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Abstract

The deepening of the recent crisis was driven by the simultaneous devaluation of stock wealth, housing wealth and commodity wealth. The potential for this devaluation process had been "built up" during the boom of stock prices, house prices and commodity prices between 2003 and 2007. Hence, this paper sketches the main causes and effects of long swings in asset prices in the context of the current crisis. It is shown that "bull markets" are brought about by upward price runs (i. e., monotonic movements) lasting longer than counter-movements for an extended period of time (and vice versa for "bear markets"). This pattern of asset price dynamics is the result of "trading as usual" on (highly regulated) derivatives exchanges. The most popular trading practices like "technical analysis" contribute significantly to asset price overshooting. These practices strengthened both, the boom of asset prices until mid 2007 as well as their collapse in recent months. A general financial transaction tax would limit the wide fluctuations of stock prices, exchange rates and commodity prices.

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Asset Price Fluctuations, Financial Crises and the Stabilizing Effects of a General Transaction Tax*)

Within 18 months a mortgage crisis in the US has turned into a deep crisis of the world economy. This process was (and in part still is) driven by the simultaneous devaluation of stock wealth, housing wealth and commodity wealth. The devaluation reduces consumption and investment directly as well as indirectly (e. g., via the devaluation of pension and college funds, of credit collaterals and through the deterioration of the current account of commodity exporters). The potential for the decline of stock prices, house prices and commodity prices had been "built up" during the boom of these asset prices between 2003 and 2007.

This paper sketches the main causes and effects of long swings in asset prices in the context of the current crisis. These fluctuations are the outcome of "trading as usual" on (highly regulated) derivatives exchanges. The most popular trading practices like "technical analysis" contribute significantly to asset price overshooting. Hence, these practices and the related "speed" of transactions strengthened both, the boom of asset prices until mid 2007 as well as their collapse in recent months. A general financial transaction tax would limit the fluctuations of stock prices, exchange rates and commodity prices.

1. The "fundamentalist hypothesis" and the "bull-bear-hypothesis" of asset price dynamics

According to mainstream economic theory, asset prices are determined by the respective equilibrium conditions, i. e., by the so-called market fundamentals. Hence, destabilizing speculation will influence prices at best over the very short run (if at all). In this chapter, I shall at first summarize the main assumptions of this theoretically (deductively) derived concept of asset price formation which I term "fundamentalist hypothesis". I will then discuss the key elements of the alternative "bull-bear-hypothesis" which is rather empirically oriented.

The main assumptions of the "fundamentalist hypothesis" can be summarized as follows (see also figure 1 and table 1):

- The theoretical benchmark model of the "fundamentalist hypothesis" is an ideal, frictionless market where all participants are equipped with perfect knowledge and where no transaction costs exist ("world 0").

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- The model underlying the "fundamentalist hypothesis" relaxes the assumptions of perfect knowledge and of no transaction costs. Also in this "world I" actors are fully rational, but they do not know the expectations of other actors. Hence, prices cannot reach a new equilibrium instantaneously but only through a gradual price discovery process.
- The high transaction volumes in modern financial markets stem mainly from the activities of market makers. The latter provide just the liquidity necessary for facilitating and smoothing the movements of asset prices towards their fundamental equilibrium.
- Speculation is an indispensable component of both, the price discovery process as well as the distribution of risks. As part of the former, speculation is essentially stabilizing, i. e., it moves prices smoothly and quickly to their fundamental equilibrium (*Friedman*, 1953).
- An endogenous overshooting caused by excessive speculation does not exist. Any deviation of asset prices from their fundamental equilibrium is due to exogenous shocks and, hence, is only a temporary phenomenon.
- The emergence of news and shocks follows a random walk and so do asset prices. Therefore, speculation techniques based on past prices cannot be systematically profitable (otherwise the market would not even be "weakly efficient" – *Fama*, 1970).

