

Chapter 5 – Forecasting FX

“... if there is a consensus result in the empirical literature, it has to be that nothing, but nothing, can systematically explain exchange rates between major currencies with flexible exchange rates.”

Kenneth Rogoff¹

Economists see the FX market through one lens and FX professionals see it quite differently; this is true of traders at banks, brokers and hedge funds, as well as analysts. Economic theory seems logical but doesn't work in the real world, which leaves practitioners with no solid economics underpinning and therefore the inability to forecast with any confidence.

This seems an enduring drawback, but it does have a virtue – FX professionals are free to abandon orthodoxy and ideology. A professional may choose to adopt an ideology and be able to defend it vigorously, but another professional can adopt an opposing ideology and defend it just as impressively. Off on the side, the key traders themselves tend not to adopt ideologies – ideology offers them no payoff.

This chapter covers some of the basic theories from economics that have failed to be effective in FX and emphasises that one reason these ideas fail to help forecast FX prices is that you can have two opposing factors at work at the same time, when theory says you *should* not see such things.

Another reason theory fails is that certain institutional developments are full-bore overrides, including banking sector crises, political developments and, most of all, government intervention in the FX market. The very existence of government intervention illustrates that FX market structure, whether fixed or floating, has a rocky relationship with the real economy. In a nutshell, economic theory is pretty useless in FX at the best of times and irrelevant when it comes to certain institutional events.

¹ Kenneth Rogoff, 'Dornbusch's Overshooting Model After Twenty-Five Years', Second Annual IMF Research Conference Mundell-Fleming Lecture, 30 November 2001 (revised 22 January 2002) (www.imf.org/external/np/speeches/2001/112901.htm).

Traders, economists and theories

Traders with shifting worldviews

Traders track the data release schedules of the major economies and have their trigger fingers poised to buy or sell depending on the data released. As a general rule, data that meets the forecast gets little response or the opposite response of what logic would dictate. This is the *buy on the rumour, sell on the news* effect. If the data is far better than expected, the existing bias is reinforced and traders buy (or sell) in bigger amounts. If it's a disappointment, the currency will be sold, although if the bias was a negative one to begin with, the selling can turn into a real rout. A disappointing data release coming into a strong pro-currency bias may get only a fleeting response or none at all. *Data always needs to be seen in the context of existing sentiment and expectations.* We see this effect in all markets, not just the FX market. Equity prices move in response to discrepancies between expected and actual earnings, for example.

Just as earnings is a core concept in equity pricing, the FX world must have core concepts that drive prices. We can see traders have a finely calibrated array of responses to certain key economic releases, so we imagine traders have a worldview that it would be useful to know about. How does the FX market prioritise inflation, trade and budget deficits, growth rates, employment, productivity, and so on? In other words, what are the macroeconomic factors, exactly, that traders use to forecast exchange rates?

Unfortunately, you will seldom find professional traders with a systematic worldview and strong opinions on what economic variables support or trash a currency. We can say with confidence that today the top factors in the US are nonfarm payrolls and purchasing managers indices, and in Europe, the purchasing managers indices and sentiment surveys by German IFO and ZEW research institutes.

But only a few years ago, the top factors were money supply, inflation and trade balances. Core clients like hedge and sovereign funds usually have a worldview, but the traders themselves tend not to embrace an analytical point of view and certainly not an ideology. If this year we are focusing on budget deficits, then traders will turn their antennae to news about budget deficits. If an *old* factor starts getting new attention, like inflation, then that's what will be watched. In the UK from 2009 to 2011, inflation never went out of favour as a key indicator, and it remains an obsession lying just under the surface in other countries.

The misalignment of exchange rates

At any one time, professional traders do have a hierarchy of economic and institutional factors they are watching, but it's a constantly evolving and shifting hierarchy, and its relationship to a theory or worldview is tenuous at best. There's a good reason for this: most of the trading in the FX market is speculative in nature. It's the trader's job to make a profit from trades lasting seconds and minutes, not to engage in deep thinking about economies or be analytically correct about the true meaning of some economic development.

How, then, do exchange rates move more or less in line with the big economic themes of the day? Well, they don't. Exchange rates are *always* misaligned with what an economist would deem *equilibrium* value or what a financial analysis would consider *fair value*. If it seems that the dollar is depreciating because of the trade deficit or budget deficit, consider all the occasions when it was announced those deficits were rising and the dollar failed to fall.

The correspondence of exchange rates with economic variables is worse than spotty – it's often downright perverse. Exchange rates do not move the way theory says they should move. FX moves are maddeningly inconsistent and unmoored from what seems like economic reality, and they can stay unmoored from reality for very long periods of time.

The problem lies not with the exchange rates, but with the theories, or rather, with what professional and armchair economists alike think economic theory says. In practice, we lack a single coherent and universally accepted theory of how exchange rates are determined.

Economic theories on FX

Theory, in FX, is a sorry thing – despite strenuous work over many decades by very smart and capable economists.

Here's a summary of what economists theorise on FX:

If you are a plain-vanilla economist, you like purchasing power parity, the idea that the exchange rate will adjust so that the same product will cost the same in two countries sharing free trade with one another. You can draw a chart showing how exchange rates track the trade balance.

If you are a monetarist, you add money supply and demand as the key driver to the price changes that determine inflation and thus purchasing power, which in turn affects the trade account. Monetarists come in several flavours but one chart that can be drawn shows how an x% increase in money supply changes the exchange rate by y% with a lag of z periods.

If you acknowledge that trade flows are only part of the total of what goes on between two countries, you add capital flows to the mix and will focus on the balance of payments. The basic framework of most exchange rate determination models starts here, with the Mundell-Fleming model. You can't read anything about exchange rate theory without running into this model. In a nutshell, Mundell-Fleming says a currency reaches equilibrium when the outflow from net trade matches capital inflow, or vice versa. One drawback of the Mundell-Fleming model, of many drawbacks, is that it assumes a small, open economy. All the same, even for big economies you can draw a nifty chart showing strong correlation between a trade-weighted currency and the current account balance.

