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All communications regarding the Review should be addressed to *Banca Nazionale del Lavoro Quarterly Review*, The Editor, Via V. Veneto 119, 00187 Roma.

Editor: Dr. LUIGI CERIANI - *Assistant Editor:* Prof. ALESSANDRO RONCAGLIA
Direttore responsabile: Dr. ALBERTO MUCCI

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Currency Speculation and Dollar Fluctuations *

The wide fluctuations of the dollar exchange rate since the breakdown of the Bretton Woods system and particularly the rise and the fall of the dollar in the 1980s remain for the most part unexplained by the prevailing exchange rate theories. In order to detect the pattern of economic behaviour which has brought about these exchange rate movements, an exploratory approach seems most appropriate. The investigation is based on the exchange rate between the two currencies which are by far the most traded, namely, the dollar and the deutsche-mark. It covers the period from March 1973 to March 1988.

In a first step the pattern of the daily exchange rate movements is carefully explored. It is shown that a sequence of upward or downward price runs interrupted by some erratic fluctuations is typical of exchange rate dynamics in the short run. Since such a pattern can be systematically exploited by certain trading rules, the importance of "technical analysis" for the formation of expectations and consequently for the determination of exchange rates is examined. It turns out that the trading rules implied by technical analysis, which are actually employed in the market, have systematically produced extra profits over the whole period without any significant risk.

The second part of the study focuses on the medium-term fluctuations in exchange rate dynamics. It is argued that these fluctuations can be explained as the result of interacting disequilibria in the goods and asset markets, where the exchange rate fluctuates around the purchasing power parity as its "center of gravity" without any tendency to converge towards a stable equilibrium.

* This article represents a short version of a more comprehensive study on exchange rate dynamics (SCHULMEISTER, 1987). For details concerning the data or methodological issues, the reader is referred to the original study.

I wish to thank Michael D. Goldberg for his many crucial contributions to this study. I am also grateful to Eva Horvath who did all of the statistical work and to Marianne Riese who wrote the computer program for the analysis of the profitability of technical trading rules. A special thanks goes to Erna Kernreich for typing the manuscript.

The pattern of exchange rate dynamics

Figure 1 shows for the period of a rising dollar (1980-85) that the exchange rate moves in a sequence of upward and downward runs (monotonic or "almost" monotonic movements), sometimes interrupted by oscillations around a constant level (referred to as "whipsaws" by professional traders). If one measures this "Gestalt" quantitatively one obtains two important results:

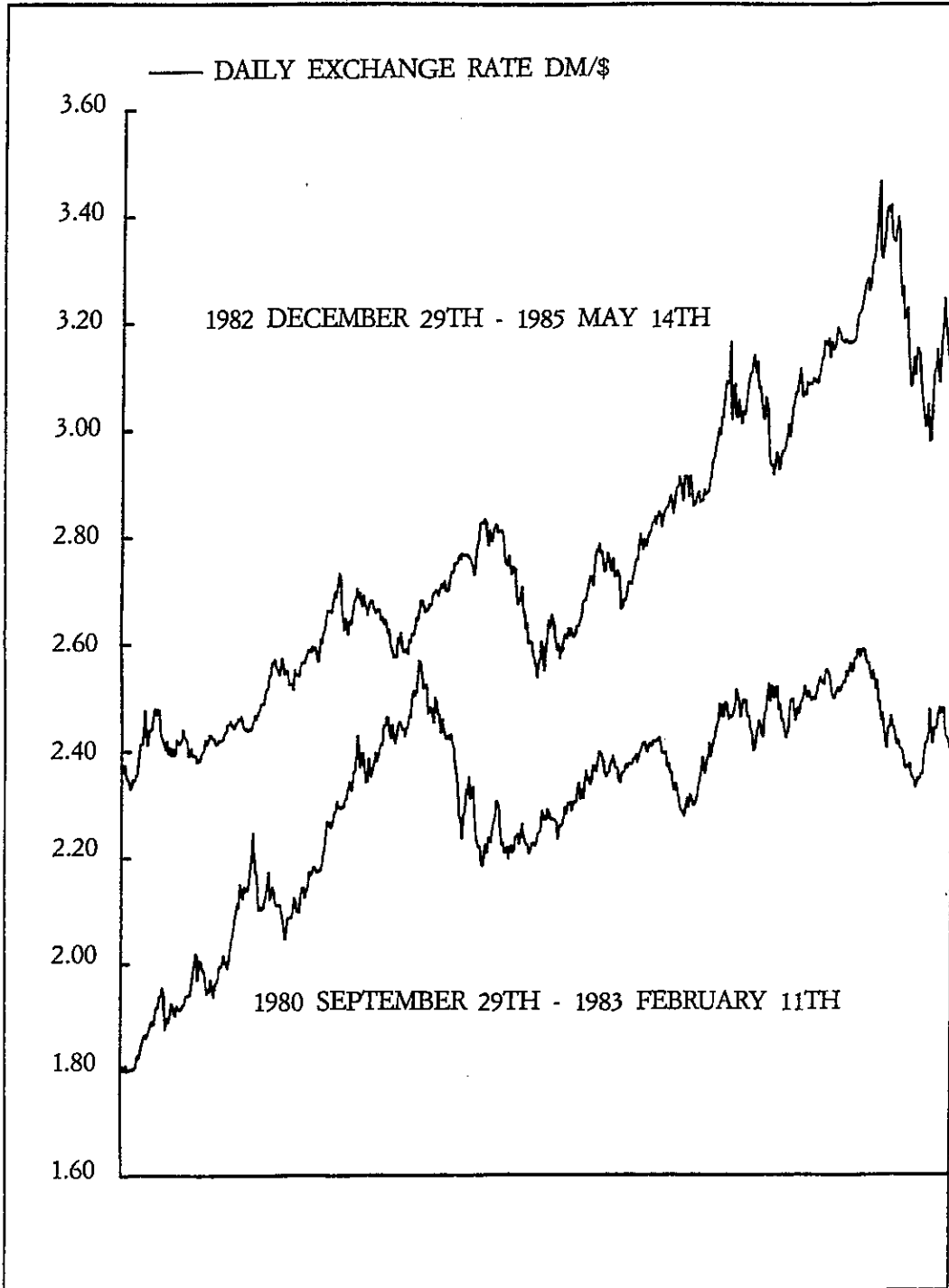
— The overall dollar appreciation in 1980-85 was due to the upward runs lasting on average 2.6 days longer than the counter-runs (the average slope of the upward and downward movements was the same in absolute terms). Similarly, the dollar depreciation after 1985 was mainly due to the downward runs lasting longer than the counter-movements. This pattern directly contradicts the assumptions of equilibrium economics under rational expectations. If exchange rate volatility were caused by changes of the expected equilibrium level due to "news", this should induce an almost instantaneous price adjustment and not a persistent run.

