

Foreign Exchange Rates and Exchange Rate Crises

This paper is drawn from Economic Lessons from the Transition to be published by M.E. Sharpe, Armonk, New York.

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This paper is drawn from Economic Lessons from the Transition to be published by M.E. Sharpe, Armonk, New York.

We review the standard theory of the determination of exchange rates, relative demand for exports and imports of goods and services, and replace it with relative demand for exports and imports of all tradables. Since international trade in financial assets dwarfs trade in goods and services, foreign exchange rates are driven by relative demand for financial assets: stocks, bonds, bank accounts in various currencies, and the derivatives based on them. Since the demand for financial assets is based on expectations of future returns on these assets, foreign exchange rates are as volatile as these expectations, that is, as volatile as global financial markets.

Fixed exchange rates are both contradictory to basic economic theory, which states that all prices must be free to go to equilibrium, and costly and difficult to maintain given the volatility of global financial markets which drive the ever changing equilibrium foreign exchange rates. We blame the commitment to fixed exchange rates for most of the international financial crises of the 1990s. We examine each crisis several times as we

develop each step in our theory. We explain in detail how speculators profit from attacks on fixed exchange rates and which defenses work or don't work and why.

We update David Hume's (1752) model of the determination of domestic price levels by gold flows between countries, which is used even today to explain that fixed exchange rates can be maintained if countries' price levels go up and down. In our update, gold flows are replaced by financial asset flows and the price levels that go up and down are mostly in financial markets. We further argue that the volatility of exchange rates will be reduced by removing capital controls and making sure that the domestic financial infrastructure is in place for households to be able to invest their savings in foreign assets, including foreign currencies, when and if they want to. This is the opposite of today's financial mercantilist policy of preventing household savings from leaving the country.

We note that fixed exchange rates are often far from equilibrium exchange rates and are a major cause of international financial crises. They are also one-sided. For example, when Argentina fixed its peso to the US dollar, the US Federal Reserve did not fix the US dollar to the Argentine peso. A two-sided fix would have held. Fixed exchange rates are also transitive. When both Argentina and China fixed their currencies to the US dollar, they also fixed them to each other. Such unintended fixed exchange rates do have consequences. For example, Argentina could not compete with China for foreign investment by allowing its currency to depreciate, effectively reducing the prices of all its real and financial assets to foreigners. Throughout the 1990s, China was a major recipient of foreign direct and financial investment while other economies with their currencies fixed to the US dollar and, thus, to the Chinese yuan, were not.

The chapter advocates floating exchange rates, removal of all capital controls, and installation of financial infrastructure to insure that all households can invest their savings in foreign assets if and when they please. Then the updated Hume financial asset flow mechanism will provide some stability to exchange rates to the extent that domestic household money outflows counteract large foreign money inflows. Also, domestic households will be able to hedge against the remaining volatility of their home currency.

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Foreign Exchange Rates

One pillar of the basic theory on international financial markets has been the theory of trade-determined foreign exchange rates. Essentially, this theory holds that the exchange rate of a country's currency is determined by trade. The currency appreciates and depreciates based on the demand for its exports and its own demand for imports.

When more foreigners want to buy that country's exports and fewer of the country's residents want to import from foreign countries, then the currency appreciates. When the converse is true, the currency depreciates.

Thus, a country that runs a trade surplus – that is, its exports exceed its imports – will see its currency appreciate relative to the currencies of its trading partners. The currency appreciates because the trading partners bid up the price of the currency of the country whose exports they demand.

But the currency appreciation has its own effect. It makes exports more expensive to foreigners. Exports become less attractive, and they decrease. The appreciation also makes imports from foreigners cheaper, so that imports increase.

Thus, the theory of trade-based foreign exchange rates argues that exports will equal imports at the equilibrium exchange rate. The mechanism of flexible exchange rates on the international currency market automatically balances trade, so that the value

of exports equals the value of imports.

The theory of purchasing power parity exchange rates is sometimes presented as an extension of this theory, and sometimes as a long-run alternative to it. Purchasing power parity exchange rates were originally developed to allow economists to compare the GDP of countries with different currencies. Since market exchange rates are volatile, if GDP is calculated using a market exchange rate, the GDP estimate will change whenever the exchange rate does. The constant changes make GDP comparisons awkward, and so the theory of purchasing power parity was developed.

Purchasing power parity re-prices each product delivered to final demand in the economy at its US dollar price and then adds them all up to get that economy's GDP in US dollars. For example, if you were to price a haircut in some foreign country, you would use the US dollar price for a similar haircut. You would not use the local price for a haircut, nor even the local price converted at the current exchange rate. When you calculated that country's GDP all of the goods and services within it, including the haircut, would be valued as though purchased in the US.

This re-pricing of goods has powerful effects. Take China for example. The GDP estimate for China is *five times greater* using purchasing power parity than it is when calculated in yuan and converted to dollars at the official rate. In fact, using purchasing power parity, China has a higher GDP than Japan. China's GDP becomes number two in the world after the US.

This is an important conclusion, and we agree that purchasing power parity is a significant advance in accurately comparing GDPs across countries. Where we disagree, however, is with the use of purchasing power parity currency conversion rates as long-

term equilibrium market foreign exchange rates.

To be fair, the textbooks do explain that trade-determined foreign exchange rates differ from purchasing power parity exchange rates. Their explanation is that the two differ “in the short run” due to transportation costs, trade barriers, and nontraded services. They usually note that “short-run differences” between the two exchange rates may persist for years. But the fact is that “short-run differences” may persist indefinitely. They are not short run differences; they are simply different.

We strongly feel that the attempted use of domestic purchasing power parity exchange rates as long-term market equilibrium foreign exchange rates is mistaken for at least two reasons.

Let us take as given for a moment that foreign exchange rates on the open market are driven by exports and imports of real goods and services. Even if this is true, there is a difference between real goods and services produced and consumed within an economy and those exported and imported. Many of the goods and services produced and consumed in an economy are not traded with foreign countries. And even if they were, their share-weights in GDP and in foreign trade would still be very different.

So, if we want to calculate the foreign exchange rate using purchasing power parity rates, we must use the things which are exported and imported, weighted as they are in exports and imports. It is not accurate to follow the existing practice, where everything produced and consumed within the domestic economy is added up with the share-weights they have in the domestic economy.

