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Exchange Rate Policies

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Exchange Rate Policies

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Abstract

Modern macroeconomic theory teaches us new lessons about exchange rates: Currency depreciations or appreciations that change the relative competitiveness of producers in different countries are undesirable from a global perspective if they lead to relative prices that do not reflect the true relative costs of production. From this standpoint, "external balance" does not mean that trade balances should be zero, but rather that global resources are allocated efficiently. The implications of this insight for the role of the exchange rate in monetary policy are explored here. Some of the traditional arguments for purely floating exchange rates are challenged by this approach. The paper also briefly considers sterilized intervention and comments on the role of international reserves.

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A debate has continued over many years on the desirable degree of foreign exchange rate flexibility. One side of the debate has sometimes made the case that the exchange rate should be freely determined by market forces, independently of any foreign exchange intervention or targeting by central bank monetary policy. This argument takes the stance that the market can best determine the appropriate level of the exchange rate.

From the standpoint of modern macroeconomics, particularly from the view of New Keynesian economics, that stance is potentially self-contradictory. Markets are able to achieve efficient, welfare-maximizing outcomes when they operate without distortions—that is, when markets are competitive and prices adjust instantly to reflect underlying costs. But in such a world, the nominal exchange rate regime is of no consequence in determining the real allocation of resources. The real exchange rate (the consumer price level in one country compared with the level in another country, expressed in a common currency) and the terms of trade (the price of a country's imports relative to its exports) could adjust freely to efficient levels under a floating nominal exchange rate regime, a managed float, or even a fixed exchange rate regime if goods markets were perfectly efficient. Nominal prices could respond to market pressures even if the nominal exchange rate does not. In a world of perfect markets, relative prices can allocate resources efficiently independently of the determination of any nominal prices or the nominal exchange rate.

If the nominal exchange rate regime matters for the determination of relative prices such as the real exchange rate or the terms of trade, it must matter because there is some kind of nominal price stickiness. For example, if the U.S. dollar/euro exchange rate is to affect any real prices, it must be because there are some nominal prices that are sticky in dollar terms and others that are sticky in euros. From the standpoint of modern macroeconomics, the question should be posed: What policy best deals with the distortions—from sticky prices and other sources? Is it a fully flexible exchange rate, or some sort of exchange rate targeting? Moreover, the relevance of an exchange rate policy is only for the "short run." Once enough time has passed for nominal prices to adjust to any economic imbalances, the nominal exchange rate regime is irrelevant—the nominal price adjustments can bear the load of relative price changes without any help from the exchange rate.

The political case for fully flexible exchange rates is sometimes made to rest on the notion that floating exchange rates can achieve "external balance." External balance is an ill-defined term, but usually what its proponents mean is trade balance or current account balance. Sometimes the term refers to "sustainable external balances," another vaguely defined term. What is clear is that the proponents of this point of view believe that floating exchange rates will eliminate large current account deficits or surpluses.

However, there is very little empirical support for this notion. The idea probably is not based on experience, but instead on open-economy models of the 1950s and 1960s that *assumed* the exchange rate would adjust to eliminate trade imbalances if it were freely floating.

I will discuss the evidence on the role of exchange rates in achieving trade balance. In fact, exchange rate adjustment may have a modest effect on current account imbalances in the short run, but even that modest

claim is not firmly established in the evidence. It is important to recognize that evidence on the long-run effects of the terms of trade on imports and exports is not particularly relevant to the issue of which nominal exchange rate regime is appropriate. The nominal exchange rate regime only matters—only can influence real prices—at the horizon of price adjustment. Once enough time has passed for nominal prices to adjust, relative price changes can occur under any nominal exchange rate regime.

The second point relates to the notion of external balance. A current account deficit or surplus does not necessarily represent any inefficient outcome in financial markets. The current account is not only the country's trade balance (with the addition of net foreign asset returns), but it is also the difference between the nation's total saving and its investment in capital goods. It is natural for some countries to borrow to finance investment, or in some cases, consumption.

Instead, I will discuss a different notion of external imbalance—an imbalance in the level of the exchange rate. If global markets allocate resources efficiently, then prices should reflect underlying resource costs (costs of labor, technology levels, efficiency in production, etc.). The competitiveness of firms should not depend on the nominal exchange rate. A currency is misaligned when the exchange rate moves to a level where a country's competitiveness in world markets is altered. I will discuss how currency misalignments can be inefficient even though exchange rates do not have large short-run effects on trade balances.

The modern Keynesian literature makes the case that the exchange rate may rightly be a target of monetary policy, along with domestic goals such as inflation and the output gap. Exchange rates do not automatically settle at a level that eliminates external imbalance as I have just defined it. Exchange rates are asset prices that are driven not only by current economic considerations, but by news about the future (and possible market sentiment or bubbles). Markets cannot reliably deliver external balance when there are distortions such as nominal price stickiness, so it may be desirable to consider exchange rate objectives in determining monetary policy.

However, any country acting on its own has an incentive to manipulate its currency—perhaps depreciating it to enhance the competitiveness of its own firms. There is a case for monetary policy coordination on broad currency targets.

I then turn to two issues that are of special interest to emerging markets. First is the determination of the exchange rate target. Even among advanced economies that have similar production structures, it is difficult to pinpoint the exchange rate that eliminates currency misalignment (just as it is difficult, for example, to determine the "full-employment" level of unemployment). But the task is much harder for the exchange rate of an emerging market relative to a high-income country. To some extent, as I will discuss, the problem is one of data limitations.

The second important point is credibility of monetary policy. Countries with a history of high inflation may find it difficult to undertake reform of monetary policy. One very visible way of establishing central bank credibility is to fix the nominal exchange rate fully. Policymakers in this situation face a trade-off: The cost of this quick route to credibility is giving up other objectives of monetary policy. Sometimes fixing the ex-

change rate can leave the country with an inflation rate that differs from the target that a fully credible central bank would desire, and fixing the exchange rate can sometimes make it more difficult to achieve a target for the output gap.

Finally, I briefly review special questions that arise under sterilized intervention, when the policymaker can target the exchange rate but still leave some room for other monetary policy objectives. The evidence strongly suggests that sterilized intervention can only be effectively used when private capital markets are unable to offset the effects of the intervention. This can occur when the government imposes controls on private flows of capital or when a country's private capital markets are not deep enough to compete with large-scale intervention by central banks.

A country undertaking general economic liberalization may find it desirable to keep capital controls in place until internal markets are sufficiently liberalized—this is a well-known conventional argument. During the period in which capital controls are effective, the central bank has the luxury of determining exchange rate policy somewhat independently of monetary policy.

But there are three dangers. First, if exchange rate policy is divorced from monetary policy, then stabilizing the exchange rate may not earn any credibility for monetary policy (though perhaps it does lend credibility for the overall stability of economic policy). Second, policymakers are particularly vulnerable to the charge of "currency manipulation." If internal nominal prices can be set by monetary policy, and the nominal exchange rate can be set separately by sterilized intervention, then the policymaker may be able to influence real external prices for a long period of time. This exposes the country to the charge that its external competitiveness is determined by monetary and exchange rate policy, rather than by its underlying comparative advantage. Third, a policy of sterilized intervention requires a policy regarding foreign currency reserves.

