

CHAPTER 8

The foreign exchange business is by its nature risky, because it deals primarily in risk—measuring it, pricing it, accepting it when appropriate, and managing it. The success of a bank or other institution trading in the foreign exchange market depends critically on how well it assesses, prices, and manages risk, and on its ability to limit losses from particular transactions and to keep its overall exposure controlled.

Broadly speaking, the risks in trading foreign exchange are the same as those in marketing other financial products. These risks can be categorized and subdivided in any number of ways, depending on the particular focus desired and the degree of detail sought. Here, the focus is on two of the basic

categories of risk—market risk and credit risk (including *settlement* risk and *sovereign* risk)—as they apply to foreign exchange trading. Note is also taken of some other important risks in foreign exchange trading—*liquidity* risk, *legal* risk, and *operational* risk.

1. MARKET RISK

Market risk, in simplest terms, is price risk, or “exposure to (adverse) price change.” For a dealer in foreign exchange, two major elements of market risk are *exchange rate risk* and *interest rate risk*—that is, risks of adverse change in a currency rate or in an interest rate.

Exchange rate risk is inherent in foreign exchange trading. A trader in the normal course of business—as he buys or sells foreign currency to a customer or to another bank—is creating an “open” or “uncovered” position (long or short) for his bank in that currency, unless he is covering or transferring out of some previous position. Every time a dealer takes a new foreign exchange position—in spot, outright forwards, currency futures, or currency options—that position is immediately exposed to the risk that the exchange rate may move against it, and the dealer remains exposed until the transaction is

hedged or covered by an offsetting transaction. The risk is continuous—and a gap of a few moments or less can be long enough to see what was thought to be a profitable transaction changed to a costly loss.

Interest rate risk arises when there is any mismatching or gap in the maturity structure. Thus, an uncovered outright forward position can change in value, not only because of a change in the spot rate (foreign exchange risk), but also because of a change in interest rates (interest rate risk), since a forward rate reflects the interest rate differential between the two currencies. In an FX swap, there is no shift in foreign exchange exposure, and the market risk is interest rate risk. In addition to FX swaps and currency swaps, outright forwards, currency futures, and currency options are all subject to interest rate risk.

There are *two forms* of market risk—an adverse change in *absolute* prices, and an adverse change in *relative* prices. With respect to relative price changes, “basis risk” is the possibility of loss from using, for example, a U.S. dollar position to offset Argentine currency exposure (in the expectation that the Argentine currency will move in step with the U.S. dollars), and then seeing the Argentine currency fail to maintain the relationship with the U.S. dollar that had been expected. It can also occur if a short-term interest rate that was used to offset a longer-term interest rate exposure fails to maintain the expected relationship because of a shift in the yield curve. To limit basis risk, traders try to stay well informed of statistical correlations and covariances among currencies, as well as likely yield curve trends.

► Measuring and Managing Market Risk

Various mechanisms are used to control market risk, and each institution will have its own system. At the most basic trading room level, banks have long maintained clearly established *volume* or *position limits* on the maximum open position that each trader or group can carry overnight, with separate—probably less restrictive—intraday or “daylight” limits on the maximum open position that can be taken during the course of a trading session. These limits are carefully and closely monitored, and authority to exceed them, even temporarily, requires approval of a senior officer.

But volume limits alone are not enough. A \$10 million open position in a very volatile currency represents a much bigger risk to profits than \$10 million exposure in a relatively stable currency. Banks and other firms dealing in foreign exchange put limits, not only on the overall volume of their foreign exchange position, but also on their *estimated potential losses* during, say, the next 24 hours, which they

estimate through calculations of “value at risk” (VAR), “daily earnings at risk” (DEAR), or other dollars-at-risk measurements. Thus, a trading unit might have an overnight volume limit of say, \$10 million, and also a VAR limit of, say, \$150,000.

► Value at Risk

The rapid growth of derivatives in recent years—growth both in the amounts traded and in the innovative new products developed—has introduced major new complexities into the problem of measuring market risk. Banks and other institutions have seen the need for new and more sophisticated techniques adapted to the changed market situation.

Consider, for example, the question of the valuation of derivatives. If a trader entered into a contract for the forward purchase of \$10 million of pounds sterling six months hence at today’s 6-month forward price for GBP, the *notional* or face value of the contract would be \$10 million. The *market* value (gross replacement value) of the contract would at the outset be zero—but that market value could change very abruptly and by significant amounts. Neither the notional value of that forward contract nor the snapshot of the market value as of a particular moment provides a very precise and comprehensive reflection of the risk, or potential loss, to the trader’s book. For currency options, the problem is much more complex—the value of an option is determined by a number of different elements of market risk, and values can change quickly, moving in a non-linear fashion. Market participants need a more *dynamic* way of assessing market risk as it evolves over time, rather than measuring risk on the basis of a *snapshot* as of one particular moment, or by looking at the *notional* amounts of funds involved.