This is one problem. There is another. The volumes of foreign trade in financial assets – stocks, bonds, and foreign currencies – are much larger and more volatile than

the volume of foreign trade in goods and services. This being true, financial assets should have high share-weights in calculations used to determine foreign exchange rates. However, trade in financial assets does not produce real goods and services, so it is not included in GDP. Thus, financial assets have zero share-weight in GDP purchasing power parity calculations. Since financial assets are not real goods and services, they are not counted in GDP.

Why is the misuse of purchasing power parity GDP conversion rates as long-term foreign exchange rates important? Because it gives a false impression that there are stable long-term equilibrium foreign exchange rates towards which global financial markets are moving. This false impression then buttresses the argument for fixed exchange rates. And fixed exchange rates are a key contributor to international financial crises.

The Anomaly of Fixed Exchange Rates

There is an interesting anomaly which concerns domestic economic theory and the theory of the international financial system. Many economists who preach the optimality of flexible market prices for allocating resources within an economy see no contradiction in advocating fixed foreign exchange rates. In classical economic theory, changing prices are key to achieving equilibria. But the same classical economic theory holds that changing prices for foreign currencies are a source of volatility and uncertainty to be resisted – even at great cost.

This leaves an important question unanswered. If the price of the foreign currency cannot change, how can exports and imports be brought back into balance?

Answering this question is a real problem for economists who advocate fixed exchange rates.

Fortunately, the problem was solved in 1752 by David Hume. Besides tackling difficult issues in philosophy and religion in his *Dialogues Concerning Natural Religion*, Hume also solved the truly difficult problem of how trade is brought into balance when the exchange rate is fixed.

Hume's theory recognized the key role of gold asset flows. In his time, the currencies of all European countries were based on gold. In economic terms, gold served as the monetary base, M_0 underlying the money supply M_1 .

Imagine two countries which trade with each other. Assume one country is running a trade deficit. That is, its imports exceed its exports. The other country accumulates the deficit country's currency, which it presents to the deficit country for gold. The trade-deficit country experiences a gold outflow, a loss of the gold reserves that back its currency. Since the country is on the gold standard (its currency is backed with gold), as the domestic gold supply contracts, so does the domestic money supply. As the domestic money supply contracts, there is a shortage of money for transactions.

Nothing else has changed in the economy, so the same amount of transactions take place as before the trade deficit. How can the same volume of transactions take place with less money in the domestic economy? The answer is simple. The price level drops by the same percentage as the reduction in the money supply.

When the prices for domestic goods drop, imports become relatively more expensive and exports become relatively cheaper. Domestic consumers find foreign imports more expensive, while foreign consumers find the country's exports less

expensive. Imports decrease and exports increase until foreign trade returns to balance.

The analogous but opposite mechanism occurs simultaneously in the trading partner country, which is running a trade surplus. The trading partner is accumulating foreign currency which presents to foreign countries for gold. The increase in the domestic gold supply increases the money supply. However, there is no change in real domestic transactions. Therefore, prices rise. This country's exports become more expensive, while its imports become relatively cheaper. As imports rise and exports fall, trade returns to balance.

The disadvantage of David Hume's price-gold flow mechanism is that the domestic prices in both economies must adjust to regain an equal balance of trade. The trade-surplus economy must undergo inflation and the trade-deficit economy must undergo deflation.

Not all prices can rise and fall so easily. If some prices are stickier than others, then relative prices within the economy will be distorted at least temporarily, causing misallocation of resources. Furthermore, if workers in the deflating economy resist having their wages cut, and/or merchants resist cutting prices, then the adjustment will not happen right away. Unemployment and recession will likely be necessary to force the needed reductions in prices and wages.

If resistance to price and wage reductions is strong and the fixed exchange rate holds, then the economy may be doomed to long-term unemployment and recession. In Argentina this precise problem has occurred – simply replace 'gold' with 'US dollars' as the currency base (the M0).

Keep Hume's theory in mind as we discuss the problems of the economies in

transition. They were advised to fix their exchange rates, so that competition from foreign imports would help fight inflation and stabilize the price level. They were also advised to tightly control their money supply (dependent now on foreign exchange reserves, not on gold reserves) to fight inflation.

The result surprised many economic advisors. Foreign exchange flowed in and out of the country with little relation to trade, but with great volatility. The volatility threatened to play havoc with the domestic money supply.

The central banks tried to disconnect the money supply from the volatile foreign exchange reserves through a process called 'sterilization.' When a central bank exchanges foreign currency for its own currency, the money that it pays out increases the domestic money supply. To counteract the increase in the money supply (which would likely cause inflation), the central banks sell an equivalent amount of government bonds. The government bonds are paid for in domestic money. So the same amount of domestic money goes out of the economy as went in, with no net change. Note that sterilization prevents the Hume gold-flow price mechanism from working.

Central bankers love to do this because it increases their foreign exchange reserves (real money, good anywhere in the world) and they pay with either domestic currency or government bonds that are paid off in domestic currency. Remember that central banks have the ability to print domestic money, as well as create central bank accounts in domestic money. There can therefore be no shortage of domestic money. Also, as we noted in Chapter Seven, the domestic currency may or may not function as domestic money.

This kind of sterilization fights inflation safely, in that no crisis occurs. But the

gains from running a positive trade balance accrue to the central bank's foreign exchange reserves rather than to the economy as a whole. Central bank foreign reserves represent real resources unavailable to the domestic economy for consumption and investment. They act like a tax which is collected but not spent.

The crisis occurs when foreign exchange flows out. To maintain the fixed exchange rate and currency convertibility, the central bank must buy domestic currency at the fixed rate whenever asked to do so. Then, to sterilize the withdrawal of domestic currency from the economy, the central bank buys back domestic government bonds, paying with domestic currency. This puts an equivalent amount of domestic currency back into the economy.

Central bankers don't like this, because they lose foreign exchange reserves and all they gain are domestic government bonds. Furthermore, central banks don't always have enough foreign exchange to pay for all domestic money presented to them. Sometimes the central bank runs out of foreign exchange. When this happens, the bank cannot maintain its fixed exchange rate, the value of the domestic currency plummets, and a currency crisis occurs.

