CENTER FOR SOCIAL & ECONOMIC RESEARCH

Recent Developments in International Currency Derivatives Market:
Implications for Poland

by

Lucjan T. Orlowski

(Professor of Economics and International Finance,
Sacred Heart University, 5151 Park Avenue, CT 06432. U.S.A.
Tel. +1 203 371 7858 Fax +1 203 230 9860,
E-mail: orlowski@shu.sacredheart.edu.us)

Warsaw, September 1995

Materials published in these series have a working papers character. They can be subject to further publication. The views and opinions expressed here reflect Authors' point of view and not necessary those of CASE .

We acknowledge the support of
Polski Bank Rozwoju SA (Polish Development Bank),
which made this publication possible.

ISBN 83-86296-53-4

Editor:

CASE - **Center for Social & Economic Research**
00-585 Warszawa, Bagatela 14
tel/fax (48-2) 628 65 81; tel/fax (48-22) 29 43 83

1. INTRODUCTION

The floating exchange rate system that prevails today among key international currencies of industrial countries brings a considerable degree of uncertainty of exchange rate movements. In order to hedge the risk of unfavorable appreciation or depreciation of a single currency, exporters, importers and financial investors have developed a vast range of currency derivative instruments that allow to lock-in in advance the rates of a future currency conversion. These financial instruments are also used by speculators willing to arrange future currency selling (or buying) contracts while hoping to buy (or to sell) the currency at favorable anticipated exchange rates in the future, thus exposing their financial position to the risk of currency fluctuations.

This paper examines the critical problems of international currency derivatives that have emerged in international financial markets over the past two years, emphasizing the departures of spot exchange rate movements from the macroeconomic fundamentals among the "triad" currencies: the U.S. Dollar (USD), the German Mark (DM), and the Japanese Yen (YE). The macroeconomic variables that theoretically play a predominant role in the exchange rate movements are: differences in comparable market interest rates among the countries (interest rate differentials), differences in the rate of growth of real GDP (income differentials), and differences in the rates of inflation (inflation differentials). The changeable sensitivity of exchange rates to these key variables is tested in this paper for the "triad" currencies in two periods: 1991-1993, and 1994-1995. In the latter period, some considerable misalignments between forward rates and changes in spot exchange rates are observed. This is contrary to the historical evidence of the validity of the so-called "unbiased forward rate hypothesis" claiming that forward rates are the best predictor of adjustments of spot rates (Levich, 1976). It is argued that the recently observed failure of the relationship between forward rates and lagged spot rates has contributed to significant losses of investors and speculators in international currency derivative markets.

The examination of these relationships and the recent empirical developments provides useful lessons for the transition economies of Central and Eastern Europe in their attempts to construct viable modern financial markets. This study limits the scope of recommendations for developing financial markets to the conditions of Poland. It assumes that currency-based derivative transactions may play a pivotal role in reducing systemic risk of external trade and financial contracts in the Polish economy presently undergoing considerable structural adjustments aimed at promoting export and net capital inflows. It further argues that an introduction of financial derivatives in Poland shall be preceded by a construction of sound underlying security markets. A stable currency accompanied by low inflation are necessary prerequisites for a successful functioning of currency-based derivatives.

Currency-based derivatives are complex financial instruments that are "derived" from the underlying currency exchange rates. They include currency forward "buying" or "selling" contracts, "buy" or "sell" currency futures, call and put options, currency swaps, and various combinations of these instruments. Their growth in the international economy

has been enormous in recent years. The total notional value of the currency-based derivatives in 1994 exceeded 12 trillion USD (Goldstein and Folkerts-Landau, 1994, p.10) up from 7.8 trillion in 1993, which itself was more than twelve times the total in 1986 (Mussa, et.al., 1994, p. 14). One may notice that the current notional value of the currency derivatives in 1994 was roughly twice the size of the United States GDP.

Despite the enormous growth of the currency-based derivatives their market was by no means "efficient" in 1994. Forward rates and strike prices of most currency futures and options contracts departed considerably from the actual changes in spot exchange rates. The reasons for these departures and recommendations for preventive actions are discussed in Section III of the paper following the brief overview of the currency-based derivative instruments in Section II. Section IV summarizes the examination of the currncy-based derivative markets by drawing concluding lessons for the construction of the efficient entry of the transforming economy of Poland into modern international financial markets.

2. CURRENCY-BASED DERIVATIVES: A BRIEF OVERVIEW

As indicated above, currency based derivatives are defined as complex financial instruments that are "derived" from the underlying exchange rates. As any financial derivative products, they can be used for risk hedging or speculation when the underlying security (the exchange rate) exhibits a high degree of fluctuations, thus generating a considerable financial risk. Therefore, the currency-based derivatives are not applicable in the system of fixed exchange rates. They play a significant role as hedging or speculative instruments under the system of floating exchange rates, especially when the currency spot rate demonstrates high volatility[1].

Currency-based derivatives are used by exporters invoicing receivables in foreign currency, willing to protect their earnings from the foreign currency depreciation by locking the currency conversion rate at a high level. Their use by importers hedging foreign currency payables is effective when the payment currency is expected to appreciate and the importers would like to guarantee a lower conversion rate. Investors in foreign currency denominated securities would like to secure strong foreign earnings by obtaining the right to sell foreign currency at a high conversion rate, thus defending their revenue from the foreign currency depreciation. Multinational companies use currency derivatives being engaged in direct investment overseas. They want to guarantee the rate of purchasing foreign currency for various payments related to the installation of a foreign branch or subsidiary, or to a joint venture with a foreign partner.

A high degree of volatility of exchange rates creates a fertile ground for foreign exchange speculators. Their objective is to guarantee a high selling rate of a foreign currency by obtaining a derivative contract while hoping to buy the currency at a low rate in the

[1] The empirical literature proves that volatility among the leading international currencies has been increasing since the inception of the floating exchange rate system in 1973. See Mussa, et al.,(1994, pp. 18-22) for detailed examination of this phenomenon.

future. Alternatively, they may wish to obtain a foreign currency forward buying contract, expecting to sell the appreciating currency at a high future rate. In either case, they are exposed to the risk of currency fluctuations in the future betting on the pattern of the spot exchange rate adjustment consistent with their initial expectations. Speculative actions may have a stabilizing character on exchange rates when the observed trend of the exchange rate is expected to be reversed. Specifically, when the foreign currency has been depreciating in domestic currency terms but it is expected to appreciate in the foreseeable future, speculators will aggressively buy it, thus contributing to the currency advanced appreciation. Adversely, when the foreign currency has been appreciating but it is expected to depreciate, speculative selling may speed up its depreciation or stabilize the currency rate. By contrast, foreign exchange speculators destabilize exchange rates when their recently observed pattern is expected to continue. Expecting a further depreciation of the foreign currency, they normally sell it, thus triggering the excessive currency depreciation (or undervaluation). They aggressively buy the currency which appreciation is expected to continue, contributing to a destabilizing currency appreciation (or overvaluation).