In a report of the Group of Thirty entitled *Derivatives: Practices and Principles*, industry members recommended a series of actions to assist in the measurement of market risk. They recommended that institutions adopt a “value at risk” (VAR) measure of market risk, a technique that can be applied to foreign exchange and to other products. It is used to assess not only the market risk of the foreign exchange position of the trading room, but also the broader market risk inherent in the foreign exchange position resulting from the totality of the bank or firm’s activities.

VAR estimates the potential loss from market risk across an entire portfolio, using probability concepts. It seeks to identify the fundamental risks that the portfolio contains, so that the portfolio can be decomposed into underlying risk factors that can be quantified and managed. Employing standard statistical techniques widely used in other fields, and based in part on past experience, VAR can be used to estimate the *daily statistical variance*, or standard deviation, or volatility, of the entire portfolio. On the basis of that estimate of variance, it is possible to estimate the expected loss from adverse price movements with a specified probability over a particular period of time (usually a day).

Thus, a bank might want to calculate the maximum estimated loss in its foreign exchange portfolio in one day from market risk on the basis of, say, a 97.5 confidence interval. It could then calculate that on 39 days out of 40 days, the expected loss from market risk (adverse price changes) would be no greater than “x.”

VAR is regarded by market participants as helpful to an institution in assessing its market risk and providing a more comprehensive

picture than is otherwise available. The institution can use the calculations as a framework for considering other questions—e.g., what steps, if any, should be taken to hedge or adjust the book, how does the situation look in terms of the institution’s strategy and tolerance for risk, and other management issues.

However, VAR has limitations. It provides an *estimate*, not a *measurement*, of potential loss. It does not predict by *how much* the loss will exceed that amount in the one day in forty (or other selected probability) when the estimated loss will exceed the specified amount of VAR. The calculations are based on historical experience and other forecasts of volatility, and are valid only to the extent that the assumptions are valid. In using past experience, there are always questions of whether the past will be prologue, which period of past experience is most relevant, and how it should be used. Many alternative approaches are possible: Should the formula be weighted toward the recent past? Should a more extensive period of history be covered? Should judgments about the fundamental condition of the market be introduced?

Also, there are certain statistical limitations. VAR calculations use standard deviation measurements—the familiar bell-shaped curve, which reflects a “normal” distribution. But there is empirical evidence that daily *exchange rate changes* usually do not closely fit a normal distribution; they exhibit a property called “leptokurtosis,” which means they have “fatter tails” (more outliers) and a higher mid-range than is seen in a normal distribution. Some practitioners make adjustments (e.g., they look toward a 97.5%, or 99%, rather than a 95%, confidence level) in light of these uncertainties.

Despite its limitations, VAR is increasingly used by market participants, along with risk limits, monitoring, stress scenarios, and other techniques to assess market risk. They regard it as a considerable complement to and improvement over previous approaches, providing a dynamic assessment of probabilities, rather than a snapshot approach. Undoubtedly, with experience, new adjustments and variations will appear. In all likelihood, the procedures will become increasingly sophisticated with increasing focus on the *extent* of expected future loss, in addition to the *probability*.

Indeed, in calculating risk-based capital

requirements, the bank supervisors of the G-10 major industrial nations, acting through the Basle Committee on Bank Supervision, now allow large banking institutions with major trading activities in foreign exchange and other instruments to measure their market risk through their internal value-at-risk models. Thus, each institution can use its own internal model as the framework for making its calculations of its market risk-based capital requirement—but subject to the approval of the appropriate supervisor, and to conformity with certain minimum qualitative and quantitative standards regarding measurement and management of market risk.

2. CREDIT RISK

Credit risk, inherent in all banking activities, arises from the possibility that the counterparty to a contract cannot or will not make the agreed payment at maturity. When an institution provides credit, whatever the form, it expects to be repaid. When a bank or other dealing institution enters a foreign exchange contract, it faces a risk that the counterparty will not perform according to the provisions of the contract. Between the time of the deal and the time of the settlement, be it a matter of hours, days, or months, there is an extension of credit by both parties and an acceptance of credit risk by the banks or other financial institutions involved. As in the case of market risk, credit risk is one of the fundamental risks to be monitored and controlled in foreign exchange trading.

In banking, the reasons a counterparty may be unwilling or unable to fulfill its contractual obligations are manifold. There are cases when a corporate customer enters bankruptcy, or a bank counterparty becomes insolvent, or

foreign exchange or other controls imposed by governmental authorities prohibit payment.

