

SPEECH

Recent Volatility Trends in the Foreign Exchange Market

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Good morning. It is a pleasure to be here. Let me extend my thanks to the organizers for the invitation to speak at this conference.

The foreign exchange market is a dynamic environment that is constantly innovating and evolving. Not too long ago, most transactions were executed by one person calling another to negotiate a price. In recent years, technology has enabled an ongoing revolution in how we trade. Some milestones include the introduction of electronic broking systems such as EBS and Reuters for interdealer trading. More recently, single-bank and multi-bank portals are connecting dealers to their customers via electronic media. An increasing number of tickets are now being executed through all forms of e-trading. Given this market's history of embracing technology, I see no reason to doubt that more innovations are on the way. The advent of white labeling and prime brokerage, while introducing some risks, are also bringing additional participants into the market.

Meanwhile, volumes continue to rise. According to the last BIS Triennial Central Bank Survey, daily turnover as of April 2004 rose to \$1.9 trillion from \$1.2 trillion in April 2001.¹ More recent regional turnover surveys conducted by the Foreign Exchange Committee for North America and by the FX Joint Standing Committee for the U.K. confirm that volumes have continued to rise at a double-digit annual pace.² In short, the business of foreign exchange is very strong.

This conference will no doubt explore these topics in greater detail. For my part, I will focus on a subject that traders and policymakers view as very important, though probably for different reasons. That topic is volatility. Viewed from a longer term perspective, the volatility of major foreign exchange rates is historically low. I will explore some potential reasons for that relative stability as well as offer a few possible implications. Given the complexity of the topic and the natural cautiousness of central bankers, it will come as no surprise that I will raise more questions than answers. My goal this morning is to leave you with a few ideas that may prompt further discussion.

Recent Volatility Trends

Volatility is typically measured in one of two ways. Historical volatility is a measure of how much an exchange rate—or any asset—has varied, on average, over a specified period, say one month.³ As its name suggests, historical volatility is backward looking. An alternative measure, implied volatility, is extracted from options prices.⁴ This measure has the advantage of telling us something about expected volatility over the tenor of the contract. It therefore has a forward-looking component. For this discussion, I will focus on one-month at-the-money forward implied volatility.

Over long periods, these two measures of volatility generally move together, though at times they can, and have, diverged. Note that these measures are independent of trends in the underlying spot rate. An exchange rate might have a substantial cumulative move that is steady and gradual over the course of a year, but shorter term realized and option-implied volatility may still remain low. Contrast that behavior with an exchange rate that ended the year where it began, but in the interim frequently moved with sudden swings in both directions. Despite ending the year where it began, the shorter term measures of historical and option-implied volatility are high.

With that introduction in place, let me turn to the facts. In the major exchange rate pairs, both historical and implied volatility have been declining in recent years. During the 1990s, daily quotations of one-month at-the-money implied volatility of the dollar/deutsche mark commonly traded in the double digits. However, that average does not convey the swings in implied volatility that were observed, for example, during the ERM crisis. Put differently, if somewhat awkwardly, the volatility of implied volatility was high.⁵

With the transition in Europe to the single currency, implied volatility in the euro/dollar initially looked similar to that of the dollar/deutsche mark exchange rate. In 2000, implied volatility of the euro/dollar averaged about 13 percent, before beginning a steady decline over subsequent years. In 2005, one-month implied volatility in the euro/dollar averaged about 8.7 percent. In 2006, it has been just above 8.0 percent. Again, looking at average implied volatility does not convey the full story. Not only is implied volatility low on average, it has also been persistently low. Whereas spikes were common in the 1990s, they have been few and far between more recently. Even dramatic events such as the terrorist attacks in 2001 barely nudged the vol meter, and volatility is nowhere near the peaks reached in the mid-1990s and 1998. In short, average implied volatility is low and the volatility of implied volatility is much lower than it used to be.

We observe the same phenomenon in the dollar/yen currency pair. One-month implied volatility averaged almost 16 percent in 1998, with spikes into the high 20s. This average fell to 11.3 percent in 2000 and to 8.4 percent by 2005. Although the last couple of weeks have seen implied volatility tick higher, overall average implied volatility thus far in 2006 remains just below 9 percent.

We find this longer term phenomenon in many emerging market currencies as well, including some that experienced currency crises in the recent past. The volatilities of currencies from Mexico, Brazil, South Korea, Taiwan, Turkey and Russia moderated from 2003 through 2005—although some of these volatilities have picked up in recent weeks.

The decline in volatility is not isolated to foreign exchange. Other financial assets exhibit some of the same broad patterns. Fixed-income volatility and equity market volatility as measured, respectively, by indices such as MOVE and VIX are at near-record lows. Only commodity prices are bucking that low vol trend.

