EMU at 1

Mark A. Wynne

The economic and monetary union is now one year old, and it seems appropriate to review what has happened during the first year and assess the prospects for the future.

On January 1, 1999, the European Union (EU) launched what will surely be one of the most ambitious political and economic undertakings of the twenty-first century: economic and monetary union (EMU), incorporating eleven of the fifteen current members of the EU. A new currency, the euro, replaced the national currencies of the eleven countries,[1] and a new institution, the European Central Bank (ECB), took over responsibility for monetary policy for the euro area. Many commentators in the United States thought EMU would never take place or, if it did, that it would not last very long. The successful launch of EMU was thus a surprise in some quarters, and some of the skeptics have been forced to reevaluate their positions. EMU is now one year old, and it seems appropriate to review what has happened during the first year and assess the prospects for the future.

Over the course of 1999, the euro depreciated steadily against the dollar. The ECB made its first rate moves, lowering interest rates in April in response to deflation risk in the euro area and raising them in November as the recovery took hold and the inflation outlook deteriorated. The ECB successfully defended its independence against challenges from the finance minister of one of the larger member states and has worked to establish credibility for its commitment to price stability. The TARGET payments system, key to the integration of euro area money markets, came online and has operated without any major problems. The euro has emerged as an important international currency, second only to the dollar. The volume of international bonds denominated in euros exceeded dollar-denominated issuance during 1999. The four EU countries that currently do not participate in EMU all moved closer to eventual membership. However, there were few moves toward the fiscal, labor, and product market reforms that may ultimately determine the fate of EMU.

MAIN DEVELOPMENTS DURING 1999

The euro officially became the currency of the eleven participating nations on January 1, 1999. The rates to be used for converting national currency units into euros were announced on December 31, 1998. During the changeover weekend, January 1 through January 3, the financial community had to reconfigure computer and accounting systems to handle the new currency. Furthermore, all government debt of the euro-area countries was redenominated in euros, as were the share prices

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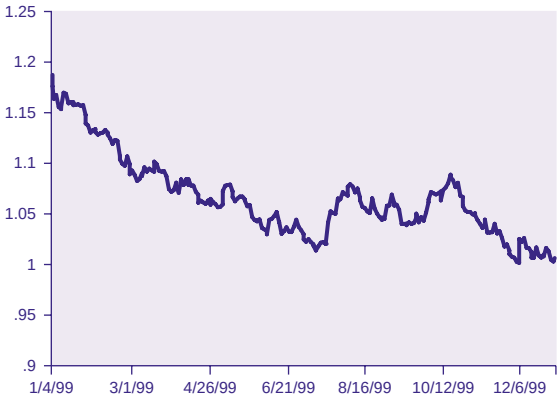
Figure 1

Dollar–Euro Exchange Rate

Dollars per euro



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of all companies listed in the euro area, along with millions of bank accounts.

The most striking and oft analyzed development during 1999 was the steady depreciation of the euro against the dollar. The euro also declined against the yen and the pound sterling. When the euro made its debut on world financial markets on January 4, 1999, it was trading at $1.18. It immediately began to depreciate against the dollar, coming close to parity (and briefly below in intraday trading) by December 1999 (*Figure 1*).[2] The depreciation took many commentators by surprise and was contrary to the confident predictions of many that the euro would rapidly appreciate against the dollar, given the relative current account positions of the United States and the euro area.

However, if we take a longer-term perspective, the decline of the euro against the dollar over the past year is less remarkable. Figure 2 shows the exchange rate of the euro's predecessor, the European Currency Unit (ECU), against the dollar from 1996 through 1998, along with the exchange rate of the euro against the dollar during 1999.[3] Under the terms of the transition to EMU, one ECU was required to equal one euro at midnight December 31, 1998. As Figure 2 shows, in late 1998, the ECU, or rather the legacy currencies of the euro, experienced a strong appreciation against the dollar in the wake of Russia's default and the failure of the hedge fund Long Term Capital Management in the United States. Some of this appreciation may also have been driven by the "europhoria" in the period between the Brussels summit in May 1998—at which the EU heads of government decided which countries would participate in EMU—and the actual launch of EMU.

Perhaps more important for the evolution of the dollar–euro exchange rate was the fact that over the course of 1999 the U.S. economy continued to grow at a robust pace, while the euro area experienced a growth recession. Through the third quarter, GDP increased only 2.3 percent in the euro area, and in autumn 1999 the European Commission forecast an increase of only 2.1 percent for the year as a whole. Unemployment in the euro area remained stubbornly high, declining from 10.6 percent of the labor force in December 1998 to 9.6 percent at the end of 1999. Evidence strengthened that trend productivity growth was accelerating in the United States, but there were few signs that much-needed structural reforms were being undertaken in Europe.

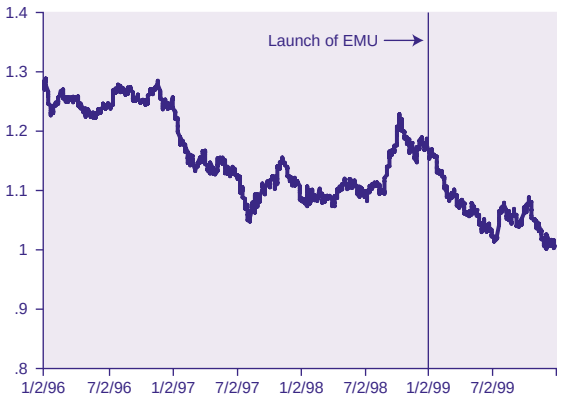
It is too early to take the decline as symptomatic of fundamental problems with the new currency. Over the long run, the nominal exchange rate of the euro against the dollar will reflect the relative success of the ECB in maintaining the euro's purchasing power, but over the short run, cyclical and other factors will be more important.

The ECB made its first rate moves in 1999, lowering its repo rate from 3 percent to 2.5 percent in April and then raising it back to 3 percent in November.[4] It is significant that in neither case was there much political opposition from the countries most likely to have opposed these moves. The rate cut in April was probably

Figure 2

Dollar–ECU, Dollar–Euro Exchange Rates, 1996–99

Dollars per ECU, dollars per euro



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the last thing the rapidly growing economies on the fringe of the euro area (Ireland, Finland, Spain and Portugal) needed. Indeed, Ireland, which has come to be known as the "Celtic Tiger," seems to be exhibiting the symptoms of a classic asset price bubble, with house prices rising by as much as 20 percent to 30 percent a year. Likewise, when it came time to raise rates in November, the sluggish German economy probably could have benefited from a longer period of lower interest rates. However, the ECB's mandate is to maintain price stability in the euro area as a whole. Thus, it has explained its decisions to raise or lower interest rates on the basis of developments at the euro-area level rather than in terms of what has happened in individual member states.[5]