If a counterparty fails before the trade falls due for settlement (pre-settlement risk), the bank's position is unbalanced and the bank is exposed to loss for any changes in the exchange rate that have occurred since the contract was originated. To restore its position, the bank will need to arrange a new transaction, and very likely at an adverse exchange rate, since no one defaults on a contract that yields positive gains. In situations of bankruptcy, a trustee for the bankrupt company will endeavor to "cherry pick," or perform according to the terms on those contracts that are advantageous to the bankrupt party, while disclaiming those that are disadvantageous.

In foreign exchange trading, banks have long been accustomed to dealing with the broad and pervasive problem of credit risk. "Know your customer" is a cardinal rule and credit limits or dealing limits are set for each counterparty—presumably after careful study of the

counterparty's creditworthiness—and adjusted in response to changes in financial circumstances. Over the past decade or so, banks have become willing to consider “margin trading” when a client requires a dealing limit larger than the bank is prepared to provide. Under this arrangement, the client places a certain amount of collateral with the bank and can then trade much larger amounts. This practice often is used with leveraged and hedge funds. Also, most institutions place separate limits on the value of contracts that mature in a single day with a single customer, and some restrict dealings with certain customers to spot only, unless there are compensating balances. A bank's procedures for evaluating credit risk and controlling exposure are reviewed by bank supervisory authorities as part of the regular examination process.

► Settlement Risk—A Form of Credit Risk

It was noted in Chapter 2 that foreign exchange trading is subject to a particular form of credit risk known as settlement risk or Herstatt risk, which stems in part from the fact that the two legs of a foreign exchange transaction are often settled in two different time zones, with different business hours. Also noted was the fact that market participants and central banks have undertaken considerable initiatives in recent years to reduce Herstatt risk. Two such efforts are worth mentioning.

In October 1994, the New York Foreign Exchange Committee, a private-sector group sponsored by the Federal Reserve Bank of New York, published a study entitled *Reducing Foreign Exchange Settlement Risk*, which examined the problem of settlement risk from a broad perspective. The Committee found that foreign exchange settlement risk is much greater than previously recognized and lasts longer than just the time zone differences in different markets. In the worst case, a firm can

be “at risk” for as long as 72 hours between the time it issues an irrevocable payment instruction on one leg of the transaction and the time payment is received irrevocably and unconditionally on the other leg. The Committee recommended a series of private sector “best practices” to help reduce Herstatt risk, including establishing arrangements to net payments obligations, setting prudent exposure limits, and reducing the time taken for reconciliation procedures.

More recently, in March 1996, the central banks of the major industrial nations issued a report through the Bank for International Settlements, called *Settlement Risk in Foreign Exchange Transactions*, which highlighted the pervasive dimensions of settlement risk, expressed concern about the problem, and suggested an approach for dealing with it. The report confirmed the finding of the New York Foreign Exchange Committee that foreign exchange settlement exposure can last up to several days, and it recommended a three-track strategy calling for:

- individual banks to improve management and control of their foreign exchange settlement exposures;
- industry groups in the private sector to provide services that will contribute to the risk reduction efforts of individual banks; and
- central banks to improve national payment systems and otherwise stimulate appropriate private sector actions.

Some steps have been taken to reduce settlement risk, and others are being considered to help deal with this problem. There are “back-end” solutions, using netting and exchange clearing arrangements to modify the settlement process,

BOX 8 - 1

ARRANGEMENTS FOR DEALING WITH SETTLEMENT RISK

One of the aims of netting is to reduce settlement risk by providing for an agreed offsetting of positions or obligations by trading partners. Netting can take either a *bilateral* or a *multilateral* form. *Bilateral* netting is designed to reduce counterparty exposure by automatically offsetting concurrent obligations of each of two parties to the other. *Multilateral* netting extends this practice to more than two participants—calculating each participant’s “net-net” position, or position against the group of participants as a whole and settling through a central party. In recent years, a number of procedural and legal changes have been introduced in various countries to facilitate netting arrangements.

Bilateral netting arrangements for foreign exchange were introduced a number of years ago, through facilities in FXNET, SWIFT, and VALUENET.

More comprehensive, *multilateral* netting schemes were subsequently introduced, operating through *ECHO* (or exchange clearing house) and *Multinet*. The two competing systems subsequently merged.

Some of the new “front-end” approaches—all of which are in various stages of study and development—reflect the fact that *cash delivery* of the various currencies is needed by the participants in only a small percentage of foreign exchange transactions.

