 necessary to satisfy (22), and subsequent P_t, p_t values are given by (19) with $\psi_1 = (\alpha - 1)/\alpha$. The price level is exploding as time passes, despite the constant value of M_t, but all of the model's equilibrium conditions including RE are

[25] It might be asked why this relation does not determine p_1 in relation to p_0. I am unclear concerning the answer given by the proponents of the fiscal theory.

satisfied nevertheless. Since P_t and B_t are growing at the same (explosive) rate, while M_t is constant, the outcome is rightfully regarded as highly "fiscalist."[26]

Now let us consider the one other path of b_t that will, with $g_t - tx_t$ constant, satisfy (12) and also (22). It is that $b_{t+1} = 0$ for all t = 1,2,…. Clearly, this is satisfied with $B_{t+1} = 0$ and in that case places no constraint on P_t values. Thus these are free to obey $p_t = m - \gamma$, as in (18). Therefore this solution is the orthodox or monetarist solution.[27]

So we end up with two RE solutions that represent two competing hypotheses regarding price level behavior in the hypothetical economy under study. It is an economy in which the money stock is constant over time, all behavioral relations are constant, and there are no stochastic disturbances impinging upon its agents or productive processes. According to the monetarist hypothesis, the price level is constant through time at a value that is proportional to the magnitude of the money stock, and no government bonds are purchased by private agents.[28] By contrast, the fiscalist hypothesis implies that, despite the constant money stock, the bond stock and the price level both explode as time passes—but without violating any optimality condition for private agents because the initial price level adjusts relative to the initial bond stock so as to make the real bond

[26] There is a serious problem, however, with this solution: if $tx - g < 0$, then a negative price level would be required for satisfaction of (25) by the assumed value of b_1. This problem is stressed by Buiter (1998, p. 20) and McCallum (1998, p. 8).

[27] It is not obvious how (25) is satisfied with $B_{t+1} = 0$ when $tx - g > 0$. But in this case the equilibrium condition $B^D_{t+1} \leq B^S_{t+1}$ is satisfied where bond supply b^S_{t+1} satisfies (22) and bond demand is $b^D_{t+1} = 0$. Buiter (1998, p. 17) argues that the fiscalist assumptions "violate the normal rules for constructing a well-posed general equilibrium model." Also see McCallum (1998, pp. 8-9).

[28] This does not necessarily imply that none are offered for sale by the government.

stock equal the single non-zero value that will permit the stock of real bonds to remain constant and the transversality condition (22) to be satisfied. Under this latter hypothesis, the initial price level is proportional to the initial bond stock and the price level grows in tandem with the bond stock.

In the introduction to this section, it was stated that the section would include not only a description of the fiscal theory of the price level but also an explanation of why I believe it to be empirically invalid. The description that has been given pertains to only one special case, and therefore fails to do justice to the richness of the fiscal proponents' analysis. But the nature of this special case is such that I think no additional words are needed to explain why I find it basically the less plausible of the two hypotheses under consideration.[29]

5. Conclusions

Let us conclude with a brief overview of the paper's arguments. The optimal currency area concept is central to economic analysis of monetary unions, as it clearly identifies the relevant optimizing tradeoff: extension of the area over which a single currency is used enhances allocative efficiency but reduces the possibility of tailoring monetary policy to the needs of different areas. Empirical work has verified the importance of various features of economies that make them strong or weak candidates for a common currency arrangement, but existing studies do not permit actual quantification of costs and benefits of adopting a common currency. In that sense, the OCA concept remains less than fully operational.

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[29] A brief but somewhat more general discussion of the interaction of monetary and fiscal policy strategies is included in McCallum (1999a).

Another relevant body of theory is that pertaining to currency crises. Formal models clarify various points concerning speculative attacks on fixed exchange rates, and show how abrupt reserve losses and depreciations can occur rationally at times when no major shocks are present. These formal models also support the notion that a fixed (but potentially adjustable) exchange regime is not a viable option for most nations, given today's mobility of financial capital. The reason, according to the theory, is that speculative attacks can succeed even if there is no current policy inconsistency if governments have other policy objectives that may at some date take priority over the support of a fixed exchange rate.

The third area discussed is the recently-developed fiscal theory of price level determination. It is emphasized that this theory is drastically different than monetarist orthodoxy; it does not contend that fiscal behavior drives an accommodative monetary authority, but rather that the price level basically mimics the pattern of the government bond stock outstanding rather than base money when their paths differ drastically. An example is exposited in which there are two rational expectations solutions in an economy with a constant money supply. The monetarist solution is that the price level is also constant whereas the fiscalist theory implies that the bond stock and price level both explode as time passes (without violation of any private optimality conditions). These solutions may be viewed as competing hypotheses about the behavior of actual economies, and the paper suggests that the monetarist hypothesis is the more likely to prevail in actuality.

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