THE CHALLENGE OF CONDUCTING MONETARY POLICY FOR THE EURO AREA

One of the most important tasks prior to EMU was to ensure that the ECB would have at its disposal adequate statistical information to make monetary policy decisions for the euro area. This required some degree of harmonization of statistical practices across the EU, in particular for inflation and monetary statistics. Primary responsibility for the production of official statistics in the EU rests with Eurostat, which is one of the Directorates General of the European Commission. Eurostat produces statistics for the euro area and the member states in conjunction with national statistical institutes and plays a key role in ensuring that statistics are harmonized. GDP estimates for the euro area are constructed on a consistent basis using the ESA95 version of the European System of Accounts (ESA). Unemployment rates for the euro area are calculated using a definition put forward by the International Labour Office in 1982.[6]

The ECB defined price stability in terms of the rate of increase in the Harmonised Index of Consumer Prices (HICP) for the euro area. The HICP program originated in the need for a common measure of inflation to assess EMU membership candidates' compliance with the convergence criteria stipulated in the treaty. The various national consumer price indexes (CPIs) differ significantly in their concept and coverage. According to the European Commission (1998), as much as 13 percent of expenditures covered by the HICP are excluded from some national CPIs, while as much as 17 percent of expenditures covered by some national CPIs are excluded from the HICP. The HICP differs from the U.S. CPI, for example, beginning with the pricing concept. While the U.S. Bureau of Labor Statistics uses the theory of the cost of living index as the framework for constructing the U.S. CPI (U.S. Bureau of Labor Statistics 1997), the HICP uses "household final monetary consumption," which means that only the prices paid in monetary transactions are included. The HICP does not, therefore, include the imputed costs of agricultural products grown for personal consumption or the services of owner-occupied dwellings. The latter is included in the U.S. CPI and accounts for approximately one-fifth of the basket.[7]

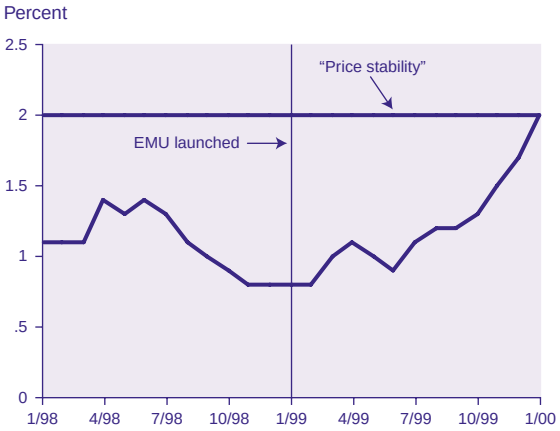
A more serious problem from the ECB's perspective is that the HICP program only began in 1997. Aggregate HICP data are available for a slightly longer period, but the fact remains that the ECB must work with price statistics for which there are a limited number of observations. Even if a long time series on prices were available, it is not clear how useful it would be to the ECB. Since Lucas (1976), economists have been sensitive to the instability of estimated empirical relationships in the face of policy regime changes. While there is some debate in macroeconomics as to what exactly constitutes a regime change, few would deny that EMU is a major change in the monetary policy regime for all the participating countries.

PRICE STABILITY

Article 105 (1) of the Maastricht Treaty states that the primary objective of the ECB shall be to maintain price stability but leaves it to the ECB to define what exactly, in terms of measured inflation, constitutes price stability. Prior to EMU, the ECB announced that it would define price stability as a "year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2%." Furthermore, price stability is to be maintained "over the medium term."[8] At the launch of EMU, HICP inflation in the euro area was running at an annual rate of about 1 percent, having slowed from rates in excess of 2 percent in early 1996. An energy price deceleration in 1997 and decline in 1998 contributed significantly to the favorable inflation situation at the launch of EMU. However, as Figure 3 shows, during 1999 the inflation rate accelerated as energy prices started to increase and the euro declined against the dollar and other major currencies.

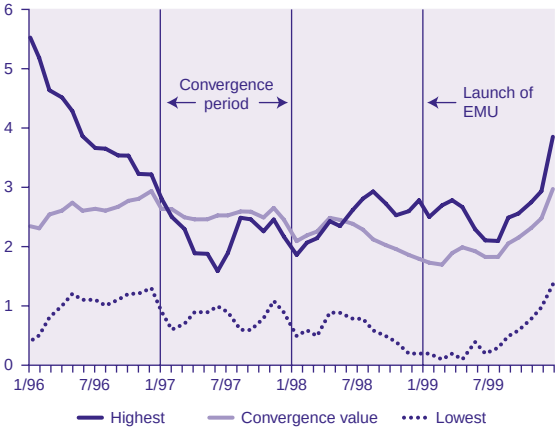
Furthermore, there has been some divergence of inflation rates across the euro area over the past year. Figure 4 shows highest and

Figure 3
Euro-Area HICP Inflation



SOURCE: Eurostat.

Figure 4
Inflation in the Euro Area



SOURCE: Eurostat.

lowest inflation rates across the eleven euro area countries, along with the limit set down in the Maastricht Treaty.[9] Since mid-1998, inflation in Portugal, Spain, and Ireland has exceeded the limit set down in the treaty, although as of December 1999 only Ireland's inflation rate was more than 1.5 percentage points above the average of the three lowest. The ECB does not yet include a measure of core inflation for the euro area in the statistical appendix to its *Monthly Bulletin*, although Eurostat, the EU's statistical agency, does include a core measure ("All items excluding energy, food, alcohol, and tobacco") on its web site.[10]

THE REFERENCE VALUE FOR M3

The twin pillars of the ECB's monetary policy strategy are a reference value for the growth rate of the broad money aggregate M3 and a broadly based assessment of the outlook for future price developments and the risks to price stability in the euro area. The choice of M3 rather than a narrower aggregate was based on research indicating the M3 aggregate has desirable characteristics in terms of stability and information about future inflation.[11]

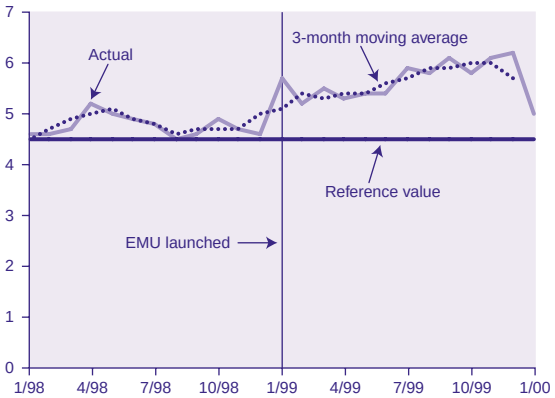
The reference value for M3 is derived from three assumptions:

1. Price stability is defined as a rate of increase in the HICP of 2 percent or less.
2. The trend rate of growth of real GDP in the euro area is 2 percent to 2.5 percent.
3. The trend rate of decline in M3 velocity is about 0.5 percent to 1 percent a year.