The contentious issue of management of foreign currency reserves is far too complex for me to address in this paper. I will briefly touch on three points. First, while it was commonly argued before the recent global financial crisis that many Asian countries were wasting resources in accumulating large foreign currency reserves, it has been widely noted that countries with large reserves fared relatively well during the crisis. Second, the odd thing about the crisis was that even though it originated primarily in the U.S. financial sector, the immediate effect of the crisis was to strengthen the dollar. The logic is that holders of dollar assets were unwilling to sell them, so there was a worldwide shortage of dollars. In this case, at least, it is dollar reserves that protected some countries—SDRs or euros would not have been as useful. Third, the willingness of the Federal Reserve to extend swaps to central banks around the world perhaps requires us to reexamine the need for foreign exchange reserves as a buffer in times of crisis.

This paper really is an opinionated survey of current research on exchange rate policy, but it does not offer a specific recipe for policymakers. Instead, the single most important point is that there is a strong case with firm analytical foundations for policy to manage fluctuations in exchange rates. Macroeconomic theory does not support the claim that a policy

that allows a fully flexible exchange rate with complete hands-off by policymakers will deliver an efficient market outcome.

1. THE EXCHANGE RATE AND CURRENT ACCOUNT BALANCE

If exporters set prices in their own currency, and there is nominal price stickiness, then exchange rate movements will alter a country's terms of trade. For example, consider a world of two countries—Europe and the U.S. If European exporters set prices in euros, $P^{€}_{E,X}$ (the subscript E refers to Europe, X refers to export prices, and the superscript refers to the currency of pricing), then the dollar price of U.S. imports, $S^{\$/€}P^{€}_{E,X}$, is directly influenced in the short run by the dollar per euro exchange rate, $S^{\$/€}$. Likewise, if U.S. exporters set their prices in dollars, $P^{\$}_{U,X}$, then the euro price of European imports, $P^{\$}_{U,X}/S^{\$/€}$, moves inversely with the exchange rate. A dollar depreciation (an increase in $S^{\$/€}$) directly and instantaneously raises the price of imports in the U.S. and lowers the price of imports in Europe. If the elasticity of demand for imports is sufficiently high, and all other influences on the trade balance are held constant, then a depreciation of the dollar should raise the U.S. trade balance. Its exports should increase relative to its imports.

Alternatively, consider a small open economy. That country may have no influence on the world prices of traded goods. For example, Korea (which is not so small, but perhaps too small to set prices of traded goods) may compete in a world in which all traded goods prices are set in dollars. It imports goods from the U.S. that are priced in dollars, and when it exports to the U.S., it must price in dollars. The level of the dollar/won exchange rate would not influence Korea's terms of trade in the short run because both prices are set in dollars. But prices of nontraded goods and services in Korea are set in won and sticky in won terms in the short run. A depreciation of the won relative to the dollar, according to this analysis, should increase the price of traded goods relative to nontraded goods within Korea. We might then expect that a depreciation of the won would switch demand toward Korean nontraded goods and away from traded goods. Potentially, this depreciation could improve the Korean trade balance if it leads to a decline in imports. The depreciation may also induce an expansion of Korea's export industry. As the won prices of exports increase, resources will move into Korea's export industries. (In contrast to the example of U.S. and Europe in the previous paragraph, this type of analysis assumes that Korea is a small enough force in world markets that it can increase its supply of exports to the world without any reduction in its export price.)

These theories imply that currency depreciations should improve trade balances for large and small economies. But the economic evidence is not so encouraging. First, it should be noted that it is very difficult to assess the effect of exchange rates on trade balances. There are few if any cases of "exogenous" changes in the exchange rate. The econometrician cannot perform a controlled experiment, depreciating a currency and then gauging its effect on trade. Instead, any comovements between exchange rates and trade quantities are confounded by the forces that cause the exchange rate to change in the first place. In the simplest case, one might believe

that a country with a trade deficit will experience a depreciation, and the depreciation will help to eliminate the trade deficit. But then it is hard econometrically to separate out the effect of the depreciation on the trade balance and the effect of the trade balance on the depreciation.

Empirical studies that have undertaken the challenge have tended to find a very low response of trade to exchange rate changes. The elasticity of import demand with respect to exchange rates in the short run is frequently found to be in the inelastic range—below one.[1] Exchange rate movements will not have a large effect on the trade balance in the short run. Or put another way, if we were to rely on the exchange rate alone to equilibrate large imbalances, the exchange rate change required may be very large.[2]

Again, I will emphasize that the relevant statistic we are trying to measure is the short-run elasticity of demand—the adjustment that can occur in response to the exchange rate at business-cycle frequencies. Take the U.S./Europe example above. The terms of trade, $S^{\$/€}P^{€}_{E,X} \,/\, P^{\$}_{U,X}$, may over the course of several years have a relatively large influence on imports and exports. Some estimates from the international trade literature put the elasticity of import demand as high as six or eight or even larger.[3] But those long-run effects occur over a period of time when nominal prices should have had time to adjust. Even with the nominal exchange rate, $S^{\$/€}$, fixed, the terms of trade can increase if either $P^{€}_{E,X}$ rises or $P^{\$}_{U,X}$ falls.

Moreover, it is mistaken to conclude that the terms of trade can adjust under a fixed exchange rate only with a general inflation in one country or a general deflation in another. If the prices of goods that a country exports rise over time, general price stability is still attainable. Other components of the consumer price index—prices of nontraded goods and services, and prices of imported goods—may fall. Over long periods of time, countries with relatively stable overall prices, such as the U.S., still find some prices—such as food and electronics—falling while other prices rise.

Given the difficulties with measuring the impact of exchange rate changes on import demand, perhaps of more interest is the recent study by Chinn and Wei (2008) that directly addresses the question of whether the exchange rate regime matters for current account adjustment. They examine the speed of adjustment of current account imbalances in 171 countries, using annual data in the 1971–2005 period. They measure the persistence of current account imbalances by the speed at which the current account returns to its long-run average. They classify countries by exchange rate regime: floating, fixed, and intermediate regimes according to the system developed by Reinhart and Rogoff (2004). The study finds that there is no strong or robust relationship between the exchange rate regime and the speed of adjustment.

The first two paragraphs of this section laid out the traditional models of why a depreciation should improve the country's current account bal-

[1] For example, see Rose and Yellen (1989); Hooper, Johnson, and Marquez (2000); Chinn (2004); Chinn and Lee (2009); and Lee and Chinn (2006). Also see Reinert and Roland-Holst (1992), Blonigen and Wilson (1999), and Heathcote and Perri (2002).

[2] See, for example, the calculations in Obstfeld and Rogoff (2000b, 2005, 2007).