— Most of the overall appreciation and depreciation was carried out in a relatively few, longer lasting runs: 21.1% of the upward runs accounted for 81.2% of the overall appreciation and 13.3% of the downward runs produced 73.3% of the overall depreciation. The reason for this concentration lies in one extremely important fact: exchange rate runs tend to be steeper the longer they last.

How can this stepwise process of dollar appreciation and depreciation be explained as the outcome of the economic behaviour of market participants? More specifically: which group of agents influences the process of exchange rate determination most directly? The answer is simple: the foreign exchange dealers. Economic theory, however, abstracts from this group of agents, mainly because they are assumed to be no more than an intermediary between the demand and supply stemming from the international trade of goods and services on the one hand and of real and financial assets on the other. But is this abstraction appropriate? The total daily volume on the foreign exchange market is estimated to be \$ 354 billion (1986), roughly 40 times the volume of world trade and 60 times the volume of international portfolio investment (Schulmeister, 1987, p. 8). These figures are consistent with bank surveys showing that customer business accounts for only 11.5%

FIGURE 1

THE RISE OF THE DOLLAR 1980-85



Source: AUSTRIAN INSTITUTE OF ECONOMIC RESEARCH

(USA) and 9% (UK) of total foreign exchange activities (there are a lot of other institutions like securities and brokerage houses, commodities firms and international industrial corporations which play the "currency game" exclusively for its own sake). One can therefore conclude that foreign exchange dealing has largely emancipated itself from the direct forces implied by market fundamentals.

In order to explain the specific pattern of exchange rate dynamics, the following questions have to be answered:

— How do foreign exchange dealers form expectations causing the exchange rate to move in a sequence of upward and downward runs, sometimes interrupted by non-directional movements ("whipsaws")?

— What causes these runs to last longer in one direction rather than in the other for several years, resulting in a medium-term trend of dollar appreciation or depreciation?

The following hypotheses can be considered first answers to these questions:

— The development of a single run can be understood as the result of two interacting effects, the bandwagon effect and the cash-in effect. If some economic or political "news" signal a short-term dollar appreciation, agents buy dollars, which in turn causes the dollar to appreciate. Once the exchange rate movement has gained momentum (usually within some hours), more dealers join the bandwagon, partly because technical trading models now produce buy signals. The longer the run lasts, the larger becomes the temptation to cash in the paper profits and the weaker becomes the bandwagon effect. Accordingly, agents become more and more responsive to external "news" that could be interpreted by other market participants as a signal of a "tilt" in the run. When the run finally bursts (usually due to a particular piece of "news") a counter-run is often triggered off (see Figure 1): the former positions are closed and new counter-positions are opened.

— A medium-term expectational bias operates in favour (1980/85) or against (1985/87) the dollar (I owe this concept to M. Goldberg): when a positive bias prevails, traders hold a long dollar position some days longer than a short dollar position. This behaviour causes the upward runs to last longer than the counter-movements leading to a stepwise process of dollar appreciation and *vice versa* for a negative expectational bias.

Can the pattern of short-term exchange rate movements as a sequence of runs and "whipsaws" be systematically exploited by certain

trading rules? How does the application of these rules feed back upon the price pattern? These problems are explored by testing the profitability of currency speculation based on technical analysis.

Technical analysis and exchange rate instability in the short run

The use of technical analysis has greatly increased in the foreign exchange markets. In a survey of the "Group of Thirty", 97% of the bank respondents and 87% of the securities houses considered that the use of technical models has had an increasingly significant impact on the market. In particular, the most important market participants, namely banks, securities houses and brokers are believed to have increased the use of these models (Group of Thirty, 1985).

Technical analysis seeks to produce profitable buy and sell signals by isolating systematic components in the behaviour of price series (see Kaufman, 1978, for an excellent treatment). The qualitative approaches rely on the interpretation of some (purportedly) typical configurations of the ups and downs of price movements (*e.g.*, head and shoulders, top and bottom formations). They therefore contain an important subjective element. The quantitative approaches try to isolate runs from non-directional movements using statistical transformations. These techniques — moving average models and momentum models — produce clearly defined series of buy and sell signals and can therefore be accurately tested. The first type usually consists of a short-term (unweighted) moving average (over the preceding 3 to 8 days) and a long-term moving average (over the preceding 10 to 30 days). The trading rule is as follows:

— Buy (go long) when the short-term (faster) moving average crosses the long-term (slower) moving average from below and sell when the converse occurs.

The momentum models work with the (first) difference between the current price and that k days ago:

— Buy (go long) when the current price exceeds the price k days ago and sell when the current price falls below the price k days ago.