These three assumptions, together with a standard quantity theory view of the determination of the price level, led the Governing Council to choose a reference value of 4.5 percent for M3 growth during 1999.[12] The monthly statistics on M3 growth are assessed in relation to this reference value using a centered three-month moving average of monthly growth rates. It should be noted that the ECB's derivation of the reference value for the euro area's M3 aggregate is similar to the Bundesbank's procedure to derive its annual M3 target (see Deutsche Bundesbank 1995).

As Figure 5 shows, M3 growth drifted steadily away from its reference over the course of the year. As of December 1999, M3 growth was almost 2 percentage points above the reference value. The ECB discounted some of the deviation as due to temporary factors associated with the euro's introduction. The ECB's failure

Figure 5
Euro-Area M3 Growth



SOURCE: European Central Bank.

Monetary Aggregates for the Euro Area

Before EMU, each of the EU member states constructed monetary aggregates using national definitions that differed across countries. It was not possible to arrive at a consistent aggregate for the euro area by simply adding together these differing national aggregates. Thus, a key challenge prior to EMU's launch was to harmonize definitions to allow consistent measures to be constructed for the single currency area. As part of this harmonization process, the European Monetary Institute and the national central banks developed the concept of a Monetary Financial Institution (MFI), consisting of three types. The first is central banks. The second is resident credit institutions as defined by EU law, and the third is "all other resident financial institutions whose business is to receive deposits and/or close substitutes for deposits from entities other than MFIs and, for their own account…to grant credits and/or to make investments in securities." This third category consists primarily of money market funds.

The main broad monetary aggregates for the euro area are defined below. The M1 aggregate consists of currency in circulation and overnight deposits and differs little from the old national definitions of M1. The category overnight deposits includes balances on prepaid cards in those countries where prepaid card schemes exist. M2 adds to M1 deposits with agreed maturity up to two years and deposits redeemable at notice up to three months. The M3 aggregate adds to M2 repurchase agreements, liabilities of money market funds and debt securities up to two years. Note that prior to EMU, repurchase agreements were excluded from the national definitions of monetary aggregates in France and Italy, while money market fund shares/units were included only in the national monetary aggregates of France. For further information on the new euro-area aggregates and how they relate to old national definitions, see European Central Bank (1999b).

Definitions of Euro-Area Monetary Aggregates

	M1	M2	M3
Currency in circulation	✔	✔	✔
Overnight deposits	✔	✔	✔
Deposits with agreed maturity up to two years		✔	✔
Deposits redeemable at notice up to three months		✔	✔
Repurchase agreements			✔
Money market fund shares/units and money market paper			✔
Debt securities up to two years			✔

SOURCE: European Central Bank.

to raise interest rates aggressively in response to the deviation suggests that it may take a pragmatic view of the reference value for M3, much as the Bundesbank did of its M3 target. From the time the Bundesbank set its first monetary target (in 1974) until the start of EMU, it succeeded in hitting its target only about half the time.

COMMUNICATION: TRANSPARENCY AND ACCOUNTABILITY

One criticism levied against the ECB during its first year is that it is not sufficiently transparent in making monetary policy decisions and is not held adequately accountable for those decisions (see, for example, Buiter 1999 and Begg et al. 1998). The critics argue that the ECB should publish the minutes of Governing Council meetings, the votes of individual council members, and the reasoning and forecasts that underlie council decisions. The ECB has resisted publication of minutes and votes, arguing that making such information public would increase pressure on council members to vote along national lines rather than in the interests of the euro area as a whole (see Issing 1999).

Transparency in monetary policymaking has many dimensions, and much of the criticism of the ECB seems unwarranted. Table 1 compares practices of the ECB, the Federal Reserve System, and the Bank of England as they relate to transparency and accountability. The policymaking committee of the ECB—the Governing Council—meets much more frequently than the Federal Reserve System's Federal Open Market Committee (FOMC) or the Bank of England's Monetary Policy Committee (MPC). Through 1999 the ECB's Governing Council met every two weeks (except during August) at the ECB's headquarters in Frankfurt, although the Maastricht Treaty requires only that it meet at least ten times a year (Protocol No. 3 on the Statute of the European System of Central Banks and the European Central Bank, Article 10.5). A press conference was held after the first of the two meetings in each month, and the tradition seems to be evolving that rate moves are only made at the meetings that are followed by a press conference. At the press conference the president of the ECB summarizes recent economic developments, then he and the vice president hold a question-and-answer session with journalists. The opening statement and the Q&A are posted on the ECB's web site (http://www.ecb.int) within hours. The ECB views the press conference, along with the editorial that appears in each issue of its *Monthly Bulletin*, as a substitute for the publication of minutes. (Neither the FOMC nor the MPC holds a press conference after its meetings.) Transparency is a slippery concept, and there is no meaningful way to evaluate whether a press conference following a policy decision constitutes more or less transparency than the publication of votes and minutes.[13]

The second issue concerns the publication of forecasts. The Bank of England has been an innovator in this regard, publishing on a regular basis its inflation forecast and not just a point forecast. The FOMC does not publish forecasts (although the chairman does report the range of forecasts of committee members in his twice-yearly Humphrey–Hawkins testimony).

Article 109b.3 of the Maastricht Treaty requires that

> The ECB shall address an annual report on the activities of the ESCB [European System

of Central Banks] and on the monetary policy of both the previous and current year to the European Parliament, the Council and the Commission, and also to the European Council. The President of the ECB shall present this report to the Council and to the European Parliament, which may hold a general debate on that basis.

The ECB submitted its first annual report in April 1999, and the European Parliament's Committee on Economic and Monetary Affairs reviewed it. In its response, the committee called for greater transparency from the ECB (see European Parliament 1999). Specifically, the committee noted that it

> 7. Regrets that the ECB has fallen short of the transparency practiced by other leading central banks; notes that the U.S. Federal Reserve Board [sic], Bank of Japan, Bank of England and Swedish Riksbank now report both sides of arguments about monetary actions; and calls for summary minutes taken at meetings of the ECB Governing Council to be published shortly after the following meeting reporting explicitly the arguments for and against the decisions taken, as well as the reasoning used in reaching these decisions;
> 8. Calls on the ECB to publish macroeconomic forecasts on a six-monthly basis which set out the prospects and the risks attached to those prospects for: domestic demand and its principal components, net exports, nominal and real gross domestic product, consumer price inflation, unemployment and the current account balance, together with such relevant data and research on which such forecasts are based, in order to permit a reliable assessment of monetary decisions, avoid market misinformation, ensure market transparency and hence counter speculation;
> 9. Calls on the ECB to publish a regular overall report of economic developments in each of the participating euro-area countries together with a summary of the national data which will facilitate comparisons of best practice; enable early warnings of potential problems within the euro-area which might require policy action by respective governments; and inform national wage bargainers of sustainable earnings developments given their own productivity, price and competitiveness trends.…

Table 1
Transparency in Monetary Policymaking at the Federal Reserve, the ECB, and the Bank of England

	ECB	Federal Reserve System	Bank of England
Policymaking committee	Governing Council	Federal Open Market Committee	Monetary Policy Committee
Frequency of meeting	Every two weeks	Every six or seven weeks	Every month
Announced strategy	Yes	No	Yes
Quantitative definition of price stability	Yes	No	Yes
Publication of forecasts	Not yet	No	Yes
Publication of minutes	No	Yes	Yes
Publication of votes	No	Yes	Yes
Press conference	Yes	No	No
Accountable to elected body	Yes	Yes	Yes

SOURCES: European Central Bank, Federal Reserve System, Bank of England.