[3] See, for example, Feenstra and Levinsohn (1995), Head and Ries (2001), Lai and Trefler (2002), and Ruhl (2005).

ance. The advocates of purely flexible exchange rates believe that a country with a large trade deficit will experience a nominal depreciation that will play a significant role in equilibrating the trade balance. Why does the evidence not support this view?

There are two main problems. First, the economic behavior described in these two paragraphs is not consistent with actual economic behavior. Second, the underlying presumption that exchange rates move to eliminate trade balances is not well grounded in theory and defies common sense observation.

In terms of the economic behavior, there are three differences between the traditional "models" (based on the 1960s-style analysis) described in the first two paragraphs and reality. First, it is well understood that short-run elasticities of import demand can be low. Because of the costs of doing international trade, import contracts are often written with significant lead times. It is difficult to cancel contracts in the short run if there are adverse exchange rate movements. Moreover, a large quantity of non-oil trade among advanced economies—perhaps two-thirds—is in durable consumer and capital goods.[4] Even if firms and households immediately adjust their desired stock durables in response to price changes, the aggregate accumulation or decumulation of these stocks occurs gradually over time due to the costs of adjusting durable stocks. Indeed, as I have already noted, long-run import demand elasticities are estimated to be much higher than short-run elasticities.

Second, there is now a large body of empirical evidence of pricing to market and low pass-through of exchange rates to prices. Contrary to the analysis above, prices of imported goods do not change very much in the short run in response to exchange rate changes. The U.S. price of imported goods from Europe is sticky in U.S. dollars. As the dollar/euro exchange rate changes, the dollar price of imported goods changes very little in the short run. This type of price stickiness leads automatically to pricing to market. If the price of a European good is set in euros when it is sold in Europe and dollars when it is sold in the U.S., then the price of the good in U.S. markets in dollar terms can deviate from the (dollar) price in European markets.[5]

Using the example in the first paragraph of this section, the euro price of the European good sold within Europe, $P_{E,C}^{€}$ (the subscript C refers to the consumer price, as distinct from the export price), is sticky in the short run. The dollar price of the European export, $P_{E,X}^{\$}$, tends to be sticky also. The price in the U.S. of European goods, $P_{E,X}^{\$}$, does not fluctuate with the exchange rate and therefore does not move closely with the price in Europe, translated into dollars using the exchange rate: $S^{\$/€}P_{E,C}^{€}$.

It is important to recognize that consumer prices of imported goods are particularly nonresponsive to exchange rates. There is a large empiri-

[4] See Engel and Wang (2008).

[5] My own work is among the earliest to emphasize the nonresponsiveness of consumer prices to exchange rates and the deviations from the law of one price. See Engel (1993, 1999) and Engel and Rogers (1996). See also, for example, Parsley and Wei (2001). A great deal of subsequent analysis supports these findings. See, for example, these very recent papers: Gopinath and Rigobon (2008), Gopinath, Itskhoki, and Rigobon (forthcoming), Burstein and Jaimovich (2009), Crucini, Shintani, and Tsuruga (2008, 2009) and Gopinath et al. (2009).

cal literature that looks at the currency of invoicing of exports and the price of imports at the dock. There is mixed evidence on the measurement of pass-through of exchange rates directly to import prices. While U.S. import prices are not very responsive to exchange rate changes, there is more responsiveness in other countries—particularly smaller countries. But that pass-through does not continue on to the prices paid by final users. The consumer prices, even in smaller countries, are not so responsive to exchange rates. Apparently, the distributors and retailers that take the good from the dock and bring it to the consumer absorb the effects of exchange rate changes. Prices paid by the final user are not very responsive to the exchange rate, which implies that demand for imports will not be very responsive to exchange rates unless the distributor/retailer is able to change sources (from other exporting countries or from internal producers) as the exchange rate changes.[6]

A third consideration that might explain why current account balances overall—rather than imports per se—are not very responsive to exchange rates is that many export goods are produced using imported intermediate goods. A depreciation may increase the price of imported goods, but if those goods are inputs into the export sector, the country's competitiveness may not be strongly affected. Putting together these three elements—low short-run elasticities, low pass-through, and imported intermediate goods—into a macroeconomic model calibrated to match Asian economies, Devereux and Genberg (2007) conclude that a depreciation of the currency will have little effect (and possibly perverse effects) on the current account balance.

It is equally important to note that there is no strong economic rationale for the case that exchange rates should move to eliminate trade imbalances. The textbook models of the 1960s defined external balance as a zero balance in trade in goods and services or a zero current account balance. But subsequent developments in economic thinking—the logic of economic models developed in the past forty years—have tended to emphasize the weaknesses in this notion of external balance.

It is a matter of simple accounting identities that a country's current account balance equals the difference between national saving and investment in capital goods. National saving in turn is the sum of private saving (household plus corporate saving) and government saving (taxes less government spending on goods and services). In the first place, the economic link is weak between exchange rates on the one hand and saving and investment on the other hand. Saving and investment are much more strongly determined by other economic variables, particularly the level of GDP and expected future growth rates, than they are by real exchange rates.

Moreover, it may be an efficient global equilibrium for some countries to run current account deficits and others to run surpluses. Global "balance" does not mean that current accounts need to be balanced. Efficient global capital markets will reallocate funds from countries whose saving exceeds their internal investment needs to those that desire to borrow to finance current consumption and investment.

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[6] See Burstein, Eichenbaum, and Rebelo (2005).

This is not to say that international capital markets are, in fact, efficient. There is a strong case to be made that capital markets failed badly, especially in the U.S., in the run-up to the crisis. Lenders, and the financial system as a whole, did not adequately provision for the riskiness of their loans. There was too much borrowing in the U.S., and that surely contributed to the large U.S. current account deficit.

But exchange rates are not primarily determined by the current imbalance between imports and exports or between output and expenditure. Exchange rates are asset prices—the price of one currency in terms of another. Like any asset price, they are forward looking. They are determined not only by current economic "fundamentals," but also and primarily by expectations of future fundamentals. This has been standard economic theory since the late 1970s, when the so-called asset market approach to exchange rates was developed. But somehow, the policy implications have been ignored. By this, I mean simply that if exchange rates are forward-looking asset prices, then equilibrium in foreign exchange markets is not reached when the trade balance is zero.

Put another way, if foreign exchange were traded only to finance imports, then the demand for foreign exchange would be determined by the demand for imports. Foreign demand for domestic currency would then equilibrate with domestic demand for foreign currency when trade was in balance. But casual observation tells us that only a very tiny fraction of foreign exchange trade is generated by import demand. Instead, foreign exchange trade is almost entirely for hedging and speculation purposes. The equilibrium in the foreign exchange market is not determined by trade balance. Instead, the foreign exchange rate will be determined as the expected present discounted value of current and future economic fundamentals.[7]

Before turning to a new perspective on external balance, I want to address briefly a different channel through which recent literature has suggested the exchange rate may equilibrate external imbalances. Gourinchas and Rey (2007a) have noted that the net external position of a country—its net indebtedness—depends not only on the accumulation of its past borrowing, but also on the valuation of that debt. A country may have borrowed extensively in the past, but if the debt has fallen in value, the country's net debt to the rest of the world may be substantially less than its accumulated borrowing.