To alleviate destabilizing speculative attacks on the domestic currency, foreign exchange traders must see signals that the domestic currency is expected to stabilize in foreign currency terms. The country's monetary authority should prove anti-inflationary efforts and monetary tightening to reverse the trend of the domestic currency depreciation. Adversely, monetary easing is desirable in order to prevent an excessive appreciation of the domestic currency. In practice, it implies that the monetary authorities of the United States, Japan and the European Union ought to coordinate the directions of their monetary and fiscal policies in order to stabilize the “triad” currencies. Consequently, the stability of exchange rates between the three leading world currencies will help to accomplish a relative stability of many other currencies which patterns depend more or less on changes of the leading currencies exchange rates. However, skillful and sound monetary and fiscal policies pursued by smaller nations governments are essential to achieve this task.

The most fertile ground for destabilizing speculative attacks on international currency derivative markets is caused by rising unbalanced inflation among the world economies. If domestic inflation increases unproportionally to the inflation trend among the leading economies, speculative selling of the domestic currency will occur, leading to the currency excessive undervaluation and to the net capital outflow. Consequently, currency derivative contracts will settle at lower strike prices and more expensive premiums. Similar effects occur when the national inflation is “stalled” at a high level, showing symptoms of high inflation inertia in the form of high wage demands and strong parallel price hikes by domestic producers and trading companies. In essence, lowering inflation and reducing speculative selling of domestic currency are necessary conditions for the introduction of viable derivative contracts for domestic currency in foreign currency terms.

The most commonly used instrument among the currency derivatives are currency **forward contracts**. These are large notional value selling or buying contracts obtained by exporters, importers, investors and speculators from banks with denomination normally exceeding 2 million USD. The contracts guarantee the future conversion rate between two currencies and can be obtained for any customized amount and any date in the future. They normally do not require a security deposit since their purchasers are mostly large business firms and investment institutions, although the banks may require compensating deposit

balances or lines of credit. Their transaction costs are set by spread between bank's buy and sell prices.

Exporters invoicing receivables in foreign currency are the most frequent users of these contracts. They are willing to protect themselves from the currency depreciation by locking-in the future currency conversion rate at a high level. A similar foreign currency forward selling contract is obtained by investors in foreign currency denominated bonds (or other securities) who want to take advantage of higher foreign that domestic interest rates on government or corporate bonds and the foreign currency forward premium. They hedge against the foreign currency depreciation below the forward selling rate which would ruin their return from foreign financial investment. Investment in foreign securities induced by higher foreign interest rates and accompanied by the forward selling of the foreign currency income is called a **covered interest arbitrage**. It is feasible when the return on foreign investment shown by the right-hand side of the equation (1) is greater than the return on domestic investment (the left-hand side of the equation).

$$K(1+i) < K(1+i^*)\,F/S \qquad (1),$$

where K is the amount of capital invested, i is the domestic interest rate, i^* is the foreign interest rate, F is the forward rate and S is the spot value of the domestic currency in foreign currency terms.

The forward selling contract is also used by speculators expecting a strong depreciation of the foreign currency. For instance, speculators may want to obtain the forward selling contract of DM at 1.39 DM per USD, hoping that the USD may depreciate well below this level, say, to 1.35 DM per USD, thus generating a profit of DM 0.04 on each USD invested.

The forward currency buying contract is widely used by importers invoicing payables in foreign currency, willing to protect themselves from the excessive appreciation of the foreign currency when it would become too costly to satisfy the foreign currency payments. International investors allocating their capital in domestic currency and willing to show profits in foreign currency (for instance, in order to pay lower foreign taxes) also hedge against an excessive foreign currency appreciation using the forward currency buying contracts. The speculative use of these contracts makes sense when the foreign currency is expected to strongly appreciate. Speculators will exercise the buying contract hoping to sell the foreign currency at a higher spot rate in the future. For example, speculators may wish to obtain the USD forward buying contract at 1.39 DM per USD expecting the USD to appreciate above it and to sell it at 1.42, thus generating a profit (before transaction costs) of DM 0.03 on each USD in transaction.

Forward contracts are the most commonly used currency-based derivative instrument in international financial markets. Their conversion rates are set by banks to their clients on the basis of simple formulas related to nominal interest rate differentials (differences between domestic and foreign market interest rates on comparable fixed income securities). For instance, if U.S. three-month Treasury bills are rising in nominal terms above the German three-month government bills, the USD will be set at a forward premium equal to the change in the nominal interest rate differential.

A simple method of determining the forward rate based on the nominal interest rate differential is illustrated by the following formula

$$i - i^* = \frac{360}{n} \times \frac{F - S}{S} \qquad (2),$$

where n is the number of days in the forward contract.

For instance, a bank offering a three-months forward contract in DM per USD would like to set the forward rate when the German nominal interest rate is 5.5 percent and the U.S. rate is 6 percent (annualized) on comparable three month T-bills, and the current DM per USD spot rate is 1.4. It may solve the problem by substituting these values to the equation (2):

$$0.060 - 0.055 = \frac{360}{90} \times \frac{F - 1.4}{1.4} .$$

Solving the equation for F gives the value of the three months forward rate in DM per USD equal to 1.40175, which implies that the USD is at 0.005 (or 0.5 percent) annualized three month forward premium in DM terms (the right-hand side of the equation), equal to the annualized interest rate differential (the left-hand side of the equation).

The empirical literature (Levich, 1985; Tucker, Madura, Chiang, 1991, pp. 259-261) presents a strong evidence supporting the claim that forward rates are the best forecast of spot rate adjustments due to speculative actions taking advantage of the exchange rate arbitrage (buying currencies at the currently available lower rates on international financial markets and immediate selling at higher available rates)[2]. The phenomenon of forward rates serving as a good predictor of future spot rates is called **an unbiased forward hypothesis**. The forward rate levels which serve as a basis for **market-based exchange rate forecasting** have been assessed as a more accurate forecasting instrument that complex econometric models developing regression functions of exchange rates, or technical forecasting methods involving use of historical exchange rate data to predict future values[3]. The principle behind spot rates following closely the pattern set by forward rates is related to the market clearing mechanism of speculative actions. For instance, when the three months forward rate shows a premium for DM in USD terms, speculators will take advantage of arbitraging opportunities by arranging forward selling contracts of DM while buying DM spot as long as spot rates are below the three months forward rate pattern. By generating a stronger demand for DM in the spot market, they will lift the spot rate to the forward level. Adversely, if the DM is at a forward discount, speculators will arrange forward buying contracts hoping to sell DM at a higher spot rate. The action will be feasible as long as the spot rate is above the forward pattern. By selling the DM spot, they will adjust the exchange rate downward to the forward trend.