If you want to combine the current account and the capital account, you embrace the real interest rate differential as the dominant factor. In this version, it's not the supply of money itself or the relative interest rate that counts, but rather the expectation of inflation baked into the interest rate. You can draw a chart showing how exchange rates track the relative real interest rate differential, as done in Chapter 4.

If you are from the equity and/or fixed income side of the universe, you are interested not only in relative real return, but also asset value and expected asset value – the so-called balanced portfolio approach. Expected asset values are influenced by factors like depth, variety and liquidity of assets on offer, plus other factors that can be hard to measure or evaluate, such as sovereign and country risk, demographic changes, education and productivity, inventiveness, confidence in the fiscal probity of governments, and political stability.

Reviews of the various economists' theories and models can be found elsewhere.² Suffice it to say that no single theory or model covers all the bases.

The absence of a single, tell-all theory

All the theories mentioned above are true, at least to some extent and for some time periods, but this also means that none of them is completely right all of the time. That means you will see a chart showing a near-perfect correlation of an exchange rate with some economic variable and become convinced that this is the holy grail for forecasting purposes, only to have it fall apart the next month, quarter or year when the next factor *du jour* becomes the fashion.

Take, for example, the issue of inflation. Many observers believe that over 2009-2012, the massive stimulative spending and injections of liquidity into the US economy by the Fed are by their very nature inflationary. Under normal conditions this would likely be true. But bank lending, the vector by which a rise in money supply multiplies into economic activity, continues to contract. Money supply, by one definition, is up 9% but commercial bank lending is down by 9%. What the Fed was worrying about in this period was deflation, not inflation. If inflation is inevitable, longer run, then the dollar *should fall*. But at the same time, the drop in economic activity back to near recession levels resulted in two countervailing effects – an improvement in the trade balance and high capital inflows seeking a safe haven, because troubles elsewhere are worse. These factors *should* cause the dollar to *rise*. So *which is it to be?*

² Michael R. Rosenberg, *Currency Forecasting – A Guide to Fundamental and Technical Models of Exchange Rate Determination* (Irwin, 1996).

Get used to situations like this. It would be comforting to think that exchange rates are determined by relative economic performance and capital flows. In theory, a country's exchange rate is an equilibrating factor of economic activity. If a country has a trade surplus for a prolonged period, for example, its currency must be undervalued and the FX market will eventually adjust the exchange rate to make exports more expensive and dissolve the surplus. If a country has a higher rate of inflation than its trading partners, it should also have rising interest rates to keep the real rate stable, and if not, capital will flow out.

Alas, exchange rate adjustments based on those sensible and logical ideas take an exceptionally long time to affect activity – and sometimes fail to affect it at all. This is the *disconnect puzzle*. Since 1976 the US has run large, persistent trade deficits and Japan has run large, persistent surpluses. That's over three decades of imbalance. Exchange rates have failed to do the equilibration job. Everyone in FX is aware of the disconnect puzzle and, as far as we know, it's unique to the FX market.

The disconnect puzzle

The *disconnect puzzle* states that exchange rates far overshoot levels where fundamental economics dictates they should go. In addition, they overshoot with far greater volatility than warranted or expected.

Not long after the dollar was floated in 1973, economists started trying to build FX models that could incorporate flexible exchange rates. By this time, price modelling was advanced and sophisticated. Price theory guru Milton Friedman had said floating rates would swiftly and efficiently reflect international inflation differentials. But it wasn't so. Prices of goods lagged and were sticky, and wages were even more sticky (and certainly sticky downwards). Exchange rates were overshooting any reasonable comparison of prices between the two countries.

The overshooting paper – Dornbusch's solution

In 1976 Massachusetts Institute of Technology (MIT) economist Rudi Dornbusch published a paper titled 'Expectations and Exchange Rate Dynamics', informally called the "overshooting paper," that is still the starting point of much FX analysis today. No book or paper from the academic sphere neglects to name the overshooting paper.

Dornbusch starts with the uncovered interest parity equation that says the home interest rate on bonds is always equal to the foreign interest rate plus the expected rate of depreciation or appreciation of the exchange rate. This concept implicitly incorporates rational expectations, an important point because later we will see that experienced FX market players loudly and rudely reject the concept of rational expectations.

Now introduce an unexpected permanent increase in money supply. Remember, prices are sticky and slow to respond, mostly because changes in real output and wages are slow to respond and information is not instantly transmitted everywhere simultaneously. The first effect of a change in money supply, while prices are stalled in the short run, is for interest rates to fall.

But the interest rate can fall vis-à-vis other foreign interest rates only if we expect the exchange rate to appreciate – that's the uncovered interest parity assumption. And yet we know that an unexpected rise in money supply will have the long-run effect of raising inflation, causing the currency to depreciate – the opposite of what is actually happening. Dornbusch argued that the *initial* depreciation of the exchange rate on the money supply news will be bigger than the *eventual* depreciation caused by the real economic effect of the money supply increase, and be followed by an appreciation in between the first depreciation and the second depreciation. In other words, any unexpected increase in money supply must cause the FX rate to overshoot downward and then, perversely, rise, before falling again. This explanation is followed logically by the deduction that if prices could, in fact, adjust immediately to changes in money supply, no other price (the price of money or the exchange rate) would need to overshoot.

Believe it or not, academics quarrelled bitterly for decades over whether prices are sticky. This calmed down a bit after Fed Chairman Volcker engineered a contraction of US money supply in 1979-1980. In those days, everyone involved in finance of any sort, including every last foreign exchange trader, watched the money supply releases, especially M3, like hawks. Forecasters specialised in money supply the way they specialise in forecasting GDP today. M3, by the way, was discontinued in 2006, although some diehards continue to create their own versions. In any case, the sticky prices argument was more or less set aside, at least outside of academic circles.

Notice that no one disputes the uncovered interest parity assumption – that interest rates will be the same everywhere except for embedded expectations of upcoming exchange rate changes. This is a classic chicken-and-egg problem, and economists resolve it by refusing to change the core assumption. They brush off empirical evidence, including sentiment surveys and behavioural studies of things like liquidity preference, as temporary aberrations away from the universal truth that interest rates are the same everywhere. In real life, interest rates are hardly ever the same everywhere and if they are, it's an accident. Another thing that is missing is realistic interactivity. The model is not exactly static, but it doesn't account for a change in the exchange rate arising from some other variable and that change affecting interest rates. A one-way causality is almost never correct in finance. We do have feedback.