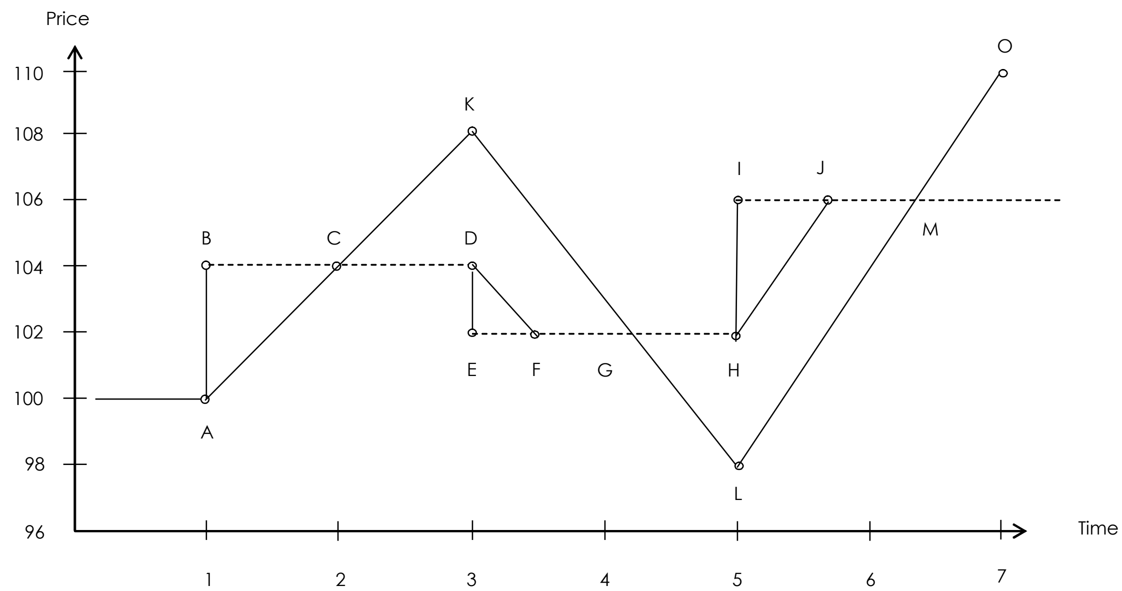
The "bull-bear-hypothesis" perceives trading behaviour and price dynamics in asset markets as follows ("world II"):

- Imperfect knowledge is a general condition of social interaction. As a consequence, actors use different models and process different information sets when forming expectations and making decisions.[1])
- As human beings, actors' expectations and transactions are governed not only by rational calculations, but also by emotional und social factors.
- Not only are expectations heterogeneous but they are often formed only qualitatively, i. e., as regards the direction of a price movement. E. g., in modern financial markets traders try to gauge within seconds if news will drive the price rather up or rather down.
- Upward (downward) price movements – usually triggered by news - are lengthened by "cascades" of buy (sell) signals stemming from trend-following technical trading systems.
- The "trending" behaviour of asset prices (based on daily or intraday data) is fostered by the dominance of either a "bullish" or a "bearish" bias in expectations. News which are in line with the prevailing "market mood" gets higher recognition and reaction than news which contradict the "market mood".
- In the aggregate, this behaviour of market participants cause price runs in line with the "market mood" to last longer than counter-movements. In such a way short-term runs accumulate to long-term trends, i. e., "bull markets" and "bear markets".

[1]) In a recent, pathbreaking book, *Frydman - Goldberg* (2007) demonstrate that recognizing the importance of imperfect knowledge is key to understanding outcomes in financial markets.

- The sequence of these trends then constitutes the pattern in long-term asset price dynamics: Prices develop in irregular cycles around the fundamental equilibrium without any tendency to converge towards this level.

Figure 1: Three stylized paths of asset prices



In order to clarify the theoretical differences between the "fundamentalist hypothesis" and the "bull-bear-hypothesis", it is useful to distinguish between three (theoretical) paths of asset prices, depending on the assumptions made about market conditions (figure 1):

- In "world 0", new information at t = 1 causes the asset price to jump instantaneously from the old equilibrium at P = 100 (at point A) to the new equilibrium at P = 104 (B). The price stays there until news in t = 3 cause the price to jump to P = 102 (E). Finally, in t = 5 new information once again causes an instantaneous price adjustment to P = 106 (I).
- In "world I", it takes a series of transactions to move the price from P = 100 to P = 104, i.e., from A to C. Since there are only rational traders in this world, the price movement will stop at the new fundamental equilibrium level and stay there until t = 3 (then the price starts to move from D to F, and later from H to J).
- In "world II", there exist traders who form their expectations according to the most recent price movements, i. e., when prices move persistently up (down) they expect the respective short-term trend to continue. Hence, they buy (sell) when prices are rising (falling), causing the price to overshoot (from C to K, from G to L, and from M to O).