Why Has Volatility Been Low in Recent Years?

Observing trends in realized and option-implied volatility is an interesting exercise. However, observations alone make it difficult to analyze and determine the forces affecting market volatility. Unfortunately, we cannot observe cause-effect relationships. So any judgments are at best tentative and at worst guesses. Instead, I will summarize some possible explanations for the low volatility patterns. I will not seek to be exhaustive, and I invite you to add your own candidates during the discussion that follows. In addition, the factors I describe are not mutually exclusive and are probably somewhat related.

I will start by discussing several macroeconomic factors, and then turn briefly to some internal market factors that may also affect short-term volatility trends.

Macroeconomic Factors

“The Great Moderation”

We would expect exchange rates to be more volatile when fluctuations in the economic outlook across national economies are greater. There is a rich and growing body of literature showing that the U.S. economy has exhibited much less fluctuation in output since the early 1980s.⁶ Even without the use of econometric equations, we can observe that the U.S. economy has had only two relatively brief and shallow recessions since 1982, and that the quarter-to-quarter variation in growth is much less than had been the case. Economists call this phenomenon “the Great Moderation.” Research shows that other major economies also exhibit much less variation in measures of output. Japan was the one major exception. One study concluded that the variance of GDP growth of the G7 economies—excluding Japan—declined by 50 percent from 1984 to 2002 compared with the two previous decades.

I have been talking exclusively about the reduced variability of GDP growth. But another powerful—and no doubt related—trend has occurred simultaneously: the generalized decline of inflation rates in both industrial and emerging economies. Inflation in most major economies has fallen from double digits in the early 1980s to the low single digits. In addition, and perhaps as important for today's topic, the variability of inflation in recent years has also dropped. If inflation is growing at very different levels, the exchange rate should anticipate and reflect those differentials and exhibit greater volatility. However, to the extent that inflation is low and stable, there will also be less need for adjustments.

Inflation has even declined in countries that suffered from hyperinflation—a condition that was all too common, for example, in some countries in Latin America and Africa in the 1970s and 1980s.⁷ Moreover, countries are not as likely to experience capital flight, as citizens sell local currency in anticipation of higher inflation.

Improved or More Transparent Monetary Policy

Another set of reasons for lower foreign exchange volatility might involve better monetary policy execution or increased transparency. A larger number of central banks have become independent, with more of a focus on price stability. I am not trying to pat central bankers on the back. We certainly have our challenges. But perhaps we learned some lessons along the way and are executing policy so as to keep inflation variability contained.

In addition, central banks have become much more transparent about their policy intentions over the last several years. This practice reduces uncertainty about interest rates, which are often considered to be a key driver of short-term exchange rate fluctuations. We have seen a number of central banks, including the Federal Reserve, provide clearer indications of future policy intentions through official statements, minutes of meetings and speeches. Another recent example has been the Bank of Japan, which in early March announced that it planned to exit from its quantitative easing policy, a move that had already been signaled through various means. Such communication strategies stand in contrast to earlier periods when some central banks sought to surprise the markets, believing that would amplify their effects. As markets understand central bank intentions better, uncertainty over future policy actions is likely to be reduced. For example, the risk-neutral option-implied probability that exists just before FOMC decisions recently has been very concentrated around the expected likely outcome, suggesting minimal uncertainty in the markets.

More Flexible Exchange Rate Regimes

My next explanation for the decline in foreign exchange volatility will probably be counterintuitive, and some may disagree. In recent years, a number of countries have adopted more flexible exchange rate regimes, often after being unable to maintain fixed or very narrow bands. Examples include the experiences of the European Exchange Rate Mechanism currencies in the early 1990s as well as those of the Mexican peso, Brazilian real, Russian ruble, Thai baht, South Korean won and others.

Earlier regimes for these currencies all too often were overly rigid. Pressures would build, reserves would be exhausted, and massive volatility would follow. Frequently sharp adjustments in one currency would spill over into others, and volatility would increase generally as market participants speculated as to which currencies were also vulnerable. In a more flexible system, adjustments are more gradual. To the extent that a better policy mix, lower inflation and steady growth are also present across countries, it may be difficult to disentangle how much credit to attribute to each distinct factor.

Reserve Accumulation

Many countries have indeed established more flexible regimes, though that does not mean they have stopped intervening. Many of the same countries that experienced vulnerabilities in the 1990s have also been building their foreign currency reserves as a precaution against potential future pressures or simply to prevent appreciation of their currencies. Insofar as these countries have large reserves, the balances may discourage speculative pressures and hence foster lower volatilities than would have existed without FX intervention and reserve accumulation. Of course, in many cases, the act of intervening may also dampen volatility.