The widely used point-and-figure technique is in many aspects a qualitative approach (Kaufman, 1978). However, its basic trading rule can be programmed and is therefore objectively testable (it was originally developed by Dow):

— Buy (go long) when a rising price exceeds the most recent high and sell when a falling price falls below the most recent low. A simple chart may clarify the meaning of this rule:

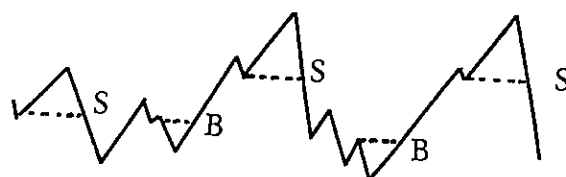


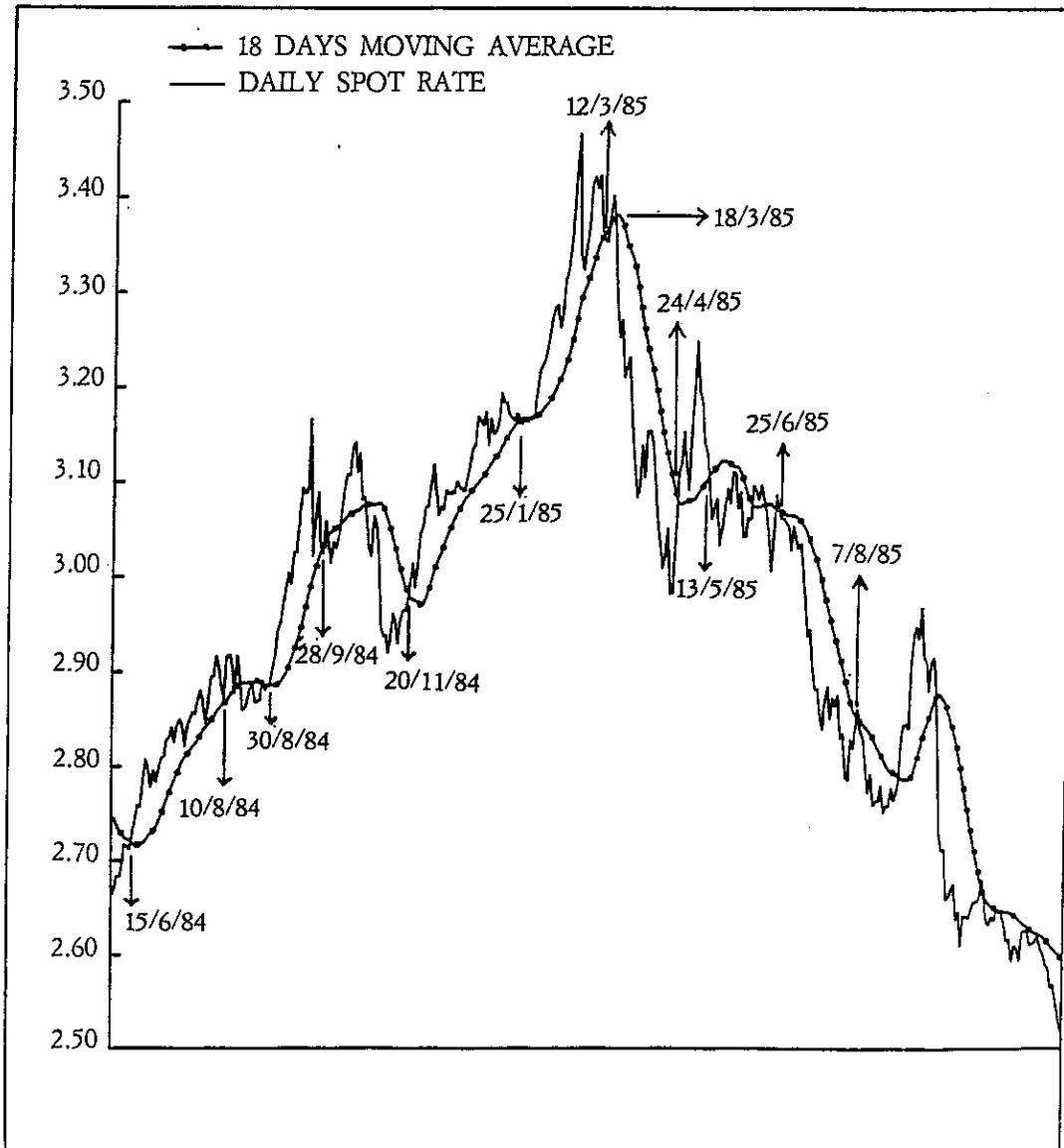
Figure 2 demonstrates how a simple trading model based on an 18-day moving average (in this case the original series serves as the short-term moving average) performed between June 1, 1984 and November 29, 1985 (18 months around the peak of the dollar exchange rate). On June 15, 1984 a dollar is bought for 2.7292 DM and on August 10, 1984 it is sold for 2.8770 DM, yielding a profit of 5.1 cents in 56 days. Figure 2 demonstrates clearly how this trading rule exploits the persistence of exchange rate runs, irrespective of their direction (the most profitable trades are indicated in the chart). However, smaller fluctuations can cause the model to produce wrong signals (losses), especially if there is no underlying upward or downward trend. Such “whipsaws” prevailed between May 13 and June 26, 1985. However, such losses were small because the ups and downs were themselves small. The overall profit from following blindly this trading rule over 18 months was 16.0% per year. A momentum model operating with a time span $k=8$ days produced an annual return of 33.3%, the Dow rule one of 24.5%.

This calculation does not take into account transaction costs and the interest rate differential. However, the size of both factors is negligible:

— Transaction costs are estimated to be at a maximum 0.04% per trade. This would reduce the profit rate to 15.0% for the moving average, to 32.2% for the momentum model and to 23.5% for the Dow rule.

FIGURE 2

BUY AND SELL SIGNALS FOR THE DM/\$ EXCHANGE RATE
 JUNE 1984 - NOVEMBER 1985



Source: AUSTRIAN INSTITUTE OF ECONOMIC RESEARCH

— Interest is earned on long positions and paid on short positions. Thus, the overall effect can be roughly estimated by comparing the average duration of the long and short dollar positions (given the relatively stable interest differential in the short run). Inspection shows that during the period of our example as well as during the overall period between 1973 and 1988 interest earnings and interest costs roughly offset each other.