The Dornbusch solution to the disconnect puzzle has some interesting consequences. If overshooting is caused by a one-time money supply shock, the spot rate should move farther than the forward rate. But empirically, this tends not to occur. In addition, investing on the basis of uncovered interest rates fails to achieve profits from the embedded exchange rate forecast – over all holding periods. Instead of trading on that basis, we have the latest staple of FX trading, the carry trade.

The Dornbusch model may have proved less than useful in day-to-day trading, but Dornbusch did everyone a big favour by repudiating the concept of equilibrium, which basically holds that market volatility is abnormal and temporary, caused by friction, imperfect information, communications problems or some external hindrance, including the disincentive of taxes and fees. The Dornbusch argument incorporates volatility as a fundamental of the market pricing process, and this is more in keeping with what real traders observe.

Pragmatic acceptance of disequilibrium

We no longer slavishly follow money supply numbers to forecast exchange rates, but we do have two cases in which this kind of ivory tower economic modelling lives on. The first is the ECB's acceptance that changes in money supply are invariably the cause of changes in inflation. And yet the ECB reported money supply growth at high levels (such as 7% to 9%) for most of the 2000-2010 decade without panicking about impending inflation. Eventually the ECB started publishing staff articles on how and why money supply, while exceeding target levels for years on end, does not necessarily affect its inflation targeting. Reasons include credit conditions, lending to various sectors, actual output and inflation expectations.

The ECB never fails to let an opportunity pass by to congratulate itself for managing inflation and has published numerous advanced economic studies demonstrating that optimum monetary policy can view monetary aggregates as only one component of the overall policy mix, if not sometimes outright irrelevant. More central to good policy is interest rate targeting, and so today that's what traders watch.³ As a result, both the users of money in the euro zone and their observers, FX traders, are almost indifferent to euro zone money supply. And yet no one doubts that if euro zone money supply were to start rising to high levels again, the old orthodoxy of money supply creating inflation would re-assert itself among the public and in the press, exactly as it has done in the US, leading the ECB to defend belief in an economic mechanism but also asserting the need for real-world modification.

Another example is from the Japanese Ministry of Finance and Bank of Japan. When they want to alert the trading world that they are thinking about FX market intervention, they speak of "excessive volatility." The MoF and BoJ never actually define what they mean by excessive volatility and it would be easy to argue that the dollar/yen is not actually excessively volatile by any standard statistical definition (varying too far both ways from a central trendline). The yen is just moving too far, too fast in a single undesirable direction.

The point, however, is that a major country implicitly accepts volatility as a norm and has some idea of when that norm has been violated. Economists do not build exchange rate volatility into their models except as noise and yet as a practical matter, exchange rates overshoot with great regularity and real-world central bank and ministry of finance officials have to deal with complaints from exporters and other economic players effected by exchange rates.

Purchasing power parity

Purchasing power parity is another theory based on the concept of equilibrium. PPP states that if trade is free of transportation costs and trade barriers, the same basket of goods will have the same price in two different markets. PPP is based on the law of one price. The logic is pretty good: if German screwdrivers are cheap relative to French screwdrivers, the pragmatic and thrifty French will buy German screwdrivers until either the French manufacturer lowers his price or goes out of business. At some equilibrium point, the cost of screwdrivers will be the same in both countries.

³ Andreas Schabert, 'Money Supply and the Implementation of Interest rate Targets', ECB Working Paper Series No. 483, May 2005 (www.ecb.int/pub/pdf/scpwps/ecbwp483.pdf).

Unfortunately, the number of things that are wrong with this theory is almost endless. Transportation is not free. The French screwdriver-maker may have a friend in the tariff office. The quality of the German screwdriver may be better. The German screwdriver may have a prestigious brand for which buyers will pay a premium whether it's actually better or not. The screwdriver may have a different relative value to the French workman in his basket of tools than to the German workman. German inflation may be rising faster than French inflation and pretty soon the advantage will vanish.

Most of all, the basket of goods of the average consumer in each country differs wildly – there is no average basket that is valid worldwide. The Japanese basket contains more rice than the American basket. But the Japanese believe that Japanese-grown rice has special qualities, so you can't compare the price of rice in the US with the price of rice in Japan. In short, rice is not an internationally tradeable good in Japan, but you can't exclude rice from a Japanese basket of goods. Finally, the price level in a country is set by more than internationally traded goods. Services like haircuts, restaurant meals and lawn-mowing are always purely domestic.

These are big reasons to be wary of purchasing power parity but for lack of better measures, important organisations like the United Nations, World Bank and, most prominently, the IMF use PPP anyway, if in a much modified and more nuanced way. The use of PPP is pervasive at the IMF and appears in many reports, including the influential semi-annual World Economic Outlook.⁴ The Organisation for Cooperation and Economic Development (OECD) is another user of PPP and publishes a monthly report available to the public. The IMF and the OECD use PPP for a multitude of purposes, including setting quotas (IMF) and evaluating competitiveness and other economic measures. Beware of searching the internet for the IMF or OECD PPP data and expecting to find an instantly readable table, though – the statistical gyrations they go through will make your head spin.

One of the main reasons not to consult the PPP tables of the supranational organisations is that few FX professionals are consulting them. The formation of sentiment is always a group exercise; a factor may be true, but it's not useful for forecasting and trading purposes unless the broader market is looking at it, too.

Recently Bloomberg News Service started publishing the OECD monthly PPP data in a highly readable format. As far as we know, traders still view PPP as a curiosity, although one not to be missed. In Table 5.1, every currency except the euro is overvalued against the US dollar as of June 2012. We do not know whether, or by how much, such a judgment affects market sentiment toward the dollar.