The 1990s were filled with exchange rate crises, not confined to small or vulnerable economies. The British pound, the Italian lira, and the Swedish koruna were forced out of the Exchange Rate Mechanism (a European system of fixed exchange rates) in 1992. There followed the Mexican peso crisis of 1994, the Asian financial crisis of 1997 (which started with the Bulgarian crisis in the spring of 1997), the Russian crisis of 1998, followed by mini-crises in Ukraine and Kazakhstan in 1999, the Brazilian crisis of 1999, and the Argentine crisis of 2001-2002.

These crises were a surprise to experts and investors alike. They should not have occurred. We believe that basic flaws in the theory of exchange rate determination, as presented in undergraduate texts and summarized above, are the reason. The theory did not serve well for the period of transition in the 1990's; and it will not serve any better in the future.

First of all, much international trade, (most oil contracts, for example), is conducted in US dollars. This is true even when there is no US actor in the transaction. For the current theories of exchange rate determination to work, each country's sellers need to require payment in their home currency, or to convert payments received into their home currency. Further, as we noted in the section on monetary policy, the home currency may not be serving as a store of value and means of exchange even within the country, so that an exporter may use US dollars or another 'strong' currency even within his home country. This breaks the link between home country transactions and demand for home currency.

Second, international trade in goods and services is small compared to international trade in financial assets: bank deposits in various currencies, government and corporate bonds, stocks, titles to real estate, and derivatives based on these assets. To update the trade-driven theory of foreign exchanges rates, we need to add trade in financial assets to trade in goods and services.

The updated theory indicates that a country's currency will appreciate as demand grows for its financial assets, as well as for its goods and services. This explains the fact that the US dollar has remained strong throughout the 1990's, despite persistent large US trade deficits. In fact, the large US trade deficits are possible because of growing global

demand for US financial assets.

So what increases demand for a country's financial assets? We cannot consume financial assets directly, so there is no consumption demand. Rather, demand for financial assets is driven by the desire to invest. We buy financial assets because we expect them to pay income in interest or dividends, or we expect them to increase in price to be resold later at a profit.

The key word in that last sentence is "expect." The present value of financial assets depends to a great extent on expectations. Logically then, the foreign exchange rate of a currency depends on the *expectations* of potential buyers for the future value of the country's assets, versus the *expectations* of those same buyers for the future value of the assets offered by other countries.

Note that this would still hold true if all financial assets were to be purchased in US dollars. All that is required is that the interest, dividends, rents, or other income from the assets are paid in domestic currency. For example, if the assets are stocks, then the value of the stock will depend on the company's profits, which in turn depend on the expected relative values of the currencies in which the company buys its inputs and sells its products.

Assuming this is true, market-determined foreign exchange rates ought to be quite volatile. They ought to be just as volatile as the expectations of investors regarding the financial assets of various countries. Is the world then doomed to volatile exchange rates? We shall return to this issue soon.

First, let us note that, under this model, fixed exchange rates are at least theoretically possible. We can update Hume's price-gold flow mechanism by

substituting modern financial assets – that is, bank accounts in various currencies, stocks, bonds, and derivatives based on them – for gold. As in Hume’s price-gold flow mechanism, prices will change as the balance of trade changes. But now the price of financial assets will change; the price of goods and services will change less and with lags. And the balance of trade in question is in financial assets rather than real goods and services.

Let’s say that global investors decide that some undeveloped country or economy in transition is really an emerging market. That is, their expectations are that the country’s assets will increase in value. The global investors acquire stocks, bonds, and the country’s currency. As demand rises, the value of these assets is bid up. The central bank merrily sells its domestic currency for foreign exchange and sterilizes the increase in the domestic money supply by selling government bonds, increasing its foreign exchange reserves.

But domestic holders of domestic assets will want to do the same. As the prices of their domestic stocks and bonds rise, they will want to diversify their portfolios, that is, to sell some of their high-priced domestic financial assets for now relatively cheaper foreign assets. Just as their central bank increases its foreign exchange reserves, they will want to increase their holdings of foreign stocks, bonds, and foreign currency bank accounts. The more overvalued domestic assets appear to be, the more domestic holders of those assets will sell them and buy foreign assets.

According to this scenario, domestic investors will continue selling domestic assets and buying foreign assets until they have achieved their desired degree of portfolio diversification, and the domestic and foreign asset price/expected return ratios are equal.

What happens when expectations change and the foreign holders of domestic assets try to sell them? The prices drop relative to foreign assets. At this point, the domestic holders of foreign assets can trade back into domestic assets at a profit. This is our updated Hume asset flow price mechanism at work.

This did not happen in the economies in transition, for two reasons. First, the internal financial infrastructure for buying and selling foreign assets was not in place. In fact, domestic assets were not sufficiently dispersed for most of the population to have financial portfolios at all. Second, most countries have laws against their citizens selling domestic assets and buying foreign assets. They call it ‘capital flight.’

Lawmakers in developing countries prevent domestic investors from purchasing foreign investments, because they prefer that the money be channeled into investment at home. Just as lawmakers in Hume’s time prevented gold from leaving the country (its unsanctioned export was illegal), modern-day “financial mercantilists” prevent domestic money from leaving. By doing so, they not only limit their citizens’ legitimate investment opportunities, they also prevent the updated Hume adjustment mechanism from working.

The standard theory says that opening to foreign trade ought to be the solution to imbalance between desired savings and desired investment. However, this has not turned out to be the case. If it were, then there ought to be no particular relation between the saving/GDP ratio and the investment/GDP ratio for the same country. High-saving countries might then have low investment, or vice versa.

However, a classic study by Feldstein and Horioka, found that for most countries, the saving/GDP ratio and the investment/GDP ratios were highly correlated. This is

strong evidence that our revised Hume financial asset flow mechanism is not working in many countries.

Restrictions on importing foreign assets means that all the gain from diversifying into foreign assets go to criminals expert in capital flight, just as in the past restrictions on import of goods benefited smugglers. Furthermore, gains from illegal foreign transactions are also *de facto* tax-free. Naturally, the elites in each country are still able to invest in overseas assets, because their positions protect them from prosecution. As with inflationary monetary policy (discussed at the end of Chapter Seven), the beneficiaries of investment restriction policies often include the policymakers themselves.

If governments in transition economies allowed all citizens to participate in international investment, the result would be more diversification and increased wealth for many households. If ownership of, and trade in, foreign assets were legal, the government could tax both income and capital gains on these assets. The “wealth effect” from increased investment gains would increase aggregate demand with positive effects on the real domestic economy. Domestic households could also diversify their asset portfolios and at least partially escape domestic theft and corruption. Furthermore, while fixed exchange rates might still not be possible in the real international financial environment, the updated Hume financial asset flow mechanism should reduce their volatility.

