

Money, Interest, and Exchange Rates in a Globalized Context

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I do not forecast world economic collapse,
because I think that our profession of economics
does not know the dynamics of the system well enough to do so.
Charles Kindleberger, 1978

I Introductory Survey

This talk will deal with exchange rates, a little with interest rates, which are closely linked with exchange rates, and, of course, with money, in which both exchange rates and interest rates are expressed.

Exchange rates are simply the price of one type of money (or currency) in terms of another type of money, e.g. the price of US dollars in terms of Euros, more precisely: it tells us how many dollars one Euro will buy. The interest rate is the increase in the price of one and the same type of money between now and a specified point in time later on. More generally, an exchange rate is basically an interlocal price, while an interest rate is a very similar intertemporal price.

Economists were sure they had a very good theory – two in fact – for explaining exchange rates. These theories we shall briefly discuss, to start with. In 1973, however, when the Bretton Woods Agreement ended and exchange rates were set free and became largely market-determined, economists came to realize that they had been wrong and that a paradigmatic theory of theirs had failed. Why this is so, is going to be my second topic. Finally, I shall discuss the first inklings of a new explanation.

But (you may ask) is this not typical of all science? One is quite sure of an explanation, then “anomalies” occur or, even worse, errors in prediction accumulate, and one has to start afresh. Such, as Thomas Kuhn memorably

explained, is *The Structure of Scientific Revolutions*¹ – and all the more so of scientific evolution.

What had changed was the economic environment. Once more, full international capital market mobility had been established. We can say that it had been regained, because the most highly developed nations had enjoyed full mobility of capital already in the 18th century and nearly all developed economies had had it in the 19th century. Capital mobility had been lost in 1914 and was regained around 1980. Thus, quite old theories may become fashionable again in financial economics. Today, international capital markets are once more characterized by a vast amount of speculation, which is central to them. For speculation is nothing other than action informed by expectations of prices in the future. And future prices determine our present, not least in financial markets.

“Physics is everything that is easily explainable”, the Nobel Laureate in economics and member of this Academy, Friedrich A. von Hayek, used to quip. And an even more eminent scientist, Sir Isaac Newton, confessed: “I can calculate the motion of the heavenly bodies, but not the madness of people.”² By calling economic behaviour “the madness of people” Sir Isaac was perhaps a little harsh. But you must excuse him, for he had just lost vastly by his own private speculation or, more precisely, he had first gained enormously, by about 2 million Euro and then lost even more enormously, viz. 6 mio. Euro – in the course of the greatest speculation ever (in terms of the ups and downs of stock market prices), namely the South Sea Bubble of 1720 and the simultaneous French Bubble of the Mississippi Company.

¹ Thomas Kuhn, *The Structure of Scientific Revolutions*, 2nd ed., Chicago 1962.

² Charles Kindleberger, *Manias, Panics and Crashes: A History of Financial Crises*, New York 1978, p. 34. Kindleberger refers to John Carswell, *The South Sea Bubble*, London 1960.

The reason why Hayek called physics easy and Newton economic behaviour “the madness of people” is that man is capable of learning; and as he learns, his economic environment is not stationary, but changes over time, quite a bit. Economic agents absorb information and process it – some of it rapidly, some of it very slowly. In exchange markets it takes about three days until any important information is said to be fully reflected in prices. But the full set of relevant information is so large, so complex that at any time normally only a subset is taken into account while the rest is ignored, for the time being. Full absorption of information may easily take a quarter century; in fact, at present financial market experts refer most often to the experiences of about 35 years ago, around 1970, and even 75 years ago, around 1930.