Table 1 shows how some selected technical trading models performed between April 2, 1973 and October 1, 1986 (this represents the sample period of the original study, see Schulmeister, 1987), as well as during 9 sub-periods of 18 months. All the trading rules produced profits in every sub-period, though at a varying rate. The annual return over the whole period centered around 15%, far above zero, which represents the expected return from following trading rules in an efficient market.¹ Two models which combine the trading rules of the moving average and momentum models performed best (in this case a trade is only executed if both techniques signal the same — long or short — position). It is therefore not surprising that the model which "Citicorp", the most important single participant in the foreign exchange market, developed as one basis for its foreign exchange activities is of this combined type ("Cititrend"). In all, 18 trading models were found which produced profits during the whole period between April 1973 and September 1986 as well as during each of the 9 sub-periods (8 moving average models, 2 momentum models, 7 models which combine both rules and the Dow rule).

The riskiness of currency speculation based on technical analysis was estimated by testing the mean of the single rates of return against zero (only if it is negative does the trading rule produce an overall loss). It turned out that for the whole sample period the t-statistic exceeded 4.0 in all cases. This implies that the probability of an overall loss was less than 0.005% if one of these trading rules was followed blindly between April 1973 and September 1986.

Table 1 also shows how the selected technical models performed between October 1986 and March 1988. Most trading techniques remained profitable, though less so than in the preceding years. This reduction of the profitability of short-term currency speculation was

¹ In SCHULMEISTER (1987) it is also shown that the \$/DM exchange rate does not follow a random walk as implied by the efficient market hypothesis. This result of two different random walk tests is in line with the significant profitability of trading rules in the foreign exchange market.

mainly due to the stabilising effects of the Louvre accord of February 22, 1987. Until then, all trading rules had produced profits, and some were extremely profitable. However, after the Louvre accord among the Group of Seven, the rates of return of the selected trading rules fell significantly, and three of them actually produced losses (see Table 1).

Table 2 details the pattern of profitability over the entire period (1973-86) by splitting the sum of profits (losses) into its components, namely, the number of profitable (unprofitable) positions, their average duration in days and the respective return per day (the product of these components gives the sum of profits or losses). The number of losses is always greater than the number of profits; the average profit (loss) per day is roughly equal for profitable and unprofitable positions. The overall profitability is therefore due to the fact that the average duration of the profitable positions is 3 to 4 times longer than that of the unprofitable positions. This pattern holds for all the trading rules. It is the result of a systematic exploitation of the pattern of runs already discussed: most of them are fairly short, so that most of the change in exchange rate changes is brought about in few longer lasting runs. The smaller fluctuations often cause technical models to produce losses, which, however, are small, precisely because the fluctuations are small. The profits from the correct identification and exploitation of the few, but persistent runs, which change the exchange rate most, can therefore easily compensate for the more frequent, but much smaller losses stemming from the minor exchange rate fluctuations ("whipsaws"). The distribution of the single rates of return reflects these regularities (Table 2). The median is negative and smaller than the mean, the distribution is consequently skewed to the right, the coefficient of kurtosis is greater than that of a normal distribution (3.0).

Market efficiency in its weak form implies that past prices do not contain any information which can be profitably exploited (Fama, 1970). Since the profitability of currency speculation based on technical analysis stems exclusively from the exploitation of past exchange rate values, one has to conclude that foreign exchange markets are definitely not efficient, at least for the most traded currencies.

TABLE 2

PATTERN OF PROFITABLE DM/\$ TRADING
Period: 2/4/1973 - 1/10/1986

	Moving Average MAS: 5 MAL: 10	Momentum K: 10	Moving Average & Momentum MAS: 3 MAL: 10 K: 10	Point & Figure (Dow Rule)
Annual Rate of Return	15.1	15.5	15.9	13.5
Sum of Profits (cents)	339.1	345.3	315.6	347.6
Profitable Positions				
Number	128	172	101	147
Average duration in days	28.6	22.0	37.6	22.4
Average return per day	0.09	0.09	0.08	0.11
Sum of Losses (cents)	-134.6	-135.7	-101.1	-165.4
Unprofitable Positions				
Number	153	222	121	235
Average duration in days	8.3	5.2	9.4	7.0
Average return per day	-0.11	-0.12	-0.09	-0.10
Single Rates of Return				
Mean	0.73	0.53	0.97	0.48
Median	-0.14	-0.09	-0.14	-0.24
S.D.	2.67	2.25	3.01	2.11
Skewness	2.41	3.41	2.26	2.14
Kurtosis	12.99	24.03	10.90	9.07
t-statistic	4.56	4.69	4.78	4.40

Expectations formation and determination of exchange rates in the short run

"It is not uncommon for professional market participants to have two opinions at the same time regarding the trend of a specific currency in the exchange market. One opinion may relate to the long-term trend, which is based on the fundamental forces... The other opinion may be concerned with the very short-term trend of a currency, which is based on the technical and psychological conditions of the market" (Riehl and Rodriguez, 1977, p. 134). Both types of expectations are formed in a qualitative manner, *i.e.*, they concern only the direction of the short and the long-term trend without specifying how long it will last or which

exchange rate level will be reached by its end. This kind of expectation is sufficient to make profits consistently. It is at the same time highly efficient in view of the specific uncertainty (in the sense of Knight and Keynes) in the foreign exchange market.