Floating Exchange Rates

If the central bank allows its currency to float, there are two effects. First, the

total relative asset price effect is split between the change in prices of domestic assets in domestic currency and the foreign exchange price of the domestic currency moving in the same direction as the prices of domestic assets. Thus, the real economy is affected by the changing relative prices of exported and imported goods and services, due to changes in the foreign exchange rate. We are thus back to the original argument for fixed exchange rates: to insulate the real domestic economy from exchange rate volatility.

To repeat our arguments in favor of floating exchange rates: first, disruptions to the domestic real economy due to financial crises when fixed rates cannot be maintained are much larger than the effects of floating rate volatility. Second, floating rate volatility is lessened by our updated Hume financial asset flow mechanism. Furthermore, even developed countries with a floating exchange rate may be suffering from the unwillingness to let the updated Hume financial asset flow mechanism function.

Exchange Rate Crises

As we noted above, the 1990s saw a series of international financial crises, all associated with the failure of fixed exchange rates. The history of these crises shows both a strong commitment to fixed exchange rates and their unreliability. We review them here again with more explanation.

The decade opened with the costs of German reunification leading to inflation in Germany. The Bundesbank decreased its money supply and raised interest rates to fight the inflation. Holders of British pounds, Italian lira, and Swedish koruna sold those currencies for German marks to deposit them in German banks at the higher interest rates. The central banks of all the countries in the Exchange Rate Mechanism lost

German mark reserves as their domestic currencies were handed in for German marks at the fixed exchange rates. Currency speculators, George Soros the most prominent, saw a chance for big profits from forcing the central banks in the ERM to float their currencies. We explain their strategy in detail below. England, Italy, and Sweden, no longer able to maintain their fixed exchange rates with the German mark, suddenly left the Exchange Rate Mechanism in 1992, letting their currencies float. ('Float' means that the currency's price in terms of other currencies is no longer 'fixed' by its central bank but is instead determined by the market minute to minute. Fixed currencies, forced to float, inevitably sink in price, because if the market price was the same or higher than the fixed price, the central bank could maintain the fixed price easily.)

The Mexican peso crisis in 1994 was triggered by the North American Free Trade Agreement, which imposed asymmetrically large reductions in Mexico's tariffs. (Note that there was no Canadian dollar crisis. The Canadian dollar floats and has depreciated against the US dollar without crisis.)

The Asian financial crisis began in July 1997 when Thailand was forced to float the baht against the dollar. Other Asian economies were forced to float their currencies in short order. Notably, China, Hong Kong, and Malaysia successfully maintained their fixed exchange rates to the US dollar. This crisis was preceded by a successful attack on Bulgaria's fixed exchange rate in the spring of 1997, but if Bulgaria is included, then the catchy title "Asian financial crisis" cannot be used.)

In August 1998, Russia's fixed ruble was forced to float (allowed to sink) when the Russian government defaulted on its bonds. In 1999, it was Brazil's turn, and its currency quickly lost 40% of its value. This put great pressure on the Argentine peso,

fixed to the dollar by a currency board. The Argentine currency board finally gave way in late 2001-early 2002, as part of yet another crisis. In the meantime, twelve European countries created and adopted a new currency, the euro. The euro, floated from its creation, had lost about a quarter of its value against the US dollar without crisis and has gained about half of that loss back in 2002 and early 2003, also without a crisis.

This brief summary suggests a real problem with fixed exchange rates: they don't stay fixed. Yet many economists still recommended them. Why? First, fixed exchange rates reduce the risk and uncertainty of international trade, promoting the gains in overall economic efficiency due to trade. Second, a fixed exchange rate helps an economy fight inflation. When the price of a domestic good rises above the price of the imported substitute, buyers will buy the import rather than the domestic good, putting a ceiling on the price of the domestic good. If the home currency were allowed to depreciate, the imported substitute would itself become more expensive to the home buyer, so the price of the domestic good could rise as well.

Both arguments have merit, but given the costs of lost production and employment from international financial crises (such as those listed above), the purported gains from trade and reducing inflation hardly seem worth the cost.

As the above discussion and historical examples illustrate, our theory of exchange rate determination differs significantly from the trade-determined theory of exchange rates still given in most textbooks. Below we present our theory of exchange rates and point out where our theory differs from the accepted theory.

As economists put it, 'money is a veil.' To understand what is really happening, one has to look behind or under the money to see what is happening in the real economy

to real goods and services, their production, sales, and prices. This is doubly true with exchange rates, which are simply the price of one money in terms of another.

We recommend that you think of an exchange rate as only one part of the price of anything you buy or sell that is priced in another currency. The other part is the price of the good in its home currency.

For example, a French citizen using euros to buy a product from a US catalog (with prices in dollars) must convert the dollar price to euros using the exchange rate to compare it to a similar product in a French catalog. Assume the item in the US catalog is priced at \$10. When the euro was first created, this item would have cost 8.33 euros, because the euro sold for \$1.20. In early 2002, when the euro cost \$0.90, the same item would cost 11.11 euros.

Obviously, if one is conducting a lot of purchases overseas, these price changes can be onerous. To protect its citizens from the risk and uncertainty of changing prices due to changing exchange rates, central banks sometimes fix the exchange rate of the home currency. This could be done in several ways. The most common fix in recent history has been a one-sided fix to the US dollar. It is one-sided because only the home central bank stands ready to trade its currency for US dollars in unlimited amounts at a fixed exchange rate. The US Federal Reserve makes no such commitment. If it did, the fixed exchange rate would be unbreakable since the US Federal Reserve can print as much US money, Federal Reserve notes, as needed to maintain the fixed exchange rate.

Interestingly enough, standard theory does not recognize the distinction between two-sided and one-sided fixed exchange rates. Two-sided fixes are rare because each central bank must trust the other not to issue too much of its currency. Nevertheless, we

think it is important to make the distinction, because it shows the inherent weakness of a one-sided fixed exchange rate.

Central Banks and Fixed Exchange Rates

A central bank buys assets, usually some combination of domestic government bonds, foreign money and foreign government bonds, and gold. The central bank pays for these assets with domestic money, either paper currency and coin or deposits in the central bank in the home currency.

