

BARBARA ROCKEFELLER  
VICKI SCHMELZER

# THE FOREIGN EXCHANGE MATRIX

A NEW FRAMEWORK FOR  
UNDERSTANDING  
CURRENCY MOVEMENTS

• • • • **Sample** • • • •

# **The Foreign Exchange Matrix**

**A new framework for traders to  
understand currency movements**

By Barbara Rockefeller and Vicki Schmelzer

The logo consists of the letters 'Hh' in a white, serif font, centered within a solid black square.

**Hh**

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BR

*To Evangeline Hogue, English teacher  
extraordinaire, with my thanks*

VS

*To my brother Bob – I would never  
have come to New York and become  
involved in currency trading without  
his support*

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# Contents

About the Authors	vii
Foreword	ix
Introduction	xiii
<b>Chapter 1</b> – The Matrix Concept	1
<b>Chapter 2</b> – Review of Risks	19
<b>Chapter 3</b> – Global Attitude Toward Risk	41
<b>Chapter 4</b> – Interest Rates and Interest Rate Differentials	61
<b>Chapter 5</b> – Forecasting FX	83
<b>Chapter 6</b> – Positions and Flows	113
<b>Chapter 7</b> – Intermarket Analysis	133
<b>Chapter 8</b> – Technical Analysis in Foreign Exchange	151
<b>Chapter 9</b> – The FX Files of Trading	181
<b>Chapter 10</b> – Be Careful What You Wish For: Reserve Diversification and the Future of the Dollar	193
<b>Chapter 11</b> – The Euro and the New Gold Standard	225
<b>Chapter 12</b> – The Central Bank Tool Kit and How it Affects Foreign Exchange	243
References	263
Index	269





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# Foreword

As you will undoubtedly gather from reading the introduction to this book, foreign exchange is a complex topic. It is complex in the number of factors that impact currency valuation, it is complex in the relative weighting of these factors and it is complex in the timing of these factors. Barbara Rockefeller and Vicki Schmelzer have done a masterful job of making sense of a market that some of the best and brightest have regarded as enigmatic if not utterly incomprehensible. Much of this scepticism is driven by what the authors refer to as the perverseness of markets – the habit of currency prices to respond contrary to what fundamental analysis would suggest. Further scepticism is caused by the perceived absence of financial market theory to explain currency valuation. Additional scepticism comes from the poor track record of many market professionals in managing foreign exchange risk – some infamously. The default view is that foreign exchange markets are random and that one should hedge away any underlying currency exposure and focus on the business at hand, whether that is investing in global equities or fixed income or managing a profitable multinational corporation.

Currency hedging is very common in global markets, but it is by no means ubiquitous. The rule of thumb is that global bond investors hedge on average 80% of their foreign exchange exposure, while global equity investors hedge on average only 20% of their exposure. Much of this is due to the positive correlation between equity market performance and appreciation of the local currency. The accepted explanation is that equity markets rally during periods of relative economic strength that are accompanied by rising inflation and interest rates. The combination of these factors attracts foreign investment into the country, which lifts the value of the local currency. Furthermore, currency hedging is more common in developed markets than in emerging markets, owing to the lack of an organised futures market in many developing countries that is needed for hedging. While some players have attempted to solve this problem through proxy hedging, their track record is not particularly encouraging. Moreover, proxy hedging tends to be more expensive than many assume, particularly in the longer term. Slippage in economic and policy variables, such as inflation or interest rate differentials, ensures that no currency is a perfect proxy for another. However, as foreign exchange exposure has grown with the globalisation of asset management over the past 30 years, there has been an increasing interest in understanding currency markets. While some portfolio managers attempt to beat their benchmarks by creating alpha from actively managing foreign exchange risk, an increasing number are even trading currency as an asset class.

The absence of a widely accepted economic model for foreign exchange valuation does not imply that currencies are random any more than equity or fixed income securities are random. As in other asset classes, currency prices are driven by supply and demand. So, we should revert to the balance of payments to determine the net inflow or outflow of trade and investment. Ideally, net trade and investment flows (or what economists refer to as the broad basic balance) should be used to explain real effective exchange rate rather than spot exchange rates. Why? The value of a currency is more than simply its relative value to the US dollar or euro. Rather, it is the trade-weighted average of a given currency with its trade and investment partners. Moreover, no two countries have exactly the same level of inflation every year over the indefinite future. Consequently, we need to work with real rather than nominal exchange rates, as inflation is corrosive to the value of a currency as demonstrated by the law of one price and the theory of purchasing power parity. While this approach is relatively uncontested, it falls short of fully explaining currency price movements. Currencies are not fully floating (determined by market supply and demand), but are often subject to intervention or even active management to limit a currency's movement over time.

There are as many foreign exchange regimes as there are countries, with only a handful truly fully floating. While major currencies such as the Japanese yen and the Swiss franc have been subject to intervention and price management recently, even the euro and US dollar have experienced market intervention over the past ten years. The reason is two-fold: first, central banks covet orderly market conditions; and second, governments prefer stable currencies to avoid threats to growth that accompany large currency movements. For these reasons, it is very difficult to use fundamental analysis to forecast foreign exchange prices. Just when a strong, fundamentally-driven currency trend is unfolding, the local authorities are most likely step in to stop it. Market intervention by the Swiss National Bank several years ago to arrest the Swiss franc's appreciation against the euro is a good example. Rather than it being driven by speculators, as suggested by SNB officials, it was largely due to the Swiss franc's safe-haven status amidst crisis-ridden Europe. Once you have controlled for all of these variables, you need to acknowledge the size of the interbank market and the large amount of cash it is able to move on a speculative basis. Trading for short-term profit in foreign exchange makes fundamental analysis useful only in the longer term. As the authors of this book point out, technical analysis is an indispensable tool of the foreign exchange trader.

*The Foreign Exchange Matrix* fills an important need in the market today regarding currency valuation and trading. With more than 50 years of foreign exchange market experience between them, Rockefeller and Schmelzer boldly go where few have dared. While they flatly admit to a lack of an elegantly

simplistic theory to currency valuation, what they provide is a vigorous and comprehensive examination of the factors that weigh on foreign exchange markets. What the reader comes away with is not only a better understanding of what moves currency prices, but a better understanding of global markets and the interconnectedness of the world we live in. The historical anecdotes alone are worth the effort of reading this book, as the authors move effortlessly from the Asian Financial Crisis to the LTCM Crisis to the Lehman Crisis with deft and skill. While the reader may not decide to quit their day job to day trade foreign exchange spot, forward and option markets, they will have a greater understanding of what factors drive currency prices and a greater degree of comfort in managing foreign exchange exposure – whether that exposure is by default or design.