[2] A contrary opinion stating a weak relationship between forward rates and future adjustments of spot rates is expressed, among others, by Hansen and Hodrick (1980), Fama (1984) and Tucker, Madura and Chiang (1991, p. 263)

[3] For a comprehensive examination of technical, fundamental and market-based forecasting see, for instance, Madura (1995, pp. 239-257)

The belief in a strong association between forward rates and anticipated adjustments of spot rates has been well established in international financial markets and confirmed by their practice until 1993 (Madura, 1995, pp. 249-252). Because of the perceived strong relationship between the forward trend and the actual changes in spot rates, strike prices of currency futures and options have been also very closely related to the forward rate trend, and ultimately, they have been strongly tied to nominal interest rates differentials.

Currency futures are financial contracts specifying a standardized volume of currency that is to be exchanged at a specified settlement date. The rate of the future currency conversion (the strike price) is locked in upon the contract origination, although the premiums (prices paid for the contract) vary all the time. Currency futures have fixed denominations and fixed settlement dates upon which they can be exercised. The largest market for currency futures is the International Money Market - a branch of the Chicago Mercantile Exchange. Blocks of currency units per contract traded on this market include: 100,000 Canadian and Australian Dollars, 125,000 DM and Swiss Francs, 62,500 British Pounds (BP), and 12,500 YE. Standard delivery dates are limited to third Wednesdays of March, June, September and December of each year. There is a security deposit requirement for these contracts. They are regulated by the Commodity Futures Trading Commission of the U.S. Government, in contrast to forward contracts which are self-regulating. Although they are traded on the centralized exchanged floor in Chicago, the access to this marketplace is available through world-wide communication. The currency futures selling or buying contracts are obtained by exporters, importers, banks and international investors, and also by qualified public speculators. Their strike prices different from spot rates attract speculative transactions in a similar way to the differences between forward rates and spot rates. Speculators may generate substantial gains as long as the futures strike price differs from the spot rate and no gains are feasible when both rates are roughly equal. Currency futures contracts must be exercised on the settlement date. Because of the high degree of inflexibility - fixed settlement dates, fixed amounts in one block, the obligation of delivery - they are becoming less popular then currency options.

Currency options are contracts that guarantee the right to buy foreign currency (a call option) or the right to sell foreign currency (a put option) on a specified date in the future and at a strike price fixed by the contract. They do not have to be exercised if spot exchange rates are more favorable to their holders. For instance, an international exporter invoicing receivables in DM may want the DM put option at a strike price of 0.70 USD per DM and the premium of 2 cents per each DM to expire if the spot rate of the DM rises to 0.73 USD or above. The Philadelphia Exchange is the major international market of both call and put options on international currencies, although currency options contracts are available in Amsterdam, Montreal, Chicago CME, Chicago Board Options Exchange, New York Mercantile Exchange and other markets as well. The blocks of currency call and put options available in Philadelphia are half of those of the Chicago futures (62,500 DM and SF, 50,000 CanD and AusD, 6,250,000 YE, 31,250 BP). Options on the French Franc (250,000 in a single bloc) and on the European Currency Units (ECUs) (62,500) are also available. These contracts have monthly settlement dates.

Currency call options are used mostly by importers invoicing payables in international currencies, investors in domestic securities (say, USD) who want to exercise gains in foreign currencies, speculators anticipating a sharp appreciation of the foreign currency above the level of the call's strike price plus premium. Perhaps the most desirable use of these contracts

is by multinational companies engaged in foreign direct investment projects which still may not go through, or companies exploring possibilities of such projects through market research and feasibility studies in foreign countries. They need to hedge certain "sunk" costs in foreign currencies, that is, costs that must be incurred regardless whether the project will or will not materialize.

Currency put options are used by exporters invoicing receivables in foreign currencies, investors in foreign currency - denominated securities, and speculators anticipating a strong foreign currency depreciation so that they are able to purchase the currency at a weak anticipated spot rate in the future reselling it by exercising the put option contract with a higher strike price.

There are two types of currency options that depend on settlement time conditions. The "American-style" currency options can be exercised at any time before or on the expiration date. The "European-style" options can be exercised only on the expiration date. The "American-style" options offer the holder more flexibility since they can be sold to a third party or exercised prior to the expiration date if the direction of spot exchange rate does not favor waiting for the options maturity date.

The level of premiums on currency options depends generally on three factors. The most influential among them is the difference between the strike price and the current spot exchange rate. In the case of call options, the higher the strike price is in relation to the current spot rate, the lower the option premium will be. This is because the speculative demand for the least expensive call options is normally the strongest. They are the most beneficial and valuable for the speculators, therefore, their premiums will be the highest. Adversely, for currency put options higher premiums are set for options with higher strike prices in relation to the current spot rate. Again, put options with higher strike prices are more beneficial to speculators willing to sell the foreign currency at the highest conversion rate. Consequently, they have normally higher strike prices. These relations are illustrated by Table 1, where premiums for the BP calls in USD terms decline with higher strike prices and premiums on puts rise as the strike price increases. The second factor affecting option premiums is the length of time until the expiration date. Options, both calls and puts, for a longer time duration are associated with a higher degree of uncertainty of the spot exchange rate forecast, thus their premiums will be higher. Table 1 shows that August 1995 options premiums for the BP are more expensive than July 1995 options. The third influential factor affecting options premiums is the degree of currency volatility. Premiums on both call and put options are higher for more volatile currencies, since the risk of departures of spot rates from the options strike prices is higher in their case.

Table 1. British Pound options in US Dollars on June 7, 1995 in Philadelphia Exchange (premiums in cents per BP; BP 31,250 in a single option).

Strike Price	Call Options		Put Options	
	July '95	August'95	July '95	August'95
1.575	1.83	3.26	0.42	2.03
1.600	0.55	2.09	1.57	3.23
1.625	0.07	1.22	3.54	4.83

Source: *Financial Times.*

Currency options provide to their holders a very high degree of flexibility of applications. They can be obtained at different levels of strike prices, considerably departing in many instances from the current spot rate. If the adjustments of spot rates assume unfavorable directions to investors and speculators, they may always consider reselling these instruments to a third party even before the expiration date. Because of the variety of strike prices and a the wide extent of duration ranging from one month to two years or recently even more, investors may apply in their financial schemes various combinations of currency options instruments creating more complex, sophisticated currency-based derivative securities. The scope of this paper does not allow for a more detailed coverage of complex derivatives, although some of their basic types are worthwhile to signalize in order to grasp the coverage of recent developments in these markets presented in the next section[4].

The simplest among option-based currency derivatives is a **straddle** which is a combination of a call and a put option with the same strike price and the same expiration date. It normally has two different premiums. It is particularly beneficial when the underlying currency has a high degree of volatility. Holders of a straddle benefit when the spot rate departs considerably from the strike price by a higher margin than the combined premium on a call and a put option. Depending upon the direction of this departure, investors may decide to exercise one of them and forego the other paying both premiums.

The combination of a call option and a put option on the same currency with the same expiration date but at different strike prices is called a **strangle**. In this case the investor expects the spot rate to fall within the margin between the call and the put strike price in order to benefit from exercising both the low-value call and the high-value put. The profit is equal to the difference between them minus the premiums on both options.