At the subsequent hearings the ECB president acceded to the request to publish forecasts and promised they would be published during 2000, along with the economic models used to produce these forecasts. However, he rejected the request that the ECB publish summary minutes, arguing as before that the information the ECB provided at its press conferences and in its *Monthly Bulletin* came "very close in substance to the publication of summary minutes." He also rejected calls for reports on each euro-area country, arguing that the production of such reports would impede the development of a euro-area perspective. The Committee on Economic and Monetary Affairs called for publication of votes on monetary policy actions after a two-year delay, but this proposal was rejected when put to a vote of the full European Parliament.

Concerns about the ECB's accountability to the European electorate have two dimensions. The first is whether the provisions of the Maastricht Treaty that require the ECB to report to the European Parliament satisfy the need of accountability in a democratic society. The second is whether the European Parliament has the stature to represent the European electorate's concerns. Regarding the latter, two significant developments took place during 1999. In March, the Parliament for the first time forced the resignation of the European Commission over allegations of financial misconduct, thereby enhancing the Parliament's standing among EU institutions and its authority as the representative body of the EU electorate. And on May 1, the Amsterdam Treaty entered into

Table 2
Functions of International Currencies

	Private use	Official use
Unit of account	Pricing/quotation currency	Pegging currency
Medium of exchange	Payment/vehicle currency In exchanges of goods and services In currency exchange	Intervention currency
Store of value	Investment/financing currency	Reserve currency

SOURCES: Cohen (1971), Hartmann (1998).

force, substantially extending the right of co-decision of the European Parliament, making it the council's legislative equal in many areas.[14]

EMERGENCE OF THE EURO AS AN INTERNATIONAL CURRENCY

Prior to the euro's launch, there was much discussion about the extent to which it would compete with or even displace the dollar as the world's most important international currency. Some argued it would take a long time for the euro to replace the dollar in international transactions because of network effects. (I find it more useful to conduct transactions in dollars when more of my trading and investment partners also conduct transactions in dollars). Others argued that EMU itself was a shock of sufficient magnitude to trigger rapid adoption of the euro (see, in particular, Portes and Rey 1998).

The ECB has stated repeatedly that "internationalisation of the euro…is not a policy objective…[and] will be neither fostered nor hindered by the Eurosystem." Table 2 lists the main functions of international currencies, using the traditional classification of the functions of money (see Cohen 1971 and Hartmann 1998). The U.S. dollar is used to quote prices for industrial commodities, and many countries maintain some type of currency peg to the dollar. There are significant holdings of U.S. dollars in countries that have experienced high inflation, while foreign central banks typically use dollars to intervene in foreign exchange markets to support their local currency. Until last year the dollar was the currency of choice for international bond issuance, and most central banks continue to hold the bulk of their foreign exchange reserves in dollar-denominated assets.

Since the introduction of the euro, most commodity prices continue to be quoted in dollars, but large European firms now use the euro for quotation purposes. For instance, Airbus no longer uses the dollar to quote aircraft prices. As of the end of 1999, three countries (Estonia, Bulgaria, and Bosnia–Herzegovina) were pegging their currencies to the euro through currency board arrangements. A larger group of countries (Cyprus, Macedonia, Cape Verde, Comoros, and the fourteen countries of the West African Colonies Françaises d'Afrique [CFA] zone) had more traditional fixed exchange rate pegs to the euro. Denmark and Greece are also pegged to the euro, albeit under a cooperative arrangement under the terms of ERM II, the successor to the Exchange Rate Mechanism (ERM) of the European Monetary System.[15] A third group (Croatia, the Czech Republic, the Slovak Republic, and Slovenia) has managed floats vis-à-vis the euro. A fourth group (Hungary, Iceland, Malta, Poland, Turkey, Bangladesh, Botswana, Burundi, Chile, Israel, and the Seychelles) has either fixed or crawling pegs to baskets of currencies that include the euro. Finally, a fifth group of countries pegs to the Special Drawing Right (SDR) issued by the International Monetary Fund in which the euro has a weight of about one quarter. (The other currencies in the SDR basket are the U.S. dollar, the Japanese yen, and the pound sterling).

Perhaps the most significant benefit to the EU from internationalization of the euro would be the seigniorage revenue it would earn from foreign demand for euros. Although euro notes and coins will not be introduced until 2002, it is worth considering the revenue this may generate. At the end of 1999, approximately $600 billion of U.S. currency was in circulation. According to Porter and Judson (1996), more than half the stock of U.S. currency—and possibly as much as 70 percent—was held outside the United States at the end of 1995. If we choose a conservative estimate of 50 percent and assume that absent these foreign holdings the federal government would have to issue an equivalent amount of short-term debt at the then-prevailing interest rate of 5.3 percent, the flow of seigniorage to the U.S. Treasury from the foreign holdings was about $15.6 billion (= $600 billion × 50 percent × 5.3 percent). As of November 1999, there was approximately €330 billion of currency outstanding in the euro area. Since euro notes and coins have not yet been introduced, this total consists of the notes and coins of the ten legacy currencies (Luxembourg was in a monetary union with Belgium prior to EMU). It is unlikely that many of the legacy currencies circulated to a significant extent beyond their national borders, with the exception of the Deutsche mark. Seitz (1995) estimates that approximately 40 percent of the stock of Deutsche marks circulates outside Germany. In November 1999, Deutsche mark notes and coins

in circulation amounted to €126 billion, or about 38 percent of the euro-area total. Thus, the estimated seigniorage revenue currently accruing to the euro area (specifically, to Germany) from non-euro-area holdings of Deutsche marks amounts to about €2 billion a year (= €126 billion × 40 percent × 4 percent, using the interest rate on two-year euro-area government bonds as of November 1999 as an estimate of what the government would have to pay to raise the funds by borrowing).[16] This probably constitutes a lower bound on the amount of seigniorage the EU will earn from non-EU holdings of the euro once the notes and coins are introduced. The euro's domestic habitat is significantly larger in economic terms than that of the Deutsche mark, making the euro more attractive to non-EU residents than the Deutsche mark was. The estimated foreign seigniorage revenue currently earned by the United States is probably an upper bound on what the EU can expect to earn.