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# Introduction

*“There is no sphere of human thought in which it is easier to show superficial cleverness and the appearance of superior wisdom than in discussing questions of currency and exchange.”*

Winston Churchill, Speech to the House of Commons, 29 September 1949

The FX market is a mystery to most people, including some of its participants. Pundits on other financial markets and legislators in most countries don't fully understand it, either. Everyone notes how big the FX market is – bigger than all other global markets combined at \$4 trillion per day – but no one ever asks “What is the purpose of all this trading volume?” There are other unanswered questions about FX too.

We also want to know whether FX secretly drives all other markets, or whether it is the passive end-product of all the other markets. Neither assertion is wholly accurate, but knowing that doesn't help us understand where FX *does* fit into the grand scheme of things. Further, why do exchange rates always overshoot any reasonable estimate of *value*, such as comparative purchasing power? Does this mean the FX market is inherently unstable, as financier George Soros has said?

Most of all, FX is money, and money has many different roles. Money is not only how we pay the electric bill (*medium of exchange*), how we measure economic sustainability (*unit of account*), and how we measure wealth (*store of value*), it is also a symbol of a country.

For example, the French were so attached to the now-defunct franc that they continued to hoard as much as €1 billion worth of them, or some 3% of the francs that were in circulation, when the euro was introduced in January 1999. In February 2012, the French government made a windfall gain of about €500 million when the franc finally hit its expiration date. Germany continues to allow the Deutsche Mark to serve as legal tender; the Bundesbank estimates that citizens hold as much as DM 13.2 billion as of end-June 2012. Then think of all the nicknames for the US dollar – such as greenback and buck – and most interesting, food names – including bread, clams and cabbage.

How do the non-functional, reputational aspects of money affect FX trading and, while we're on that theme, is it justified that the dollar is seemingly in perpetual crisis?

It is possible to provide easy answers to these questions.

## Easy answers

### What is the purpose of FX trading volume?

The FX market is so big because accounting convention allows it to be largely hidden. FX is a contingent asset/liability on the balance sheet of both banks and corporations, and is reported only in the footnotes of financial statements. Even then, FX is lumped together with “other securities.”

Further, the FX market is so big also because FX is a market dominated almost entirely by private speculators, including banks and hedge funds, who are trading almost entirely on private credit. The positions are not reported, nor are the credit lines backing the trading. You will search in vain for a number representing the gross credit lines of any bank to other banks for the purpose of FX trading.

FX trading outcomes are reported on the income statement, but do not have to be broken out from other securities trading. You will never discover how much profit Citibank, Deutsche Bank or Goldman Sachs made last quarter trading FX. And because FX traders are not burdened like equity and bond traders by having to meet a benchmark rate of return, relative performance among competitors is not in the public eye. FX traders have only cash profit targets and sometimes these are the bare minimum to justify the expense of the desk, quote terminal and telephone.

Finally, FX traded by institutions is not directly regulated by governments, although retail trading by individuals is usually regulated. FX escapes new efforts at regulation, as in exemption of FX derivatives in the US during 2010 and 2011, because self-regulation actually works, and works with impressive efficiency. This is in part because FX is a market on the leading edge of technology advances. We have not had a global problem due to FX since the Herstatt Bank failure in 1974, which was even then actually a credit risk issue and not strictly an FX issue. In essence, Herstatt accepted FX payments due to it and then declared bankruptcy, avoiding paying out its side of the FX trades. Note that credit risk always starts with the *character* of the counterparty.

### Does the FX market drive other markets, or is it a passive end-product? Why do FX markets overshoot?

FX is both the driver of economic conditions and the end-product of economic conditions, mainly through a single factor set – inflation and expected inflation, and its financial market manifestation, interest rates. The government entity most associated with inflation is the central bank and its interest rate policies. FX



traders watch inflation and its evil cousin, deflation, tirelessly and obsessively, even when they are low and flat.

It is true that exchange rates often overshoot reasonable estimates of their true value, but in the absence of any objective measurement of true value we count on market participants to judge when they have gone too far and to correct this themselves. If governments do not agree with the market's valuation, and desire a correction to be forced, they may order their central banks to intervene directly in the FX market.

The FX market is the only financial market in which governments intervene and such intervention is intermittent and fairly rare. Its rarity may suggest that governments dislike quarrelling with the market's valuations because they actually do believe the best policy is to *let the market decide*, or alternatively they may be lily-livered in the face of such a behemoth. It would in fact be easier and cheaper to change the policies that led to a *wrong* currency valuation than to intervene.

If the FX market is inherently unstable, it would be because governments engage in policies that lead to overshooting, including inadequate advance signalling of policy changes. So, if governments make bad decisions and manage policy poorly, it may be justified to say FX is inherently unstable.

Exchange rates also overshoot because we misinterpret economic data and do not have a universally accepted theory of how exchange rates should be determined. The absence of a single theory of FX determination allows overshooting to occur on the influence of other markets. A shop-keeper in Lucerne will glibly comment that the dollar is down against the Swiss franc because oil is up. An amateur retail FX trader in Hong Kong will say it's obvious that the S&P 500 and the FTSE 100 will follow the Shanghai Composite index down in a nerve-wracking big move, and a drop in global stock markets logically harms the dollar. *Really?* This is true only in the sense that greed and fear can easily jump asset boundaries. As for real-world fundamental connections, nearly everything posited about intermarket relationships is badly formulated, mistaken and often easily refuted.

But note that professional traders and key players like hedge funds are required to behave as though they accept the cause-and-effect relationship of FX and other markets because this is how they earn a living. A trader may know perfectly well that a big change in the price of oil or gold has no fundamental relationship to currencies in any particular situation, but will trade as though it does because that's the profitable strategy. This is one of the more vital of the insights into the FX market that we want to convey in this book – data *proving* intermarket correlations may be undeniable, but correlation is not causation and to assume intermarket relationships are valid and long-lasting can be dangerous.

Finally, sometimes the FX market overshoots because a technical pattern is being completed. FX is always heavily influenced by chart-reading, more so than any other market. Traders use technical analysis because it is an effective tool to measure sentiment and reliably leads to profitable trading. Anyone with a bias against technical analysis will not fare well in FX.

## How do the reputational aspects of money affect FX trading and is it justified that the dollar is in perpetual crisis?

Sentiment has many faces but can be boiled down to one concept – risk appetite or risk aversion. Preconceptions and bias toward nationalities is incorporated in the rolling risk appetite/risk aversion calculation. The euro, for example, has magic, and the dollar does not. The euro is able to withstand a major sovereign debt and banking crisis with less loss of value and less volatility than the history of currencies would suggest.

In contrast, the dollar can't get a break and is sold heavily on the slightest pretext, with bad economic news exaggerated and good news dismissed or undervalued. This is the fate of all reserve currencies, including the dollar, because to serve the reserve currency needs of the rest of the world, the reserve country always has to issue more currency than it needs for purely domestic uses. And yet the reserve currency is a safe haven in times of financial market panic.