Put another way, a country can afford borrowing and debt if valuation changes work to its advantage. The U.S. has been a net borrower from the rest of the world for most of the past four decades. But, Gourinchas and Rey argue, the U.S. debt position may be sustainable if, as the country accumulates debt, the value of the debt deteriorates. In particular, since the U.S. is able to borrow in dollar-denominated debt, the foreign-currency value of its debt will fall when the dollar depreciates. Gourinchas and Rey present evidence that, indeed, in periods in which U.S. debt has risen substantially, the dollar has tended to depreciate. Valuation effects have worked as a mechanism of adjustment.

[7] A recent extensive examination of the exchange rate from an asset market perspective is in Engel and West (2005).

It is not clear whether this mechanism works for other countries or whether the empirical relationship is very robust for the U.S.[8] But even if it is true that in the past the U.S. has successfully relied on valuation changes to ease adjustment in its financial position, it is unlikely that many countries could rely on this channel of adjustment. If we expect a country's currency to depreciate, then borrowers should incorporate that expectation into asset prices. Countries that lend to the U.S. in dollar terms should require a higher nominal interest rate on U.S. debt to compensate for this expected depreciation. This outcome is mitigated substantially only if U.S. dollar-denominated debt is considered to be a very good "safe haven." Then foreigners are willing to accept a lower expected return on U.S. debt, so that the expected depreciation of their dollar assets is an acceptable cost for holding such a safe asset.

But not many countries can enjoy this safe haven privilege. Most countries borrow externally in debt denominated not in their own currency, but in foreign currency. Gourinchas and Rey (2007b) have used the term "exorbitant privilege" to describe the ability of the U.S. to borrow in its own currency, potentially at a lower expected rate of return than other countries.[9]

Finally, on this point, economic logic suggests that a country can enjoy the safe haven privilege even if it had a fixed exchange rate. Under a fixed exchange rate system, the safe haven currency would simply have a lower interest rate or higher face value to reflect its value as a safe haven. The point here is that "valuation effects" do not just operate through the exchange rate, but through the price of the underlying assets as well.

2. CURRENCY MISALIGNMENT

Modern Keynesian macroeconomics follows the general theme that policy—especially monetary policy—should be aimed at correcting or at least combating economic inefficiencies. In particular, monetary policy is particularly useful in working to offset short-run sticky price distortions.

In the open-economy setting, sticky prices can lead to currency misalignments if they cause international prices to deviate from their underlying resource costs. Prices allocate goods efficiently when the relative price of goods reflects the relative marginal costs for producing those goods (the marginal rate of transformation). Moreover, the prices paid by different consumers should differ only because the costs of delivering the goods to the consumers may differ. The efficient equilibrium requires that the marginal rate of substitution between any two goods for any household should equal the relative marginal costs of those goods (inclusive of the costs of distributing the goods to households).

When goods prices are sticky, short-run changes in exchange rates

[8] See, for example, Curcuru, Dvorak, and Warnock (2008, forthcoming).

[9] Curcuru, Dvorak, and Warnock (2008, forthcoming) argue that, in fact, there is no exorbitant privilege. They find instead that to the extent the U.S. is able to earn higher returns on its foreign investments than foreigners earn on U.S. investments, it is attributable both to the mix of assets in the portfolios (U.S. investments abroad are in riskier assets) and poor investment timing by foreigners in U.S. assets. Devereux and Sutherland (forthcoming) cast doubt from a theoretical perspective on whether valuation effects can be a channel for external adjustment from an ex ante perspective.

generally will deliver relative price changes that do not have an efficiency rationale. The exchange rate may move because of expectations of some future change in fundamentals, but those expectations do not reflect any current change in the resource costs of producing goods. Additionally, some have argued that exchange rates in the short run are influenced by investor sentiment, or bubbles, and of course those changes also do not reflect underlying true economic costs.

I will say that an exchange rate or a currency is misaligned when the exchange rate change, in combination with nominal price stickiness, has led relative prices internationally to deviate from the efficient levels that represent underlying costs. External balance means the currency is not misaligned. This is a notion of external balance that is not arbitrary and simply assumed, but rooted in economic logic.

Even if exchange rate changes lead to changes in relative prices that are inefficient, it is not necessarily the case that monetary policy should target exchange rates as a separate objective beyond its domestic objectives. Obstfeld and Rogoff (2000a, 2002) and Clarida, Gali, and Gertler (2002) have developed well-known and influential models, with the implication that currency misalignments should not be a separate goal of monetary policy. According to these models, if monetary policy targets its familiar internal objectives—inflation and the output gap—then the exchange rate will adjust to eliminate any misalignments.

Those papers build simple models that rely on the economic assumption discussed above, that export prices are set in the exporter's currency and adjust only slowly. To recap the example given previously, assume European exporters set prices in euros, $P^{€}_{E,X}$, and American exporters set prices in dollars, $P^{\$}_{U,X}$. Then the terms of trade, $S^{\$/€}P^{€}_{E,X} / P^{\$}_{U,X}$, will fluctuate with changes in the nominal exchange rate. As Devereux and Engel (2006) discuss, when exchange rates are asset prices and subject to fluctuations based on news about future fundamentals, the terms of trade will not reflect underlying resource costs of the traded goods. Exchange rate fluctuations will affect the relative competitiveness of European compared with American producers, and there can be currency misalignments.

But in the simple models of Obstfeld and Rogoff (2000a, 2002) and Clarida, Gali, and Gertler (2002), these misalignments do not require that central banks directly target exchange rates. When the dollar depreciates relative to the euro, for example, there will be an increase in aggregate demand for U.S. goods and a switch in demand away from European goods. If the central banks target internal aggregate demand, as reflected in producer price inflation and the gap between actual output and its efficient level (the "output gap"), then the policy is automatically working to eliminate the currency misalignment. When aggregate demand returns to its optimal or efficient level, the exchange rate will have adjusted back into place where it is no longer leading to misalignments in demand for U.S. relative to European-produced goods.

In essence, these models are similar to the models of the 1960s—exchange rates directly affect aggregate demand by affecting import prices—but they dispense with the archaic notion that the exchange rate will automatically adjust to achieve external trade balance. Instead, the onus is on monetary policy to restore balance in markets. But in these models,

when internal balance is restored, the currency will adjust so it is no longer determining the relative international competitiveness of producers.