Table 5.1 – OECD purchasing power parities against the US dollar

Undervaluation (%)	Currency	Overvaluation (%)
	Australian Dollar	33.98
	Norwegian Krone	26.86
	Swiss Franc	21.84
	Danish Krone	21.70
	Canadian Dollar	17.40
	New Zealand Dollar	16.81
	British Pound	2.12
3.03	Euro	

Source: Bloomberg

⁴ Nick Silver, 'IMF Applications of Purchasing Power Parity Estimates', IMF Working Paper, November 2010 (www.imf.org/external/pubs/ft/wp/2010/wp10253.pdf).

Those who observe fair value – PPP forecasts

Even given the above, the concept of PPP-based fair value does lurk in the bushes, presumably contributing to overall sentiment, even if it's doubtful anyone ever places a big bet on PPP alone. Some banks (and possibly some hedge or sovereign risk funds) create PPP tables and those are occasionally quoted in the financial press.

Credit Suisse, for example, calculates PPI using not only traded goods but also market-relevant factors such as investor demand for portfolio investments and direct investment. Direct investment, for example, is derived from long-term productivity trends, a splendid deduction, whereas portfolio investments are influenced by interest rates. The Credit Suisse model takes into account other factors, including trade deficits/surpluses. Its goal is to derive fair value for a currency pair, chiefly the euro/US dollar. Wisely, the bank offers a range based on standard deviation and not just a single number.

UBS is another of the banks that adds to PPP by estimating the amount of time a worker must expend in each country to earn enough to buy a Big Mac from McDonalds, an add-on to *The Economist's* Big Mac Index.

The Big Mac Index

The Big Mac Index, published every year since 1986, judges whether a currency is undervalued or overvalued, and by how much, based solely on the cost of a single item – a Big Mac – instead of a basket of goods. The index has had a surprisingly accurate track record for *forecasting* currency moves, albeit with varying time lags. *The Economist* now tweaks PPP by adjusting for GDP per person, since the price of a Big Mac has to have some relationship to affordability.

The measurement starts with the cost of a Big Mac in the US as the benchmark, against which is measured the cost in other countries. The implied purchasing power parity cost in other countries is deduced by how much more or less the Big Mac actually costs. The difference is attributed to the exchange rate. If the exchange rate were to change to the implied PPP cost, it would equilibrate the costs perfectly and everyone in the world would pay the same amount for a Big Mac.

Looking at Table 5.2, in July 2011 *The Economist* implied PPP exchange rate for the Australian dollar was \$1.12 when the actual exchange rate was \$0.92. Sure enough, a year later, the Australian dollar had appreciated to \$1.0313, closer to the implied rate.

The euro should have been \$1.18 on the implied PPP basis when it was actually \$1.43 in July 2011, and again the euro moved in the correct direction and a year later was closer to the PPP forecast, \$1.2154 from \$1.43. The UK pound, however, went the wrong way. In 2011, the implied PPP exchange rate was \$1.70 when the pound was actually \$1.63. The pound should have risen but, instead, a year later it was lower at \$1.5498. Obviously the FX market considers many factors other than relative purchasing power.

Table 5.2 – forecast outcomes from the Big Mac Index

	Actual Exchange Rate (25 July 2011)	Economist implied PPP exchange rate (25 July 2011)	Actual exchange rate (25 July 2012)
Australia	0.92	1.12	1.0313
Euro zone	1.43	1.18	1.2154
United Kingdom	1.63	1.70	1.5498

Eurostat purchasing power parity and advance applications of PPP

Eurostat, the statistics arm of the European Union, doesn't have a use for a dollar-based purchasing power measure but does have a use for one based on its own members. Only 17 of the 27 European Union members belong to the European Monetary Union and therefore use the euro. The other ten use their own currencies.

Since a primary goal of the EU is to facilitate regional cross-border trade and price convergence, Eurostat wants to display the range of price levels using its own European currency base. It achieves this aim by creating a purchasing power standard (PPS) in which the combined currencies of the EU-27 equals 100. Every other measure is in reference to this standard.

For example, as of June 2012 for June 2011, the price levels of the EU-27 vary from 51% of the standard (Bulgaria) to 142% (Denmark). The GDP per capita of the 27 EU members ranges from 45% to 274% of the standard. The comparison among countries shows that after prices are standardised to the EU-27 benchmark, the EMU countries have GDP that is 8% higher than the standard (as shown in Table 5.3).

Table 5.3 – GDP per capita at the EU purchasing power standard (June 2011)

European Union (27 countries)	100
European Monetary Union (17 countries)	108
Germany	120
United Kingdom	108
Norway	189
Switzerland	151
United States	148
Japan	105

Source: epp.eurostat.ec.europa.eu/portal/page/portal/purchasing_power_parities/introduction

In other Eurostat data, you can find relative price comparisons. By comparing any price in a country to the EU-27 purchasing power standard, you can tell whether a good or service is expensive or cheap relative to the group. A 2010 study found that overall prices in the UK (for food, clothing, electronics and other items) were exactly 100, or equal to the EU-27 standard. Ireland was relatively expensive at 118 and Albania was the least expensive at 50.5

One of the most interesting applications of the purchasing power parity concept is Eurostat's measurement of private household consumption (including indirect taxes) over time, since a goal of a currency union is to get price convergence. Eurostat calculates a coefficient of variation away from the EU-27 purchasing power standard. Increasingly lower numbers mean convergence of prices and this is what the EU and EMU have achieved. From 1995 to 2011, the EU-27 had decreasing coefficients, from 42.6 to 25. The EMU-17 also had price convergence, from 28.3 to 15.5.

5 epp.eurostat.ec.europa.eu/cache/ITY_PUBLIC/2-28062011-AP/EN/2-28062011-AP-EN.PDF

6 epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsier020

The Taylor Rule

Economists and traders watch inflation very carefully – inflation is the source of currency devaluation now that coin-clipping and counterfeiting of metal coins are irrelevant. A key cause of inflation is money supply outstripping production capacity, and so we also care about GDP and the so-called output gap, referring to spare capacity or its absence. A rise in input prices will be passed through to the buyer if demand is high and capacity is tight, but producers will let higher input prices eat into their profit margins if demand is weak and there is a lot of spare capacity.