The forecasted pattern of adjustments of spot rates decides whether the investor prefers to apply a **bull spread** or a **bear spread**. The bull spread is a combination of currency options with different maturity dates designed to profit when the spot value of the underlying currency is expected to rise, for instance, a combination of a short call (in one month) and a long call (in several months) option. The bear spread is applied when the underlying currency is expected to depreciate and it will normally involve short and long put options in order to lock in currency selling rates within the next few months. Such an option is highly desirable to hedge a continuous revenue stream in a currency expected to considerably depreciate. Similar directions of expected changes in spot rates decide about the choice between a **strip** and a **strap**. A strip is the combination of a long position in one call and two put options with the same strike price and expiration dates, designed to benefit the investors betting on the currency depreciation in the future. A long position in one put and two call options with the same strike price and expiration date is called a strap, aimed at benefiting the investors when the underlying currency is expected to considerable appreciate.

When the direction of changes in the spot rate is highly uncertain, importers invoicing their payment in a foreign currency ought to consider applying a **butterfly spread with calls**. This instrument involves three calls with the same expiration date on a given currency at three different strike prices. Correspondingly, exporters and investors in foreign currency-denominated securities may consider a **butterfly spread with puts**, again, when the

[4] A highly recommended examination of complex derivative securities can be found in Hull (1993, pp. 415-432) and in Kolb (1994, pp. 387-640).

expected direction of the spot rate is highly uncertain. They may obtain a combination of three puts with the same expiration date but at three different strike prices. Since these instruments involve a larger number of options at different strike prices their combined premium is normally very high, they are certainly very expensive to their holders.

The listed above instruments are only the very basic combinations of currency options used predominantly for hedging purposes. From the standpoint of this analysis it shall be emphasized that designing all of these financial instruments very much depends on the direction of the spot exchange rate forecast. The viability of these derivatives exists only if they are centered around the actual future pattern of the exchange rate. They completely fail if the actual adjustment of the spot rate departs considerably from the forecasted level. Although these options do not have to exercised and they may be resold to other investors, their premiums to be paid are normally very high and may be a source of considerable losses. Therefore, it is essential to correctly predict future changes in spot rates to benefit from these derivative instruments.

As discussed before, the available forward rates have been perceived as the empirically-proven best indicator of future changes in spot rates. Consequently, they have served as a basis for forecasting spot exchange rates by "derivative product engineers" at financial institutions. Until the early 1990s, the spot rates among the leading international currencies did follow forward rates, which, as indicated above, were closely related to nominal interest rate differentials. This situation contributed to a relative success of more complex currency-based derivatives. However, recent departures of spot rates from the forward trend and from the macroeconomic fundamentals, especially from interest rate differentials, tell a different story.

III. RECENT DEVELOPMENTS IN DERIVATIVES OF THE "TRIAD" CURRENCIES

There has been a number of failures of investments in currency-based derivatives reported since mid-1993. Several leading international investment banks reported heavy losses from investments in derivative securities. American investment institutions such as Merril Lynch or Bankers Trust reported losses from currency-based derivatives in 1994. Barrings of London lost close to USD 1 billion on wrong betting on Tokyo market futures as a result of a tremendous risk exposure created by the bank's trader Nicholas Leeson investment schemes. One of the leading international investors Mr. George Soros and his investment fund who were once able to benefit USD 2 billion from correct speculation on the BP depreciation on the day of the European Exchange Rate Mechanism crash on September 19, 1992, reported a heavy loss of USD 600 million from wrong betting on the Japanese Yen alleged depreciation against the USD in February 1994. Many other financial institutions also admitted losses in these markets.

Perhaps the most useful lessons for the discussion on the scope of international regulation of derivative markets can be learned from the cases the Chilean copper mining company Codelco, and the German mining and metals conglomerate Metallgesellschaft AG

(Goldstein and Folkerts-Landau, 1994, p. 11). Codelco reported a loss of USD 207 million in January 1994 from trading in copper futures. The head futures trader of the company apparently entered incorrectly some of the futures transactions in the computer system generating an original loss of USD 30 million and he did not inform his supervisors about his error. Later, he attempted to regain the loss by speculating on the futures markets. But with the declining copper prices this speculation multiplied the original loss. In the beginning of 1994, Metallgesellschaft had to admit its financial fiasco. The company sold long-term contracts to customers to provide petroleum products at fixed prices with an option to terminate the contract by the customers at the cost equal to half of the realized profit at any time, if the spot price of petroleum was above the forward price.To cover this risk exposure, the company hedged its position in long-term futures contracts. The scheme was beneficial to the company as long as the market was in the so called "backwardation" position related to the advantage of spot prices over the forward prices. In the "contago" position, when spot prices were lower than the forward price, the contract was disadvantageous. This position prevailed in international futures markets contributing to a loss of DM 1.9 billion reported in January 1994. The company traded 55,000 of these contracts in the New York Mercantile Exchange (Nymex) and since the amount was twice larger that the allowed limit, Nymex requested a margin call that could only be covered through the rescue package of DM 1.5 billion from Deutsche Bank and Dresdner Bank.

These failures have contributed to an extensive discussion among the U.S. lawmakers and governments other countries on the methods and the scope of possible regulation of international derivative markets. However, their deliberations have produced almost no concrete results. It is impossible to introduce an extensive regulatory framework for these markets. They are too complex and too global to be restrained by a single government regulation. For instance, hedging or speculation on Philadelphia currency options and their complex combinations can always circumvent possible domestic restrictions on currency-based derivatives outside the U.S. American investors may also go to international derivative markets in response to possible regulatory efforts in the U.S. There is a high degree of liquidity of international capital which can always bypass attempts of regulation escaping to financial centers where restrictions on capital flows do not exist.

Nevertheless, some general rules for companies engaged in derivative instruments shall be applied as a lesson from the Codelco, Metallgesellschaft, Barrings and other companies mistakes. Among them are full disclosure rules to the management or, perhaps even to shareholders of firms on the mechanism and the degree of risk of transactions involving derivative securities. Most of the international banks have already such rules in place but they do not always follow them, especially in the cases when very complex currency-based derivative instruments are applied by portfolio managers and they are not fully understood by senior executives. It seems that an extensive training of executives in modern financial products conducted by qualified professional companies and consultants and cosponsored by government regulatory agencies shall be also recommended. Most of the leading financial companies in the U.S. have established "product engineering" divisions aimed at introducing complex derivative schemes to which they hire mathematicians and physicists with doctoral degree, but with a limited economic training. Another desirable regulatory effort is the introduction of high margin requirements for investors in derivative securities so that smaller, more risky players-speculators are discouraged from these markets.

If the regulation of these markets is to be successful it must be coordinated internationally by most qualified agencies, preferably by the Bank for International Settlements of Basel, Switzerland. The BIS has already accomplished solid steps toward partial regulation of international capital through the 1988 Capital Adequacy Directives (CAD) modified and extended in April 1993 by the BIS Committee on Banking Supervision introduction of a new set of capital requirements for banks. Corresponding measures have been also endorsed by the European Union Capital Adequacy Directives in March 1993 which modified the Solvency Ratio and Own Funds Directives of 1989. In brief, these measures include:

- the rules for capital requirements for market risk
- measurement of interest risk
- recognition of netting schemes
- separation of bank's loan and trading books
- the isolation of market risk from specific risk (which includes credit risk, settlement risk, liquidity risk, and the risk of adverse movements of underlying securities)
- rules of conversion of fixed-income securities into more liquid debt-related securities.