Another strand of the open-economy New Keynesian literature has emphasized that currencies can be misaligned even if internal markets are in balance. Devereux and Engel (2003), Corsetti and Pesenti (2005), and Engel (2009), among others, have focused on the role of incomplete pass-through of exchange rates to consumer prices. Again, we can recap an example given above. Suppose European goods are priced in euros for sale in Europe ($P^{€}_{E,C}$) and priced in dollars for export sale in the U.S. ($P^{\$}_{E,X}$). Then the prices paid by U.S. consumers are not equal to the prices paid by European consumers (when the latter are expressed in comparable dollar terms, $S^{\$/€}P^{€}_{E,C}$). Abstracting from transportation, distribution, and marketing costs, these price wedges imply that resources will be distributed inefficiently. For example, if the dollar is extremely weak ($S^{\$/€}$ is very high), then the price paid by Europeans may be high compared with the price paid by Americans. $S^{\$/€}P^{€}_{E,C}/P^{\$}_{E,X}$ may rise to high levels that cannot be explained by differences in distribution costs.

This inefficiency does not get reflected in demand for the good in either Europe or the U.S. in the short run. As the evidence indicates, prices faced by consumers do not vary much in the short run even when exchange rate changes are large. How, then, is the inefficiency manifested? Suppose the dollar depreciates for reasons unrelated to current economic costs. $S^{\$/€}P^{€}_{E,C}/P^{\$}_{E,X}$ rises, so that the price Europeans pay for the European good rises relative to the price Americans pay. The European producer finds his margin on U.S. sales slipping. The revenue per unit sold in euro terms is given by $P^{\$}_{E,X}/S^{\$/€}$, which falls as the dollar deteriorates. Owners of European firms—who are primarily European—will earn less profit, and the value of European firms will deteriorate. Conversely, American exporters to Europe will gain when the dollar depreciates—each euro in sales will be worth more dollars. The relative profitability of the firms, and therefore the relative wealth of the firms' owners, is driven by changes in the nominal exchange rate that may have little or nothing to do with the productivity or efficiency of those firms.

It is crucial to recognize that almost all movements in foreign exchange rates are inefficient from the criterion of resource allocation. Even in the absence of financial market inefficiency—even if financial markets are efficient and there are no bubbles—there are essentially no market forces to drive the nominal exchange rate toward the level that would reflect underlying real costs. The basic market failure is the failure of nominal prices to adjust to shocks. Nominal exchange rates are determined by expectations of the future, as any asset price should be, so they are not determined by the current factors that affect the relative competitiveness of firms in different countries. The foreign exchange market cannot be relied on to somehow magically offset the distortions introduced by sticky nominal prices. It is up to policymakers to do their best to combat currency misalignments (while focusing on their other, perhaps primary, goals of inflation and the output gap).

Why do firms not adjust nominal prices? The lost profit for an exporter could be large given the size of exchange rate changes we commonly observe. In essence, this is the question that all Keynesian economists

must confront, though perhaps it is heightened in the international context where the incentives to change prices might be large.

Part of the answer is the standard one given in the Keynesian literature. There may be costs to adjusting prices. Firms must undertake substantial research to determine the optimal price that the market will bear for their good. Firms update their research only infrequently—quarterly, or even annually. The gain in profits from optimal price adjustment in the interim may be small. This is particularly true when price setting is not synchronized. A firm thinking about resetting its price this week must take into account that many other firms are not on the same pricing cycle as it is. If the firm finds it is optimal given market conditions to raise its price, it must consider that it will lose market share until other firms react to conditions and adjust their prices. So the firm only partially adjusts its price to current conditions. But then other firms that subsequently set their price must take into account that this first firm has not raised its price fully. Overlapping pricing cycles can substantially lengthen the price adjustment process.

We might consider the market share of a firm as a sort of capital. Firms need to advertise to attract customers. The stock of customers is costly to acquire, so firms are reluctant to let go of their customers when market conditions turn against the firm temporarily. In particular, a temporary change in the exchange rate may hurt the competitive position of a firm. But the firm may be willing to suffer lower temporary profits, or even losses, to avoid losing its customer base and market share. Drozd and Nosal (2008) have demonstrated that firms may change prices very slowly and tolerate large differences in prices and profitability across markets because of the incentive to retain customers.

Monetary policy should consider these currency misalignments. Engel (2009) specifically has shown that the exchange rate is a separate concern of policy from its goals of low inflation and low output gaps.

A considerable literature has shown that monetary policymakers have another reason to target the exchange rate—to move the terms of trade in their favor.[10] For example, the Federal Reserve, if it were acting in competition with the European Central Bank, might find it optimal to depreciate the dollar when there is local currency pricing. Such a policy would benefit U.S. producers at the expense of European producers. But the European Central Bank would have a similar incentive to depreciate the euro. The Nash equilibrium of this policy game would resemble the prisoner's dilemma. Because the objectives of the central banks are competing, their efforts on the exchange rate are offsetting. But the efforts devoted to using monetary policy to influence the exchange rate distract attention from the other goals of the central banks such as inflation. The outcome could be improved if central banks cooperate on exchange rate goals.

Indeed, I think it is realistic to describe current central bank policy among the richest countries as cooperation on the exchange rate. There is an understanding among them that policy will not be used for competi-

[10] See Corsetti et al. (2000); Clarida, Gali, and Gertler (2002); and Benigno and Benigno (2003) for analysis of this incentive in the context of noncooperative monetary policy among "large" countries. Very similar analysis arises in models of small open economies that have some monopoly power in their export market. See, for example, De Paoli (2009) and Faia and Monacelli (2008).

tive devaluations. But the work of Engel (2009), building on the earlier research in this area, shows that optimal cooperation does not generally take the form of leaving hands off of the exchange rate. Instead, policymakers should agree on a target for exchange rates that they would like to achieve cooperatively.

It is commonplace to state that a country that fixes the exchange rate through monetary policy gives up monetary policy independence. In other words, if monetary policy is devoted toward fixing the exchange rate, then policy cannot be used to achieve domestic targets on inflation and output. The recent open-economy monetary policy literature does not, however, favor fixing exchange rates. As Engel (2009) puts it, currency misalignment should be one goal of policy along with its other goals on inflation and output. There is a trade-off—to the extent that policy pays attention to exchange rates, it must give less attention to other goals. The importance of the exchange rate target will depend on the degree of misalignment of the currency and the openness of the economies. More open economies suffer more from large misalignments.

Experience suggests that any attempt to announce a narrow target band for the exchange rate may stimulate speculation, and such a band will be difficult to enforce. Instead, central banks should agree on exchange rate goals, enunciate those clearly, and also make clear the priority of the exchange rate goal relative to inflation and employment targets. In that case, I do not see any reason why there should be more speculation in the foreign exchange market engendered by the foreign exchange target than there is in the inflation-indexed bond market generated by inflation targets.

I have consistently used the dollar/euro rate in my examples of currency misalignment. It is tempting to think that this example is misplaced or at least that it shows that exchange rates are a minor concern for policymakers. I say that because one might look at the volume of trade between the U.S. and Europe, see that it is small relative to the size of GDP in each region, and conclude that the size of the problem is small. But this is not the right comparison.