Euro notes will include €100, €200, and €500 denominations.[17] Currently, the highest denomination note issued by the Federal Reserve is the $100 bill. Higher denomination notes may make the euro an attractive alternative to the dollar as a store of value in countries undergoing high inflation. It may also make the euro more attractive for transactions in the underground economy. The existence of high-denomination euro notes in and of itself will not cause individuals who currently hold dollars as a secure store of value in high-inflation countries or for illicit purposes to immediately switch to euros. These individuals will also have to be convinced that the euro will retain its value as well as, or better than, the dollar. This, in turn, will depend on the ECB's track record in maintaining price stability in the euro area.

TARGET

The architects of EMU faced a key challenge in the creation of a payments system that integrated money markets in all EU countries. The TARGET system (TARGET stands for Trans-european Automated Real-time Gross settlement Express Transfer) consists of fifteen national real-time gross settlement systems and the ECB payment mechanism. It provides a uniform platform for processing cross-border payments. Prior to EMU, payments between EU countries relied almost exclusively on correspondent banking arrangements. Since the beginning of 1999, these relationships have declined dramatically, although most banks seem to be maintaining one or two correspondent accounts for each euro-area country until the euro notes and coins are introduced in 2002.

The TARGET system was created, first, to provide a pan-European payments system that would integrate national money markets and support the monetary policy of the ECB, and second, to safeguard financial markets and institutions from systemic events. The former was accomplished by linking the existing national payments systems. The latter was accomplished by moving to a real-time gross-settlement standard for national payments systems prior to EMU and away from end-of-day settlement, or netting systems, in which participants accumulate large open positions against their counterparties.

On January 4, 1999, its first day of operation, the TARGET system processed about 156,000 payments, with a total value of about €1.18 trillion. Of these, about 5,000 were cross-border payments, totaling about €245 billion. The volume of cross-border payments rapidly increased to 20,000 to 30,000 a day, with a total value between €300 billion and €400 billion, after only a week of operation. The successful launch of TARGET—and the consolidation of national money markets—was reflected in the rapid reduction in interest rate spreads in overnight money markets in January 1999.

Of the other systems available for processing payments in euros, the three largest are Euro 1, Euro Access Frankfurt (EAF), and the Système Net Protégé (SNP) (known since April 1999 as Paris Net Settlement, PNS). There are also two smaller local systems: Servicio Español de Pagos Interbancarios (SEPI) in Spain and Pankkien väliset On-line Pikasiirot ja Sekit (POPS) in Finland. Together these systems settle a daily average volume of €400 billion, and the Euro 1 system (a cooperative undertaking between EU-based commercial banks and the EU branches of foreign banks) is by far the most extensively used alternative to TARGET. The existence of competitively priced alternative payments systems caused some concern (see, for example, Prati and Schinasi 1999) that TARGET might not attract the volume of high-value payments needed to significantly contribute to a lowering of payments-system systemic risk. That concern appears to have been unfounded: through September 1999, the average value of TARGET payments was €5.8 million. The average value of cross-border payments was €12.9 million, while the average value of domestic payments was €4.4 million.

The average values of the payments settled by the three biggest other systems (Euro 1, EAF, and PNS) were €2.8 million, €3.3 million, and €4.5 million, respectively.

WHAT ABOUT THE OUTS?

Not all fifteen members of the EU chose to participate in EMU from the outset. Greece failed to meet the convergence criteria laid down in the Maastricht Treaty, while the UK, Sweden, and Denmark chose to stay out for domestic political reasons. Greece formally applied for membership in March and hopes to become a member at the beginning of next year. As part of the convergence process, the Greek drachma was revalued on January 17, 2000. The situation in the UK, Sweden, and Denmark as to eventual membership in EMU is less clear.

When the Maastricht Treaty was first put to a referendum in Denmark, it was decisively rejected by the electorate. The treaty was ratified in a subsequent referendum, but only after it had been amended to provide an opt-out from the single currency for Denmark (Protocol No. 12 of the Maastricht Treaty). However, since the start of EMU the Danish krone has been pegged to the euro with a ±2.25 percent fluctuation band under the terms of ERM II, meaning that, in effect, Danish monetary policy is dictated by the ECB. The Danish prime minister has already launched a political campaign to bring Denmark into EMU, and in September the ruling Social Democrats will hold a referendum on Denmark's entry into EMU.

Although Sweden satisfied all the convergence criteria for participation in EMU, it did not join at the outset because of domestic "Euroscepticism." Some of this skepticism waned in the closing months of 1998, when Denmark and Sweden were more adversely impacted by fallout from the Russian default than was Finland, which had elected to join EMU. Over the past year, attitudes in Sweden have wavered between joining and not joining. However, in January the ruling Social Democratic Party announced for the first time that it formally supports Swedish membership in EMU.

Which leaves only the UK. The government secured an opt-out from EMU when the Maastricht Treaty was negotiated (Protocol No. 11 of the Maastricht Treaty). With the change of government in the UK in 1997, official attitudes toward the EU changed significantly, and the new Labor government declared its intention to take the UK into EMU when the time is right. In late 1997 the UK Treasury announced five economic tests that would be used to determine when the UK should join (see HM Treasury 1997):

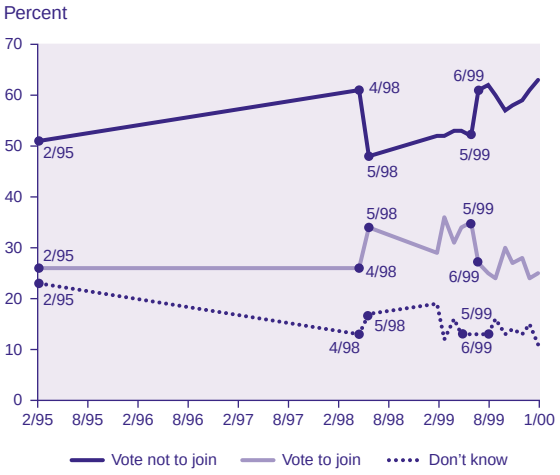
1. Are business cycles and economic structures compatible so that the UK and other members of EMU could live comfortably with a common interest rate on a permanent basis?
2. If problems emerge, is there sufficient flexibility to deal with them?
3. Would EMU membership enhance the attractiveness of the UK to overseas investors?
4. How would EMU membership affect the competitive position of the UK's financial services industry?
5. Will EMU membership promote higher growth, stability, and a lasting increase in jobs?

These tests are sufficiently vague that the government could easily announce that the tests are satisfied at any time. The UK took a further step forward in February 1999 with the publication of a National Changeover Plan (HM Treasury 1999) that details how UK membership in EMU might come about and presents a timetable for replacing sterling with the euro.

A more binding constraint on UK membership is the Labor government's commitment to put the issue to a referendum. As Figure 6 shows, the UK public remains skeptical about the single currency, and in the June 1999 elections to the European Parliament, the anti-euro Conservative Party won 36 seats, compared with the Labor Party's 29 seats. However, while public opinion in the UK remains decidedly against membership in EMU, a significant segment of British industry believes it is in the UK's interest to join. A June 1999 survey of members of the Institute of Directors revealed that 67 percent were in favor of the UK joining the single currency (in principle). In July the Confederation of British Industry (CBI) announced that it was in favor of the UK joining EMU. The CBI adopted a pro-EMU stance after a poll of its members showed that some 52 percent backed eventual membership.[18] However, the CBI has subsequently announced that it will no longer actively campaign for UK membership until the government takes a more active role in promoting the issue.