## Decoding how the FX market really works

Many economists and financial professionals view the foreign exchange market as the pinnacle of sophistication. FX rates embody all the important Big Picture Macro developments of the day as well as the hidden undercurrents of the international capital markets. The FX market is linked to core economic health, central bank monetary policies, various countries' fiscal conditions, and trends in stocks and commodities. FX is the glamorous top of the heap.

And yet the professional bank traders who actually move the market minute by minute and day by day are like any other traders. They rarely have PhDs in international economics and finance. They are not paid to have analytically correct opinions. Their sole job is to make a speculative profit for the employer, literally out of thin air. It is thin air they are trading with because banks, hedge funds and other big players do not allocate actual cash or collateral to trade FX

– it's all done on credit lines. Professional FX traders can be viewed as the biggest speculators on the planet, with the primary currency traders at each of the big banks, sovereign risk funds and hedge funds having a credit line *stake* of hundreds of millions of dollars.

So which is it, pinnacle of high finance or grubby profit-seeking? It's both. How, then, do we get FX prices that reflect all those high-level economic factors and links to governments and other markets? Well, we don't. The reflection is like that in a fun-house mirror. Currencies *do not* equilibrate disparate conditions and imbalances, as economists theorise they should. Imbalances persist not for brief periods, but for decades. We see big exceptions to seemingly classic and timeless rules, like capital following the highest real rate of return and exiting a currency when returns fall. This is just one of the many strange and seemingly contradictory characteristics of the FX market that we seek to explain in this book.

Our goal is to describe how the FX market works in practice and to demystify as many of these puzzles as we can. Together we have about 50 years of experience in the FX market as big-bank spot desk dealer, big bank corporate FX trader, market economist, technical analyst, risk manager, and wire service reporter/financial advisor. Between us, we know or have heard of just about everything, and are equipped to verify or to debunk much of it.

Our purpose, however, is not to present a primer on FX. We assume that the reader already has a high level of knowledge about financial markets generally and a particular curiosity about the FX market. We can't puncture every misleading or inaccurate idea about FX that has been published as fact in the past decade, but we can offer a perspective that is both true and useful.

To help us do this, we use the overarching concept of risk appetite and its opposite side, risk aversion. Risk appetite is the only explanation that bridges the tangle of contradictory facts and theories about FX. For example, how can a crisis in Europe trigger an already overvalued Japanese yen to become stronger, even in the face of Japanese economic data that dictates the yen should be weaker? The answer lies in risk aversion inspiring Japanese investors to repatriate funds into the *safe-haven* home currency, the yen. The explanatory value of risk appetite/risk aversion is powerful, and much needed. Before we go further it is important to understand what risk aversion is and how it came to be used in analysis of the FX markets.

## Risk aversion

Risk aversion is a concept arising from economists in the insurance industry (later applied with great efficacy in designing lotteries). Academic work on this area includes measuring and modelling such things as the effect on absolute and relative risk aversion of a change in wealth. For example, a rich man fears losing 0.01% of his wealth more than a poor man fears losing 10% of his, which is one of the great mysteries of the human brain. Following the Lehman debacle in the autumn of 2008, the use of the concept of risk aversion to explain FX market behaviour was quickly adopted. Application of the concept to financial markets and especially FX quickly went viral and became universal within weeks.

In financial markets generally and the FX market in particular, we observe that players mostly act like the rich man – risk aversion starts out high and goes higher as a one-time specific threat to wealth appears. The Lehman Brothers bankruptcy was a spectacular example of a variable outside the usual scope of the FX market that became internal to the FX market through the transmission mechanism of short-term interest rates. The perception of excessive riskiness in the interbank lending market morphed in to a perception of excessive riskiness in the euro/dollar currency market. Risk aversion is what they have in common – it's a force through which price actions are produced.

As liquidity dried up and interbank lending tapered off to a trickle everywhere in the world, the US 4-week bank discount rate shifted from 1.92% at the beginning of June to 1.35% on 12 September – and 0.28% on 15 September, the date of the Lehman bankruptcy announcement. By year-end 2008, it was 0.11%. Yields fell all along the curve, too. The yield on the 10-year note was 4.324% on 13 June and dipped to 3.25% on 16 September. It bottomed near year-end at 2.038% on 18 December 2008. Around the same time, the euro fell from 1.5948 on 16 July 2008 to 1.2738 on 22 October 2008.

The drop in return reflects a massive safe-haven inflow to the dollar that violates the usual rule that *currency follows yield*. In other words, if all other things are equal, we expect a currency to fall if its yield is falling, especially the after-inflation, *real* yield. In 2008, investors were happy to get return *of* capital and never mind return *on* capital. The Treasury's report on capital flows bears out this thesis. The net capital flow to the US, including Treasuries, Agencies and equities, rose from \$14.76 billion in August 2008 to \$59.10 billion in September. This is risk aversion in action.

It's probably fair to say that risk appetite/risk aversion were known for decades under a different name: *greed* and *fear*. But whereas greed and fear arise from personal emotions that overcome rational cognition, risk aversion is entirely rational. The new *flat* world of international finance consists of players who

recognise *shocks* and *events* outside their own securities' factor set as capable of jumping barriers into their own factor set. In a sense, all factors, however exogenous-seeming, are potentially endogenous, and that's not even counting *unknown factors*.

It's not only the FX market that sees this effect. In US equities, after a 40-year delay, securities analysts started to acknowledge that multinational corporation earnings are influenced by FX rates; they were forced to start accounting for the FX effect of overseas earnings along with less difficult things like cash flow, EBITA and book value.

## Information overload

Risk appetite and risk aversion are handy proxies for a broader and more thorough analysis, but if you want to follow FX and understand why prices are moving the way they are, you need to hold in your head a mix of economic data, institutional factors, and technical indicators on six or ten currencies, not to mention that ineffable thing called *sentiment*, which includes what the majority in the market are thinking and thus how they are positioned.

Each country has, at a minimum, ten variables you need to follow, including rate of growth of GDP, inflation, industrial production or some proxy for it like the purchasing managers index, unemployment, consumer sentiment, debt-to-GDP ratios, and so on, plus the viability of the banking system, political developments and the policy bias of the central banks and resulting interest rates. In addition, you want to know the technical condition of the currency – is it trending up or down, and with what robustness?

This is clearly impossible.

To make life more complicated, the foreign exchange market is driven by factors that constantly shift. One week, the market is focused on interest rate differentials, the next on the trade balance or fiscal deficit, and after that, an upcoming election. One minute, the market is risk-averse and clamouring for safe-haven US Treasuries, and the next minute it is willing to dive head-first into frontier markets.