Central banks strive to make monetary policy that keeps the output gap small but not zero, meaning production capacity needs to increase, assuming rising population and thus rising demand for goods and services. How do you get investment in production? You have a real (after inflation) rate of return that rewards savers and investors. If the real rate of return is zero or negative, nobody will invest and your manufacturing base (or housing stock) goes to wrack and ruin. Central banks face the question of how to balance the mix of money supply, the inflation rate (inflation targeting) and the interest rate to obtain the optimum non-inflationary growth rate.

Since standard economics fails to inform us how to make effective monetary policy, in 1993 a Stanford University economist named John B. Taylor devised the Taylor rule in which he observed that central banks make the best and most effective policy when they raise or lower short-term interest rates when inflation is rising too fast or output growth endangers closing the output gap. As a practical matter, you can use the unemployment rate as a proxy for the output gap. The Taylor rule incorporates the principle that to keep savers/investors involved, a rate increase needs to be bigger than any inflation increase. If inflation is going up at a pace of 1%, the rate increase needs to be more than 1%.

The Taylor rule is far more useful than other formulations because it shows the trade-off between inflation and growth. In the original, most simple version, the Taylor rule said the short-term interest rate should be a direct function of the divergence of inflation from the desired rate of inflation, plus the assumed equilibrium real interest rate, plus the difference between GDP and potential output.⁷

A problem immediately surfaces – which inflation rate? Core inflation, controversially, excludes volatile prices like energy and food. Taylor uses the GDP deflator, which is closer to core inflation than to headline inflation. Another issue is how you treat negative growth in GDP. A negative number makes everything else in the equation negative but you can't have a negative nominal interest rate (although you can have a negative real interest rate). In May 2009, for example, Taylor applied his own rule and concluded that Fed funds should be 0.50% (the rate was 0% to 0.25% at the time). The FX market deduced that the Fed had over-loosened and this would be a dollar-negative because inflation must follow – helping the euro in its recovery off the March low at 1.2457 caused by the Greek bailout to the high in November that year at 1.5142.

By June 2009, according to an article on the Bloomberg News Service, Dr. Taylor said the data suggested a rate of negative 0.955% (when the Fed funds rate was the same 0% to 0.25%). This was harder for the FX market to digest. Observers who thought the Fed had gone too easy were confused. Pimco, the biggest bond fund in the world, had reduced holdings of long-term government debt on the inflation scare early in 2009 and added more on the equities side. That same spring, Pimco made a splash with “the new normal,” a roadmap for post-crash conditions that explicitly called for much slower growth – permanently slower growth – but accompanied by higher inflation, or stagflation. The anti-inflationary (if not downright deflationary) effects of slower growth were not recognised at Pimco for several more years – in 2011, Pimco admitted it was wrong about the yield trajectory of longer notes and bonds. Pimco may end up being right about ultra-low interest rates leading eventually to inflation, but that assumes policy-makers are not following Taylor rules.

The ECB and Fed do not officially and explicitly follow the Taylor rule, although you can find research papers from Fed economists that go into excruciating detail suggesting that they do.⁸ Overall, the Taylor

⁷ J. B. Taylor, ‘Discretion versus Policy Rules in Practice’, *Carnegie-Rochester Conference Series on Public Policy* 39, December 1993, pp. 195-214 and J.B. Taylor (ed.), *Monetary Policy Rules* (Chicago: University of Chicago, 1999).

⁸ www.frbsf.org/economics/economists/grudebusch/el2009_17data.xls

rule is an effective, if simple, policy guide.⁹ It should go without saying that economists and market players alike enjoy debating the finer points of the Taylor rule, now expanded to the plural – Taylor rules. European economists apply the rules to the ECB, with both historical data and on currently evolving data, to judge the central bank, including many who work for the central bank. It's safe to say that the Taylor rule ideas have taken over whatever theoretical debate is still going on in the field of FX determination. If you Google 'Mundell-Fleming', you get 318,000 hits, but if you Google 'Taylor rule', you get 18.9 million.

Notice that the Taylor rules do not address the determination of FX rates directly. Instead we care about the Taylor rule as a way to judge a central bank's ability to measure the most important variables affecting exchange rates – inflation and growth. From this we can easily see why traders view as the most important indicators those that pertain to inflation (or pending inflation) and growth expansion or contraction, featuring most prominently the purchasing managers indices in all countries and sentiment indicators like the IFO index in Germany. In fact, in the oversimplified trader's world where decisions have to be made in a fraction of a second, the top indicators all pertain to inflation or the output gap, even if the output gap is not the economics concept most traders would say out loud.

⁹ Athanasios Orphanides, 'Taylor Rules', Staff Working Paper in the Finance and Economics Discussion Series (FEDS), 2007-18 (www.federalreserve.gov/Pubs/FEDS/2007/200718/200718pap.pdf).

Institutional overrides

Events with an upper-case E affect exchange rates in a predictable way, generally because they contain the seeds of a plausible forecast. We can think of dozens of events over the past 20 years that have moved the market like a herd, including central bank announcements, the Shanghai Surprise, the invasion of Kuwait and Iraq, the US Secretary of the Treasury denouncing China's exchange rate policy, and Europe's sovereign debt and banking sector crises that started in 2009 and have not yet ended.

Events can come from any direction, let's look at some examples.

Markets for other assets

Moves in *other markets*, especially very large downward stock market or commodity price moves, affect currencies. On the whole, routs and crashes in other markets tend to send traders to the dollar as a safe haven, unwinding months and years of diversification into equities, especially emerging market equities, and commodities. We talk about this in more detail in Chapter 6.

Central banks

Central banks are often the source of Events. As everyone in finance knows, central banks use code words to alert markets to their upcoming actions. The ECB favours phrases like "second round effects" (meaning wages are moving up and threatening inflation). One of the most interesting cases was ECB chief Jean-Claude Trichet using a single word – "brutal" – to describe the overvalued euro on 12 January 2004. It worked – the euro fell over 500 points in response in subsequent days. He tried it again in November that year and failed to get the same effect, at least not right away. But by December 2004, analysts at Goldman Sachs were writing of the overvalued euro and predicting a drop. The euro obediently fell from a close of \$1.3558 at end-December 2004 to \$1.1638 by 15 November 2005.