Opponents of UK membership in EMU often argue that the UK business cycle is more closely aligned with the U.S. business cycle than

Figure 6
UK Attitudes to the Single Currency



SOURCE: ICM Research.

with the cycle in continental European countries and that the criterion of cyclical convergence will never be satisfied. This fact is documented by Wynne and Koo (forthcoming), among many others. They show that the correlation between the cyclical component of output in the UK and the United States is 0.67, which exceeds the correlation of UK output with that in France (0.58) or Germany (0.45). The relative magnitudes are similar if we look at employment instead of output. However, the relevance of this fact to the debate about UK membership in EMU is not obvious. To begin with, we do not fully understand why the UK business cycle is more closely correlated with the U.S. cycle than with the cycle in the rest of Europe. The correlation may reflect the significant volume of trade and investment flows between the UK and the United States (most U.S. foreign direct investment in Europe goes to the UK), or it may be due to other factors.

These flows, in turn, may be influenced over time by the UK's attitude toward EMU. If the UK were to remain outside EMU permanently, some of these investment flows might shift to the euro area. Already a number of Asian investors in the UK have indicated they will rethink their location choices should the UK delay for long its decision on EMU membership. Rose (1999) presents evidence suggesting the real effects of a monetary union may be substantial. Specifically, he shows that two countries that share a common currency tend to trade three times as much as they would if they had different currencies. Furthermore, Frankel and Rose (1998) demonstrate that the closer the trade links between countries, the more highly correlated their business cycles are.

OUTLOOK

I noted at the beginning of this article that many commentators in the United States doubted EMU would ever happen or thought that, if it did, it would be a source of conflict within the EU and between the EU and the United States (see Feldstein 1997a,b). The common thread in the skeptics' arguments was that the EU does not constitute an optimum currency area in the sense of Mundell (1961).[19] While there were some differences in economic performance across the euro area over the past year, we did not see the kind of dramatic asymmetries the skeptics believe will cause EMU to collapse. Despite sluggish growth in two of the larger economies (Germany and Italy), unemployment continued to decline across the euro area, although it does remain at unacceptably high levels. Germany, which accounts for about one-third of euro-area economic activity, only experienced one quarter of negative growth (at the end of 1998) rather than a full-blown recession. How well the institutions of EMU will deal with more severely asymmetric cycles if and when they occur is an open question.[20]

In the near term it is also essential that the EU address the issue of lender of last resort for the euro area. The ECB has a very limited role in bank supervision and regulation, and the Maastricht Treaty does not spell out what exactly the responsibilities of the ECB are in the event of a major financial crisis. Article 105 of the Maastricht Treaty mandates that the European System of Central Banks (ESCB) shall "promote the smooth operation of the payments system." The same article also states that "the ESCB shall contribute to the smooth conduct of policies pursued by the competent authorities relating to the prudential supervision of credit institutions and the stability of the financial system" and that the European Council may confer upon the ECB specific tasks related to supervision. Begg et al. (1998) argue that the current arrangements are unsafe and that there is no secure mechanism for creating liquidity in the event of a crisis. Banking supervision remains a national responsibility, and there are questions about whether the ECB would have access to the relevant information to allow it to make quick decisions if a crisis occurs.[21] The European Parliament's Committee on Economic and Monetary Affairs (EPCEMA) recently noted that "…the ESCB's arrangements for the emer-

gency provision of liquidity to financial institutions in distress have been called into question by the International Monetary Fund and by private sector observers, and EPCEMA urges the ESCB to make clear that the necessary procedures for approval and disbursement of such 'lender of last resort' facilities are in place and have been rehearsed."

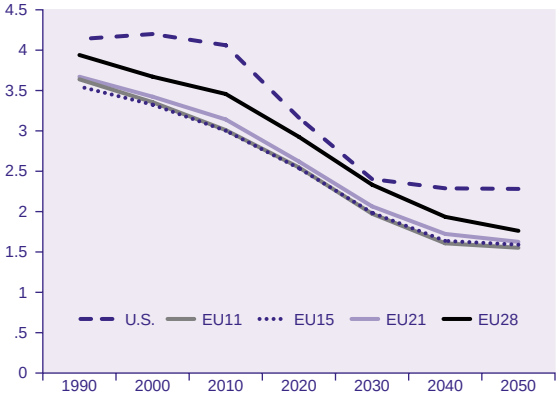
In its convergence report prepared as part of the transition to EMU, the European Monetary Institute (the forerunner of the ECB) drew attention to the long-term problems posed by pay-as-you-go pension systems in the EU.[22] The ECB reiterated this point in its January 2000 *Monthly Bulletin*, noting that "the ageing of populations represents a serious challenge to the sustainability of the pay-as-you-go financed public pension schemes" in the euro area. To give some sense of the scale of the problem faced by the euro-area economy, Figure 7 presents projections of the number of potential workers per retired person over the next fifty years for the United States and the EU.[23]

The decline in the ratio in the United States reflects the aging of the baby-boom generation and is the primary demographic factor fueling the debate over the long-term sustainability of the Social Security program here. However, as Figure 7 shows, the aging problem is more severe in the EU than in the United States. The figure presents four variants for the EU. The first two are for the euro area (EU11) and the current fifteen members of the EU (EU15). Variant 3 (EU21) shows the projections if the EU expands to include the six current applicants considered the most likely candidates for early membership (Estonia, Poland, the Czech Republic, Hungary, Slovenia, and Cyprus). The final variant (EU28) shows what happens if the EU expands to include all thirteen of the current applicants (in addition to the six just mentioned, Latvia, Lithuania, the Slovak Republic, Bulgaria, Romania, Malta, and Turkey).

Figure 7

Aging Populations in the EU and U.S.

Workers per retiree



SOURCE: United Nations.

The rapid rise in the dependency ratio (decline in the number of workers per retiree) in the EU reflects declining birth rates and increased longevity. The decline in the birth rate in three of the largest euro-area economies (Germany, Italy, and Spain) has been so dramatic in recent years that, were it not for immigration, the populations of these countries would have fallen.[24] The aging of the population might not be so problematic were it not for the extensive reliance on publicly funded pensions in these countries and the relatively generous nature of these pensions. In Germany, for example, workers are entitled to a public pension equal to 72 percent of their average net lifetime earnings. Additionally, public expenditure on health care for the elderly is high and has risen with recent costly advances in medical technology. In short, demographic developments over the next decades could prove a serious threat to the fiscal positions of many of the euro-area governments that will necessitate painful reforms at some point. Some changes have recently been made (France now indexes pensions to prices rather than wages; Germany switched from indexing to gross wages to indexing to net wages), but more remains to be done.