Technical analysis fits this type of qualitative expectations formation particularly well. However, this type of expectations formation does not have to be based on technical analysis in order to be profitable. European banks, for example, also profit consistently from foreign exchange trading (and particularly from holding open positions as I was told in interviews), yet they subscribe much less to technical analysis than market participants in the US. European dealers try to separate runs from "whipsaws" mainly by observing "the psychological conditions of the market", using the network of personal contacts with other dealers. Both approaches, the observation of "market psychology" and technical analysis try to solve the same problem; namely, how to form expectations about other agents' expectations, since the market price represents the aggregate outcome of these individual expectations. This dilemma was first described by Keynes in his famous "beauty contest example" (Keynes, 1964, p. 156). It seems to be particularly important in the case of exchange rate determination since the specific characteristics of this market generate powerful feed-back forces. For the same reason, technical analysis has become increasingly influential. One banker has remarked (with respect to charts): "Even if you don't subscribe to their use, you can't ignore them. Too many traders are using them today."²

The specific and ultimately price-determining behaviour of foreign exchange dealers can largely be explained by Heiner's theory of predictable behaviour (Heiner, 1983). The specific complexity of the market — its worldwide interdependence, the interaction of the goods market and asset market, and the volume and speed of transactions — and its specific uncertainty leads to a gap for every agent between his competence to make an optimizing decision and the actual difficulties involved with this decision, Heiner's "competence-difficulty gap". The wider the gap, the more likely agents are to follow a rule-governed strategy that in turn makes their behaviour predictable. As an example

² The general implications of this "beauty contest" problem in a decentralized market economy are analysed by FRYDMAN (1982). He shows that, even within the framework of rational expectations, models of the market process will not converge to a general equilibrium solution "due to the fact that individual agents cannot ascertain the average of forecasts... formed by other agents" (p. 654). Further discussions of the "beauty contest" problem can be found in FRYDMAN and PHELPS (1983).

of the dynamic aspects of this theory Heiner mentions the "switching between buying and selling strategies in financial markets" (p. 582). However, Heiner does not seem to be sufficiently aware that the predictability of this behaviour accounts for its exploitability at the same time.

Medium-term (long-term) expectations influence the behaviour of foreign exchange dealers insofar as they impact on the length of time a strategic position is held; *i.e.*, open positions that are congruent with the prevailing bias are held longer than positions that are incongruent. In this way a basic expectational bias in favour or against a currency brings about an overall appreciation or depreciation in a stepwise process which can last for several years.

To summarize: a specific interaction is at work in the foreign exchange market between the expectations formation and profit-maximizing behaviour of agents, on the one hand, and the pattern of price fluctuations, on the other. Individual agents perceive the sequence of exchange rate runs and "whipsaws" as given and consequently exploitable, particularly by means of technical analysis. At the same time, however, this systematic speculation feeds back upon the pattern of exchange rate movements, thereby strengthening its specific shape. It is therefore not surprising that 85% of banks and securities houses in the survey of the Group of Thirty responded that exchange rate volatility had a positive impact on their firms' profitability (Group of Thirty, 1985, p. 19).

The winners and the losers in the currency game

The actual income of banks from foreign exchange trading as reported in their income statement is in line with the systematic profitability of technical trading rules. In 1985, 12 US banks earned a foreign exchange trading income of \$ 1,165.4 million, almost five times as much as in 1977 (\$ 247.5 million). The four most profitable banks were Citibank (\$ 358.0 million), Chase Manhattan Bank (\$ 173.4 million), Morgan Guaranty Trust (\$ 172.6 million), and the Bank of America (\$ 150.0 million). It is highly significant that foreign exchange business was profitable for every single bank in every single year between 1977 and 1985. These figures cover the banks' income from all

types of foreign exchange activities; profits from speculation-oriented business cannot be separated from arbitrage-oriented activities or customer business. However, there can be no doubt that short-term currency speculation contributed considerably to the overall profitability of foreign exchange trading. This is clear from the growing importance of technical analysis as reported by banks and securities houses (Group of Thirty, 1985, p. 15) as well as from the increasing number and profitability of firms which produce and sell technical models for foreign exchange trading (for a description of these services see *Euromoney*, August 1986, pp. 198-201).

Buying and selling currencies per se is of course a zero-sum game (the profits in our simulations stem exclusively from the differences between the sell and buy prices, which correspond to equivalent losses on behalf of the partners of technical traders). Now, if banks, but probably also securities houses, commodities firms, and multinational industrial corporations, consistently win in this game, who then is the loser? Or more concretely: which group of agents sell dollars to foreign exchange traders when the dollar appreciates in the following days or weeks (and *vice versa*)? The answer is simple: all those market participants who buy or sell foreign exchange for other reasons than short-term profit maximization from foreign exchange dealing itself (including intervening central banks), particularly traders of goods and services who perceive and use foreign exchange for international payments rather than as a financial asset. The decisions of exporters or importers to buy or sell a currency are determined by the wish to carry out an import transaction or to convert export earnings into the producer's domestic currency (the ultimate reason being the interest of the producer to obtain liquidity in the currency in which he has to pay the costs of production). For example a German exporter who happens to receive a dollar payment on June 15, 1984 (Figure 2) will change it into deutschemarks without realizing that an appreciation run of the dollar is on its way (the same would be true for a US tourist who happens to change dollars for deutschemarks in Germany on the same day). Whereas the actors of the "real world" see foreign exchange as a flow which has to be converted into the domestic currency of the producer for reasons of liquidity, the actors of the "financial world" see foreign exchange as an asset which has to be held for reasons of speculation. In other words, the exchange rate represents a flow price and an asset price at the same time, with traders of goods and services perceiving mainly the flow aspect and traders of financial assets mainly the asset aspect.

On a more insidious note, exporters and importers, must participate in a casino to make their international payments. However, most commercial agents (including those of services like tourists) are not aware of this type of financial intermediation and do not know the specific rules of the game. Ironically, exporters (importers) perceive only the service aspect of the banks' activities, which certainly facilitate the international trade of goods and services. The banks themselves may not be completely aware of this relationship since customer business and foreign exchange trading are usually carried out in two different divisions. The same might be true for multinational industrial corporations with professional foreign exchange departments. Certainly they realize the profitability of currency speculation but it is less certain whether they realize that their activities in the asset market often impede their activities in the goods market. For example, if the currency speculation of a corporation like Renault contributed to the dollar depreciation since 1985 (this is highly probable since this French car maker is heavily engaged in foreign exchange trading), this activity also restricted the export, and consequently the production, of the company's cars. Of course, the contribution of any single bank or industrial corporation to exchange rate instability is miniscule. However, this is not true for the aggregate of all professional players. The effect of currency speculation on the overall profitability of activities in both markets, the goods market as well as the asset market, is difficult to estimate, for the interaction of both types of activity certainly does not represent a zero-sum game, neither for a single industrial corporation nor for the world economy as a whole.