At the Kansas City Fed's annual international conference in Jackson Hole, Wyoming, in 2010, Fed chief Bernanke tactfully mentioned a second round of quantitative easing. Traders didn't need to be hit over the head – they knew instantly it meant the dollar would fall. Sure enough, the EUR/USD rose from a close of \$1.2762 on the date of the speech (27 August 2010) to a high of \$1.4281 by 4 November when QE was actually announced.

Political events

Political events like elections tend to get short shrift among FX market players – Japan has booted out more than one prime minister, including for corruption in office, without causing the yen to twitch. When the US was nearing official default during the Clinton Administration because of opposition party pique, the dollar remained in a narrow range around 1.1550 against the Swiss franc for the entire crisis period (October to December 1995). When the US was nearing default in the spring of 2011, however, more than pique was at play. The political environment was poisonous and the S&P ratings agency downgraded US sovereign paper on the basis of political dysfunction as well as the ratio of debt to GDP. This time, EUR/USD fell from \$1.4055 on the downgrade date (5 August 2011) to a high of \$1.4517 by 17 August. The dollar index fell from a high of 75.383 on 5 August to a low of 73.452 on 17 August over the same period. Many other things were happening at the time, of course, but it's not unfair to attribute the dollar's drop to the downgrade.

In Europe, many political developments during 2011 were euro-negative, such as the announcement by Bundesbank chief Weber that he would resign from the BBK and withdraw his candidacy for the top job at the ECB. In September, the German representative on the ECB's policy-making board, Juergen Stark, resigned. In each case the euro was already falling when the news was released and it fell another 50 to 100 points on the news.

War

Military skirmishes and events during wars tend not to move the FX market, but declaration of war does. When the US moved to the aid of Kuwait in early 1991 – something in the works ever since the Iraqi invasion on 2 August 1990 – the dollar/DM ended a lengthy downtrend by rising from \$1.4535 (7 February 1991) to \$1.8386 on 6 July 1991. The same thing happened again when the second President Bush invaded Iraq in March 2003. Against the euro, the dollar rose from the euro high at \$1.1084 on 11 March to 1.0498 at the low on 21 March 2003 – in the midst of a major euro upmove. This time the dollar's gains were short-lived but the point is made – the rising dollar was a vote of confidence in the US, perhaps somewhat puzzling in the context of much of the world disapproving of the US' action.

International conferences

The Group of 7 or G7 hardly ever delivers thrilling news, but an exception was US Treasury Secretary Snow announcing, ahead of the 15 April 2005 meeting, that it was time for China to “fix” its financial system “and increase FX market flexibility.” At the same time, John B. Taylor, US Treasury Undersecretary for International Affairs (the same Taylor of the Taylor rule) urged China to revalue the yuan, saying China had been in preparation long enough. These comments caused a tremendous stir, not least because the G7 tends to be decorous to the point of stupor. And yet a few months later, in July, China did indeed end the yuan's peg to the US dollar and initiate a float.

At the G20 summit in Seoul, South Korea, in 2010, Brazilian Finance Minister Mantega spoke passionately about the developed countries ruining emerging market financial plans by selfishly keeping interest rates abnormally low for the sake of their domestic economies. He said this was inspiring excessive capital inflows to emerging markets and currency appreciation to the point of harming exports. The emerging market response had to be FX market intervention, capital controls and other unpleasant policy choices.

The phrase “currency war” was the hot ticket for many weeks and while superseded shortly after by the European sovereign debt crisis and debate over the future of the euro, it has not completely gone away. In fact, James Rickards published *Currency Wars, The Making of the Next Global Crisis* in 2011, postulating that currency wars are historically not uncommon and public policy makers persist in failing to see how currencies interact with other financial affairs as well as national security and other non-financial matters. Currency wars always end badly, he says.¹⁰

The G7 (or G8 with China) have now largely been replaced by the G20, which consists of 19 countries along with the European Union. In September 2009 at the G20 Summit in Pittsburgh, President Barack Obama said “We can no longer meet the challenges of the 21st century economy with 20th century approaches. And that's why the G20 will take the lead in building a new approach to cooperation. To make our institutions reflect the reality of our times, we will shift more responsibility to emerging economies within the International Monetary Fund, and give them a greater voice.”¹¹

It remains to be seen whether giving emerging markets like Brazil, Russia, India and China a bigger voice in actual decisions is even remotely possible. For example, they disapprove of the Fed cutting interest rates to the bone because it means yield-seekers arrive on their shores, driving up asset prices and causing currency overvaluation, which in turn harms export-driven growth. The Fed's rate cuts are targeted to the US economy without regard for others' economies. Should the Fed not do the best job it can to promote US growth in order to provide succour to emerging markets? The mind boggles.

While these Events were going on, they captured the attention of the trading world almost entirely. Economic data was being released on schedule, as usual, but the standard responses to the data were heavily influenced by the Events, sometimes to the point of being excluded as determining factors altogether. That is certainly the case when governments intervene.

¹⁰ James Rickards, *Currency Wars, The Making of the Next Global Crisis* (Penguin, 2011).

¹¹ www.whitehouse.gov/the-press-office/remarks-president-g20-closing-press-conference

Government intervention in the FX Market

The uniqueness of FX intervention

FX is the only market in which governments regularly intervene directly, buying or selling their own currency to influence its price. We see government interference in other markets in other forms, including subsidies and taxes, limits on short sales in equities, and adding or releasing strategic commodities like oil. For example, during the Asian crisis of 1997, the Hong Kong Monetary Authority intervened in the equity market as a means of defending the HK dollar peg to the US dollar, and at various times, Japan has directed government entities to buy Japanese equities as an offset to falling equity prices triggered by a too-strong yen. Even so, government intervention in FX is unique among financial markets.