Large financial markets are the most highly competitive ones in the world; and that means prices in them react quickly, but they are also very unstable over time. In financial markets, the survival of only the fittest is the rule. And let me point out that natural selection, which stresses the survival of the fittest is, as is well documented, an idea that Charles Darwin took from economists, from Adam Smith and Robert Malthus, whose works he read soon after his voyage to the Galapagos Islands.³

Thus, economic science and biological science are of the same waft. *Pace* Hayek, there is also a basic unity even with physics. In both cases it is tempting to think of the metaphor of Schrödinger’s cat. You will remember that, according to Schrödinger, if one only thinks of a cat in a closed box that cat is at once alive, with a certain probability, and dead, with the complementary probability. Only if and when one intervenes and opens the box, the cat is either

³ Peter J. Bowler, *Charles Darwin: The Man and his Influence*, Oxford 1990, esp. pp. 82ff. The first reference to Malthus is found in one of Darwin’s notebooks of September 1838, three years after the *Beagle* reached the Galapagos archipelago. On p. 196 Bowler says: “It is certainly true that Darwin drew some of his inspiration from the individualism that characterized the society in which he lived and was well read in the classics of laissez-faire economics, including Adam Smith and, of course, Malthus.”

dead or alive. It is just the same with exchange markets: Two opposing theories, in fact even three, hold true at the same time. It depends on the looker-on or the analyst for which of those theories he opts. For our theories are only simplifications, as once more Hayek pointed out in his *Festschrift* article for the philosopher Karl Popper, an article appropriately titled “The Theory of Complex Phenomena”.⁴ At the end of my lecture we shall see that both A and non-A can be true at the same time, both a theory and its opposite can be correct, depending upon how we look at economic phenomena. Both A and non-A can, of course, easily be true at slightly different moments in time; but in economics they can also be true at once, because, as pointed out, they are only simplifications of reality, and different simplifications of the same, highly complex reality can all be more or less valid. And just that is the synthesis of exchange rate explanations we are gaining at present: First the full assurance of one type of theory, then losing it and finally coming to the conclusion that several contradictory theories all hold and may even be found by transforming one theory into the other. It is a tricky business, however, to find out which theory to rely on at any moment in practice, particularly when you have to forecast.

II Historical Prelude: The International Gold Standard

After this introduction I turn to my historical prelude. From 1699 to 1727, for no less than 28 years, England and then Great Britain had one and the same master of the mint. (This is a position somewhere between a very high civil servant and a junior cabinet minister, comparable to that of Alan Greenspan, for more than 18 years now governor of the U.S. Federal Reserve.) After more than six years in that highly important political office and being also President of the Royal Society, said master of the mint was knighted and became – Sir Isaac Newton.

⁴ F.A. Hayek, “The Theory of Complex Phenomena”, in *The Critical Approach to Science and Philosophy. Essays in Honor of Karl R. Popper*, Mario Bunge (ed.), Glencoe–London 1964, pp. 332–345.

In 1717 the British Parliament asked Newton at what value the monetary price of gold to silver should be fixed. For Britain had both a gold coin, the guinea, so named because the gold had originally come from Guinea in Africa, and an official silver currency: the pound sterling of twenty shillings, whose silver content had by then been fixed for about one and a half centuries. Newton suggested a slight devaluation of the gold coin to 21 sh. for the guinea, at which price the guinea actually remained as long as it existed. That meant a parity of one gramme gold to 15,21 grammes of silver. But while that was a good parity within Europe, in India silver was much more valuable, standing at about 12 to 1; and in Japan it was even more valuable, standing at 9–10 to 1. So in the course of the increase in trade with South East and East Asia a kind of *perpetuum mobile* developed: The East India Company exported silver from Britain to India and bought silks and spices there; and it exported silver to Japan where it bought copper. By selling part of the silks, spices and copper on the continent, the British East India Company drained the continent of Europe partly of its silver and for the rest it fully drained Great Britain so that, by the gold to silver parity that had been established by Sir Isaac Newton (and also by the unique right of Britons to mint any amount of gold they desired at zero cost), Great Britain rapidly became a pure gold currency country. Silver simply disappeared. Curiously enough, the official currency, the pound sterling, actually ceased to be the currency in circulation.⁵

After the Napoleonic Wars the British gold standard was re-established and, by and by, became the common European standard. The central personality responsible (as *Sektionschef*) for bringing the then Austro-Hungarian Empire into the gold standard was the man for whom this lecture series is named, Eugen von Böhm-Bawerk. With the gold standard there existed one and only one world

⁵ On this, see T.S. Ashton, *An Economic History of England: The 18th Century*, London 1966 (1955), ch. VI; on Newton esp. pp. 170f.

currency: gold. National currencies did have different names, *franc*, *Mark* or *Krone*; but they differed only in name, while in fact they were known different quantities of the one standard, gold. Even if a country temporarily left the gold parity of its currency, expectations were stabilizing, in contrast to today: For as all those gold coins were still around, people knew that eventually the particular currency had to return to the known parity.