Thus, domestic money is the liabilities of the central bank. This is because if a legitimate customer presents domestic money to the central bank demanding central bank assets in return, the central bank must deliver assets in return for its own domestic money. Legitimate customers are usually home commercial banks and other central banks but may also include large international banks. Significantly, often the home country's own citizens are not legitimate customers.

Parts of the central bank's liabilities are domestic cash in circulation and domestic cash and deposits in the central bank held by domestic commercial banks. These liabilities are M0 or the monetary base. The parts of M0 held by commercial banks (rather than circulate outside them) are the reserves which secure the loans made by the country's commercial banks. Depending on the reserve requirement, the loans outstanding will greatly exceed the monetary base.

If the reserve requirement is 10%, then the money multiplier will be 10 and the total money supply, M1, which includes checking accounts at commercial banks, can be expanded by loans by the commercial banks up to 10 times the part of M0 held by

commercial banks as reserves. The central bank controls M1 by buying and selling domestic government bonds to control M0. If it buys bonds, it pays with domestic money, increasing M0. If it sells bonds, it collects domestic money, reducing M0.

Now what happens when a central bank fixes a currency exchange rate and makes that currency fully convertible to other currencies? It declares that it will exchange either currency for the other at a fixed rate in unlimited amounts. (Note that you don't have to be a central bank to fix an exchange rate. You just have to have sufficient assets. If he wanted to, mega-billionaire Bill Gates of Microsoft could fix the exchange rate between two small countries. He would simply exchange either currency for the other at his declared fixed rate buying whichever currency he needed with his US dollars.)

If central bank customers want to buy the domestic currency, there is no problem. The central bank can either print more domestic currency or create domestic-currency central bank accounts as needed. But a crisis may occur when customers want to hand in domestic money for the foreign money reserves at the fixed exchange rate. The central bank's foreign reserves can cover only part of the domestic money it has issued.

This is because the central bank has also issued domestic money backed by other reserves: usually domestic government bonds and gold. These reserves are useless in maintaining the fixed exchange rate, because the bank's customers will not accept domestic government bonds instead of foreign exchange. Nor is the gold much use in this case, because even a hint of increase in gold sales quickly lowers the price of gold worldwide.

If customers keep handing domestic money into the central bank and demanding foreign reserves, the bank will be unable to meet their demands. It will either use up all

of its foreign reserves trying to meet demand, or simply declare a moratorium on accepting domestic money in order to keep some foreign exchange in the vaults. Either way, the fixed exchange rate is now broken. The domestic currency ‘floats,’ that is, its price as measured in foreign currency abruptly sinks.

What happens when a currency implodes like this? Anybody owing foreign currency debt backed by assets defined in the domestic currency may go bankrupt: their debts are suddenly much larger than the domestic currency assets intended to pay the debt. Pensions defined in domestic currency lose their purchasing power. Imports suddenly become much more expensive. This fuels inflation. The country is in economic trouble, likely very serious trouble. And all of this occurred, because economists recommended a fixed exchange rate to reduce the risk and uncertainty of currency fluctuations in foreign transactions!

We contend that fixed exchange rates do not reduce risk and uncertainty, although they may appear to for some period of time. Risk and uncertainty in economics behave much like energy in physics. They cannot be reduced or increased, neither created nor destroyed, only transferred. Thus, if risk and uncertainty seem to disappear, the correct question to ask is not “Why did the risk and uncertainty disappear?” (because the exchange rate was fixed) but “Where did the risk and uncertainty go?”

The answer is that the risk and uncertainty are transferred to the central bank, and thus to the general population of the country, who depend on a stable currency. There is a further analogy to physics. As with energy, risk and uncertainty can be transferred to one place and be concentrated there. There is a name for such concentrations: a bomb. A central bank defending a fixed exchange rate with insufficient foreign reserves is full of

pent-up risk. When all of this pent-up risk explodes into the economy at once, the analogy is quite accurate.

Speculative Attacks on Fixed Exchange Rates

Fixed exchange rates are doubly dangerous economic policy: not only are the consequences of failure severe, but there is profit to be made in breaking the fixed rate.

Profit for whom? Certainly not for the general population, for the beleaguered central bank, or even necessarily for politicians and elites who benefited from the fixed exchange rate while it lasted. But there are actors who see great potential in the fixed exchange rate system. They have devised creative ways to liberate all that foreign exchange from the central bank, and make a killing on the eventual collapse. It's even legal – most of the time. The attack is called currency speculation.

How does it work? First, borrow a lot of money, denominated in the local currency. Really a lot – enough to either exhaust the central bank's reserves or bring them to the point where collapse seems inevitable and the central bank will allow the currency to float (sink). Note that you won't have to do this alone. Other speculators, thinking as you do, will attack the fixed exchange rate with you, and may even consult with you.

You now have a loan that you must repay. You must repay the amount you have borrowed, plus interest. Say **HC** is the quantity of home currency borrowed, and **iHC** is the interest rate. You owe:

$$\mathbf{HC * (1 + iHC)}$$

Now you present all of your borrowed home currency to the central bank, and

demand that the bank exchange it for foreign reserves at the fixed exchange rate. The central bank must honor your request – it if wants to maintain the fixed rate – although it may lose quite a bit of its foreign reserves.

You now hold foreign currency, call it **FC**, which you can deposit in a bank somewhere else and earn interest on it. The money you have in the bank is:

$$\mathbf{FC * (1 + iFC)}$$

The foreign currency you hold equals the home currency you previously held, at the fixed exchange rate, so that

$$\mathbf{FC = E_{fc/hc} \times HC}$$

where **E_{fc/hc}** is the fixed exchange rate price of the home currency in terms of the foreign currency.

Now it is time to reap the benefits of globalization, computerization, and all the other marvelous inventions which have made financial transactions instantaneous and easy. If you've picked your currency well, other speculators will do the same as you have. Like sharks nibbling at a whale, they will nibble off bits of the central bank's foreign exchange reserves piece by piece, until the majority of it has been transferred to the speculators' bank accounts offshore.

The home central bank will, of course, fight to keep from having to devalue its currency, perhaps securing foreign currency loans from the IMF or issuing bonds in the foreign currency. But speculators can extract that money too. Furthermore, requirements for 'transparency' will ensure that the central bank publishes the amount of its foreign exchange reserves, so that speculators can see how close they are to victory. Eventually, barring a very clever central bank governor or tremendous luck, the central bank will give

up, and the currency will float (sink).