How do you know whether a factor will dominate trading for months to come or is merely a one-day wonder? How do you make wise trading decisions when a driver is brand new and the market is trading in response to this driver for the first time? When has one trend run its course and another trend begun? More importantly, how do you know when to believe commentators and when to intuit they are talking through their hats?

A difficulty commentators and traders alike face is that the economics industry has failed to offer up a coherent theory of exchange rate determination (see Chapter 5). The FX industry has failed to give us basic information, so easily available in other asset classes, on positions and flows (see Chapter 6). Even the most accessible of explanations, relative interest rates (see Chapter 4), fails with great regularity. Conventional thinking would have it that the country with the highest real rate of return (real denoting *after-inflation*) will get the biggest capital inflows and thus a rising currency. But in 2009 and 2010, Australia was the first to start raising interest rates and had the highest real rate of return among all the developed countries, and yet the Australian dollar fell about 14% from the April peak to the May low in 2010 and again in the fall of 2011 as global risk aversion got all markets by the throat. Obviously the relative differential is not the only factor at work.

The effect of events on other asset classes, including equities and commodities like oil and gold, has a spotty record (see Chapter 7). When one big market, like equities, is in a tizzy, it tends to infect other markets. This is a variation of the *falling tide lowers all boats* market lore. But it takes falling stock markets in more than one market to affect currencies – usually.

And even if the fundamentals, relative interest rates and other markets all line up to point to a single conclusion, the FX market still may not obey – if the chart dictates otherwise. The chart is one of the few ways we have to get some idea of how a consensus of traders is positioned. Traders resist negative news when they are long and exaggerate the importance of negative news when they are short, and this can be seen on the chart. Unlike equity and other markets, FX embraces technical analysis with open arms – it pretty much has to, given the shortage of other information (see Chapter 8).

So, why bother to try to understand mountains of conflicting and contradictory data when a simple application of risk appetite/risk aversion will cut through the mess? The answer is that sometimes the most unlikely things can promote risk appetite and FX traders need to be like Boy Scouts – prepared. When Lehman failed, no one expected that the failure of one bank in the US would set off a global liquidity crisis, the failure of European banks, the drop in the price of oil from \$146 to \$36 in less than six months, or volatile gyrations in the EUR/USD as money flowed to safe haven US Treasuries.

Even when you can see risk appetite or risk aversion developing in the news day-by-day, you still want to be able to judge whether it has lasting power. As the sovereign debt crisis in Europe has evolved over several years and encompassed 19 summits (as of July 2012), the market has been mostly willing to give the European Monetary Union (EMU) the benefit of the doubt. But periodic euro rallies after summits have not been inspired by any measurable progress toward repairing problems, but rather by the extent the outcome was expected.

For example, the euro rally after the end-June 2012 summit was not set off by the seeming capitulation of Germany to a looser interpretation of Treaty conditionality, but rather because expectations of any progress at all were practically zero. A small change in conditions was seen as a breakthrough and worthy of a currency rally, even though, at the time, the euro zone was facing worsening recession and a central bank interest rate cut to boot. On the dire institutional conditions and bad economic data, the euro *should* have fallen. In this instance, though, risk appetite came roaring back to lift the euro on the triumph of hope over experience. In order to trade the euro correctly through this period, you had to be able to judge whether the risk appetite embodied in the euro rally was strong enough to overcome the economic data and interest rate outlook, for how long the sentiment might last, and what other institutional factor might jump up out of the shrubbery and bite the market.

The bottom line is that risk appetite/risk aversion is a handy tool but it's no substitute for having a bird's eye overview of economic and other conditions that may become the source of change in the current risk sentiment or the source of a reversal in sentiment. Judging risk appetite is an *ex-post* exercise – you can identify the sentiment only after it has started to appear in the form of changes in prices. In fact, many commentators are lazy and attribute anything they can't otherwise explain to a change in risk sentiment. And, in fact, sometimes we cannot go back and retrace the route taken by risk appetite or risk aversion through the winding path over which it touched and changed various asset prices and data. The transmission of risk appetite and risk aversion is as yet an uncharted mechanism. We know that wild fear in one market, say a bond market, may sometimes bleed over to fear in another market, say a stock market or FX, but we can't count on it happening every time in exactly the same way.

To overcome the tangle of data and questionable or unknown transmission routes, we propose a matrix of factors as the core organising principle. We describe this matrix in Chapter 1. What we cannot describe is the route by which a change in one factor will invariably affect another factor, or even if a change in one factor will affect other factors at all. It's wiser to assume that risk sentiment attached to any factor has the capability to affect the risk sentiment associated with other factors, but not always in a predictable way. The lack of predictability is no excuse for not having a firm grip on what the factors are in the first place. Again, the motto is "Be prepared."

A secondary motto might be "Drop ideology." If you assume, for example, that gold must go up and the dollar must go down as the Federal Reserve balloons its balance sheet with massive amounts of new money supply that will induce high inflation, you might be shocked to see gold fall and the dollar rise as other factors sometimes take centre stage. These factors might include on a drop in demand for gold from Asia, the rise and fall of the popularity of gold as a diversification

commodity, contraction of bank lending in the US so that no inflation appears, and safe haven inflows to the dollar. One thing that watching the FX market will teach you is that ideology is a poor guide to trading success.

## The FX market is not what you think

Chances are the realities of the FX market are not what you might think. In this book, we point out that:

- FX is driven more by pure speculation and global investment flows than by economic facts and ideas.
- FX players thumb their noses at the efficient market hypothesis and the concept of rational expectations.
- FX has a *disconnect puzzle* in which factors that should move the market do not, such as the three decades of persistent trade surpluses in Japan and deficits in the US. The exchange rate does not work as an equilibrating factor, as economists insist it should.
- While we cannot forecast exchange rates systematically, we can trade FX systematically.
- FX does not have a benchmark rate of return that traders or investors must try to match and surpass.
- FX traders are vastly more disciplined than traders in other sectors, in part because they use technical analysis.
- We do not have volume statistics in FX, except in the most delayed and roundabout forms.

In summary, the FX market is endlessly fascinating, not least because figuring out some of its puzzles and perversities leads to profound insights into the human heart and mind, albeit sometimes all you get is the same old insight that the profit motive always rules in markets and it doesn't pay to attribute mystical properties to mere prices.



# CHAPTER 1 –

## THE MATRIX CONCEPT

*“I do not believe such a quality as chance exists. Every incident that happens must be a link in a chain.”*

**Benjamin Franklin**



# What is the matrix?

*The FX Matrix* refers to a grid format of the multiple factors and players in the FX market and the way they interact. The term matrix is borrowed from *random matrix theory* and we use the matrix concept as a metaphor to help you avoid reaching or accepting oversimplified explanations of why the market behaves the way it does.