These efforts will never compensate for the factors that are essential for the stability of international derivative securities. Perhaps the most critical among them is international coordination of monetary policies leading to a relative stability of floating exchange rates. Such coordination is essential since “dreams” of returning to the global fixed exchange rate system are simply unrealistic. Foreign exchange reserves of central banks reaching up to USD 120 billion for Japan and Taiwan are a tiny fraction of daily capital turnovers of approximately USD 600 billion in international financial markets. There is no reserve money to support such a system especially under the present conditions of growing trade and fiscal imbalances among the leading economies. Stable market-determined exchange rates will undeniably reduce the ground for destabilizing speculation and lower the risk of currency fluctuations. This, in turn, will reduce the cost of complex currency derivatives. For instance, butterfly spreads with call or put options will no longer be feasible if the spot exchange rate is expected to fluctuate within a narrower range. Instead, simple straight and less costly call or put options will be preferred.

The reality of foreign exchange markets in recent two years has not shown an improved stability of exchange rates between the leading international currencies. Consequently, there has been a growing difficulty to correctly forecast changes in spot rates and to set strike prices of most currency-based derivatives. As a result, significant errors and losses in investing in international derivatives have emerged. At least three general factors that contributed to these losses deserve a closer examination. They include:

- departures of spot exchange rate from the macroeconomic fundamentals
- a growing instability of spot exchange rates
- departures of spot rates from the forward level that historically serves as a best-fit forecast for spot rates adjustments

To illustrate the relationship between spot exchange rate fluctuations and changes in the macroeconomic fundamentals, a multivariate regression function of spot rates, as a dependent variable and income (GDP) differentials, interest rate differentials, and inflation differentials can be applied. The function which serves as a basis for technical or econometric forecasting of current exchange rates can be written:

$$S = a + b(y - y^*) + c(i - i^*) + d(p - p^*) \qquad (3)$$

where S is the spot exchange rate expressed in a foreign currency value of a unit of domestic currency, y is the rate of growth of domestic GDP, y^* is the rate of growth of foreign GDP, i is the domestic market interest rate, i^* is the foreign market interest rate, p is the domestic rate of inflation and p^* is the rate of inflation overseas.

All of the variables are coincident in time t and no lagged adjustments are incorporated in this simple function. Parameters a, b, c and d are regression-fitted coefficients.

Since the purpose of this analysis is to examine the most recent relationships between spot rate and macroeconomic fundamentals, the empirical testing of this function has been conducted in two series of weekly observations. The first sample of observations covers the two-year period between November 15, 1991 and February 15, 1993 and the second sample investigates the most recent period between March 2, 1994 and July 18, 1995. The examination is restricted to the "triad currencies" (USD, DM, YE) in relation to the GDP differentials between the United States, as a "domestic" variable and, separately, Germany's and Japan's GDP growth rates as "foreign" variables. The same countries differentials are applied to short-term (three month government securities) interest rates, and inflation rates. Spot exchange rates and interest rates are monitored on the end-of-week basis, and GDP growth rates and CPI inflation rates are carried over respective weeks based on the most recently reported national statistics.

The results of these tests are presented in Table 2. The empirical testing is based on two general modifications of formula (3). The investigated function is a log-lin relationship, which has been proven by the empirical literature to have a higher deterministic value (Hakkio, 1986; Frankel, 1989; Marrinan, 1989). This form also holds better in test applied for the purpose of this analysis yielding higher R-squared and F-statistics. The applied function has been also modified in all cases by the first-order autoregressive correction *AR(+1)* aimed at neutralizing the substantial positive autocorrelation of unadjusted functions reflected by their Durbin-Watson (DW) d-statistics ranging between 0.31 (for the DM per USD test in the early series) and 0.43 (for the YE per USD series in the early test). The modified function that served as a basis for empirical testing which results are shown in Table 2 is represented ny the euqation (4):

$$\mathrm{Ln}\, S = a + b(y - y^*) + c(i - i^*) + d(p - p^*) + eAR(+1) \qquad (4),$$

where LnS is the natural logarithm of spot rates in DM per USD and, separately, in YE per USD terms.

Based on the theory of determination of exchange rates, coefficient *b* ought to assume a negative sign if one believes in the adjustments between international demand in commodity markets and spot exchange rates. Namely, if the U.S. economy grows at a faster rate than the Japanese (or the German) economy, the American demand for foreign goods increases and the spot value of the USD in YE terms (or in DM terms) falls. The stronger U.S. demand for foreign goods results in the stronger U.S. demand for foreign currencies which are expected to appreciate, thus the USD ought to depreciate. Adjustments in capital markets have an adverse effect. If the U.S. GDP is expected to grow faster than the foreign GDP, the international demand for U.S. securities should rise, thus contributing to the USD appreciation. Therefore, *b* would assume a positive sign. Coefficient *c* is always expected to have a positive sign, since rising U.S. nominal interest rates above the corresponding foreign rates generate higher interest yields on USD-denominated fixed-income securities and result in a stronger foreign demand for these securities and for the USD. Consequently, the USD will appreciate, showing a direct relationship between the interest rate differential and the spot exchange rate. Coefficient *d* is expected to be negative reflecting an inverse relationship between the inflation differential and the spot exchange rate. Specifically, if the U.S. inflation grows faster than overseas, the USD is expected always to depreciate.

The empirical results presented in Table 2 show very low values of statistical significance (low t-statistics) of sensitivity coefficients *b*, *c* and *d*. Only in the first series of observations, the DM per USD exchange rate shows statistically significant sensitivity of spot rates to interest rate and inflation rates differentials between the U.S. and Germany. The second DM per USD regression does not comply with this degree of significance. For the YE per USD exchange rate both series have extremely low significance of *b, c* and *d* coefficients proving a weak adherence of spot exchange rates to these key macroeconomic variables. The highest statistical significance is assigned to coefficient *e* and to the autoregressive correction *AR(+1)* reflecting a very strong role played by expectations of future spot rate movements in the determination of current exchange rates. The departure of the DM per USD rate from interest rate differentials and inflation differentials proves that in the recent period spot exchange rates have exhibited a weaker sensitivity of spot rates to macroeconomic relationships than before.