When the devaluation or depreciation of the home currency seems to be complete, you and your fellow speculators can use some of the foreign exchange (**FC**) that you have in your bank account to purchase some domestic currency at the new, lower rate. This money can be used to pay off your debts in the home currency. If the attack was successful, your foreign exchange holdings will exceed your home currency debts, i.e.

$$\mathbf{FC * (1 + iFC) > HC * (1 + iHC)}$$

As the equation shows, the speculators' profits depends on how much the home currency falls as compared to the foreign currency, the interest owed for borrowing the home currency, and the interest collected on the foreign currency while waiting for the fixed exchange rate to be abandoned. Let's say that **Edepreciated** is the new exchange rate at which a speculator can buy the home currency to pay off the debt of home currency originally borrowed plus the interest due.

$$\mathbf{Profit = (1 + iFC) \times (E_{fx/hc} \times HC) - (1 + iHC) \times HC \times E_{depreciated}}$$

Naturally, the profit is denominated in foreign exchange, handy for stashing in overseas banks. Lest you think that this gambit is limited to shady operators or shaky currencies, we should point out that George Soros made over a billion pounds in just this manner when he "broke" the British pound in 1992.

There are several ways to fight off a speculative attack. The most obvious is to

amass foreign reserves. During the 1997 Asian financial crisis, China had foreign reserves exceeding \$150 billion. Hong Kong and Taiwan had reserves in the \$100 billion range. Central banks love to amass foreign reserves. However, these foreign reserves are resources earned from the domestic economy's exports but not available to the domestic economy, so they have a real cost, like a tax that is collected but is not spent.

Another tactic is to make a preemptive devaluation to reduce the difference between the new fixed exchange rate and the floating rate resulting from a successful speculative attack. This reduces the profits of late joiners to a speculative attack since they will be able to get less foreign reserve currency with their borrowed home currency. Unfortunately, this tactic seldom works because the devaluation is usually too little and too late. Speculators also see such devaluations as a sign that a forced full float is even more likely.

Another way to reduce the profits from an attack is to raise **iHC**, the interest rate on borrowing the home currency. The central bank can do this by raising its interbank borrowing rate, which causes interest rates throughout the economy to climb. This will also happen automatically as speculators present home currency to the central bank for foreign reserves, because the amount they pull out reduces the domestic money supply, raising **iHC**. However, it also hurts the domestic economy, an effect we will discuss later.

Some countries also make it difficult for speculators to borrow domestic currency. China does this explicitly. Malaysia did it successfully with *ad hoc* administrative controls on ringgit lending both in 1997 and in previous, less well publicized attacks.

Chile had a rather unique approach. The central bank required borrowers of its

currency to put 30% of the amount borrowed into a Chilean account that paid no interest. This significantly reduced the net payoff from a speculative attack.

For example, ignoring interest rate effects, a \$100 speculation which forced a 50% depreciation of a fixed currency would double the original \$100, a yield of 100%. But with 30% of the \$100 held hostage in a Chilean currency account, the speculator would double only the \$70 available for the speculative attack to \$140. The \$30 in Chilean currency would lose half its value to \$15. So the net yield from the same 50% depreciation of the Chilean currency would be only \$155 or a return of only 55%. Chile's approach has been effective in deterring speculative attacks.

As noted above, central banks are vulnerable to speculative attacks on their fixed exchange rates because they issue money not only for foreign exchange, but also for both domestic government bonds and gold. So the bank has less foreign reserves than it has liabilities in the form of domestic M0 issued. There is one way to avoid this: institute a currency board.

A currency board differs from a central bank in that a currency board can only buy foreign reserves with its domestic money and can hold only foreign money as reserves. That is, M0 is 100% backed by foreign reserves. A currency board makes speculative attack more difficult, but not impossible.

Hong Kong has a currency board, the Hong Kong Monetary Authority (HKMA), yet it was subjected to a speculative attack. It's a rather interesting story, because both sides were so clever in their tactics. The speculators knew they could not break the fixed exchange rate, because of the currency board. But, they reasoned, if they borrowed large amounts of domestic currency they would force up interest rates, and therefore affect

stock prices on the Hong Kong Stock Exchange. Everyone knows that when interest rates go up, stock prices tend to go down.

So the speculators borrowed shares on the Hong Kong Exchange, and sold them at high prices (short sales). They used the proceeds from these sales and additional borrowed Hong Kong dollars to buy US dollar reserves from the HKMA. This reduction in the money supply increased interest rates and stock prices fell.

The speculators were betting that they could get the stock prices to go down, buy back the shares they had borrowed at much lower prices, and make a tidy profit on the difference. They didn't reckon on an active defense by the HKMA. The HKMA discovered the scheme and bought shares for itself, which kept the share prices from falling. This defeated the speculators, and also turned a profit for the HKMA when it later sold its shares.

The HKMA was later criticized for interfering in the stock market. We think they did an excellent job defeating a speculative attack aimed at its stock market, rather than its exchange rate. We also think, however, that Hong Kong would be better off with a floating exchange rate.

But there are other problems besides speculative attacks. Several recent currency crises - the Russian financial crisis in 1998, Brazil's abandonment of its fixed exchange rate with 40% depreciation in 1999, Argentina's crisis and abandonment of its currency board in 2001 - were not attributed to speculative attacks. To fully explain these crises, we believe that the basic theory of exchange rate determination needs to catch up with changes that occurred mostly in the 1990s. So we further expand our theory of exchange rate determination different from those in the textbooks.

Our theory of Exchange Rate Determination

There are two basic motives for holding money, that is, a currency: to conduct transactions and as a store of value or purchasing power. This second motive leads to currency speculation, as people seek to hold currencies that they think offer the best chance of gaining in purchasing power relative to other currencies. For this reason, it is sometimes called the speculative demand for money.

Your transactions demand for a currency is a function of what you can buy with a currency, how much you want what you can buy with the currency, and the prices in that currency for what you can buy with it. Note that the transactions demand for a currency may be partly outside its country's borders. For example, the fact that most global oil trade is conducted in US dollars increases the demand for US dollars even among oil buyers and sellers outside the US who don't trade with the US. Furthermore, an increase in the price of oil will increase the demand for US dollar balances to conduct oil trade.