In random matrix theory, the maths is truly advanced. Graduate students, hedge funds and governments devise models of complex dynamic systems. Most of us can't get past page one of their articles and books because of the daunting calculations, but the metaphor is helpful to get a general grasp of the idea. In finance, random matrix theory was borrowed from physics and used to do things like remove idiosyncratic noise from correlation studies in designing optimum portfolios, leading to better estimates of component risk. The factor modelling includes weighting endogenous variables, exogenous variables and unobserved factors, and measuring their vectors.

Most relevant to the FX market today is estimating effects like sovereign risk contagion. Central bankers, including the Federal Reserve, are avid practitioners.<sup>1</sup> As the European Monetary Union (EMU) grapples with bank capital adequacy and sovereign credit issues, it's a pretty good assumption that European economists are using matrix theory, too.

The 2008 failure of Lehman Brothers (considered a *local behaviour*) jumped the boundaries of its own (large) matrix and became a *universal* factor independent of the pre-existing probability distributions of the other matrices. In the vernacular, a falling tide lowers all boats. But we want to know whether the factors involved in the Lehman failure (including the behaviour of the US government) were random noise to the FX market, or an exogenous factor (out of left field), or maybe an endogenous (inherent) factor in the FX matrix. Some correlations are, after all, just coincidence. Millions of random correlations exist in the financial world. We want to know how much weight to give *Big Financial Institution Failure* and *Government Refusal to Intervene* in the FX matrix.

Lehman Brothers declared bankruptcy on 15 September 2008. Before then, the rumour mill was already active with word of the bankruptcy. We heard of European banks closing lines to Lehman several months before the final collapse. Lehman wasn't the only factor in the FX market, but consider the trajectory of the dollar index. It had bottomed in March 2008 (at 70.698) and put in a second low in July (71.314) but then rose to 80.375 by 11 September. Over the next week, encompassing the Lehman debacle, the dollar index fell to what turned out to be an intermediate low of 75.891 on 22 September. The index then rose to a high of

88.463 by late November. The dollar's rise was a surprise to those FX players accustomed to selling the currency of a country in trouble. The dollar's use as a safe-haven trumped the negativity of Lehman's bankruptcy and therefore gave the safe-haven status more weight in the matrix.

The dollar index was already on the upswing when Lehman went bankrupt and the sell-off on the actual bankruptcy news was very short-lived; only one week. Smart FX analysts were detecting that overall financial market risk aversion was in play over the summer of 2008 and the dollar kept rising. The Lehman bankruptcy in hindsight was an exogenous *shock*, mostly because it was inconsistent with our assumptions about how the US government behaves and how the financial sector had behaved in the past. Up until the very last minute, some observers expected a bailout like the one of Long-Term Capital in 1998, and a return to risk positioning. But once the news was digested, the FX market returned to its previous mode of shunning risk. At that time (and up to the S&P downgrade of the US sovereign rating in August 2011), to be risk averse was to buy the safe-haven dollar.

### Why the matrix is useful

The Lehman case is an example of a factor from a relatively distant corner of the FX matrix wending its way to FX prices themselves via interbank liquidity and interest rates, coupled with a major change in perception of the banking sector and US government – the *Establishment*. We would normally not expect an exogenous variable like the bankruptcy of a single financial institution to have such broad-reaching effects. It remains a puzzle why the rumours of the bankruptcy and then the event itself caused such an exaggerated reaction among international investors, sending them rushing to the safe-haven dollar.

The Lehman bankruptcy marks a dividing line in FX history between a time when price determinants encompassed an already wide range of factors to a new period in which price determinants range even more widely and reach into even more unexpected corners. This is why the concept of risk appetite and risk aversion is so useful – today, just about any exogenous variable has the potential to fly over the standard cause-and-effect factors and land on FX.

In the next sections of this chapter, we see examples of the new power of exogenous variables in FX. Pre-Lehman, for example, a popular uprising in an emerging market seldom had any effect on FX prices. But in 2011, regime change in North Africa had a pro-dollar effect, but in limited and varying ways. The effect of the Egyptian change differed from the effect of the change in Libya, in part because of Libya's role as an oil producer and the presence of foreign military

forces. The addition of geopolitical events to the universe of FX determinants through the medium of risk appetite/risk aversion has made the FX world a vastly more complicated place in just a few years.

We now have to enter into consideration issues to which we used to give little thought, such as what will happen to oil prices if and when the current Venezuelan leader Chavez leaves office? We can suppose that the oil market will respond but we do not know whether a resulting rise or fall in oil prices will be correlated with the dollar – or the euro. The matrix helps us to make sense of all these interconnecting strands and thus of the FX market.

## The primitive matrix

When an economist sits down to map out a hierarchy of fundamental factors that determine exchange rates, he may come up with something like Table 1.1. For each exchange rate on the left, the factors that affect it can in theory be checked off to reach an understanding of what affects that rate. Note that the factor list is incomplete – we could add dozens of other fundamentals such as labour market flexibility, tax rates, etc.

**Table 1.1 – fundamental factors**

Currency	Interest rate	Inflation rate	Terms of trade	Purchasing power parity	GDP growth	Degree of market freedom
USD						
EUR						
GBP						
JPY						

But if an economics-minded trader tries to apply incoming data to real-time trading, very quickly he discovers that economic fundamentals are sadly insufficient to explain FX price action – you also need the institutional context, as in the Lehman case and European sovereign risk contagion in 2009-2011. So now we need the mindset of *political economy* (as it was named in the 19th century). Table 1.2 shows how this grid might look.

**Table 1.2 – institutional factors**

	Public deficit as a percentage of GDP	Demographics	Central bank stances	Financial market size, liquidity and freedom	Reserves	Alliances, including military	State of the sovereign and politics
USD							
EUR							
GBP							
JPY							

For example, the European Central Bank (ECB) famously has a single mandate – to maintain price stability – whereas the US Federal Reserve has an additional mandate, to promote employment. In addition, as the issuer of the reserve currency, the US has a unique responsibility to lend to other central banks in time of crisis. Meanwhile, the euro is a currency without a state, which circles around to public deficits and to several factors in the economic factors spreadsheet, like the terms of trade.

Just when the analyst is trying to figure out how to combine the two sets of factors, he realises something else is missing, and it's big – the goals and attitudes of the FX market players themselves. In this grid (Table 1.3) it's the players that are on the y-axis rather than the currencies.

**Table 1.3 – market player factors**

	Correlation with other assets	Risk on-risk off	Technicals	
			Trend-following	Momentum
Bank professional				
Hedge fund				
Sovereign fund				
Multinational corporation (MNC)				
Retail trader				
High frequency trader				

In short, the fundamentals matrix introduced first doesn't include all the factors you need to analyse the FX market, and by the time you add institutional factors and market player factors, you need a three-dimensional matrix more like a Rubik's cube than a spreadsheet.