The gold standard, established by the expertise of Sir Isaac Newton, lasted longer than his theories on physics; it lasted up to 1914. After the First World War it broke down because those responsible did not take account of the fact that the relative values of the different monies had changed in consequence of the enormous international gold flows that had financed the war.

The final break-down came in 1973, when the link of the last currency to gold, that of the US dollar, was severed. Since then we have been living in international currency chaos, quite different from the orderly monetary world established by Newton. The economist Robert Mundell concluded his Nobel Lecture of 1999, “A Reconsideration of the Twentieth Century”⁶ by pointing out that after Newton’s gold standard had been left, the 20th century was simply one series of major blunders in monetary policy.

Newton thus brought about the international gold standard. Had he planned it? The answer may be suggested by one more comparison with Alan Greenspan of the US Federal Reserve. Just recently, Greenspan published his theory that says that in formulating policy in a world of uncertainty one has to consider several possibilities at the same time – again the idea of different theories at once; and then one has to pay attention above all to the most dangerous possibility. Newton, according to his own statements, thought exactly alike: If the new

⁶ Robert A. Mundell, „A Reconsideration of the Twentieth Century“, *American Economic Review* 90 (2000), pp. 327-340.

parity of silver to gold worked, all right; if not, the parity would have to be fixed in such a way that a pure gold standard was most likely to emerge. He devalued gold only slightly, and to a magic number, three times seven: 21 shillings. For remember, Newton was also an alchemist. And for alchemists, gold has magical properties. For once, alchemism proved of practical use.

III Purchasing Power and Interest Parity Theory

Since 1973, we have been living in a post-Newtonian world of currencies in constant change of their values. During the 1970s, the worst decade for the USA in the last century both politically and economically, the dollar plunged in value by about 50 percent from the high point to the low point – or by 100 percent if you calculate in the opposite direction, from the low point to the high, reckoning the dollar relative to the German Mark, the most stable currency during the 51 years of its life. In the 1980s, both US optimism and the value of the dollar recovered significantly under President Reagan. They recovered in fact inconveniently much; so that a dollar depreciation had to follow, partly engineered on purpose and partly as an unintended consequence of a change in US tax laws.⁷ From early 1985 to 1987 the dollar plunged once more, by about the same 50 percent down or equivalently 100 percent, calculating upwards. Normally it changes by up to 20 percent a year nowadays.⁸

How to explain these fluctuations? There are two theories around for two different sets of circumstances, two theories well established since soon after the break-down of the Newtonian world. And they are both based on one of the most basic ideas in economics, namely arbitrage theory. Arbitrage theory says that, if moneys are freely exchangeable, it should make no difference whether

⁷ Hans-Werner Sinn was the only economist to argue that the capital inflow into the USA, which at first caused appreciation and, when it stopped, depreciation, was due to tax law changes, the large first Reagan tax revision causing higher net returns on capital, the second reversing that.

⁸ See Mundell, *loc.cit.* (note 6).

you pay in one type of money or in another. Money is money. The exchange rate of the dollar to the Euro has to adjust in such a way that it is all the same to you whether you pay in dollars or in Euros.