It is worthy to explain the reversal of the sign of the *c* coefficient between both periods. The coefficient is positive in the first period both for the DM per USD and the YE per USD regressions, being consistent with theoretical assumption of the determinants of exchange rates. But in the second period it assumes negative values. It is not surprising. In 1994 and in the first quarter of 1995 the U.S. Federal Reserve applied seven rounds of monetary policy tightening while the USD actually experienced a sharp depreciation. Consequently, U.S. three months T-Bill rates gradually increased to the peak level of 6.3 percent in the beginning of January 1995, being only slightly adjusted downward by mid-July of 1995 to 5.7 percent, while comparable German rates gradually fell from the peak level at the beginning of the series in March 1994 of 5.8 percent to the lowest level of 4.3 percent at the end of the series. Japan's rates, operating at very low nominal levels due to some deflationary pressures, peaked at 2.35 in mid-January 1995, falling to a mere 0.82 in mid-July. Correspondingly, the USD gradually fell in DM terms from 1.73 in the beginning of the series to 1.38 in the beginning of July 1995, and in YE terms it fell from 105 in March 1994 to 84.2 in the beginning of July 1995. The sign reversal of *c* and the subsequent departure of spot exchange rates from the nominal interest parity condition is an unprecedented

phenomenon. It strongly distorted the relationship between forward and spot rates since forward rates, always strongly tied to nominal interest rate differentials, showed a much stronger USD than spot rates.

Table 2: Regression Estimates of the Log-Lin Functions of DM per USD and YE per USD Exchange Rates and Income, Interest Rate, and Inflation Differentials. (End-or-Week Data)

Coefficients	Nov 15, 1991 - Feb15, 1993 Series		March 2, 1994 - July 18, 1995 Series	
	DM per USD	YE per USD	DM per USD	YE per USD
a	0.6948	4.7604	0.3834	4.4252
	(10.94)[1]	*(28.43)*	*(16.64)*	*(2.86)*
b	0.0052	0.0045	0.0153	-0.0039
	(1.53)	*(0.91)*	*(2.02)*	*(-0.32)*
c	0.0501	0.0131	-0.0024	-0.052
	(4.51)	*(1.09)*	*(-0.15)*	*(-0.35)*
d	-0.0338	0.0054	-0.0418	0.0104
	(-4.74)	*(0.82)*	*(-1.71)*	*(0.89)*
e	0.8140	0.9768	0.7608	0.9760
	(12.16)	*(25.02)*	*(6.41)*	*(25.91)*
R^2	0.92	0.85	0.92	0.94
F-stat.	156.92	74.56	121.05	164.18
DW- stat.	1.64	1.97	2.06	1.51

Note:
[1] t-statistics in parentheses
Source: Author's own estimation.

Another intriguing finding is the difference in the sign of the coefficient *d* between the DM per USD and the YE per USD series. The coefficient of sensitivity of spot rates to the inflation differential for DM per USD series is negative, thus consistent with theoretical assumptions. However, the coefficient has a positive value for the YE per USD series. This development is complex to explain and an answer to this puzzle would require additional investigations. However, throughout the 1990s the USD was continuously depreciating in YE terms while at the same time the U.S. inflation was declining by a stronger margin than the Japanese inflation. This stems from the fact that inflation in Japan already operates at a very low or negative level, while the U.S. inflation had a higher starting point with the beginning of the current economic recovery.

The reversal of the sign of the coefficient *b* in the second series of observations for the YE per USD rate deserves a further explanation. For the remaining series *b* is positive indicating that the U.S. GDP outperforming the growth of German and Japanese economies contributed to the USD appreciation. This relationship is usually transmitted via adjustments in capital markets, since the faster U.S. economic growth contributes to a stronger international demand for U.S. securities and, consequently, for the USD. The negative sign

of the coefficient *b* for the YE per USD in the second series implies that the growing U.S. income created a strong U.S. demand for Japanese goods and for the YE. The sustained deep U.S. trade deficit with japan confirms this relationship. Therefore, it may be argued that the recent changes in the YE per USD rate have been very sensitive to the inability of the U.S. to improve its trade imbalance with Japan and despite the positive income differential for the U.S., it is the Japanese currency which has actually appreciated.

In summary, spot exchange rates between the "triad" currencies are recently showing a relatively weak sensitivity to income, interest rate and inflation differentials[5]. They are, therefore, increasingly related to determinants of exchange rates that are not incorporated in the basic model prescribed by formula (4). One may speculate that the relative weakness of the USD has been recently tied to a low confidence of international investors and currency traders in the U.S. ability to control its fiscal and trade imbalances. Among them, the persistent deep U.S. trade deficit with Japan is particularly relevant for the determination of the YE per USD exchange rate. It contributes to a significant undervaluation of the U.S. currency (Krugman, 1992, chapters 1 and 2).

The second general factor that contributed to failures in currency-based derivatives is the growing degree of instability of exchange rates between the leading international currencies. As argued before, larger fluctuations of exchange rates contribute to higher premiums paid for currency futures and options making them more expensive for investors and speculators. The empirical literature on the subject of stability of floating exchange rates generally proves a growing degree of volatility and misalignments of spot rates between key currencies as the system of floating rates progresses (Mussa, et.al., 1994, pp. 18 - 24). To some extent, the development of currency-based derivatives has cushioned the growing volatility of spot exchange rates by providing a vehicle for hedging the increasing risk of currency fluctuations. But the augmented volatility also means that costs of hedging with derivatives are higher due to more expensive premiums. Mussa (et.al., 1994) provide a convincing evidence that since the inception of the floating exchange rate system in 1973 fluctuations of exchange rates among the "triad" currencies have gradually become larger and less predictable.This finding can be enforced by the examination of recent developments in spot exchange rates between these currencies. In both series of weekly observations that served as a basis for the tests presented in Table 2, the growing volatility of spot exchange rates can also be detected. In the first series of observations covering the period between November 15, 1991 and February 15, 1993, the coefficient of variation (the ratio of standard deviation to the mean value) of the DM per USD spot rate was 4.0 percent (0.04). For the YE per USD spot rate the coefficient of variation was only 2.8 percent. The coefficient rose sharply for both currencies in the second series of weekly observations covering the period March 2, 1994 - July 18, 1995, reaching 6.9 percent for the DM per USD and 7.9 percent for the YE per USD exchange rates. In essence, spot exchange rates between the "triad" currencies are not only departing from the macroeconomic fundamentals but they are also experiencing a growing degree of volatility and unpredictability. Under such conditions, the risk of failures in investing in currency-based derivatives becomes more apparent.

The third factor contributing to jitters in currency-based derivative markets are misalignments between forward rates and future changes in spot exchange rates in the recent

[5] An interesting alternative analysis of recent departures of exchange rates from macroeconomic fundamentals is presented by Clark (1994)

period of time. As discussed above, the unbiased forward rate hypothesis requires that the spot rate ought to follow the trend set forth by the forward rate level[6]. But the empirical evidence in 1994 and 1995 does not support this rule. For instance, the one-year forward rate available on July 1, 1994 showed a mere 0.52 percent USD discount in DM terms and a 3.27 USD discount in YE terms. In fact, the DM per USD spot rate fell from 1.583 on July 1, 1994 to 1.390 on July 1, 1995, which indicates a 12.2 percent depreciation of the U.S. currency. At the same time, the YE per USD spot rate fell from 98.68 to 84.22 showing a 14.7 percent depreciation of the USD. In both cases the USD scored much lower than the forward rate would imply. The weaker USD spot rate on July 1, 1995 than the one-year forward rate available on July 1, 1994 reflects negative savings from hedging DM receivables in USD terms (expressed as a difference between the lagged spot rate and the forward rate). If the exporters and investors in DM securities did not hedge with the forward DM selling contract they would generate higher USD returns by converting the DM at a lower spot rate. The same rule applies to receivables from exports or investments denominated in YE. Correspondingly, speculators betting on the USD appreciation above the forward level obtained DM or YE forward buying contracts (or buy futures and call options) to be exercised on July 1, 1995. Their forecast of spot rates stemming from perceived adjustments in monetary policies would be consistent with theoretical principles of exchange rate determination since the Federal Reserve tightened monetary policy more than Bundesbank or the Bank of Japan. To those who assumed such investment position the steep depreciation of the USD in both DM and YE terms turned out to be a disaster.