No sooner can you fix on a matrix like the one above than something will come along and show its inadequacy, if only because financial markets evolve. China opened a gold and precious metals commodity futures exchange in 2011, and is exploring reserve diversification not only in other currencies, especially the euro, but also in the form of bigger equity investments at the expense of US Treasury and Agency paper. European peripherals may default on sovereign debt, an event that has never happened in quite the same way throughout all history because we never before had a currency union quite like the EMU. So even if you build a system for analysing the FX market, you have to be prepared for it to be out of date, or for a factor you didn't think to take account of to occur, quite soon.

As for two-dimensional charts that appear to illustrate that Factor X is highly correlated with Currency Outcome Y and must be causative, this is often misleading. Two-dimensional charts are deceptive – correlation is not always causation, and worse, they result in emphasis on outcomes instead of processes. The salient question in FX analysis is in fact: *how do traders rank various multiple variables and events to determine whether they want to buy or sell a currency?*

Charts in two dimensions lack explanatory power and analytical depth – they don't enable us to answer the question just posed. Worse, they are static. It would be nice to be able to display interactive, dynamic effects, but that would take video, and even then it's not clear we could see cause-and-effect clearly.

We can try another matrix. Along one axis are the players in the FX market and along the other axis are the factors that influence FX prices. The grid should be imagined like a standard spreadsheet so that a big change in one cell is transmitted to other cells.

For example, we know that not only current interest rate differentials influence FX traders and investors, but also interest rate expectations. When a big change in expectations arises, as when Federal Reserve Chairman Bernanke announced in August 2010 that a second round of quantitative easing was pending, it dominates the market. When news of this magnitude is released we can grey out all the other variables on the matrix until bigger news about a key factor comes along. Because the graphic process is not a dynamic one, we need to prepare additional matrices and throw away the old ones as conditions change.

As a practical matter, you could combine and simplify to produce a master matrix that looks something like the one shown in Table 1.4.

**Table 1.4 – combined master matrix**

	Exogenous factors, shocks	Global attitude toward risk	GDP growth	Trade deficit	Capital flows	Interest rate	Interest rate forecast	Fiscal position	Politics	Other asset classes	Technicals, trend-following	Technicals, breakout/momentum
Bank trader												
Position trader											X	
Carry trader												
Fund manager, equities												
Fund manager, bonds												
Individual retail trader												
High frequency trader												X

The two Xs mark the primary factors for just two types of FX market participants, the position trader and the high-frequency trader. The position trader, which includes the deep pockets of sovereign wealth funds and hedge funds (as well as hedgers from the equity and bond markets), will probably analyse the market using trend-following technicals, while high-frequency traders will use short-term breakout and momentum technicals. They may be on opposite sides of the same trade. Fund managers, whether of money market instruments, stocks or bonds, may have their antennae tuned to GDP growth and capital flows, while the carry trader cares about only thing; the stability of interest rate differentials.

## The matrix process

We are still missing an important component, namely the weights to attach to each player and his favoured factor, and the vectors by which the factor invades another player’s consciousness. In the set of matrices shown below, we start out with an allocation of the importance of various factors to professional bank traders. We chose bank traders as the leading edge of FX price determination – these are the players who cause directional breakouts based on their interpretation of factors. Don’t forget that the professional bank traders are informed by the trading decisions of hedge funds and others who have a global worldview and make value judgments; the bank trader is not going to *fight the tape* if he sees sentiment shifting in a particular direction.



Let's say that over the summer of 2010, professional traders attributed a weight of 50% to interest rates and expected interest rates (Period 1 in the tables below). We can quibble over the weights, but let's take 50% for the minute.

### Period 1 – June 2010 to end-August 2010

	Interest rates	Expected interest rates	Geopolitical risk	Equities	Commodities	Technicals
Bank traders	25%	25%	10%	10%	20%	10%
Sovereign funds	X	X	X	X	X	X
Hedge funds	X	X	X	X	X	X
Long-term investors	X	X	X	X	X	X
MNC's	X	X	X	X	X	X
Retail market	X	X	X	X	X	X

Then Ben Bernanke pre-announced QE2 at the Kansas City Fed summit in Jackson Hole, Wyoming in August 2010. The focus immediately shifted to interest rate expectations, which now get a much higher weight in Period 2. The other players, seeing the dollar fall on the pros building a wider differential against the dollar, increased their weight to that factor, too. The weight attributed by the pro bank traders bled into the other players' evaluations of factors.

### Period 2 – Quantitative Easing 2: end-August 2010 to end-December 2010

	Interest rates	Expected interest rates	Geopolitical risk	Equities	Commodities	Technicals
Bank traders	25%	75%	0%	0%	0%	X
Sovereign funds	X	X	X	X	X	X
Hedge funds	X	X	X	X	X	X
Long-term investors	X	X	X	X	X	X
MNC's	X	X	X	X	X	X
Retail market	X	X	X	X	X	X

In Period 3, Eurostat released data showing that inflation was over the ECB cap of 2%, raising the spectre of the ECB tightening rates faster than the US. The interest rate expectation factor thus got stronger, the dollar fell more, and because the FX market is reactive, all the other players imputed a higher weight to this factor, too.

### Period 3 – euro zone inflation rises: January 2011

	Interest rates	Expected interest rates	Geopolitical risk	Equities	Commodities	Technicals
Bank traders	0%	100%	0%	0%	0%	X
Sovereign funds	X	X	X	X	X	X
Hedge funds	X	X	X	X	X	X
Long-term investors	X	X	X	X	X	X
MNC's	X	X	X	X	X	X
Retail market	X	X	X	X	X	X

At end-January 2011, Tunisia experienced rioting and the government fell (Period 4). Civil unrest broke out in Egypt, and in a single day, geopolitical factors became the dominant factor. Oil rose, returning the commodity correlation story to the fore.

### Period 4 – revolution in Egypt, 28 January 2011

	Interest rates	Expected interest rates	Geopolitical risk	Equities	Commodities	Technicals
Bank traders	5%	5%	90%	0%	0%	X
Sovereign funds	X	X	X	X	X	X
Hedge funds	X	X	X	X	X	X
Long-term investors	X	X	X	X	X	X
MNC's	X	X	X	X	X	X
Retail market	X	X	X	X	X	X

If these matrices were on a set of cards and you could fan them in order, you would get a moving picture that would show first the interest rate expectation gaining dominance, then bleeding to the other players, and then the geopolitical factor taking over. In other words, you'd get a moving picture showing how the weight of factors increases and then bleeds into other factors.

Flickering off to the side would be the technical factors. Technical factors never really go away but can always be trumped by institutional factors. This is a useful way to think about how and why exchange rates move – better than two dimensional charts labelled with world events – but obviously it is too cumbersome and impractical for anyone but a programmer to attempt.