The first such arbitrage theory deals with the exchange of goods and services between different currency areas. It deals with export and import transactions in the current period: If you decide to buy a commodity not at home but “in foreign”, as this is called for short, you should pay the same sum of money – as soon as the foreign price is multiplied with the exchange rate. If you are an entrepreneur and wish to export, you will expect that the price you receive is the same as at home – after you have changed the foreign currency into your own. In other words: arbitrage theory leads you to expect that the exchange rate will adjust in such a way that your purchasing power is the same in foreign as at home. This first theory about the determination of the exchange rate is called the purchasing power parity theory, PPP for short. When the Euro was brand new, the Nobel Laureate Milton Friedman used this theory to forecast that this new currency would soon have to rise in value, because at that time Euro-Europe was relatively cheap and the USA were expensive. And the Euro did rise.

As a rough and ready theory, PPP theory seems all right. But the goods on the market in one country are not the same as in another; nor are the tastes of consumers alike internationally. Therefore, prices are likely to differ in their levels, especially between distant countries. But once such permanent price differences are well established, the changes in price levels should be fully reflected in the changes of exchange rates. The percentage changes in price levels over time are called the rates of inflation. Therefore the so-called relative PPP theory, a theory in changes says: Exchange rates will change in the same way as the difference in inflation rates between the two currencies. The currency of the more inflationary area will fall in value; in other words: it will devalue.

For a long time, this effect was familiar to Austrian travellers in Italy. Italy used to have a much higher rate of inflation than Austria, so the Italian lira tended to devalue relative to the Austrian Schilling – and after devaluation Italy was “cheaper” for us.

The two versions of PPP theory both concern transactions of goods: exports and imports – or, as one says, transactions on current account. Actually, however, the sales and purchases of foreign exchange on current account make up a very small percentage only of the entire volume of transactions of dollars, of Euros or of Yen against each other. Most transactions in foreign exchange are not on current account, but on capital account: they are done for investment purposes, usually for a financial investment in the foreign currency. Firms are buying foreign firms, investors are buying foreign real estate and even more foreign private and government bonds and, above all foreign stocks and shares on the stock market. This last was true particularly during the huge US stock market boom of 1995 to 1999. Call the percentage rate of return you earn on these capital markets the interest rate, and you immediately have a second highly persuasive arbitrage theory, interest parity theory. It says: Capital movements between currency areas will only stop when one earns exactly the same percentage on one’s investment in both currencies. Thus, if the interest rate one earns in the United States is 2,75 p.c. higher than in Europe, as it is at present for short-term interest rates, then the dollar has to depreciate by 2,75 p.c. per year, so that you lose on the exchange rate exactly what you have gained in terms of a higher interest return.

Actually, however, the recent increase in U.S. short term interest rates by 2,75 percent has caused the dollar not to depreciate by those 2,5 percent, but much rather to appreciate by some 10 or 12 percent; and that within a much shorter period than a year, so that on a yearly basis the appreciation came to something

like 40 or 50 percent. On the other hand, vast amounts of international capital are at present constantly flowing into the USA: only a little from Europe, much more from Japan, from China, from very poor India and other Asian countries, from Brazil and even Venezuela, which latter country is not even on good terms with the USA. Most unusually from a historical point of view, many poor countries are financing the per capita richest nation in the world, the USA.

But then, of course, we are not in equilibrium, where capital movements stop, according to interest parity theory. In fact, the USA reached such an equilibrium only once within the last 24 years, and that year was 1991, a year with an internationally financed war. Normally, over the last quarter century the USA have attracted capital – a normality which is abnormal in itself in terms of previous historical experience. If a country attracts capital because investors think they will earn a higher rate of return there than at home, then the high demand for the currency of that country will appreciate that currency, of course. As long as money flows into a country we generally get appreciation. And that is what happened once more to the dollar just recently, when Alan Greenspan pushed up US interest rates.

So, we can summarize a slightly modified classical version of the two classical exchange rate theories: The country with the lower rate of inflation and/or with the higher rate of return on capital will have an appreciating currency. And we were able to show that these conclusions are empirically correct. Sometimes.