Bonds and Their Use in Fixed Exchange Rate Regimes

The 1990s were not only the period of transition for former centrally planned economies. They were also the years of emerging market economies. The economies of the former Soviet Union and Eastern Europe were both. The economies in transition and emerging market economies underwent privatization and opened their economies to foreign investment. Former state enterprises became private companies that issued stock to be bought on new stock markets, debt to be bought by foreign banks, and corporate bonds to be sold to foreign investors. Governments began to issue and sell government

bonds on new domestic bond markets.

This explosion of financial and real assets that could be bought with the currencies of emerging market economies dramatically increased what could be bought with those currencies, and thus increased the transaction demand for those currencies. Furthermore, as the prices of those assets rose, so did the demand for the currencies needed not only to buy, but also, to trade them. The creation in emerging market economies of new financial assets and active markets to trade financial assets contributed greatly to the transactions demand for their currencies needed to trade those assets.

This brings us to the second motive for holding a currency, the speculative motive. The key difference between assets, including currencies, which are traded on the capital account, and real goods and services, which are traded on the current account, is that asset prices are driven solely by expectations about their future.

People buy stocks because they expect their prices to go up. They buy bonds because they expect to collect interest and get their principle back at maturity. They buy a currency because they expect it to appreciate. They may even buy and hold a currency with a fixed exchange rate because they expect another floating currency to depreciate against it.

Western optimism about the transition and emerging market economies created a strong demand for the assets of these economies including their currencies. They were expected to expand their export-led growth and to improve their efficiency and profitability. These factors, in turn, would increase their governments' tax revenues. All this made their stocks and bonds very attractive to foreign investors.

Even as late as 1996-97, foreign investors were complaining loudly about being

excluded from the lucrative Russian government bond (GKO) market (Picture sheep bleating at the abattoir door to be let in.), and a Russia fund was among the top performing mutual funds in the US.

The inflow of money (export of assets) on the capital account increased the equilibrium value of these countries' currencies above their fixed rates. Outflows of money (imports of foreign assets), which would have tended to reduce currency values were illegal, condemned as 'capital flight,' and impossible for most households due to lack of financial infrastructure. The updated Hume financial asset flow mechanism was prevented from working.

Western economic advisors generally approved of this on the grounds that it kept domestic savings at home to finance domestic investment. One result was an increase in the foreign reserves of emerging market and transition economy central banks, making their fixed exchange rates look very secure.

However, the demand for assets, unlike trade patterns, is wholly dependent on expectations about the future and therefore is just as volatile as those expectations. As it became clear that exports would not continue to grow as fast as previously expected and that their prices (for Russian oil, for example) were falling, investors reduced their inflated profit expectations and became concerned about the abilities of companies and governments to meet their debt obligations.

Investors began selling off their assets for domestic currencies, and converting the currencies to US dollars. As they did so, the central banks experienced substantial losses of their foreign reserves. Several abandoned their fixed exchange rates.

We believe that these rapid changes in expectations precipitated the Russian crisis

in August 1998 (when the Russian government even defaulted on its bonds, severely reducing domestic commercial banks' reserves), the Brazilian crisis in 1999, and the Argentine crisis of late 2000-2001.

Let's talk about the Argentine crisis in more detail. Argentina had a currency board, and currency boards are supposed to be invulnerable to exchange rate crises because all their M0 is backed by foreign reserves. However, Argentina had several serious problems, not addressed by the currency board. First, the Argentine peso was fixed to the US dollar. Thus, when Argentina's competitors on global markets, for both goods and financial assets, depreciated their currencies, Argentine goods and assets became more expensive, and less competitive, in comparison.

The most devastating change occurred when the Brazilian real depreciated by 40% in 1999. Under Mercosur, Argentina and Brazil had reduced their barriers to trade with each other. Brazil's depreciation meant that Argentina would run a large trade deficit with Brazil. It also meant that Brazil's exports of both goods and assets would be cheaper than Argentina's on global markets. Remember that the exchange rate is only part of the price of an export. The other part is the domestic price in the domestic currency. So, for the export price of a good or asset to fall, either the domestic currency must depreciate and/or the domestic price in the domestic currency must fall.

Argentina's peso was fixed to the US dollar, which meant that it appreciated against the depreciating floating currencies of its competitors for the export of both goods and assets. Thus, the Argentine peso prices of both goods and assets had to fall substantially if they were to be exported. The prices of financial assets are very flexible both up and down. So Argentine bond prices fell, and interest rates rose. Stock prices

also fell. Foreign direct investment got redirected elsewhere, often to Brazil, where complementary inputs to production were cheaper.

One can think of foreign direct investment as the ‘export’ of the ownership of physical investment assets. The prices of real goods and services, especially labor, however, are often very sticky, especially downward. If the prices will not fall sufficiently to clear markets, then unsold goods pile up in unwanted inventories, and services, including labor services, go unsold, that is, unemployment rises.

This is what happens when neither the exchange rate part of total prices nor the domestic price part of total prices can fall sufficiently so that demand is high enough to buy the total supplied. Argentina’s domestic prices, especially for labor, are sticky downward, so it is a poor candidate for a fixed exchange rate. (Both China and Hong Kong suffered much less from the foreign exchange part of their total prices being fixed because their domestic prices are quite flexible downward. Both have experienced significant deflation in the prices of real goods and services since 1997.) The presence of a currency board fooled investors into thinking that the peso was firmly fixed. So, Argentina was able to finance its deficits by exporting government debt, much of it to the IMF.

However, a currency board’s defense of its fixed exchange rate is not painless. As the domestic M0 is presented to the currency board for its foreign reserves, M1 must contract, raising interest rates and stifling the domestic economy. A currency board basically holds its own economy hostage, threatening to stifle it with high interest rates as it is forced to redeem its M0 for foreign reserves. Eventually, the hostage rebels.

Our recommendation is to let exchange rates float. Flexible exchange rates

provide more flexibility in the total prices of both real goods and services and of financial assets. Flexible prices clear markets and increase overall economic efficiency. They also dissipate risk and uncertainty into smaller problems rather than concentrating risk and uncertainty into a critical mass suitable for explosive crises. Crises may also occur under flexible exchange rates but they will be much less explosive.

Confusion About Exchange Rate Systems

In all honesty, it is difficult to understand the commitment to fixed foreign exchange rates which is held by many mainstream economists.