Unlike the official pro-intervention policy of the late 1970s, the current US stance is that intervention should be a rare thing and should become ever-rarer:

“Since the breakdown of the Bretton Woods system in 1971, the United States has used FX intervention both to slow rapid exchange rate moves and to signal the US monetary authorities’ view that the exchange rate did not reflect fundamental economic conditions. US FX intervention became much less frequent in the late 1990s. The United States intervened in the FX market on eight different days in 1995, but only twice from August 1995 through December 2006.”¹²

But in practice, the US has intervened in FX every few years in one context or another. Just after the March 2011 earthquake/tsunami/nuclear meltdown in Japan, the US joined the other members of G7 to intervene, at Japan’s request. Japan went on to intervene on its own, spending \$58 billion in August 2011 alone.

Intervention in practice

Even a partial list of interventions by the major countries would run for dozens of pages. A full list would include numerous interventions by emerging market central banks, including South Korea, Taiwan and China as well as others, and also run for many pages. During the period 1985-95, the Fed intervened in the dollar/DM 237 times and in the dollar/yen 213 times. During the same period, the Bundesbank intervened on 326 days and the Bank of Japan, 380 days.¹³ One of the most sentiment-affecting interventions was on 22 September 2000, when the Fed, ECB and BoJ jointly intervened to drive the euro up after it fell below 85¢ for two days in a row, a loss of almost 30% from inception in January 1999. It was the first-ever intervention by the ECB.

Another remarkable instance was the massive intervention undertaken by the Bank of Japan during 2003 and ending in March 2004. During 2003 alone, the amount spent was ¥20.2 trillion, or \$177 billion, and in the first quarter of 2004, it spent another ¥14.8 trillion, or \$139 billion. This was the biggest intervention before or since. During this period, the yen still appreciated from ¥119 to the dollar to ¥104, although of course nobody knows how much further the yen might have gone in the absence of intervention. After all, in an earlier incident, the yen had reached ¥79.75 in April 1995. If you are a Japanese exporter, ¥104 is still preferable to ¥79.75.

Japan is the biggest serial intervener among countries, not only for the size of the commitment but also the frequency. Before the stunning 2003 blow-out, the BoJ had been actively intervening from 17 September to 28 June 2002, with the US joining on 27 September 2001. And before that, the BoJ sold yen a total of 18 times between January 1999 to April 2000, with coordination with the Fed and ECB on a few occasions.

We often do not know the exact amounts governments are spending in intervention forays, although traders try to judge from the price effect. Japan is the only country that publishes data from which intervention can be deduced. The Bank of Japan (and the Federal Reserve) announce intervention or having refrained from intervention in the monthly central bank reports.

¹² www.newyorkfed.org/aboutthefed/fedpoint/fed44.html

¹³ www.michelbeine.be/pdf/paris10.pdf

In July 2012, the Swiss National Bank reported a rise in official reserves, attributed to FX market intervention, to over 60% of GDP and the press extrapolated that to 100% by year-end. Nobody knows what this means or what action the Swiss can or should take. Is 100% too much? In what way does it matter? As long as the central bank sterilises the money supply so it does not leak into the domestic banking system to promote inflation, it's not clear that intervention has any effect on the real economy.

Sterilisation

Note that when a central bank intervenes to prevent its own currency from getting too strong or too weak, it pumps more money into the money supply or siphons it out by buying/selling FX reserves, generally dollars and euro. Altering monetary aggregates like this can really mess up other policy goals. Raising money supply risks inflation, for example. Central banks sterilise the FX operation by withdrawing or adding to money supply in some other manner.¹⁴

Note also that sometimes central banks have to borrow FX reserves to intervene, which is one stated purpose of various swap line arrangements. Unlike the Asian crisis when emerging market central banks had low foreign exchange reserves, in recent years, with reserve holdings beefed up, EM central banks are better fortified to intervene when their currency is weakening.

Sterilisation is vitally important in any discussion of intervention, including intervention in bond markets as well as foreign exchange. This is because failure to sterilise results in a surge in the domestic monetary base and can therefore the intervention can become self-defeating as the central bank feels compelled to raise rates alongside rising inflationary expectations, resulting in the very capital inflows the intervention is trying to ease. Then the intervening country can end up with debt to the other country that has lent it the reserves with which to intervene and no respite from rising capital inflows. The immediate currency effect may be as desired but, longer run, the country has shot itself in the foot.¹⁵

Therefore, FX traders are always on the lookout to discover whether an intervening country is also sterilising, regardless of whether the intervener is an advanced country or an emerging market country. As the ECB intervened in the peripheral sovereign bond market in recent years, for example, analysts were careful to stipulate the amount of sterilisation it also undertook – nearly 100%, as it happens. If the ECB had not sterilised, FX traders would have deduced the ECB was flirting with inflation and the ECB would have lost some of its hard-won chops as a dedicated inflation-fighter.

Why governments intervene

The chief reason governments give for FX intervention is to combat “disorderly market conditions.” The Versailles intervention study added “to reduce short-term volatility” and “on occasion to express an attitude toward exchange markets.”¹⁶ Another idea is to *signal* to the market what the government believes is true fundamental value. The official BIS and G7 stance is that intervention is effective only when other policies support and complement it, especially monetary policy. During the late 1970s, for example, Fed economist Edwin Truman reports, US thinking ran along the lines that inflation was not so bad that interest rates needed to be goosed upward and intervention could take care of the dollar devaluation resulting from rising inflation expectations. Equally counterproductive is to intervene to resist a currency rising while the central bank is tightening. This is exactly what happened during 1989-90, when the US Treasury intervened for a record 97 days (to the dismay of the Fed).

¹⁴ Michael M. Hutchison, ‘The Role of Sterilized Intervention in Exchange Rate Stabilization Policy’, June 2002, for the conference ‘Stabilizing the Economy: Why and How?’ sponsored by the GeoEconomics Center of the Council on Foreign Relations, New York City (www.blackwellpublishing.com/specialarticles/Hutchison.pdf).

¹⁵ www.imf.org/external/pubs/ft/issues7/index.htm

¹⁶ Edwin M. Truman, ‘The Limits of Foreign Exchange Intervention’ (Chapter 12), *Dollar Overvaluation and the World Economy* (Institute for International Economics, 2003).