That brings us to the thorny problem of factors that are temporarily not at the top of the list but which are still present; a form of *known unknowns*. On the day in January 2011 when the Egyptian riots took over the imagination of traders in all markets, nobody was talking about fiscal sustainability in Greece, Ireland, Britain, Japan or the US. In fact, S&P had downgraded Japan's sovereign rating just the day before, but the yen didn't move an inch on the downgrade. Still, a new geopolitical issue coming along does not kill a factor, it just supersedes it for a while.

## Perversity of the FX market

While the various matrices are a handy metaphor for market behaviour, not everything can be explained in a rational way. On any day, a sane interpretation of events may suggest the dollar should move up when in fact it goes on to move down. In the middle of the worsening euro zone peripheral debt crisis, the euro rose for almost a full year (June 2010 to May 2011).

*What's going on here? Why does the FX market behave in this perverse fashion?*

### Understanding this perversity

In a way, perverse FX responses to events are a form of *irrational rationality*, like the prisoner's dilemma. Both parties (bulls and bears) would benefit if they both stay silent, but often the first prisoner will confess because he doesn't know whether the second prisoner appreciates that his self-interest lies in staying silent. Translated to FX, it pays to jump to conclusions on the assumption that others will jump to those conclusions, even if they are nonsensical conclusions. One such perversity, after the 2008 global financial crisis, is the dollar reliably, consistently and persistently falling on good economic news – it occurs because

good US data implies the environment is safe for risk-taking in non-US dollar currencies and assets.

To get oriented in trying to answer the perversity question, you have to accept two ideas mentioned in the Introduction: the first is that the price of a currency is set at any one moment in time by traders whose only goal is to make a profit. FX traders usually do not know, nor do they care about, *fair value*. They want to buy low and sell high, or buy high and sell higher. The second idea is that a key tool in this quest for profit is technical analysis.

### Technical analysis in the FX market

Like the addition of hitherto exogenous variables to the basic FX matrix, the spread of technical analysis is relatively new. While technical analysis has been used since right after the dollar was first floated in 1974 – as a remedy to mass confusion over the determinants of FX prices – it was the advent of the personal computer in the 1990s that made it widespread. Technical analysis is more efficient than fundamentals – you use three or four indicators on a single chart against a complicated, interactive matrix of fundamental and institutional factors.

Moreover, technical factors can drive and override fundamentals, at least sometimes, even if in the end the fundamentals always have the last word. Unlike in other securities fields, in FX there is no clear-cut dividing line between the fundamental and the technical. Fundamental and technical effects are as interactive with one another as fundamental and institutional factors. For example, once the euro bottomed in June 2010 and started rising, it had upward momentum and upward-pointing patterns that set a new stage for evaluating the later worsening of sovereign debt and the banking crisis.

This is called Bayesian analysis, wherein what you think you knew is changed by subsequent knowledge. You literally go back and remember your original thinking differently from what it really was at the time. In a nutshell, everything is relative. The first appearance of a crisis is more shocking (and causes a bigger price move) than a later worsening of the same crisis, when the effects of the first shock have worn off and the first shock has become part of the background environment. In the case of the euro, the second shock was buffered significantly by its healthy image, which was both cause and effect of the first rebound.

Pinpointing how multiple factors – fundamental and technical – interact is tricky because in FX there are no absolutes. We might postulate that at the beginning of a price move, fundamentals drive the technicals, but once the fundamental event is known, the technicals can lead. For instance, a key level will be resisted solely because the probability of a negative news release is high, even when traders don't have anything specific in mind. The trader has an existing position

to defend and therefore a bias against reversing from pessimism to optimism – unless and until it becomes profitable to drop the position.

Technical analysis is so important in FX trading that we can say that a FX market event gets some of its importance from what is happening on the chart at the time. Untangling what is technical and what is fundamental in any specific move thus becomes complex. Unlike the situation in equities, where price-earnings ratios are a fixed (if evolving) number, fundamental events do not have a fixed hierarchical ranking in FX but rather gain or lose power over the minds of traders depending on how the chart looks. A bad news release will be dismissed if a currency has just made a decisive upside breakout, but the same news may be fatal to an existing upmove if it comes when the price is already flirting with reversal.

It's a mistake to dismiss technical analysis as some strange sideline of a minority. Professional traders bet hundreds of billions of dollars per day using technical analysis and they would not do that if technical analysis failed to help achieve profits and avoid losses. Virtually everyone in FX applies some concepts from the technical analysis world, even if they are not self-described techies; a trader who does not subscribe to technical analysis concepts will still be aware that others in the market are using them.

Every once in a while, you may meet a brilliant, intuitive trader who uses no technical indicators at all and yet succeeds in generating winning trades. He is almost certainly using the same ideas as the technical trader, just not measuring and labelling the ideas with the same terms. After all, most of the indicators in technical analysis derive from long-standing trading practices. Ask an intuitive trader why he changes from long to short, and he may say "I couldn't see any more buyers out there – the bid was gone." The technical trader will point to three or four indicators and say "It was overbought." Same thing.

## The pinball effect

Sometimes a price change comes out of left field and we literally cannot find an explanation for it in the fundamentals, technicals or what little information we have on professional positioning. It's as though one deep-pocket trader had an epiphany that inspired him to take a huge new position. Some of these initiatives fail and are never heard of again, but in the time-honoured way of crowd behaviour, others take a profitable ride. As recounted in the many books about the Soros 1992 sterling trade, many other FX players declined to believe the statements of UK officials and instead put their money on the same trade as Soros, short the pound, because they could see a clear trajectory on the chart. Soros did the hard work of analysing the situation, but it was his positioning that everyone could see, even if they didn't know exactly who was behind it.<sup>2</sup>

Where do these inspirations come from? Oddly enough, they often come from outside the immediate conditions in the financial markets themselves, from perceiving a historical analogy, from maths, or even from superstition. Thus is created a *pinball effect*, where a new idea (or an old idea resurrected) shoots around several markets along multiple interconnecting and criss-crossing pathways. An inspired trade in oil futures can pinball to emerging market currencies, to advanced country fixed income securities, to mutual fund valuations, to the new-technology energy names on the NASDAQ, to the Shanghai and Nikkei indices, to the dollar/yen... and so on. Transactions are conducted at such speed and the world is so interconnected today that we can't explain everything, and often, ex-post explanations are unconvincing. Explanations do exist, but we may never know them. This is a wonderful and frightening thing.<sup>3</sup>

## The actors

Let's take the actors, or *agents* as academics might call them. How you interpret FX market developments depends on what sort of trader you are, so it is important that we consider how various actors think.