Table 1: Features of three hypothetical "worlds" of financial markets

	World 0	**World I**	**World II**
General characteristic	Perfect knowledge and foresight. Rational expectations. No transaction costs (frictionless markets).	As in world 0 with two exceptions: – Transaction costs matter – Expectations of other actors due to news have to be discovered in a gradual adjustment process.	Imperfect knowledge as general condition of social interaction: Actors process different information sets using different models. Actors are human beings: Expectations and transactions are governed by rational, emotional und social factors.
Expectations	Homogeneous.	In general homogeneous, but heterogeneous during the price discovery/adjustment process.	Heterogeneous.
Expectations formation	Quantitative.	Quantitative.	Often only directional (qualitative).
Price adjustment to news	Instantaneous jumps to the new fundamental equilibrium.	Gradual price movement towards the new fundamental equilibrium.	Price movement overshoots the ("region" of) the new fundamental equilibrium. Short-term trending of asset prices accumulates to medium-term trends due to optimistic or pessimistic biases in expectations ("bullishness/bearishness").
Transaction volume	Low (counterpart of the "underlying" transaction in goods markets).	"Basic" liquidity necessary for the price discovery process => Trading volume higher than the "underlying" goods markets transactions, moving in tandem with the latter over time.	"Excessive" trading causes transaction volumes to grow significantly faster than the "underlying" transactions in goods markets.
Trading is based on	Fundamentals.	Fundamentals.	Fundamentals, technical models as well as on psychological factors on the individual level (e.g. emotions) as well as on the social level (e.g. market moods, herding).

As a consequence of asset price "trending", rational investors (in the sense of profit-seeking) will try to systematically exploit this non-randomness in price dynamics. The conditions of "world II" will therefore almost inevitably emanate from those of "world I": If prices move smoothly from one fundamental equilibrium to the next, and if this price discovery process takes some time, then profit-seeking actors will develop trend-following trading strategies (for models dealing with the interaction of heterogeneous actors see *DeLong et al*., 1990A and 1990B; *Frankel – Froot*, 1990; *De Grauwe – Grimaldi*, 2006; *Hommes*, 2006; *Frydman – Goldberg*, 2007).

Over more than 100 years people have developed and used a great variety of "technical" trading systems. All models of "technical analysis" have in common that they attempt to exploit price trends and by doing so they reinforce the pattern of asset price dynamics as a sequence of upward and downward trends (for a comprehensive treatment of technical analysis see *Kaufman*, 1987; the interaction between technical trading and price dynamics is explored in *Schulmeister*, 2006, 2009B).

In our stylized example those transactions (in "world II") which cause the price to overshoot (driving it from C to K, from G to L and from M to O) have to be considered "excessive" (as in "world I" price movements are triggered by news also in "world II"). These overshooting price changes amount to 12 between t = 1 and t = 7. The overall price changes over this period amount to 30 (8 + 10 + 12), whereas only cumulative price changes of 10 (4 + 2 + 4) would be fundamentally justified.

This stylized example shows that once prices start to overshoot, their overall price path becomes much longer and the related transaction volumes get much bigger than under purely rational expectations (as in "world I"). At the same time the trending of asset prices provides opportunities for technical (i. e., non-fundamental) speculation, and the use of these speculation systems in turn strengthens asset price trends.

2. Pattern of asset price dynamics

I shall now investigate how short-term runs of asset prices bring about long-term overshooting. Hence, I address the relationship between the following two phenomena:

- Exchange rates but also stock prices and commodity prices move in a sequence of upward trends ("bull markets") and downward trends ("bear markets") which last for several years.
- Trading volume in financial markets has expanded enormously, at present it is almost 100 times higher than nominal GDP of OECD countries. This expansion is mainly driven by the acceleration of trading: The time horizon of most transactions is shorter than a few hours.

The coincidence of both developments constitutes a puzzle. How can very short-term transactions generate asset price movements which accumulate to long-term "bull markets" and "bear markets"? To put it differently: Which properties of asset price dynamics cause asset prices to move in long-term irregular cycles, i. e., in a sequence of upward and downward trends?

To find preliminary answers to these questions, I investigate the movements of the dollar/euro exchange rate with respect to the following hypothesis (a special case of the more general "bull-bear-hypothesis"):

- Over the short run, asset prices fluctuate almost always around "underlying" trends. If one smoothes the respective price series with simple moving averages, one can easily identify the "underlying" trends.
- The phenomenon of "trending" repeats itself across different time scales. E. g., there occur trends based on 1-minute-data as well as trends based on daily data. However, the volatility of fluctuations around the trend is higher the higher is the data frequency.