Obviously the aging of the EU population is independent of whether the countries share a common currency. Rather, its significance stems from the institutional framework of EMU and, in particular, the restrictions on national fiscal policies as set out in the Maastricht Treaty and elaborated upon in the Growth and Stability Pact.

Article 104 of the Maastricht Treaty states that

> 1. Member States shall avoid excessive government deficits.
> 2. The Commission shall monitor the development of the budgetary situation and of the stock of government debt in the Member States with a view to identifying gross errors. In particular it shall examine compliance with budgetary discipline on the basis of the following two criteria:
> (a) whether the ratio of the planned or actual government deficit to gross domestic product exceeds a reference value….
> (b) whether the ratio of government debt to gross domestic product exceeds a reference value….

5. If the Commission considers that an excessive deficit in a Member State exists or may occur, the Commission shall address an opinion to the Council.
6. The Council shall, acting by a qualified majority on a recommendation from the Commission…decide after an overall assessment whether an excessive deficit exists.
7. Where the existence of an excessive deficit is decided…the Council shall make a recommendation to the Member State concerned with a view to bringing that situation to an end within a given period….
9. If a Member State persists in failing to put into practice the recommendations of the Council, the Council may decide to give notice to the Member State to take, within a specified time-limit, measures for the deficit reduction which is judged necessary by the Council in order to remedy the situation….
11. As long as a Member State fails to comply with a decision taken in accordance with paragraph 9, the Council may decide to apply or, as the case may be, intensify one or more of the following measures:
– to require the Member State concerned to publish additional information, to be specified by the Council, before issuing bonds and securities;
– to invite the European Investment bank to reconsider its lending policy towards the Member State concerned;
– to require the Member State concerned to make a non-interest-bearing deposit of an appropriate size with the Community until the excessive deficit has, in the view of the Council, been corrected;
– to impose fines of an appropriate size.

The Growth and Stability Pact adopted at the Dublin Summit in December 1996 is intended to clarify and strengthen the provisions of the treaty in regard to excessive deficits by strengthening fiscal discipline under EMU.[25] The existence of large, unfunded public pension liabilities will certainly complicate EMU participants' ability to abide by the terms of the treaty and the Growth and Stability Pact.[26]

CONCLUSIONS

By any reasonable standards, the first year of EMU must be judged a success. The changeover weekend went by without incident, the TARGET payments system was launched without any major problems, and the ECB has successfully taken over monetary policy for the euro area. The ECB faced the first serious challenge to its independence and effectively defended its status. It also conducted its first policy moves, easing monetary policy in April in the face of a growing threat of deflation and weak real activity in the euro area. In November it reversed course, tightening policy as the balance of risks shifted to higher inflation, and the euro-area recovery took hold.

The success of the first year does not mean that it will be all plain sailing from here on. Many challenges remain, and how the EU and the ECB tackle these will determine the ultimate fate of EMU. One issue highlighted in this article is the rapidly aging population of the EU. The aging of the population over the coming decades in conjunction with generous pension provisions will put a severe strain on the public finances of the euro-area economies. One solution might be to admit large numbers of immigrants, but Europe does not have a tradition of encouraging large-scale immigration. The only alternative is drastic reform of the public pension programs in all the countries, something no government has yet been willing to tackle. More generally, structural reforms of labor and product markets are crucial if the EU is to address the high unemployment rates and sluggish growth that have plagued it for the past decade. Small moves have been made in this direction, but a lot more needs to be done.

NOTES

I thank Bill Gruben, Evan Koenig and Carlos Zarazaga for comments on an earlier draft and Eric Millis for research assistance. Martin Boon at ICM Research in London kindly supplied the results of the ICM Research/Guardian polls of UK attitudes to the single currency. Responsibility for remaining errors rests with the author.

1 The eleven countries participating in EMU are Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain.

2 On January 27 the euro closed at below parity for the first time ($0.9883 in New York).

3 The European Currency Unit (ECU) was a synthetic currency defined on the basis of a basket of the currencies of the EU member states. Specifically, on December 31, 1998, one ECU consisted of 3.301 Belgian francs, 0.6242 German marks, 0.1976 Danish krones, 6.885 Spanish pesetas, 1.332 French francs, 0.08784 British pounds, 1.44 Greek drachmas, 0.008552 Irish punts, 151.8 Italian lira, 0.13 Luxembourg francs, 0.2198 Dutch guilders and 1.393 Portuguese escudos (see European Central Bank 1999a, 72).

[4] Arguably the first policy action of the ECB was taken in December 1998, when the eleven euro-area central banks (the so-called Eurosystem) coordinated a reduction in their short-term interest rates to a common 3 percent level before the formal launch of EMU.

[5] To this end, in its *Monthly Bulletin* the ECB publishes statistics only for the euro area as a whole and not for individual member states. Statistical information is provided on developments in the four EU countries that do not participate in EMU (Denmark, Greece, Sweden, and the UK) and also on developments in the United States and Japan.

[6] Formally, people are counted as unemployed if they are without work, are available to start work in the next two weeks, and have actively sought employment at some point during the previous four weeks.

[7] The relative importance of owner's equivalent rent in the U.S. CPI as of December 1997 was just over 20 percent.

[8] Interestingly, the ECB does not define how long the "medium term" is.

[9] The Maastricht Treaty stipulates that, as one of the convergence criteria for assessing suitability for EMU membership, a country's inflation rate should not exceed the average rate of the three best performers by more than 1.5 percentage points.

[10] See http://europa.eu.int/comm/eurostat/.

[11] See, for example, the recent working paper by Coenen and Vega (1999), which builds on other research conducted by the ECB's predecessor, the European Monetary Institute.

[12] In December 1999, the Governing Council announced that this value will also be used for 2000.

[13] Note also that the president of the ECB has indicated that none of the decisions to change interest rates were made by a formal vote.

[14] One of the objectives of the Intergovernment Conference that drew up the Amsterdam Treaty, which was signed in October 1997, was to enhance the democratic accountability of EU institutions.

[15] The main components of the European Monetary System, which existed prior to EMU, were the Exchange Rate Mechanism, which was essentially a system of fixed exchange rates between the currencies of the participating countries, and the European Currency Unit, which has now been replaced by the euro.

[16] Note that the seigniorage revenue will be distributed among participating countries using a formula prescribed in the Maastricht Treaty Protocol No. 3 on the Statute of the European System of Central Banks and the European Central Bank, Articles 29 and 31.

[17] The denominational structure of the euro will consist of coins at the 1, 2, 5, 10, and 20 euro cent denominations, coins at the €1 and €2 denominations, and notes at the €5, €10, €20, €50, €100, €200, and €500 denominations.

[18] *The Economist* newspaper surveyed British economists in early 1999 and found that about 65 percent favored UK membership in EMU.

[19] Ironically, the critics seem to overlook the later papers by Mundell (1973a,b) in which he proposes additional criteria for evaluating the suitability of a single currency for a group of countries. As a result of these works, he has been referred to in some circles as the father of the euro. See also Mundell (1998a,b).