The persistent redistribution of income from activities in the goods market to activities in the asset market through currency speculation has not received much attention for several reasons. First, the overall amount of the redistributed income is very small relative to the volume of international trade of goods and services. Second, the number of participants in the international goods market is much greater than the number of foreign exchange dealers. Third, the volume per transaction is much smaller in the goods market than in the asset market. Fourth, most end-users (traders of goods and services, portfolio investors) transact on only one side of the market, either buying or selling, so that any loss is only an opportunity loss rather than a realized cash loss. Fifth, most participants in the goods market (particularly smaller firms and tourists) do not watch exchange rate changes every day and are therefore not aware of their respective opportunity losses or profits.

Hence, a large profit for an individual speculator like a bank — contributing in some cases to more than 30% of its overall income — consists of many miniscule losses distributed more or less randomly over the many transactions associated with the international trade of goods and services. The direct effect of short-term currency speculation on international trade through income redistribution is almost negligible. Much more important, however, are the indirect effects through the destabilization of exchange rates, particularly with respect to the dollar as the world currency.

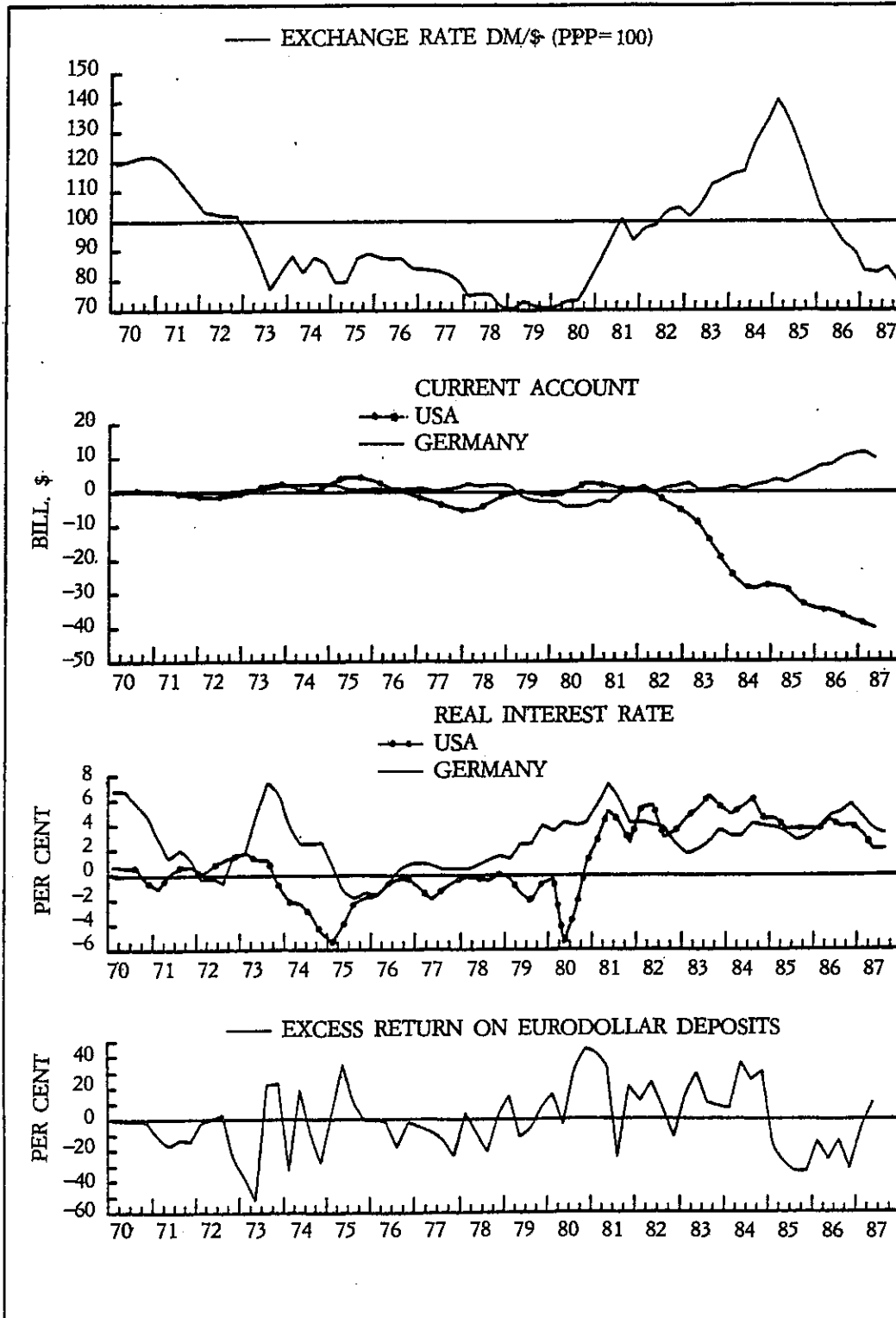
The currency bias and exchange rate instability in the medium run

Foreign exchange dealers operate on the basis of a medium-term expectational bias in favour or against a currency. If a current run is in line with the prevailing bias, they hold a strategic position some days longer than otherwise. This behaviour brings about a medium-term appreciation or depreciation in a stepwise process. Which factors determine the existence of such a medium-term bias as well as the turnabouts? A first answer to this question can be sketched by using the dollar fluctuations of the 1980s as an example (Figure 3).