The sharp depreciation of the USD below the forward rate level was beneficial to importers of goods invoicing payables in DM or in YE, or to investors in USD securities exercising benefits in foreign currencies if they hedged with the forward DM and YE buying contracts with the USD stronger than in the spot market. Exercising forward contracts, DM and YE buy futures and call options cost them less USD for each unit of DM or YE than the purchase of these two currencies in the July 1, 1995 spot market. On the contrary, if importers invoiced their payables in USD hedging with the USD forward buying contract was less beneficial. One may presume that this position was widespread among international importers since most of the international trade transactions are still paid in USD and unhedged transactions are rather rare.

In summary, departures of exchange rates from macroeconomic fundamentals, growing volatility of key exchange rates and misalignment between forward rates and the spot adjustments have generated a higher degree of risk in international financial markets. They also have contributed to a failure of exchange rate forecasts which in turn generated a higher degree of uncertainty of investing in currency-based derivatives. All of the currency-based derivatives are designed on the basis of forecasted underlying spot exchange rates. Specifically, if the USD is expected to appreciate in terms of other leading international currencies, forward buying contracts, buy futures, USD call options or any combinations of options with calls prevailing shall be applied by international investors. Their application may turn out to be catastrophic if the USD actually depreciates.

[6] Refer particurarly to Fama (1984) for a dissident voice expressing doubts about the evdence supporting the unbiased forward rate hypothesis.

IV. CONDITIONS FOR INVOLVEMENT OF POLISH FIRMS IN CURRENCY-BASED DERIVATIVE MARKETS

An effective currency risk management shall be a part of financial strategies in transforming economies of Central and Eastern Europe. The examined increasing volatility of exchange rates among the world's leading currencies, growing inaccuracy of exchange rate forecasts and misalignments between forward rates and actual changes in spot rates contribute to an accelerating degree of currency risk in international trade and financial transactions. On the one side, an exposure to the currency risk can be harmful for expanding trade transactions, international financial investing and foreign direct investment projects which are critical for constructing a modern open economic systems. But on the other side, developing hedging mechanisms of currency risk may promote international exchange of goods and capital, as well as enhance gains from trade, and international financial and foreign direct investment. A greater involvement of Poland and other former centrally-planned economies in international currency-based derivative markets allows to establish an effective mechanism of currency risk hedging.

For the purpose of an effective entry of the Polish Zloty (ZL) into forward contracts with other currencies Poland needs to establish a relative stability of underlying spot exchange rates. This stability does not mean an application of a currency peg at the present stage of the economic transformation. Rather, somewhat more flexible formulas of the exchange rate ought to be favored so that the country's monetary policy is not fully based on the exchange rate target. The stage of transformation which requires active structural adjustments induced by the realignment of relative prices ought to be accompanied by the exchange rate flexibility, so that the mechanism of adjustments of relative prices is not distorted. At the same time, monetary policy ought to be targeted on domestic credit and based on predetermined feedback rules. Such orientation will help to facilitate domestic credit necessary for structural adjustment and will create a ground for construction of domestic security markets (Orlowski, 1994).

The currency stability shall be accomplished through a sustained, non-discretionary monetary policy oriented on controlling inflation. A steady course of anti-inflationary monetary policy will eventually improve credibility of the National Bank of Poland (NBP) and reduce “inertial” inflation, that is, the one which is self-propelled by rising inflation expectations of firms and consumers. At the same time, the environment of lower inflation will diminish the degree of real appreciation of the ZL when the spot exchange rate fluctuations are limited to the permitted band under the adjustable peg formula. The task of stabilizing the exchange rate shall not be based on a completely flexible adjustment of the spot rate to the galloping inflation in an open market, but on the achievement of price stability in the first place.

If the underlying spot rate is more stable and more predictable, it will be easier to offer forward contracts with more accurate ZL per foreign currency conversion rates and with a

longer time horizon. Such contracts will improve the quality of hedging export receivables, import payables and income from international investment. Their longer time span will help to hedge funds necessary for foreign direct investment in Poland and direct investment of Polish companies abroad, ultimately leading to acceleration of these activities.

It shall be noted that several commercial banks in Poland have already established forward contracts, mostly in ZL per USD and ZL per DM transactions. They are, however, experiencing difficulties with setting proper forward rates and expanding their time horizon. Specifically, it is difficult to set proper forward rates on a longer time forward contracts under the present conditions of high inflation running around 30 percent annual rate and, therefore, more unpredictable real interest rates. Nevertheless, the only feasible solution is that forward rates shall be based on interest rate differentials. They will have the same degree of error as forecasted interest rates. Relating them to spot exchange rate forecasts would be more risky. The expected pattern of spot rates is even more unpredictable with the recent (May 19, 1995) departure from the adjustable peg to the "crawling bend" formula having a wider band of permitted fluctuations of plus-minus 7 percent[7]. Since the present formula incorporates more risk of spot rate fluctuations, the need for forward contracts is even stronger. In essence, their accuracy depends on stabilization of the spot exchange rate which is closely tied to lower inflation accomplished through coherent programs of fiscal and monetary convergence.

Forward contracts are the only type of currency derivatives in which the ZL shall be involved. It is impossible to enter the Polish currency into currency futures and options trading before the underlying security markets are well developed. Such involvement may be considered in a very remote future or, perhaps, it shall not be debated at all since the Polish monetary system will have to be gradually more aligned with the DM or the European Currency Unit (ECU) when the program of accession to the EU is under way. Consequently, the ZL will have to be closer tied to the future European currency and Polish banks will be able to use for hedging purposes futures and options between the European currency and other leading international currencies. Furthermore, the program of accession to the EU may also help to stabilize the ZL by the unavoidable reorientation of monetary policy targeting on stable ZL per ECU (or DM) rates (Orlowski, 1995).

Regardless of the limited scope of involvement of the ZL in currency derivatives, Polish exporters, importers and banks when invoicing payments in DM, USD or other leading currencies ought to be engaged in international options markets. For instance, it would be particularly beneficial to obtain the DM per USD put option by exporters invoicing receivables in DM if the for any reason the USD were expected to considerably appreciate in DM terms above the put option strike price. This type of cross-currency hedging would significantly increase ZL gains from the transaction. Certainly, exporters shall always attempt to apply invoicing in the currency expected to appreciate the most, in this case in the USD. This hedging transaction shall be considered if the exporters do not have a bargaining position to invoice payments in the most desirable currency, which would be a likely case of Polish firms exporting goods to Germany.