- Long-term upward or downward trends ("bulls and bears") are the result of the accumulation of price runs based on daily data which last for several years longer in one direction than the counter-movements.

Figure 2: The movements of the dollar/euro exchange rate and technical trading signals 1999 - 2008

At first, I look at the "Gestalt" of exchange rate movements taking the dollar/euro rate as example. The (irregular) cycle of the dollar/euro exchange rate between 1999 and 2005 was shaped by two pronounced long-term trends, a downward trend lasting from January 1999 to October 2000, and an upward trend lasting from January 2002 to December 2004 (marked by A and C in figure).[2])

Both long-term trends were realised in a sequence of shorter (medium-term) trends. For example, the euro depreciation over period A was brought about in three downward trends which were interrupted by only small counter-movements (figure 2). In a similar manner the euro appreciation during period C was realised in a sequence of several trends, each lasting some months. Figure 2 shows how an extremely simple technical model would have exploited exchange rate trends: Whenever the price crosses the 50-days moving average from below (above), a buy (sell) signal is given (marked in some cases by L(ong) and S(hort) in figure 2).

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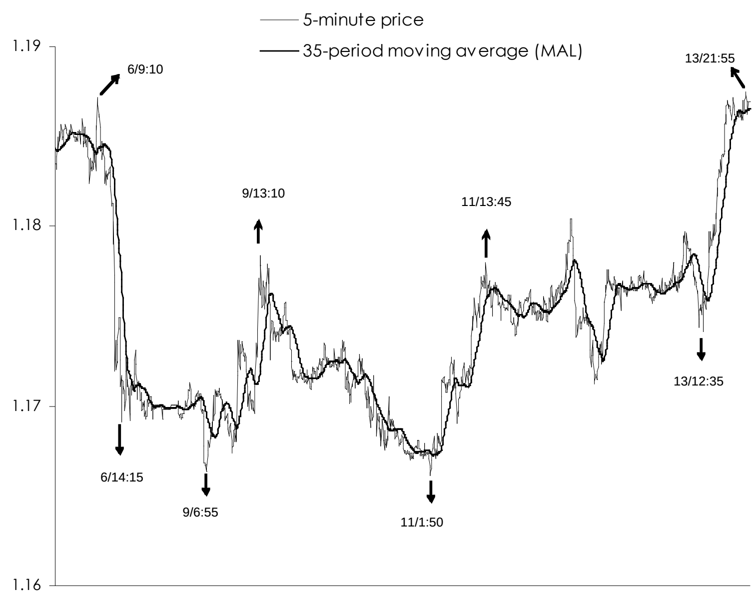
[2]) In the following, I present some results on a recent study (*Schulmeister*, 2009D) which covers the period 1999 to 2006. Hence, the second dollar/euro "bull market" between end 2005 and mid 2008 is not included in the analysis.

Figure 3: Technical trading signals based on intraday dollar/euro exchange rates, June, 6-13, 2003
5-minute data



The pattern of exchange rate dynamics as a sequence of trends, interrupted by counter-movements and – comparatively seldom - by non-directional movements ("whipsaws"), seems to repeat itself across different time scales. Figure 3 displays exchange rate movements based on five-minute data over six business days in June 2003 (also the trading signals of a simple MA model are given).

As next step, I demonstrate how the accumulation of monotonic movements ("runs") of the daily exchange rate brings about exchange rate trends lasting several years (as during period A and C). As table 2 shows, the euro depreciation in period A was primarily due to downward runs lasting by one third longer than upward runs (2.4 days versus 1.8 days), the average slope of upward and downward runs was approximately the same.

This pattern is particularly pronounced on the basis of 5-days moving averages of the original price series (table 2): The long-term appreciation (depreciation) trend of the $/€ exchange rate in period A (C) is primarily brought about by upward (downward) runs lasting longer than "counter-runs" - the differences in the slopes of upward and downward runs play only a minor role.[3])

[3]) This result was already obtained in a study which elaborated the pattern of exchange rate dynamics by measuring the path of the daily deutschemark/dollar exchange rate between 1980 and 1986 (*Schulmeister*, 1987). Also the "bull markets" ("bear markets") of commodity futures are realized by upward (downward) runs lasting longer than counter-movements (*Schulmeister*, 2009A).