To begin with, fixed foreign exchange rates contradict basic economic theory. Basic economic theory proves that freely moving competitive prices are an absolute requirement for the market system to work. Foreign exchange rates are just a kind of price: the price of one currency in terms of another. Why should the prices for currencies be fixed, when all others float?

It is especially puzzling when you consider that freely floating exchange rates perform economic functions analogous to those of other freely floating prices in achieving market equilibrium. The exchange rate is also a part of the price for anything bought in one currency and sold in another. As such, it absorbs part of the total required price changes for markets to clear.

We have no good explanation to propose. In our view, floating exchange rates ought logically to be as much a part of economic orthodoxy as floating prices in the domestic economy.

There are three often missed characteristics of fixed exchange rates. First, fixed

exchange rates are one-sided: the fixed exchange rate is maintained by only one member of the fixed pair. If the fix were two-sided, the currency peg would be immune to speculative attack. After all, each country could supply unlimited reserves of its own currency to defend the other's currency against speculators. But this arrangement has been tried only once to the best of our knowledge: between Belgium and Luxembourg before they adopted the euro. This plan was so successful that it went absolutely unremarked outside the small circle of those directly concerned. (Apparently a scheme which results in neither a currency crisis nor any other controversy is bound for economic obscurity).

Second, fixed exchange rates are also transitive. When both Argentina and China fixed their currencies to the US dollar, they also fixed them to each other. Such unintended fixed exchange rates do have consequences. For example, Argentina could not compete with China for foreign investment by allowing its currency to depreciate, effectively reducing the prices of all its real and financial assets to foreigners. Similarly, Hong Kong cannot compete with Shanghai through currency depreciation. Throughout the 1990s and into the 2000s, China has been a major recipient of foreign direct and financial investment while other economies with their currencies fixed to the US dollar and, thus, to the Chinese yuan, were not.

There are reasons given to fix currencies, of course. Robert Mundell received the Nobel Prize in economics for his theory of optimal currency areas, which says that countries' currencies should be fixed to each other if they trade a lot and have large cross border movements of labor and capital.

But China and Argentina did not fulfill Mundell's criteria for an optimal currency

area. Argentina's main trading partner within Mercosur is Brazil, while China and Argentina hardly trade at all. Mundell's theory of the optimal currency area suggests that Brazil and Argentina would have been better off with a two-sided fix of their exchange rate to each other rather than each trying to maintain a one-sided fix to the US dollar. (This arrangement was not tried because each country feared high inflation if its currency was fixed to the other's. The country with the lower inflation would have had an advantage in exporting to the other. The price competition of imports would foster reductions in the inflation rate in the importing country, but would also foster inflation in the exporting country by reducing domestic supplies of the exported goods and services.)

Third, fixed exchange rates are also incomplete. China's yuan and the Argentine peso (during the period it was fixed to the dollar) both floated against the yen, the euro, and all other currencies not fixed directly or via another currency to the US dollar. So, currencies with fixed exchange rates do float against other currencies. Furthermore, a fixed exchange rate may be broken by the actions of another country. For example, when Brazil dropped its fixed exchange rate to the US Dollar, the Argentine peso suddenly was forced to appreciate about 40% against the Brazilian currency.

Economic theory has been silent on the peculiar effects of fixed exchange rates that are one-sided, transitive, and incomplete. Given the complex interconnections of global foreign exchange markets, it is hard to believe that these peculiarities have no effects.

Fixed exchange rates have proven to be destabilizing and costly in the real world. The collapse of the Bretton Woods system in the early 1970s was followed by efforts to fix exchange rates within the European Monetary System in the late 1970s. The 1990s

saw an epidemic of international financial crises with fixed exchange rates at their core: the UK pound and Italian lira in 1992; the Mexican peso in 1994; the East Asian crises in 1997; the Russian crisis in 1998; and the Argentine crisis in 2000-01. If airliners crashed as often as the international financial system, the aeronautical engineers responsible would be, if not under criminal charges, out of work at least.

Economists' commitment to fixed foreign exchange rates has "evolved." That is to say, the staggering evidence against them has forced economists to reconsider the theory. It is now generally recognized that a country can, at any one time, use only two of these three policy options: a fixed exchange rate, free movement of money and other financial assets across its borders; and an independent domestic monetary policy.

As discussed earlier, Argentina had chosen to drop its independent monetary policy in favor of an open economy and a fixed exchange rate to the dollar. This decision has mired the Argentine economy in unemployment and under-investment, which ought to be countered by monetary policy, but which has instead been allowed to run unchecked because of the country's commitment to the fixed exchange rate. The population lost patience with this policy at the end of 2001, with well-known results.

The fact that European countries have abandoned the idea of a fixed exchange rate arrangement, like the one that was broken by speculative attack in 1992, and adopted a single currency, is a *de facto* admission that the only truly fixed exchange rate is a common currency.

The "evolution" away from fixed and toward market-determined foreign exchange rates is still incomplete. The new consensus among mainstream economists is that foreign exchange rates, although not fixed, should be very stable and predictable,

making smooth adjustments to economic shocks.

We disagree. Foreign exchange rates should quickly and accurately signal the need to reallocate aggregate demand or factor inputs (or both) across currency borders. They should also signal in advance the expected effects of bad policies--economic, political, and, social--within a currency area. If these early signals forestall bad policies before they are fully executed, so much the better.

We have already discussed the advantages of allowing free household capital movement across borders. The diversification and increase in household wealth will stabilize the consumption function and increase the spending multiplier, making fiscal and monetary policy more effective. Furthermore, free capital movements both inward and outward by both foreigners and domestic residents combined with our updated Hume financial asset flow mechanism will also lead to less volatile foreign exchange rates.

The foreign exchange rate is only part of the price one pays for a foreign asset. The other part is the price of the asset in its home currency. Since domestic asset prices in their home currency are themselves highly flexible, the foreign exchange rate needs to change relatively little for the total price of any financial asset to foreigners to change dramatically.

This is in sharp contrast to the original Hume price gold flow mechanism, which requires the general price level of all goods and services in an economy to move up and down if the exchange rate is fixed. One cannot have both fixed domestic prices and a fixed foreign exchange rate. The original Hume mechanism proposed that all domestic prices suffer constant flux for the sake of a fixed foreign exchange rate. We suggest that the opposite: fully flexible domestic prices and exchange rates with no restrictions on

trade in goods, services, and financial assets, and with the updated Hume asset flow mechanism allowed to function, will result in less volatile exchange rates.