The strong depreciation of the dollar had come to an end in 1979, when it was 28.7% below the purchasing power parity level. Partly as a consequence of the undervaluation of the dollar, the US current account moved into surplus in 1980. At the same time, the German current account deteriorated to a greater extent than at any other time in post-war history (Figure 3). Thus, the goods market suggested an appreciation of the dollar against the deutschemark. But this expectation was held in balance by the asset market, through a continuous increase of the real interest rate differential. In January 1979, the real interest rate in Germany was only by 0.9% higher than in the US. This differential rose to 4.9% in September 1979 and reached a post-war maximum of 10.8% in May 1980 (Figure 3). Thus the “real” forces of the goods market and the “financial” forces of the asset market were working in opposite directions and helped to maintain a “precarious equilibrium”.

FIGURE 3

GOODS MARKET, ASSET MARKET AND
THE DYNAMICS OF THE DM/\$ EXCHANGE RATE



Source: AUSTRIAN INSTITUTE OF ECONOMIC RESEARCH

However, when the new monetary policy of the US finally became effective, the US real interest rate increased abruptly relative to the German rate, by 8.6% within 6 months (May 1980 to November 1980). Instead of the asset market holding in check the expectations arising from the goods market, it now reinforced this already strong motivation. Thus an expectational bias in favour of the dollar was established. Consequently, foreign exchange dealers held open dollar positions longer than open deutschemark positions and portfolio investors shifted capital out of the deutschemark into the dollar. This induced a continuous self-sustaining appreciation of the dollar in a stepwise process. Both the variables which form exchange rate expectations, the "real" forces of the goods market and the "financial" forces of the asset market, were now working in perfect unison. (The result of polls indicating that Ronald Reagan would be elected president of the US may have served as a start signal for the dollar appreciation process which actually took off in October 1980.)

Once such capital and exchange rate movements start, their profitability strengthens the expectational bias in international financial markets. This induces a further currency appreciation, so that the profitability of changing the currency denomination of assets endures. This can be seen from the excess return from changing the currency denomination of a 3-month Eurodeposit from deutschemarks into dollars. During the 54 months between July 1980 and December 1984 this return, in excess of the deutschemark interest rate, was negative only 8 times. The average annual rate was 18.7% (see Figure 3 — standard theory expects this return to oscillate around zero).

It follows from this feed-back mechanism that such an exchange rate movement will not stop near the purchasing power parity line. Shooting "through" becomes a consequence of the preceding overshooting. Thus, the growing disequilibrium in the goods market (increasing current account deficit of the US and the increasing current account surplus of Germany) could only dampen the speed of the appreciation process, which was further fueled by the widening of the interest rate differential. In August 1983 the real interest rate in the US was 4.2% higher than in Germany. This differential remained large compared with experience in the post-war period. In August 1984 the interest rate differential began to narrow again; however, the expectational bias in favour of the dollar still prevailed for some months. One reason could be that the US economy was greatly outperforming the other industrial economies (for the first time since the early 1950s). In

2Q84, for example, the US economy grew faster than the German economy by 6.0% (in real terms). At the same time it seemed as if the widening of the US current account deficit had come to a halt (see Figure 3). However, when the growth differential narrowed and the US current account started to deteriorate again, the appreciation process was finally broken and tilted abruptly into a depreciation process (see Figure 3). Once again a political event may have served as a start signal, namely, the change of the US Treasury: Donald Regan, very much a "Wall Street" man, was followed by James Baker, who seemed to be much more concerned with the problems of the real sector of the US economy.

Since February 1985 the developments in the goods market (persistent current account deficit of the US and persistent current account surplus of Germany) and the developments in the asset market (since January 1986 the real interest rate in Germany has again been higher than in the US) have established an unambiguous expectational bias against the dollar.

This disequilibrium approach can also explain the bubble-like dollar depreciation in the early 1970s, which led to the definite breakdown of the Bretton Woods system in March 1973 (Figure 3). By mid-1972 the dollar was still slightly overvalued and the US current account was in deficit. At the same time the expectation of a further dollar depreciation was held in check by the forces of the financial markets. The real interest rate in the US was 2.2% higher than in Germany (August 1972). However, with the aim of reducing domestic inflation the German authorities instituted a tight monetary policy and caused a sharp increase in the German interest rate. By December 1972 the real rate was already 0.6% higher than that in the US and by June 1973 the differential reached 4.7%. Thus an unambiguous expectational bias against the dollar and in favour of the deutschemark was established which induced large capital movements and led to a strong deutschemark appreciation and high extra profits. Between November 1972 and June 1973 changing the currency denomination of a 3-month Eurodeposit yielded an average return of 49.0%.

Between mid-1973 and mid-1976 a "precarious equilibrium" prevailed (see Figure 3). The US current account improved, so that the goods market pointed to a recovery of the dollar. This force, however, was balanced by the asset market since the real interest rate in the US remained below the German rate by more than 5%. In the first half of 1975 the "real" and "financial" forces changed their role in this

“precarious equilibrium”. The current account of the US deteriorated continuously (in spite of an undervaluation of the dollar in terms of PPP) while at the same time the US real interest rate increased strongly compared with the rate in Germany. However, when the US interest rate began to fall again relative to the German rate in June 1976, a change in the currency preference of asset holders was triggered off. The bubble-like dollar depreciation lasted for more than two years (see Figure 3). Changing the currency denomination of a 3-month Eurodeposit yielded an excess rate of return of 11.3% per year between June 1976 and September 1978.

To summarize: exchange rate dynamics in the medium run can be viewed as a sequence of bubble-like trends, based on an upward or downward expectational bias and non-directional movements based on an ambiguity in the formation of expectations (*i.e.*, conflicting signals emanating from the goods and asset markets and thus the prevailing of a “precarious equilibrium”). This sequence is driven by the interaction of disequilibria in the goods and asset markets.