[20] The studies of Frankel and Rose (1998) and Rose (1999) just cited are also relevant to this question. Insofar as sharing a common currency enhances trade flows within the euro area and these trade flows lead to more synchronous business cycles, the concern about asymmetric shocks may prove unfounded. However, within a monetary union as long-standing and fully credible as the United States, asymmetric cycles may occasionally emerge. Through the 1980s and 1990s different regions of the United States experienced shocks that caused localized recessions of varying degrees of severity; the term "rolling recessions" entered policy debates to describe this phenomenon.

[21] Prati and Schinasi (1999) articulate similar concerns.

[22] See also the recent report by the G-10 (Group of Ten 1998).

[23] Specifically, the figure shows the ratio of the population aged 25 to 64 to the population aged 65 and older and is taken from the "medium variant" projections in United Nations (1998).

[24] In its most recent forecasts the United Nations (1998) projects that the population of Italy will fall from 57.3 million in 2000 to 41.2 million in 2050, that of Germany from 82.2 million to 73.3 million, and that of Spain from 39.6 million to 30.2 million.

[25] For further details see the May 1999 issue of the ECB's *Monthly Bulletin*.

[26] The need for fiscal rules under a monetary union is a contentious issue. Artis and Winkler (1997) argue that the excessive deficit provisions of the treaty can be justified on the grounds that under monetary union the costs of an overly expansionary fiscal policy will be borne by all members of the monetary union and not just by the country pursuing the policy, creating an incentive for countries to be more lax with their fiscal policy. Bergin (2000), arguing from the perspective of the fiscal theory of the price level, makes a similar point.

REFERENCES

Artis, Michael J., and Bernhard Winkler (1997), "The Stability Pact: Safeguarding the Credibility of the European Central Bank," European University Institute Working Paper RSC no. 97/54 (Florence, Italy: European University Institute).

Begg, David, Paul De Grauwe, Francesco Giavazzi, Harald Uhlig, and Charles Wyplosz (1998), "The ECB: Safe at Any

Speed?" *Monitoring the European Central Bank,* no. 1 (London: Center for Economic Policy Research).

Bergin, Paul R. (2000), "Fiscal Solvency and Price Level Determination in a Monetary Union," *Journal of Monetary Economics* 45 (February): 37–53.

Buiter, Willem H. (1999), "Alice in Euroland," Center for Economic Policy Research Policy Paper no. 1.

Buiter, Willem H., Giancarlo Corsetti, and Nouriel Roubini (1993), "Excessive Deficits: Sense and Nonsense in the Treaty of Maastricht," *Economic Policy* 16 (April): 57–100.

Coenen, Günter, and Juan-Luis Vega (1999), "The Demand for M3 in the Euro Area," European Central Bank Working Paper no. 6.

Cohen, Benjamin J. (1971), *The Future of Sterling as an International Currency* (London: Macmillan).

Deutsche Bundesbank (1995), *The Monetary Policy of the Bundesbank* (Frankfurt am Main: Deutsche Bundesbank).

European Central Bank (1999a), *Annual Report 1998* (Frankfurt am Main: European Central Bank).

——— (1999b), *Euro Area Monetary Aggregates: Conceptual Reconciliation Exercise* (Frankfurt am Main: European Central Bank).

European Commission (1998), *Report from the Commission to the Council: On the Harmonisation of Consumer Price Indices in the European Union* (Brussels: Commission of the European Communities).

European Parliament (1999), *Report on the Annual Report for 1998 of the European Central Bank*, European Parliament Session Document, October 15, 1999.

Feldstein, Martin (1997a), "EMU and International Conflict," *Foreign Affairs* 76 (November/December): 60–73.

——— (1997b), "The Political Economy of the European Economic and Monetary Union: Political Sources of an Economic Liability," *Journal of Economic Perspectives* 11 (Fall): 23–42.

Frankel, Jeffrey A., and Andrew K. Rose (1998), "The Endogeneity of the Optimum Currency Area Criteria," *Economic Journal* 108 (July): 1009–25.

Group of Ten (1998), *The Macroeconomic and Financial Implications of Ageing Populations* (Basle: Bank for International Settlements).

Hartmann, Philipp (1998), *Currency Competition and Foreign Exchange Markets: The Dollar, the Yen and the Euro* (Cambridge: Cambridge University Press).

HM Treasury (1997), *UK Membership of the Single Currency: An Assessment of the Five Economic Tests* (London: HM Treasury).

——— (1999), *Outline National Changeover Plan* (London: HM Treasury).

Issing, Otmar (1999), "The Eurosystem: Transparent and Accountable or 'Willem in Euroland,' " Center for Economic Policy Research Policy Paper no. 2.

Lucas, Robert E., Jr. (1976), "Econometric Policy Evaluation: A Critique," *Carnegie–Rochester Conference Series on Public Policy* 1: 19–46.

Mundell, Robert A. (1961), "A Theory of Optimum Currency Areas," *American Economic Review* 51 (September): 657–65.

——— (1973a), "A Plan for a European Currency," in *The Economics of Common Currencies*, ed. Harry G. Johnson and Alexander K. Swoboda (London: George Allen and Unwin), 143–72.

——— (1973b), "Uncommon Arguments for Common Currencies," in *The Economics of Common Currencies*, ed. Harry G. Johnson and Alexander K. Swoboda (London: George Allen and Unwin), 114–32.

——— (1998a), "The Case for the Euro–I," *Wall Street Journal*, March 24, A22.

——— (1998b), "The Case for the Euro–II," *Wall Street Journal*, March 25, A22.

Porter, Richard D., and Ruth A. Judson (1996), "The Location of U.S. Currency: How Much Is Abroad?" *Federal Reserve Bulletin* 82 (October): 883–903.

Portes, Richard, and Hélène Rey (1998), "The Emergence of the Euro as an International Currency," *Economic Policy* 26 (April): 307–43.

Prati, Alessandro, and Garry J. Schinasi (1999), "Financial Stability in European Economic and Monetary Union," Princeton Studies in International Finance no. 86 (Princeton, N.J.: Princeton University Printing Services).

Rose, Andrew K. (1999), "One Money, One Market: Estimating the Effect of Common Currencies on Trade," NBER Working Paper Series, no. 7432 (Cambridge, Mass.: National Bureau of Economic Research, December).

Seitz, Franz (1995), "The Circulation of Deutsche Mark Abroad," Discussion Papers of the Economic Research Group of the Deutsche Bundesbank, no. 1/95.

United Nations (1998), *World Population Prospects: The 1998 Revision*, vol. I, Comprehensive Tables (New York: United Nations).

U.S. Bureau of Labor Statistics (1997), *BLS Handbook of Methods* (Washington, D.C.: U.S. Government Printing Office).

Wynne, Mark A., and Jahyeong Koo (forthcoming), "Business Cycles Under Monetary Union: A Comparison of the EU and U.S.," *Economica*.