First, the size of actual trade is a poor measure of international competition. A better measure requires an assessment of the size of the sectors that produce goods that potentially compete on international markets. A European firm can be hurt directly by a very weak dollar even if it does not export to the U.S. That is because it may be unable to compete in the U.S. market precisely because of the misaligned dollar. The firm may be efficient enough to overcome the costs of engaging in international trade, and so with a correctly aligned currency may be able to compete with U.S. firms for the U.S. market. When the dollar is too weak, the firm might not even enter the U.S. market.

Second, if the dollar/euro rate is misaligned, then other currencies by necessity must be misaligned with either the dollar or the euro or both. The renminbi cannot be efficiently priced against both the dollar and the euro when the dollar is out of line with the euro. So the amount of trade, even potential trade, between the U.S. and Europe is not a sufficient statistic to capture the possible losses from a misaligned dollar/euro exchange rate.

Third, commodities whose prices are determined efficiently and flexibly still cannot achieve the right level in both the U.S. and European markets if the dollar/euro rate is out of line. As Devereux and Engel (2009) state: "Between the last day of March 2002 and the last day of December 2004, the price of a barrel of crude oil rose from $26.31 to $43.45, a 65.1 percent increase. This represents a 55.1 percent increase relative to the U.S. consumer price index (CPI). Over the same period, the price of a barrel of oil rose from €30.18 to €32.09, a 6.3 percent increase. Relative to the French CPI, this was a 0.7 percent increase, and relative to the German CPI, a 2.5 percent increase. Apparently, the United States experienced a major oil price increase, but Europe did not."

Of course, the explanation is that the dollar depreciated against the euro by 55 percent during this short time period. This depreciation was almost all in real terms. It is difficult to imagine an economic theory in which markets are efficient and the currency of one major economy can depreciate relative to another in real terms by over 50 percent within the space of three years—especially when there were no major economic shocks that hit the U.S. but not Europe, or vice-versa. Instead, the depreciation must reflect some sort of misalignment. Either the dollar was too strong in March 2002, or too weak in December 2004, or both. But the consequence of this great depreciation was real—the U.S. suffered an oil price shock, and Europe did not.

3. DETERMINING THE TARGET EXCHANGE RATE IN ADVANCED COUNTRIES AND EMERGING MARKETS

Conceptually, the object of policy is to achieve an exchange rate level such that the competitive positions of firms are not determined by the exchange rate, but instead by underlying resource costs. Measuring this equilibrium exchange rate is potentially difficult even among similar economies, such as the major advanced economies. It is even harder to get a precise estimate of the equilibrium exchange rate between an emerging market and a mature economy.

The problem comes in measuring the resource costs of producing traded goods. It might seem simple enough to gather data on wages, rents, costs of intermediate goods, and other costs for producing traded goods in a pair of countries. But it is not. First, we need to measure the efficiency of firms. Two different firms may use similar inputs, but one may use them more efficiently than another and so will have lower costs. Comparing efficiency of firms internationally may be a very difficult task. Moreover, the comparison of these relative costs may be distorted if the costs themselves are subject to nominal stickiness. If U.S. wages are sticky in dollar terms, the U.S. costs may be relatively low when the dollar is weak. But that cost advantage again does not reflect an efficiency advantage—it is just another manifestation of a misaligned currency.

But we can probably get a rough measure of the equilibrium exchange rate when comparing similar economies by looking at purchasing power parity (PPP) deviations. Deviations from PPP may arise for reasons other than currency misalignments, but between comparable economies these differences might be sufficiently small.

Suppose we have measures of consumer prices of traded goods in the U.S. and Europe. Those prices may differ because of real cost differences. Perhaps firms are more efficient in Europe than in the U.S. If Europeans have a home bias in preferences, so they prefer to consume more European goods, their overall consumer prices of traded goods should be lower than in the U.S. Costs of transportation, distribution, marketing, and retailing may differ between Europe and the U.S., which may lead to differences in consumer prices based on real costs.

Generally, it is difficult to determine which goods are tradeable and which goods have sufficiently high trade costs that they are nontradeable. Consumer price levels may differ because of differences in costs of nontraded goods.

But these factors leading to real differences in price levels—that is, leading the efficient level of the real exchange rate to deviate from unity—are minimized when comparing two similar economies. So a rough measure of the equilibrium real exchange rate that policymakers could use is the PPP exchange rate, or perhaps a PPP exchange rate for urban areas. A PPP exchange rate based on urban area prices would account for the differences in underlying costs of consumer goods based on the degree of urbanization. Generally, urban areas have higher living costs due primarily to higher housing costs.

It is much more difficult to use this sort of back-of-the-envelope calculation to arrive at an equilibrium real exchange rate when comparing an emerging market economy to an advanced economy. It is well known that nontraded goods prices tend to be lower in countries with lower incomes. A number of plausible theories have been advanced to explain this phenomenon, and it is reasonable to assume that such pricing represents an efficient market outcome.

But how then can we measure the efficient level of the real exchange rate? We do not want to use the PPP real exchange rate, because the poorer country ought to have lower prices (a weaker real exchange rate) than the richer country. Nobody should contend that the equilibrium value of the renminbi is the one that achieves purchasing power parity with the dollar.

Instead, we might try to make adjustments based on the relative incomes of countries. But how much weaker should the real value of the currency be in a poor country relative to a richer country? The approach taken by Cheung, Chinn, and Fujii (2007) seems like a reasonable one. They look at a broad cross section of countries. They reason (or, more precisely, they assume) that, on average, real exchange rates relative to the U.S. are at the efficient level. Some may be overvalued and some undervalued, but on average they are just right. We can then look at the average effect of relative income on real exchange rates to gauge the appropriate degree by which we should adjust the PPP real exchange rate to get our measure of the equilibrium rate.

Unfortunately, this approach has a significant difficulty because it requires comparing levels of real income between countries. That exercise in itself requires some comparison of prices, because we need to measure the real value of output in the nontraded sector. This problem is illustrated in the comparison of the calculation of the equilibrium value of the renminbi

in Cheung, Chinn, and Fujii (2007) with the calculation in Cheung, Chinn, and Fujii (2009). The earlier paper does find evidence that the renminbi is undervalued, though it emphasizes that the measure of the equilibrium exchange rate is imprecise so that they cannot conclude with statistical certainty that there is undervaluation. But the second paper uses new, revised measures of the real income of China. The new measures lowered the assessment of the level of real income in China. But lower income means that the equilibrium value of the renminbi should be lower. Using the new measures of Chinese income, Cheung, Chinn, and Fujii (2009) conclude that there is no evidence of undervaluation of the renminbi.

4. FIXED EXCHANGE RATES AND CREDIBILITY

The modern literature on monetary policy has emphasized the gains from credibly committing to a monetary policy rule. The question facing many emerging market is how does monetary policy establish credibility?