IV Friedman's Theory of Stabilizing Speculation

Difficulties with the classical exchange rate theories arose soon after the exchange rate of the US dollar was actually freed from its link to gold in 1973. But long before that a theoretical second line of defence for freely floating

exchange rates had been built up by the most persuasive economist now alive, Milton Friedman. Prior to 1973, all economies that were not fully state-controlled fixed their exchange rates to the dollar, but revalued them periodically in significant jumps. Friedman considered such a policy-controlled exchange rate regime unstable and argued in a famous publication of 1950, “The Case for Flexible Exchange Rates”⁹, published 23 years before exchange rates actually became flexible, as follows: Freely market-determined international exchange rate regimes will be much more stable than politically controlled ones. They will be stabilized by speculation because profitable speculation is price stabilizing.

His idea is so simple that within two minutes one can convince anybody that it must be correct. For, if any price, e.g. an exchange rate, is at any moment below its average a speculator will buy, hoping for the return of the price to this average; but by buying when the price is relatively low, he will push up the price towards its mean value, thus reducing intertemporal price fluctuations. If, on the other hand, the price is high relative to its mean value, the speculator who wishes to make a profit, will sell, thus pushing the price down, once more towards its mean value. In that way, says Friedman, profitable speculation has to be price stabilizing, while unprofitable speculation will be eliminated pretty soon – because the unlucky speculator will go broke.

Actually this plausible argument is wrong, which shows that in economics it often happens that one cannot derive a new argument without going into a well-formulated mathematical derivation. Friedman had persuaded himself and a large number of practical economists by simply assuming what he would have had to prove. By arguing that speculators would push the price towards the mean by buying and selling, he assumed that such an invariant mean existed. His

⁹ Milton Friedman, “The Case for Flexible Exchange Rates” (1950) in idem, *Essays in Positive Economics*, Chicago-London 1953, pp. 157–203, here p. 175.

theory is already wrong if the exchange rate is a non-linear function of the quantity bought and sold,¹⁰ because then the additional purchases and sales of speculators will change the average exchange rate. It is even more wrong if there does not exist a time- invariant mean exchange rate or, to be mathematically precise, if the mean of the exchange rate tends towards an infinitely large variance. In this case the best estimate of the mean exchange rate is always the point where the exchange rate is at present. That would be the case if the exchange rate follows the counter-theory to both PPP and interest parity theory that was soon formulated, that is: if the exchange rate follows a so-called random walk or, again more precisely, if it shows Martingale behaviour.

I shall soon turn to this alternative theory, destructive of hopes for stability, prior to 1973. But before I do that, let us briefly turn from theory to facts and ask what did happen. Friedman had hoped that flexible exchange rates would prove to be more stable than those in the previous regime, and he persuaded most everybody who was anybody that that would be so. Actually, by 1986 Mussa showed¹¹ that the exchange rates of the dollar and other exchange rates had increased in instability: Their variance by then had risen four to eight times. Furthermore, most of the time exchange rate movements are simply unpredictable. In the long run, as Meese and Rogoff have shown,¹² their behaviour is not to be distinguished from a random walk.

V The Disappointing Breakdown of Received Theory

¹⁰ Gerhard O. Orosel, "Profitable Speculation and Price Stability", *Jahrbücher für Nationalökonomie und Statistik* 199 (1984), pp. 485–501.

¹¹ Michael Mussa, "Nominal Exchange Rate Regimes and the Behavior of Real Exchange Rates: Evidence and Implications", *Carnegie-Rochester Conference Series on Public Policy*, vol. 25, Autumn 1986, pp. 117–213, here p. 131.

¹² Richard A. Meese and Kenneth S. Rogoff, "Empirical Exchange Rate Models of the Seventies: Do They Fit Out of Sample?", *Journal of International Economics* 14 (1983), pp. 3–24.