I will now document the distribution of the single upward and downward runs according to their length for two periods, first, for the period of a long-term depreciation trend of the euro (period A), and, second, for the period of an appreciating euro (period B).

Over the depreciation phase A, short upward runs occurred more frequently than short downward runs (93 runs compared to 69 runs; short runs are defined as lasting up to 2 days). By contrast, within the set of medium runs (between 3 and 6 days) and long runs (longer than 6 days), downward runs occurred more frequently than upward runs (table 3).

By the same token, short downward runs occurred more frequently than short upward runs over the appreciation phase C, however, medium and long runs were more often upward directed than downward directed (table 3).

Table 2: Runs of the $/€ exchange rate 1999/2006
Daily data

	Upward runs			Downward runs		
Period	Number	Average duration in days	Average slope 1)	Number	Average duration in days	Average slope 1)
			Based on original data			
A	113	1.79	0.47	113	2.38	- 0.48
B	79	1.97	0.51	79	2.13	- 0.46
C	210	1.95	0.56	209	1.66	- 0.51
D	139	1.80	0.51	139	1.93	- 0.48
			Based on 5 days moving average			
A	44	3.80	0.23	45	6.64	- 0.24
B	37	3.97	0.25	36	4.75	- 0.20
C	70	6.77	0.24	68	4.06	- 0.24
D	56	4.36	0.23	56	4.82	- 0.22

Source: WIFO. - 1) Average change in exchange rate level per day in cents.

Note: Period A: 1/1/1999 bis 25/10/2005, period B: 26/10/2000 bis 31/1/ 2002,
Period C: 3/1/2002 bis 30/12/2004, period D: 31/12/2004 bis 14/11/2006.

In order to test for the robustness of these results, I generate 1000 random series ("random walks without drift"). I then compare the observed distribution of monotonic price movements to the expected distribution under the random walk hypothesis (RWH). This comparison shall reveal in which class of runs (by length) and based on which smoothing parameter (length of moving average = MA) does the observed number of runs deviate (most) significantly from the expected number according to the RWH.

Table 3: Non-random components in the duration of exchange rate runs
Daily data

		Upward runs		Downward runs		Upward runs		Downward runs	
		observed	RWH	observed	RWH	observed	RWH	observed	RWH
		Period A: 1/1/1999 bis 25/10/2000				Period C: 1/2/2002 bis 30/12/2004			
Original data	1-2	*93*	*88.7*	*69 ****	*88.8*	*163 ***	*141.9*	*177 ****	*141.8*
	3-6	*20 ***	*27.7*	*42 ****	*27.5*	*43*	*44.3*	*32 ****	*44.3*
	≥ 7	*0 **	*1.8*	*2*	*1.8*	*4*	*2.9*	*0 ***	*2.9*
	All	*113*	*118.2*	*113*	*118.2*	*210 ****	*189.0*	*209 ****	*189.1*
5 days moving average 1)	1-6	*37*	*35.9*	*27 **	*36.0*	*44 ***	*57.2*	*53*	*57.1*
	7-14	*5 ***	*10.4*	*11*	*10.4*	*18*	*16.6*	*15*	*16.8*
	≥ 15	*2*	*2.0*	*7 ****	*2.0*	*8 ****	*3.3*	*0 ***	*3.2*
	All	*44*	*48.4*	*45*	*48.4*	*70*	*77.1*	*68 **	*77.1*
20 days moving average 1)	1-14	*16*	*18.0*	*11 **	*18.0*	*29*	*28.7*	*31*	*28.7*
	15-34	*3*	*4.1*	*5*	*4.1*	*4*	*6.5*	*6*	*6.6*
	≥ 35	*0 **	*1.4*	*4 ****	*1.4*	*5 ***	*2.4*	*0 ***	*2.3*
	All	*19*	*23.5*	*20*	*23.5*	*38*	*37.5*	*37*	*37.5*

1) Before being classified, the observed exchange rate series as well as the 1000 random walk series are smoothed by the respective moving average.

Notes: The table compares the observed numbers of exchange rate runs by duration to their expected means under the random-walk-hypothesis (RWH). These means are derived from a Monte-Carlo-simulation based on 1000 random walk series (without drift). The random walks were constructed with an expected zero mean of the first differences and with an expected standard deviation of the first differences as observed in the original exchange rate series over the respective period. * (**, ***) indicate the significance of the difference between the observed means and the expected means under the random-walk-hypothesis at the 10% (5%, 1%) level.