Few countries specify their ideal exchange rate, at least not out loud. In fact, some academics who studied interventions come to the conclusion that governments are more effective when they do not specify a target exchange rate when intervening, although traders always try to guess the “line in the sand,” the FX rate that will trigger intervention. Exceptions include currencies managed to a basket of other currencies and the influential dollar/yen forecasts of the Japanese business association Keidanren, technically not a government agency.

Instead, as a general rule the goal of free market economic management is to get the fastest growth and highest employment rate possible without inflation. The level of the currency (and the trade or current account balance) doesn’t enter into it and can conflict with the high growth or low inflation goals. If monetary policy remains higher for longer to be sure of having stamped out inflation, as in the early 1980s in the US, you get a strong dollar and damage to the export sector. In other words, often the goals of a government for its domestic economy are wildly different from its goals for external sectors (trade and current account balances). In two major countries, the US and Japan, the agency tasked with managing the currency is the Treasury and Ministry of Finance, while the agency responsible for monetary policy and domestic sectors is the central bank (even though in both countries it is the central bank that actually executes the intervention trades at the direction of the Treasury or Ministry of Finance).

The efficacy of intervention

A fair amount of government and academic ink has been expended to evaluate whether intervention works, including studies covering a few hours to those covering the longer term, or three months.

Academics tend to be sceptical about the efficacy of sterilisation. It seems to work in the short run, but Hutchinson writes:

“The evidence is not clear on how long the effects of intervention last. Moreover, large-scale sterilised intervention, coordinated intervention and substantial currency swap arrangements may not be enough to stabilise an exchange rate parity in the face of a speculative attack in the absence of a strong and credible political commitment by the affected central banks and, ultimately, coordinated monetary policy. A strong political commitment, in turn, is usually more easily sustained when economic fundamentals are broadly in line both with the desired exchange rate parity *and* other macroeconomic objectives.”

Remember, though, that studies of intervention and sterilisation are written by economists for whom equilibrium is not a fiction but an actual policy goal.

In 1993, the BIS published a study saying intervention doesn’t work, but it was overtaken by other studies – and by events, including the shocking, massive and successful Japanese intervention in 2003-2004. On the whole, the hammer comes down on the side of intervention working about half the time. Former Fed official Truman says intervention is effective when it incorporates:

1. a public announcement
2. others joining in (coordinated intervention)
3. policy consistency (monetary policy is going in the same direction as intervention)

The Swiss National Bank had two of the three success factors when it announced in early September 2011 that it would intervene to rein in the too-strong Swiss franc. The public announcement was strong and the SNB had already signalled near-punitive measures against hot money inflows. Judging from Figure 5.1, which illustrates the price movement around the intervention, the market was as impressed and fearful as the Swiss wanted. The EUR/CHF put in an upside channel breakout, if not to the 200-day moving average.

Figure 5.1 – EUR/CHF September 2011

But in the wider picture, Switzerland had been intervening fitfully for many years. In June 2009, the BIS intervened on Switzerland’s behalf. Switzerland intervened six to eight times during 2010 and earlier in 2011 before the September pegging announcement. If you look at the big-picture Figure 5.2 of the EUR/CHF, the chief target, you can see that the overall trend remains the same.

Figure 5.2 – EUR/CHF long-term trend unaffected by interventions

Similarly, the earlier Japanese intervention – which failed for months on end during 2003 as traders played chicken with the Bank of Japan – was abruptly ended in February 2004, on no advance notice. The dollar/yen stopped falling by the end of that year and proceeded to put in three full years of less-strong yen prices, even surpassing the 200-day moving average. This is illustrated in Figure 5.3.

Figure 5.3 – dollar/yen

But over the longer run, can Japan claim to have won? No. But then it was not the intent of the Japanese Ministry of Finance to effect permanent change, just to provide relief for the beleaguered export sector. The dollar/yen has been on a downtrend since 1985 and in 2011 broke the lowest-low line from 1995, when the grounds of the Imperial Palace in Tokyo were notionally worth more than the entire state of California. See Figure 5.4 for the longer-term picture.

Figure 5.4 – dollar/yen longer term

Japanese financial officials have a specific constituency not shared with most other nation's officials – the Nikkei stock index, which is highly correlated with the dollar/yen. In fact, of all the purported intermarket correlations, this is the tightest and longest-lasting of them all. When the yen gets too strong, exporter shares suffer. See Figure 5.5.

Figure 5.5 – USD/JPY vs. Nikkei stock index

Emerging market interventions

As noted above, emerging markets have found it necessary to intervene to slow down the rise of their currencies in recent years to avoid killing off their export markets, including China, Brazil, South Korea, and Taiwan. The assertion of a “currency war” by Brazilian Finance Minister Mantega at a G20 meeting in late 2010 continues to reverberate. The hot emerging markets (like Brazil) feel that ultra-low interest rates in the developed economies are a selfish policy and amount to “currency manipulation,” since the universal and never-ending quest for yield drives investors to their markets.

Ironically, sometimes emerging market central banks have also had to intervene in the other direction – defending their currencies from excessive depreciation – when a global financial crisis sends capital to safe-havens, as occurred in September 2011. Emerging market equity markets tanked and hot money flowed out.

Summary

Economic theories of exchange rate determination are inadequate to help the FX market practitioner, especially professional traders, make good decisions. We use various bits and pieces of theory along the way, such as taking notice of a fresh estimate of purchasing power parity or responding vigorously to the payrolls report in the US (if they are too low this means the output gap is widening, there is reduced danger of inflation and thus reduced probability of a rate hike).

The important thing about economics and the trader is that where theories are not helpful, simple formulas like payrolls are adequate to the job. We disparagingly refer to stockbroker economics as inaccurate and often misguided but, in practice, following the crowd on interpretation of economic data is the pragmatic and expedient path to good trading outcomes, at least in the short run.

It is especially wise to abandon any preconceived ideas about how economics affects exchange rates when Events emerge, and most of all when governments intervene. Intervention pretty much proves the point that economics has yet to help governments adequately design policies that cover all the bases.