The modern literature does not have a clear-cut answer to that. One important ingredient is central bank independence. If central banks are subject to political pressure, they may be tempted to follow policies that are too activist. But policies that respond too aggressively when there is unemployment or declining output will build in expectations of a bias toward expansionary policy. Those expectations have a cost. When policymakers need to disinflate, they must battle these expectations. They will have to increase real interest rates more and dampen aggregate demand to a greater degree to achieve a given amount of disinflation than they would if they were perceived as being committed to a policy rule. Optimal policy rules need not have inflation alone as their target, but the rules must be verifiable to be credible.

Some economists, and indeed some central bankers, have concluded that fixing the exchange rate is one way to achieve credibility quickly. The exchange rate is a very visible price—very easy to verify. A policy that commits to fixing the exchange rate will be viewed as a clear abandonment of discretionary policy. Clerc, Dellas, and Loisel (2008) provide an analysis of this view in the context of the modern Keynesian approach.

A currency board is the cleanest example of a fixed exchange rate. The experience of Hong Kong and Argentina with currency boards also provides some lessons on the benefits and the limitations of a fixed exchange rate policy.

First, as we have already mentioned, if monetary policy is committed to fixing the exchange rate, then policy cannot have separate goals of keeping inflation low or maintaining full employment. To be sure, generally the goals of a stable currency, low inflation, and full employment may coincide. To maintain a fixed exchange rate, money growth must be restrained. Argentina, after adopting the currency board, experienced a dramatic drop in inflation. And a stable policy environment imposed in a previously inflationary setting will also tend to increase certainty about economic relationships and will lead to stronger real economic growth. Again, the initial years of the Argentine experience, as well as the entire history of the Hong Kong experience with a currency board, tend to lend support to this view.

But there are possibilities of a trade-off. A country that has a fixed exchange rate can achieve a real appreciation only through inflation. Sometimes economic circumstances require a change in the real exchange rate, and that change can occur only through changes in the nominal price level. So while we have argued that the exchange rate should be an objective of central bank policy, in general there is a trade-off between the exchange rate objective and the inflation and output objectives. The choice to give up independent influence on inflation and the output gap by adopting a currency board can be supported only if the gains in credibility for policymaking are sufficiently large.

Finally, it perhaps goes without saying that adopting a fixed exchange rate cannot raise credibility of policy indefinitely if, in fact, policies are being implemented that are ultimately incompatible with the fixed exchange rate. Here, again, the experience of Argentina comes to mind.

5. STERILIZED INTERVENTION

The analysis of exchange rate policy up until now has been predicated on the idea that the exchange rate is one target of monetary policy. Sterilized intervention offers the possibility of separating exchange rate policy from monetary policy. Here I will offer only some brief observations about sterilized intervention. There is very little analysis of sterilized intervention in the new Keynesian framework. Instead, my comments are primarily based on empirical evidence and observation.

The first point is that sterilized intervention appears to be effective only when the country has capital controls in place or the country's external capital markets are thin. In these cases, the central bank can be a large player in the market for its own currency. It is able to support its currency essentially by drying up the supply of its currency in world markets by selling off its foreign exchange reserves. If capital markets were deep, then the private capital market could "undo" any effect of sterilized intervention. Suppose, for example, that a central bank wants to keep its currency from depreciating. It sells off reserves (for example, of dollar assets) and buys its own currency. But when capital markets are deep, private speculators can reverse the effects of this action. If the market believes that the central bank's target ultimately overvalues the currency, speculators may be willing to sell very large amounts of the currency without changing their assessment of its market value.

The empirical literature on the effects of sterilized intervention faces a significant difficulty of endogeneity. Intervention usually only occurs in response to changes in the value of the currency driven by market forces. For example, the market might perceive that the currency should depreciate, and the central bank responds with intervention to strengthen the currency. The empirical researcher will be confronted with data that show the central bank intervening to support the currency, but the currency is depreciating. It is almost impossible to separate out the effects of the private market from the effects of the central bank action.

Typically, econometric studies deal with simultaneous causality by using instrumental variable techniques. In this case, in order to measure the effects of intervention, researchers would need to find a variable that influences exchange rates but does not influence the amount of intervention. It is even conceptually difficult to come up with such a variable, and there

are few, if any, empirical studies that have successfully used this approach to assess the effects of sterilized intervention. One well-known paper by Kearns and Rigobon (2005) uses a technical econometric technique involving restrictions on correlations to identify the effects of intervention on exchange rates. They find that large interventions in exchange markets with deep capital markets have only small effects on the exchange rate: The equivalent of a US$100 million intervention in the market for Australian dollars moves the exchange rate by about 1.5 percent on the day of the intervention, with the effect receding over time, while in the market for the Japanese yen an equivalent intervention leads to only a 0.2 percent effect on exchange rates.

One tack that a number of research studies have taken recently is to examine very high frequency intra-daily data on interventions and exchange rates. The idea is that if we examine the behavior of foreign exchange markets at five-minute intervals (for example), we can directly measure the effects of intervention in the five minutes immediately after the central bank enters the market. This type of analysis has two obvious limitations: First, it can only separate out the exogenous effects of intervention over a very short horizon. Second, it still relies on an assumption that the effect of the intervention can be separated out from the effects of market purchases over the short time interval. Even with these assumptions, the studies tend to find little effect of sterilized intervention in currencies with deep capital markets. For example, Fatum and Pedersen (2009) find that intervention by the Danish central bank can influence the value of the krone/euro rate, but only when the intervention policy is consistent with underlying Danish monetary policy. Other studies, such as Dominguez (2006) and Fatum and Hutchison (2006), find that sterilized intervention can have an influence on exchange rates, but only for short periods (less than one month.)

On the other hand, clearly some countries such as China are able to influence exchange rates while effectively largely sterilizing the effects of intervention on the money supply or monetary conditions. The effectiveness of this intervention is generally believed to be attributable to restrictions on capital flows.

While restricting flows of capital is clearly a case of government intervention in the free operation of markets, there is by now a large literature that supports the case for capital controls in emerging markets. Some of the literature makes a theoretical case. For example, Rodrik (1998, 1999) and Obstfeld (2008) argue that without well-functioning economic, social and legal institutions, opening international capital markets may be counterproductive. Empirical studies (such as Klein and Olivei 2008 and Chinn and Ito 2007) support the view that capital market liberalization does not lead to better economic performance in the absence of internal reforms. In other words, a country in the midst of economic liberalization should first focus on internal liberalization before opening capital markets.

Because sterilized intervention can be effective where capital controls are in place, such countries enjoy a sort of policymaking luxury. They can conduct exchange rate policy with some independence from monetary policy. These countries have effectively two policy instruments—sterilized intervention and the monetary policy instrument (money growth or interest rates)—while countries with free, deep and very open capital markets

lose the option of using sterilized intervention. Very little research has been conducted on the value of this option.

However, that option comes with a price. One benefit of controlling exchange rates with monetary policy, as has already been argued, is that such a policy may quickly gain credibility for the central bank. Central banks that fix exchange rates clearly are not following discretionary polices with an inflationary bias. It is difficult to imagine how monetary policy alone can fix the exchange rate, except when a currency board is established (or a country joins a currency union). But to the extent that policymakers rely on sterilized intervention to control exchange rates, the exchange rate policy contributes less to the credibility of monetary policy. If exchange rate policy and monetary policy are seen as separate tools, then evidence of the former may tell markets very little about the latter.