Let's say, for example, a key technical level is being hit – but it's Friday at 3 pm. The FX market's reaction to the key level is entirely different from when a key level is hit at 8:30 am on a Monday morning. More nuanced than this, a key level being hit at 3 pm in London on any day is different from the level being hit at 3 pm in New York. In the London case, traders still have several hours to see what the New York market will make of the development. If New York responds predictably to the key level, London traders have a new profit opportunity, although it means working late.

The New York traders do have an overlapping time zone – New Zealand opens around 3 pm New York time, Australia opens around 5 pm and Tokyo opens around 7 pm. But these are much smaller markets than London and New York, and New York traders have different work habits. They arrive at work early to partake of the London and European action, rather than staying late to join the Asian markets. The importance of the key level is far lower in New York at 3 pm on any day than at 8:30 am on any day.

Now consider which group of actors cares the most about a key level at any time of day – technical traders. After all, with algorithm-trading and pre-set electronic entries and exits, the trader doesn't have to be physically at the trading terminal to respond to a technical event like a key level. If the key level is a match of a past benchmark high or low, or a round number, or widely publicised (like a Fibonacci

level), then non-technical traders know about it, too. If the technical group responds as expected, the non-technical groups feel compelled to react, whether defensively or opportunistically.

In other words, the sets of players are interactive. Because we have so much news and chatter in the electronic age, we are all getting a great deal of information about the other players, and we are getting it 24 hours a day. A good case is when the FX newswires have reported where a big buy-side client has an option strike, often a round number. The existence of the option and its strike price is a mechanical aspect of the market and not strictly speaking *technical*, but the strike level is almost always set by technical considerations. It may be just past a moving average, a historical benchmark level, or some other calculation.

The financial institution that wrote the option will have hedged at least part of its position (although not all, or it wouldn't make a profit on the transaction), but still probably prefers not to have to pay up, while other market players know that a failed test of the level opens the door for a big move in the opposite direction of the strike. This is a case in which the widespread knowledge of the option strike is the top factor and it would take a big event in the macroeconomic world to overwhelm it.

## Positions

The option strike price case illustrates the most important aspect of the player groups – their positions. When the vast majority of the market holds a particular belief, their positions reflect those beliefs. If a set of factors lines up against the pound sterling, for example, a short sterling position is rewarded with every news release reinforcing the negative tone. Good news is dismissed and disregarded. Every trader is gunning for sterling. It doesn't matter that by any objective measure on a fundamentals matrix, five factors are negative and two factors are positive.

But there is always a tipping point at which the market gets oversold sterling – something experienced traders can smell and that technical analysts can measure – whereupon a key level gets hit and a cascade of short-covering ensues. The tipping point may appear with or without a news announcement pertaining to a factor. Sometimes the factor is directly relevant, whereupon the press says “the release of the XYZ data caused the pound to firm.” In other instances, and we say it's the majority of the time, the release of the XYZ data is just an excuse for traders to get out of Dodge. If you can't sell it (anymore), buy it.

Hence the seeming perversity of the FX market. The objective measure would still have four negative factors versus the new count of three positive ones; it

would still be net negative. Logically, we say the pound *should* remain in a falling trend and the factor weights do not line up to support a rise, but the market is not responding only to the factors, but to the quickly disappearing probability of making a profit from the existing short position.

This is the sense in which the market is not *always right*, as the old law has it. The market is always right in the sense that every trader has to accept the prices offered and a single trader cannot change the market's mind about what is the correct price. The market can be dead wrong about factor analysis but it doesn't matter. You have to trade the prices in front of you, not what you think prices should be.

## Making sense of the information

Now enter the poor retail trader, who often has no idea that FX trading is not easy, as the TV and website ads proclaim. Retail FX trading is rapidly expanding, hot on the heels of professional asset managers diversifying their base. How do these new traders make sense of the market? FX commentary is keeping pace, but much of it is of dubious quality.

One book author asserts the Canadian dollar is 40% correlated with the price of oil – without naming the time period over which the statistic was calculated, rendering it literally useless. In practice, you can manipulate the CAD to be correlated with the price of oil to any number that suits your argument by changing the correlation timeframe. In the funniest case, a publisher was so eager to get a book in print and capitalise on the demand for market commentary that it failed to notice a whole chapter and multiple other references devoted to “rouge” traders (when “rogue” was the intent).

The lesson here is to be careful what conclusions you draw from what you read. And also, to come back to our matrix, that single-factor explanations of FX market behaviour are always wrong. To explain a move, you need:

1. fundamental factors;
2. technical measurement of the sentiment derived from those factors;
3. technical dynamics, and
4. existing positions of the key players.

Once you have these four things and decide which weight each should have, you can begin filling out your matrix and deciding how best to position yourself for a move. In the chapters ahead, we will go deeper into the specific factors that drive currencies.



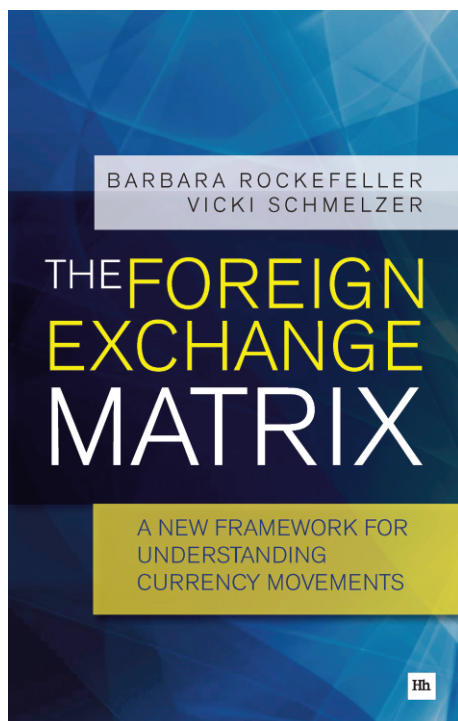
It's probably fair to say that very few, if any, highly sophisticated FX market players have programmed a matrix to include all the factors or succeeded in figuring out how a change in one fundamental feeds the technicals and then how the resulting positions create a feedback effect on other technicals and sometimes the fundamentals themselves. A computer program that is capable of taking new data and have it light up the relevant variables in some kind of logical order and have it all result in a price deduction would be a splendid machine, indeed. If some advanced hedge fund or sovereign fund has created a working matrix, they are keeping it a deep, dark secret.

Until such a thing can be devised, we mere mortals must struggle with the sets of variables the old-fashioned way, using our brains. It should come as no surprise that some of the best traders are fairly ignorant of economics and historical context, but are cracker-jack at game theory. In the chapters that follow, we do not actually mention the matrix very often. Instead our goal is to describe the FX market in ways that will be useful to the reader in creating his own matrix in his imagination, if not in programming code.

# The Foreign Exchange Matrix

A new framework for understanding  
currency movements

Barbara Rockefeller and Vicki Schmelzer



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