[7] The term "crawling bend" referring to the present exchange rate system in Poland has been suggested to me by prof. Andrzej Wojtyna.

Correspondingly, Polish importers would significantly benefit from the DM per USD call option while invoicing payables in DM and expecting a considerable appreciation of the DM above the call option strike price. By exercising the option, the effective payment would be realized through the USD as a relatively weak currency. It would be, therefore, less expensive for Polish importers. In both cases, American-style options shall be preferred since they can always be exercised in advance or sold to a third party if spot rates assume unfavorable directions.

Although similar effects could be calculated from hedging with currency futures, their markets shall not be advised to Polish firms willing to hedge payments. As discussed before, futures markets are less flexible in terms of settlement dates, the size of blocs of foreign currency in a single contract, and they are mostly used by speculators.

In general terms, Polish exporters shall always make efforts to invoice receivables in the currency expected to appreciated the most and importers ought to follow the rule of invoicing payables in the currency expected to depreciate. If they do not have bargaining power to do so, they may maximize their gains by cross-hedging via currency-based derivatives, primarily forward contracts and currency options. In any case, the correct choice of their hedging or currency investment strategy very much depends on their accurate forecasts of key exchange rates not only between the ZL and other currencies, but also the rates between the leading international currencies. It is also advisable that Polish companies develop systems of accounting of exposure to currency fluctuations not only in the domestic currency, but parallelly also in USD, to allow to design most beneficial risk hedging schemes.

The access to international currency-based derivative markets shall be also expanded for Polish banks and investment funds. Using currency derivatives gives them an opportunity to hedge the risk of converting foreign currency earnings into ZL. Existing barriers on international capital investment and high capital gain taxes shall be reduced to allow them to profit from international investing and accumulate capital funds. At the same time, speculation by Polish firms in international derivatives markets ought to be discouraged. Speculative transactions generated considerable losses in 1994/95, especially to inexperienced participants. These losses are likely to persist if underlying currencies spot rates continue to exhibit increasing volatility and misalignment.

Polish international trade companies shall be fully aware that the risk of exposure to exchange rate fluctuations can be also hedged with methods not involving currency-based derivatives. This is particularly important when the ZL per foreign currency exchange rates show an increasing degree of volatility and unpredictability. Among such methods **the money-market hedge** is highly recommended. Specifically, if an exporter sells goods to Germany and invoices receivables in DM, it may borrow a DM loan from a German bank at the time of signing the contract. Simultaneously, the Polish exporter will exchange borrowed DM into ZL at the current spot rate and invest the amount in ZL denominated interest-bearing assets. It will generate a desirable ZL income for the time of duration of the export contract. At the end, the collected receivables in the future will be used to repay the German bank loan. This transaction is risk-free since it involves all parameters (the German credit rate, the ZL deposit rate and the current spot exchange rate) known upon the contract origination. The income will, therefore, depend on the amount of earning from the ZL-denominated assets. It can be easily observed that this operation is beneficial if the ZL real

interest rate or, eventually, the DM deposit rate in a Polish bank exceed the real rate of interest on the German bank loan.

A similar scheme can be also applied by Polish importers. If they invoice payables in DM, they may consider borrowing ZL from a Polish bank, converting the amount to DM today, and investing in DM interest-bearing securities for the duration of the import contract. The DM assets will be later cashed-in and used to cover DM payables. At the same time in the future the Polish bank loan will be repaid in ZL, which in effect will be a cost of the import transaction. This time, the ZL credit real interest rate must be lower than the DM asset interest rate to exercise relative gains from this transaction.

In summary, international currency-based derivative products open vast opportunities for firms of the emerging market economy of Poland. Yet, they bring a growing degree of risk for speculative transactions. It is desirable for Polish companies to engage in these markets to enhance hedging opportunities and to maximize profits from international investing. To a limited degree, forward contracts on the ZL exchange rate shall be expanded. But building derivative security markets in transition economies must be preceded by strengthening of underlying security markets, which success strongly depends on the ability of the economic authority to reduce inflation. The policy adjustments that are inevitable in rational programs of preparation for accession to the EU will help to strengthen domestic security markets, stabilize inflation and the exchange rate and, ultimately, assist in a future construction of derivative security markets.

* * *

References

Clark, P., et.al., (1994). "Exchange Rates and Economic Fundamentals: A Framework for Analysis". International Monetary Fund: Occasional Paper No. 115, Washington, D.C., December.

Fama, E. (1984). "Forward and Spot Exchange Rates". Journal of Monetary Economics, pp. 319 - 338, November.

Frankel, J. (1989). "Flexible Exchange Rates: Experience versus Theory". Journal of Portfolio Management, pp. 45 - 54, Winter.

Goldstein, M. and D. Folkerts-Landau (1994). "International Capital Markets: Developments, Prospects and Policy Issues". International Monetary Fund: World Economic and Financial Surveys, Washington, D.C., September.

Hansen, L.P. and R.J. Hodrick (1980). "Forward Exchange Rates as Optimal Predictors of Future Spot Rates: An Econometric Analysis". Journal of Political Economy, pp. 829 - 853, October.

Hull, J.C. (1993). "Options, Futures and Other Derivative Securities" (2nd. ed.). Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Kolb, R.W. (1994). "Futures, Options and Swaps". Kolb Publ. Co., Miami, Florida.

Levich, R.M. (1985). "Empirical Studies of Exchange Rates: Price Behavior, Rate Determination and Market Efficiency" in R.W. Jones and P.B. Kenen (eds.) "Handbook of International Economics" North-Holland Publ. Co., Amsterdam. Chapter 19.

Madura, J. (1995). "International Financial Management" (4th ed.). West Publ. Co., St. Paul, Minnesota.

Marrinan, J. (1989). "Exchange Rate Determination: Sorting Out Theory and Evidence". Federal Reserve Bank of Boston: New England Economic Review, pp. 39 - 51, Boston, Massachusetts, November-December.

Mussa, M. et.al. (1994). "Improving the International Monetary System: Constraints and Possibilities". International Monetary Fund: Occasional Paper No. 116, Washington, D.C., December.

Orlowski, L.T. (1994). "Spanish Monetary Policy Before and After the Inclusion into the European Community: Lessons for Poland". Banque Internationale a Luxembourg: Reperes - Bulletin Economique et Financier No. 39, pp. 4 - 14. Luxembourg, November.

Orlowski, L.T. (1995). "Preparations of the Visegrad Group Countries for Admission to the European Union: Monetary Policy Aspects". The Economics of Transition No. 3.

Tucker, A.L., J. Madura and T.C. Chiang (1991). "International Financial Markets". West Publ. Co., St. Paul, Minnesota.

Table of Contents