The preceding exercise in “stylizing” the facts of the dollar fluctuations can be generalized as follows. An expectational bias in favour of or against a currency is established when the “real” forces (disequilibria in the goods market) and the “financial” forces (disequilibria in the asset market) work in the same direction. An expectational bias in favour of the dollar causes short-term oriented speculators (foreign exchange dealers) to hold long dollar positions some days longer than short dollar positions and it causes medium-term oriented speculators (portfolio investors) to shift capital out of the other currencies into the dollar. This behaviour brings about a medium-term dollar appreciation in a stepwise process. The feedback between the profitability of currency speculation and its exchange rate effects makes the appreciation process self-sustaining for some time. During such a period fundamentals like a growing current account deficit seem to have virtually no influence on the exchange rate. Consequently, the exchange rate movement does not stop near the purchasing power parity level. However, the longer the overappreciation lasts, the more the exchange rate causes growing external and internal imbalances (when the currency bias was established the market imbalances were the causes and the exchange rate movements the consequences). The strong and persistent overvaluation leads to a widening of the current account deficit through three channels, a decline in price competitiveness, a shift in the

industrial structure from tradeables to services (the former being increasingly imported) and rising interest payments on external debt. In turn, the widening of the current account deficit (goods market disequilibrium) requires a widening of the real interest rate differential (asset market disequilibrium) in order to attract more foreign capital. At the same time the imbalances in the domestic economy increase because a high real exchange rate and a high real interest rate dampen aggregate demand through a relative decrease of exports and investment (in the case of the dollar appreciation of 1980-85 this effect was delayed by the expansionary stance of fiscal policy). Thus the external and internal imbalances exert growing downward pressure on both the exchange rate and the interest rate. As a consequence, economic policy turns from tight to loose money (also because inflation becomes much less of a problem owing to the large overvaluation). Once the interest rate differential between the overvalued currency and the other major currencies narrows significantly, the downward pressure on the exchange rate is finally set free, leading to a sustained and again overshooting depreciation. During this shift from an undervaluation to an overvaluation of the US currency, a reciprocal development takes place in the partner countries which strengthens the tensions in the international economy.

To conclude: any sustained appreciation process is necessarily brought to an end by the unbalancing effects on the international goods and asset markets, the dampening effects on the domestic economy and the stimulating effects on foreign economies (with respect to both real output and prices). In other words, any persistent exchange rate deviation from purchasing power parity generates the conditions for a counter-deviation. Thus the exchange rate fluctuates around the purchasing power parity as its "center of gravity" without any tendency to converge towards a stable equilibrium (see Figure 3).³

³ This disequilibrium approach is very similar in spirit to the theoretical explanation of "currency cycles" as elaborated by BIASCO (1987). Both approaches explain medium-term exchange rate fluctuations in terms of the interaction of disequilibria in the goods market ("real" forces) and in the asset market ("monetary" or "financial forces").

Conclusions

The main findings of this essay can be summarized as follows:

— Exchange rate movements between the most traded currencies, the US dollar and the deutschemark, are characterized by a sequence of upward and downward trends, interrupted by non-directional movements. This pattern is typical of exchange rate dynamics in the short run as well as in the medium run.

— This pattern can be and actually has been persistently and systematically exploited through currency speculation, particularly through the use of "technical analysis".

— This currency speculation has in turn reinforced the specific pattern of exchange rate dynamics.

— The winners in the short run currency game are the professional traders of financial assets whereas the losers are mainly the traders of goods and services. The persistence of this game is based on the fact that the exchange rate is both an asset price as well as a flow price, with traders of financial assets perceiving mainly the asset aspect and traders of goods and services mainly the flow aspect.

— The most detrimental effect of currency speculation is not the redistribution of income from the "real" sector to the "financial" sector but rather the destabilization of exchange rates and consequently of international economic relations.

— Foreign exchange markets are not weakly efficient since the profitability of currency speculation based on technical analysis stems exclusively from the exploitation of past exchange rate values.

— Exchange rate dynamics in the medium run can be explained by the interaction of changing disequilibria in the goods and asset markets, with the disequilibria being caused in part by the preceding deviations of exchange rates from their fundamental equilibrium values based on the goods market, *i.e.* purchasing power parity.

Since the breakdown of the Bretton Woods system in 1973 currency speculation has been significantly, persistently, and systematically profitable, at least for the most traded currencies. At the same time this currency speculation has to be considered destabilizing since the

sequence of price runs caused large and persistent deviations of exchange rates from their equilibrium values (purchasing power parity). A slight modification of a famous Keynes quotation exactly describes the changes in international economic relations induced by the transition from a fixed to a floating exchange rate system: "Speculation may do no harm as bubbles on a steady stream of enterprise. But the position is serious when enterprise becomes a bubble on a whirlpool of speculation. When international trade becomes a by-product of the activities of a casino, the job is likely to be ill-done" (Keynes, 1964, p. 159).

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STEPHAN SCHULMEISTER

REFERENCES

- BIASCO, S., "Currency Cycles and the International Economy", in this *Review*, March 1987, No. 160, pp. 31-60.
- FAMA, E.F., "Efficient Capital Markets: A Review of Theory and Empirical Work", *The Journal of Finance*, 1970, 25 (2), pp. 383-417.
- FRYDMAN, R., "Towards an Understanding of Market Processes: Individual Expectations, Learning, and Convergence to Rational Expectations Equilibrium", *American Economic Review*, 1982, 70 (4), pp. 652-668.
- FRYDMAN, R., PHELPS, E.S. (eds.), *Individual Forecasting and Aggregate Outcome*, Cambridge University Press, Cambridge, 1983.
- GROUP OF THIRTY, *The Foreign Exchange Market in the 1980's*, New York, 1985.
- HEINER, R.A. "The Origin of Predictable Behavior", *American Economic Review*, 1983, 73 (4), pp. 560-595.
- KAUFMAN, P.J., *Commodity Trading Systems and Methods*, John Wiley and Sons, New York, 1978.
- KEYNES, J.M., *The General Theory of Employment, Interest and Money*, Harvest Books, New York, 1964.
- RIEHL, H., RODRIGUEZ, R.M., *Foreign Exchange and Money Markets*, McGraw Hill, New York, 1977.
- SCHULMEISTER, S., *An Essay on Exchange Rate Dynamics*, Discussion Paper IIM/LMP 87-8, Wissenschaftszentrum Berlin für Sozialforschung, Berlin, 1987.