Once exchange rates were freed in March 1973 and started to “float” up and down, disappointment with the classical pair of exchange rate theories, PPP and interest parity, set in. Of course, now and then they were and are correct and I gave you such examples; but on the average they proved to be simply wrong. Let us just take the last three years, 2002 to 2004: Over that period the long term interest rates were exactly the same in Euro-Land and in the United States; and the rates of inflation, too, were exactly the same. Thus, both according to PPP, which explains exchange rate movements by differences in inflation, and by interest parity theory, which explains them by differences in interest rates, the Euro – dollar exchange rate should not have moved at all. Actually, however, the dollar depreciated by a full 60 percent over that three year period, which, you will admit, is not quite the same as staying put. Nevertheless, all standard American text books still teach you – after 32 years of disappointment – either the one classical theory or the other, the best known text book in international economics, by Obstfeld and Krugman,¹³ teaching both. 32 years of nearly always being wrong in an empirical science – that’s what I would call persistence in adversity!

Actually, when one started to apply the two classical theories after 1973, one soon found that they were not even well defined. What actually was “the” rate of inflation? Inflation is not even a real price change but an average, it is a mere figment of the economists’ imagination. And there are many different rates of inflation, those measured by the consumer price index, the wholesale price index, the wage index, the index for rented flats, for senior citizens, etc. etc. When inflation is serious, these different indices all point more or less in the same direction. But frequently they point in different directions, e.g. when, as now, inflation is low or even hardly noticeable. One should remember that the most usual inflation index, the consumer price index, overestimates inflation by

¹³ Paul R. Krugman and Maurice Obstfeld, *International Economics: Theory and Policy*, 6th ed., Boston etc. 2003.

one to two percent each year so that at present inflation is nearly non-existent – a fact I would willingly explain in discussion. And what do these complex indices mean to the individual entrepreneur, who is actually interested in his input prices and his output prices, not some other average?

Interest rates, on the other hand, are actual prices, but there are so very many of them. Alan Greenspan has just complained that although he can control short term rates the more relevant long term interest rates in the USA are by now uncoupled from short term ones and move in the opposite direction. And the rates of return on houses or in the stock market are mere expectations about future developments, and often these expectations turn out to have been wrong. To make all this even more complicated, the different types of rates of return vary in importance over time, depending on which particular type of investment appears most attractive to international investors.

If you delve a little deeper, you begin to realize that the two equally logical theories, PPP and interest parity theory, even contradict each other. They do so if the relevant so-called real interest rates, that is the interest rates after the rates of inflation have been deducted, are not the same in both currency areas. At present, they happen to be the same in the USA, in Euro-Land and in Japan, but, historically speaking, they would tend to differ.¹⁴

So as the two classical theories usually are not what we call “operational” and are not even well-defined, it is no wonder that many economists turned to the counter-theory: the so-called random walk. What is commonly called that – although actually only a Martingale – simply says :The exchange rate to be expected for tomorrow is always the same as for today; or, putting it differently, the exchange rate change to be expected for the next day is zero.

¹⁴ Erich W. Streissler, *Exchange Rates and International Financial Markets: An asset-theoretic perspective with Schumpeterian innovation*, London–New York 2002.

The so-called random walk alternative theory— a random walk without drift — seems to say that you cannot forecast any one-directional exchange rate change; and this in spite of the fact that exchange rates keep changing, often quite noticeably by several percentage points within a very short time. But the reasoning is really that the exchange rate may just as well go up by a given amount and with a certain probability as it may go down by the same amount and with the same probability. And if it can go up just as well as down, your best guess is that it stays put.

Furthermore, if we bend the model a little and come slightly closer to reality, it is quite possible that there are certain brief periods when one can actually forecast the exchange rate correctly, in spite of the fact that on average in the longer run one cannot. It has been shown conclusively for the US dollar against all other currencies — but not for other currencies against each other — that on average you cannot forecast correctly, which may be explained by the fact that unpredictable capital movements are largest for the dollar. So the random walk as the prevalent behaviour does not preclude that other exchange rate explanations are sometimes true, particularly for certain currencies.

In case of true random walk behaviour the variance of the exchange rate will, over time, go to infinity. This is what Friedman did not reckon with and what is still being assumed away in many econometric estimations. Actually, we know the variance does not go fully to infinity. Any changes are brought down to less than 5 percent within 15 to 25 years. In a human life-time, however, 15 to 25 years is so long that we may safely approximate it by infinity.