Even under sterilized intervention, there surely is some signal about policy commitment when a country maintains a fixed exchange rate. Although I cannot cite empirical evidence to support this, I do believe that international markets increased their confidence in the stability of Chinese economic policy because China maintained a fixed exchange rate during many difficult years, including the Asian crisis.

Moreover, it is difficult to maintain a fixed exchange rate with sterilized intervention if there is a big discrepancy between the goals of monetary policy and exchange rate intervention. Suppose there are no underlying reasons for a real appreciation in a country, but it maintains a fixed exchange rate in combination with an inflationary monetary policy. Eventually the overvaluation of the currency will lead to disequilibria in goods and financial markets that are undesirable.

The converse problem also arises—a country can use monetary policy and exchange rate policy separately to gain a competitive advantage through devaluation. The country can devalue its currency in nominal terms but use monetary policy to control inflation. This type of policy will cut off the channels for real price adjustment. China has, of course, been accused of essentially running such a policy. However, in China's case, there was no devaluation of the currency in nominal terms. Instead, the argument goes, China should have allowed a real appreciation, but by fixing its nominal exchange rate and dampening inflation, it prevented the real appreciation from occurring. Even if this accusation is untrue (recall, Cheung, Chinn, and Fujii 2009 find little evidence the renminbi is overvalued), it is difficult to refute the charges.

6. CURRENCY RESERVES

To conduct sterilized intervention, central banks acquire foreign exchange reserves. The management of these reserves is the subject of an intense ongoing debate. I will stay out of that debate, given that it is straying too far from the central topic of this paper. I will limit myself to three observations.

First, many commentators and researchers argued—before the crisis—that accumulation of reserves by central banks was wasteful and ill-advised. It was said that central banks accumulated far more reserves than was necessary to fend off an attack on their currencies and that the

reserves earned low rates of return compared with other investment opportunities.

Since the crisis, opinions have changed. It turns out that, on the whole, countries with a large war chest of reserves weathered the crisis relatively well—better than countries with low levels of reserves.[11] Obstfeld, Shambaugh, and Taylor (2008) reassess the stock of reserves needed to defend a currency. When the central bank is the lender of last resort, it may be required to have a very large war chest of reserves to defend the currency. To prevent a run on banks and subsequent flight to foreign currency, the central bank holds reserves. Its potential liabilities include the bank deposits that could be converted to foreign currency. By maintaining a large stock of foreign exchange reserves, the central bank signals that it will be able to defend the currency, and it can therefore discourage a bank run from occurring in the first place.

Another point to be made is that the return to the portfolios of central banks that held U.S. Treasury bonds has been relatively very strong. It turns out that other assets were risky—probably riskier than the market perceived—and it was the wise investor that held a portfolio heavily weighted toward Treasuries. In the immediate aftermath of the crisis, the dollar appreciated (from \$1.60/€ to \$1.25/€, before weakening again to around \$1.42/€ at the time this paper is being written). And the dollar value of Treasury bonds rose while equity markets crashed.

Clearly, now central banks are worried about the value of their dollar assets falling. But they are looking at things from the top of the mountain. The performance of their portfolios has been very strong, and they are worried about underperformance in the future. That is still a much better position to be in than if the reserves had been largely invested in equities or even nondollar currencies. Then emerging market central banks would be like the rest of us—at the bottom hoping things improve.

The second point I want to make is that there is, of course, something very different about this crisis from other recent financial crises. In emerging market crises, the crisis countries had accumulated debt denominated in foreign currency (U.S. dollars, mainly). The crises led to steep depreciations of their currencies and an increase in the value of their external debt in units of their own currency.

On the other hand, the recent crisis, which had its epicenter in the U.S., led to an appreciation of the dollar. But the U.S. had also borrowed primarily in dollar terms, so the appreciation did not reduce the external value of its debt in terms of dollars. The crisis was clearly unusual because the currency of the crisis country appreciated. The emerging markets, which largely did not suffer from the underlying distortions in financial markets that are now evident in large financial centers, nonetheless needed foreign currency reserves to defend their own currency. The simple story for the appreciation of the dollar was that there was hoarding of dollar assets. Banks and other financial institutions, especially, needed to protect their balance sheets. Dollar liquidity dried up, creating an excess demand for dollars, driving up its price.

[11] Obstfeld, Shambaugh, and Taylor (2009) provide the empirical evidence to support this assertion.

My point here is that, at least in this case, central banks did not need a pot of reserves to protect their own weakened currency. Instead, they needed specifically dollar reserves in order to protect their currencies against this peculiar dollar drought. Other forms of reserves—euros or SDRs—probably would not have been as useful during this crisis.

The third and final point I will make on reserves is that the currency swaps offered by the Federal Reserve during the current crisis have altered the picture. Obstfeld, Shambaugh, and Taylor (2009) demonstrate that in cases where central banks did not hold large dollar reserves, the availability of the swap lines apparently had a significant effect in stabilizing exchange rates. On the other hand, many Asian countries already held large and adequate war chests of reserves, so the availability of the swap line was more symbolic.

The role that these swap lines played does demonstrate the importance of having access to a large store of reserves. It may also demonstrate that there is less need to hold reserves if the swap lines are available. However, Obstfeld, Shambaugh, and Taylor (2009) make two observations. First, the scale of the lending to central banks that was necessary in this crisis was so large that it is difficult to imagine any other institution providing such a large supply of dollars save for the institution that can create that currency—the Federal Reserve. These authors note that some central banks, such as China's, do have very large holdings of reserves, but it would take an extraordinary commitment for these banks to lend their reserves in a crisis. For example, the size of the swap lines envisioned under the Chang Mai initiative may need to be reassessed in light of the experience in the recent crisis. Second, this was an extraordinary event. We have no way of knowing whether the Fed would be willing to create such enormous swap lines in the future.[12]

7. CONCLUSIONS

The main conclusion of this paper is that there is a case for policy to stabilize exchange rates. Large fluctuations in exchange rates—even if they are not "excessive" fluctuations due to market sentiment or bubbles—can lead to inefficient allocation of resources. Unperturbed free markets in foreign exchange cannot be relied upon to arrive at exchange rate levels that deliver terms of trade and real exchange rates that reflect the underlying economic productivity, efficiency, and competitiveness of economies.

Probably the main case for freely floating exchange rates is a political one: Policymakers cannot be relied on to intervene in foreign exchange markets in a benign way. From a selfish standpoint, each country may have an incentive to devalue to gain a competitive edge. The competitive devaluations of the Great Depression loom large in the memories of many economists and policymakers. I conclude that some effort to control exchange rate fluctuations is desirable, but that it is best achieved in the context of cooperation among policymakers.

[12] See also Obstfeld (2009).

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