One novel “front-end” approach designed to reduce settlement risk from foreign exchange trades beyond conventional bilateral netting systems is called “netting +.” Under this technique, each day (say, day 1) two “netting +” counterparties scheduled to settle a dollar amount for a non-dollar amount “tomorrow” (day 2) will, instead, arrange a “tom-next” (or tomorrow/next day) swap for the non-dollar amount and the dollar equivalent, effectively rolling forward the settlement one day (to day 3) and combining it with other settlements scheduled for that day. The only payment (on day 2) is a (usually relatively small) dollar amount to cover any difference between the contracted price and that day’s market price.⁵ This approach is in the developmental stage.

Another experimental “front-end” approach is “foreign exchange difference settled” (FXDS), under which the two counterparties, instead of exchanging two full payments at settlement, agree to settle only the net amount by which the relevant values of the two currencies have changed.

A group of leading international institutions called the “Group of 20” has proposed a concept of “continuous linked settlement” (CLS) for reducing settlement risk, in which a specialized bank would act as clearing institution, providing for “real time” settlement—payment versus payment, or “PVP,” in major currencies among participating institutions. The participants expect the system to begin operating in the year 2000.

and “front-end” solutions, which change the nature of the trade at the outset, modifying what is to be exchanged at settlement. (See Box 8-1.)

Steps have also been taken to improve central bank services in order to reduce foreign exchange settlement risk. At the beginning of 1998, the Federal Reserve extended Fedwire operating hours. Fedwire is now open 18 hours a day. Its operational hours overlap with the national payment systems in all other major financial centers around the world. Similarly, CHIPS has expanded its hours and introduced other improvements.

► Sovereign Risk—A Form of Credit Risk

Another element of credit risk of importance in foreign exchange trading is *sovereign risk*—that is, the political, legal, and other risks associated with a cross-border payment. At one time or another, many governments have interfered with international transactions in their currencies. Although in today’s liberalized markets and less regulated environment there are fewer and fewer restrictions imposed on international payments, the possibility that a country may prohibit a transfer cannot be ignored—the United States Government has imposed such restrictions on various occasions. In order to limit their exposure to this risk, banks and other foreign exchange market participants sometimes establish ceilings for individual countries, monitor regulatory changes, watch credit ratings, and, where practicable, obtain

export risk guaranties and other forms of insurance.

► Group of Thirty Views on Credit Risk

As with market risk, the management of credit risk has become more complicated and more sophisticated with the development of derivative instruments and, more generally, the evolution of financial markets. The Group of Thirty report, *Derivatives: Practices and Principles*, addressed questions of measuring, monitoring, and managing credit risk in derivatives activity. The report recommended that each dealer and end-user of derivatives should assess the credit risk arising from derivatives activities based on frequent measures of current and potential exposure against credit limits. It further recommended that dealers and end-users use one master agreement as widely as possible, and that each counterparty document existing and future derivatives transactions, including foreign exchange forwards and options, and cover various types of “netting” arrangements. The report also recommended that regulators and supervisors recognize the benefits of netting arrangements and encourage their wider use.

More recently, other ideas have been put forward for a portfolio approach to credit risk, similar to the value-at-risk approach to market risk. The aim would be to produce a single number for how much a bank stands to lose on a portfolio of credits of varying characteristics, and thus to determine how much the bank should hold in reserve against that portfolio.

3. OTHER RISKS

Numerous other forms of risk can be involved in foreign exchange trading, just as in other financial activities.

Trading activities are subject to *liquidity risk*, since in times of stress market liquidity can change significantly and rapidly—within

the course of a day, or, in extreme cases, within minutes—and a bank may find itself unable to liquidate assets quickly without loss or to manage unplanned decreases or changes in funding sources. Given the size, breadth, and depth of the foreign exchange market, liquidity risk is less a danger than in most financial markets.

There are *legal risks*, or the risk of loss that a contract cannot be enforced, which may occur, for example, because the counterparty is not legally capable of making the binding agreement, or because of insufficient documentation or a contract in conflict with statutes or regulatory policy. While such legal risks are encountered in traditional banking, they have taken new forms with the growth in derivatives, since many existing laws and regulations were written before these products and transactions came into

being, and it is not clear how the laws and regulations apply.

Also, foreign exchange trading and other financial businesses face considerable *operational risks*—that is, the risk of losses from inadequate systems, human error, or a lack of proper oversight policies and procedures and management control. There are numerous examples of problems and failures in financial institutions around the world related to inadequate systems and controls—although employee dishonesty of one sort or another is very often involved.

All of these risks develop, evolve, and mutate as conditions change and new foreign exchange techniques and instruments are created. In foreign exchange trading, as in other banking and financial transactions, the matter of managing risk is a continuous and exacting part of doing business.