The random walk model is standard for the theory of financial markets.

And is a foreign currency not a financial market asset? It is only traditional exchange rate theorists who tend to shy away from it, merely for reasons of tradition.

VI A New Consensus Emerging

In the eyes of some observers exchange rate theory seems to be in a mess: approximate random walk behaviour most of the time and this or that standard theory being a good explanation once in a while. Actually this is a promising situation for bright young people going into international finance: There are profit opportunities for those who are both highly trained and bright, while there will be losses for the “primitive” crowd that believes in one unfailling theory.

One of the facts of life that we have not yet mentioned and which makes our theory even messier, is the behaviour of central banks. Contrary to popular belief, central banks are rather poor in funds, as compared with private speculators. But they can influence exchange rates decisively for short to medium term periods. Central banks are unusual in one respect: they can afford to make losses permanently. At present, South Asian and South East Asian central banks are buying dollars like mad in order to keep the dollar from crashing too soon. They do that in order to subsidize the exports of their countries by assuring them a fine dollar price. Eventually, however, these government banks will make huge losses.

There is one central bank, though, that has had a record of successful exchange rate speculation for one and a quarter centuries now: It is the Austrian National Bank, formerly the Austro-Hungarian Bank. During the 1990s, it increased its equity by speculation, increasing it most impressively from one tenth of the German Bundesbank equity to one quarter. And its annual speculative returns go

mostly into the federal budget to finance research in Austria. So, from the viewpoint of the Austrian Academy of Sciences we can only hope that the “Nationalbank” will continue speculating successfully in the exchange markets. That would be good for the funding of research.

It is actually because of the unpredictable behaviour of central banks and the even more unpredictable moods of investors in foreign capital markets that exchange rate behaviour approximates a random walk most of the time. It is the heterogeneity of actors and the very partial explanations they use, jumping from one partial explanation to another when serious disappointments occur, which generates this random walk behaviour.

But there are other reasons as well. In fact you can show that a little more elaborate treatment of the classical theories, in particular of interest parity theory, would make them merge with random walk behaviour or something close to it.

Interest parity theory is an equilibrium theory. It says: Given a certain difference in interest rates, exchange rates will, for equilibrium to be achieved, move exactly as the interest rate differences, but in the opposite direction – so that capital movements cease. When interest rates change, however, and if that change is expected to last long, there will be big jumps from one equilibrium path to another; in fact a new equilibrium path may never be reached. That is exactly what happened this spring: US short term interest rates went up by 2,75 percent, and the exchange rate of the dollar to the Euro appreciated by some 40 or 50 percent on a yearly basis, i.e. about 20 times the interest rate change.

The difficult question for the investor to decide is how long the new, in this case higher, interest rates will last. If many investors react and if they believe the new

interest rates will last long, you get those big jumps of exchange rates. But they have to estimate how long the new – relatively higher – interest rate will hold. If they can only estimate the average length of duration¹⁵ of given interest rates, but not the exact length each time, one can already prove theoretically that the effect will generate precisely the random walk behaviour of interest rates.

Another line of argument is that, whenever central banks counteract every single change in exchange rates, one may again get something close to a random walk.¹⁶ And for the case of low interest rates and low inflation rates – and that is the situation we have had for about five to seven years now – it was recently shown that standard financial market behaviour will yield something very close to a random walk.¹⁷ It is the forward-looking nature of all financial investment and the expectations behind it that generate both the complexity of exchange rate movements and the merger of different explanations into each other.

Another question is the rapidity of fundamental changes – in contrast to small day to day changes – of both exchange rates and interest rates. In developed economies long run real interest rates – that is: interest rates minus inflation rates – have hovered around three to four percent for centuries now. Therefore they are the cause of other economic relationships much rather than that they should be caused by them. Similarly, it has been shown that it is easier to explain the movement of other variables via exchange rates than to show the opposite causation of exchange rates by other variables. The latter, however, is a challenging and practically useful research agenda, in which many of my students have been successful. It is fascinating to do research when everything is still in flux.