Market Factors

In addition to broad macroeconomic factors, structural market forces may be at work. Two that I will comment on are increased transparency and participation, and heightened activity in the options market.

I mentioned technology's importance to the market. Besides simplifying transactions, technology has enabled greater price transparency and a wider range of agents to participate in the marketplace. Newer players include smaller fund managers, individuals and so-called algorithmic traders—all of whom participate mostly or exclusively through e-trading systems, particularly in the spot market. A larger number of participants trading more actively results in higher turnover, narrower bid-offer spreads and continuous pricing. Some of these newer participants may be more willing to provide liquidity at “slower” times of the day. With more participants supplying prices, the probability of price gaps in the spot market may be reduced, thereby lowering realized and option-implied volatility.

As more players have entered the spot market, more have become involved in the options market. The expertise of pricing options has become more diffuse in recent years, as traders have moved from market-making banks to hedge funds and brought with them the pricing and risk management expertise that only a few firms had at one time. One theory is that this diffusion of expertise has led to a decrease in implied volatility—which frequently was higher than historical volatility—as the newer participants sold what they knew were “expensive” options that they knew how to hedge.

A less benign explanation for the low level of implied volatility is that market participants are selling options to generate premiums. Under this theory, the supply/demand dynamic may have driven down the price of the options and the implied volatility. If option protection is sold too cheaply, the seller may not be compensated adequately for the risk assumed.

Looking Ahead

As my remarks suggest, foreign exchange markets have been unusually stable in recent years. We don't know why they have been so stable. Optimists point to structural changes in how the global economy operates. Greater macroeconomic stability across countries, coupled with increased exchange rate flexibility among many countries, has allowed for gradual exchange rate adjustments. The optimists argue that these factors have reduced risk premia and thus a reduction of volatility is justified by these benign conditions.

Pessimists counter that fundamentals have not changed. Rather, investors are now willing to take on large risks for little extra compensation. The pessimists believe that the current environment is one with huge uncertainties associated with geopolitical risks, energy prices and productivity that markets are mispricing.

We cannot determine which of these two scenarios is correct—or whether a third one might exist. With profits in the financial sector strong, it is seductive to assume the current benign period will persist. The danger is that this current period may not persist if, for example, the economic backdrop changes. There have after all been other times when low volatilities have been followed by an increase in risk aversion, a sudden widening of risk spreads and a spike in volatility.

We don't know the direction of exchange rates or the speed at which they will move in the future. But firms should not be lulled into complacency by the recent period and assume that market volatilities—and risks—are permanently lower. Risk managers should be conscious of how the inclusion of the most recent data is affecting their risk models. Statistical risk measures, such as value at risk, may not capture the full extent of so-called “tail events,” even during periods of normal volatility. These measures are even more likely to paint too rosy a picture of risk when market volatilities are low. As a result, managing and sizing tail events—through stress testing and other risk containment tools—is particularly important in the present market environment.

More broadly, the stress testing of positions and exposures is an especially important tool for sizing FX risks, because correlations between the foreign exchange market and other markets are famously unstable. For this reason, we should be extremely skeptical of risk measures based on the status quo assumption that volatility will remain low. This is precisely because the events that we should be most concerned about are those that have the ability to turn the status quo on its head.

Thank you.

1 For more information: [Bank for International Settlements' Triennial Central Bank Survey](#) [OFFSITE](#) [PDF](#) .

2 For more information: [Foreign Exchange Committee's FX Volume survey](#); and [FX Joint Standing Committee's volume survey](#) [OFFSITE](#) .

3 For example, historical volatility can be measured using the annualized standard deviation of continuously compounded returns of closing prices.

4 Implied volatility can be calculated in a variety of ways. Using the Brenner and Subrahmanyam (1988) approximation, the formula is: $\sigma \approx \frac{c_m \sqrt{2\pi}}{S e^{(b-r)T} \sqrt{T}}$, where c_m is the market price of an at-the-money forward call or put option, S is the spot rate and T represents the time period of the option.

5 $dVega/dVol$ = volatility of implied volatility, also known as Volga.

6 "Has the Business Cycle Changed? Evidence and Explanations," [PDF](#) James H. Stock and Mark W. Watson, Federal Reserve Bank of Kansas City Symposium on Monetary Policy and Uncertainty: Adapting to a Changing Economy, August 28-30, 2003.

7 "Globalization and Global Disinflation," Kenneth Rogoff, Federal Reserve Bank of Kansas City Symposium on Monetary Policy and Uncertainty: Adapting to a Changing Economy, August 28-30, 2003.