¹⁵ First developed in Erich W. Streissler, “6 1/2 Wechselkurse”, Thünen-Vorlesung, Schriften des Vereins für Socialpolitik N.F. 271: *Die Zukunft des Sozialstaates*, Berlin 2000.

¹⁶ Bennet T. McCallum, “A Reconsideration of the Uncovered Interest Parity Relationship”, *Journal of Monetary Economics* 33 (1994), pp. 105–132.

¹⁷ Charles Engel and Kenneth D. West, “Exchange Rates and Fundamentals“, *Journal of Political Economy* 113 (2005), pp. 485–517.

VII Endgame: The Balance of Trade

I have described to you a new consensus being approached: Exchange rates cannot be easily explained, but in a much more complex way than one used to think they can be explained if one applies large doses of expertise and judgement. So are we once more back in the best of all possible worlds? Not quite. So far, I have left out the possibility of serious financial crashes, which still occur now and then.

And I have left out the balance of trade, the difference between exports and imports. It is via the balance on current account that the yearly imbalances caused by exchange rate movements accumulate: If the exchange rate appreciates, or even if it does not depreciate sufficiently, the balance on current account worsens. And it worsens progressively, because any “balance of trade deficit”, i.e. imports being higher than exports, means importing partly on credit. For credit you have to pay interest, and the additional interest payments once more require additional exports to finance them.

Today the USA have a huge current account deficit of some 800 billion dollars a year, more than six percent of their annual national product. This current account deficit has continuously increased for more than a dozen years and has exploded under President Bush II, progressing from year to year. By now the foreign debt of the USA exceeds 25 percent of the country’s annual product. At the Jackson Hole conference this autumn Alan Greenspan was celebrated as the greatest Central Bank President ever, the man who brought down both inflation and interest to unknown lows. Or, more truthfully, once more to the levels normal in the 19th century. Politely, it was not mentioned that exactly by his non-restrictive monetary policy Greenspan had at least partly caused the huge

US trade deficit, the USA now importing twice as much as they export. But he took up this serious problem and was heard to warn about that deficit, which is good tactics when one is about to retire (at nearly 80, mind you) and the mess will be left for one's successor to clean up. A serious crash of the dollar is in the cards. As the Nobel Laureate Robert Mundell showed for the 1930s,¹⁸ a crash hits the creditor nations even worse than the debtors – and the creditors are we!

What did that other great monetary expert I quoted think on this topic? “The safety and increase of our coyn depends principally on the ballance of trade”, Sir Isaac Newton pronounced in 1702,¹⁹ just at the beginning of one of the most costly wars ever, that of the Spanish Succession. The “coyn”, of course, is what we now call money. That the increase of money in circulation in an internationally free monetary system depends on the balance of trade, was then as obvious as now. But that the safety of money depends on the current account, was a deep insight. A constant current account deficit must eventually imperil the safety of the respective currency, in our case the US dollar. Or, as one of the best- known international economists, Maurice Obstfeld, has just put it: “America's Deficit, the World's Problem”.²⁰

So how serious will the crash be and when will it occur? Once more I turn to the theory of random walks without drift, the limiting case for exchange rates. There is a mathematical theorem exactly for a random walk without drift. It says: “Any value” – in our case any exchange rate, including one after a crash – “any value will be reached with probability one”, that is: it will be reached with certainty, “but the average waiting time till it is reached is infinity”.²¹

¹⁸ Mundell, *loc.cit.* (note 6), passim.

¹⁹ Ashton, *loc.cit.* (note 5), p. 193.

²⁰ Maurice Obstfeld, “America's Deficit, the World's Problem”, Keynote speech, 12th International Conference of the Institute for Monetary and Economic Studies, Bank of Japan, Tokyo, mimeographed, June 2005.

²¹ See e.g. D. R. Cox and H. D. Miller, *The Theory of Stochastic Processes*, London 1965, p. 413: „Thus return to origin is certain only if the walk has zero drift ... In the case of zero drift $F_{00}(s)$ is the

So I wish you, I wish us all, that infinity may still be far off.