Based on the original data (MA = 1), there occurred significantly more short runs than under the RWH over the appreciation period C (this holds to a larger extent true for short downward runs as compared to short upward runs). At the same time there occurred significantly less medium and long downward runs (table 3). Over the depreciation period A, by contrast, there occurred significantly less short downward runs, but significantly more medium downward runs, and less medium and long upward runs than under the RWH (table 3).

Table 4: Non-random components in the duration of exchange rate runs
30-Minutes data

		Upward runs		Downward runs		Upward runs		Downward runs	
		observed	RWH	observed	RWH	observed	RWH	observed	RWH
		Period A: 1/1/1999/01/01bis 25/10/2000				Period C: 1/2/2002 bis 30/12/2004			
Original data	*1-2*	*4571 ****	*4037*	*4611 ****	*4037*	*7105 ****	*6594*	*7203 ****	*6594*
	3-9	*1234 ****	*1325*	*1196 ****	*1324*	*2118 **	*2164*	*2019 ****	*2162*
	≥ 10	*3 ****	*10*	*2 ****	*11*	*6 ****	*16*	*6 ****	*18*
	All	*5808 ****	*5372*	*5809 ****	*5372*	*9229 ****	*8773*	*9228 ****	*8773*
5 periods moving average 1)	1-6	*1907 ****	*1631*	*1863 ****	*1631*	*3040 ****	*2664*	*3054 ****	*2664*
	7-14	*468*	*477*	*495*	*479*	*789*	*779*	*788*	*782*
	≥ 15	*52 ****	*93*	*69 ****	*92*	*101 ****	*152*	*88 ****	*150*
	All	*2427 ****	*2202*	*2427 ****	*2202*	*3930 ****	*3596*	*3930 ****	*3596*
50 periods moving average 1)	1-14	*492*	*516*	*488*	*515*	*772 ***	*843*	*785 **	*841*
	15-34	*85 ***	*69*	*63*	*70*	*87 ****	*112*	*114*	*115*
	≥ 35	*91 ***	*103*	*117 ****	*102*	*205 ****	*169*	*164*	*167*
	All	*668*	*688*	*668*	*688*	*1064 **	*1124*	*1063 **	*1124*
100 periods moving average 1)	1-14	*350*	*363*	*330*	*364*	*559*	*595*	*575*	*596*
	15-34	*41*	*46*	*36 **	*47*	*63 **	*75*	*77*	*77*
	≥ 35	*70 **	*78*	*95 ****	*76*	*145 ****	*128*	*114 **	*125*
	All	*461*	*488*	*461*	*488*	*767*	*798*	*766*	*798*

1) Before being classified, the observed exchange rate series as well as the 1000 random walk series are smoothed by the respective moving average.

Notes: The table compares the observed numbers of exchange rate runs by duration to their expected means under the random-walk-hypothesis (RWH). These means are derived from a Monte-Carlo-simulation based on 1000 random walk series (without drift). The random walks were constructed with an expected zero mean of the first differences and with an expected standard deviation of the first differences as observed in the original exchange rate series over the respective period. * (**, ***) indicate the significance of the difference between the observed means and the expected means under the random-walk-hypothesis at the 10% (5%, 1%).

Based on smoothed series (both, the observed exchange rate series as well as the random series are smoothed by a 5 days and 20 days moving average), the most significant deviations of the observed number of runs from their expected values under the RWH concern the most persistent runs (lasting longer than 14 days in the case of a 5 days MA, and longer than 34 days in the case of a 20 days MA – table 3). Over the depreciation period A,

e. g, there occurred many "abnormally" long lasting monotonic downward movements (many more than upward movements). In an analogous way, over the appreciation period C there occurred many "abnormally" long lasting upward movements (many more than downward movements).

Finally, I show the results of the same exercise based on 30 minutes data. The frequency of these data is by a factor of 48 higher than the frequency of daily data. Hence, the length of the moving averages is much longer than in the case of daily data. The most important results for the original (unsmoothed) 30-minutes exchange rates are as follows (table 4):

- Short lasting exchange rate runs occurred significantly more frequently than expected under the RWH, whereas persistent runs occurred less often than under the RWH.
- The overall number of observed exchange rate runs is significantly higher than is to be expected if 30 minutes exchange rates followed a random walk.

When the 30-minutes data are smoothed by a 50 period MA and by a 100 period MA, respectively, a very different picture emerges (table 4):

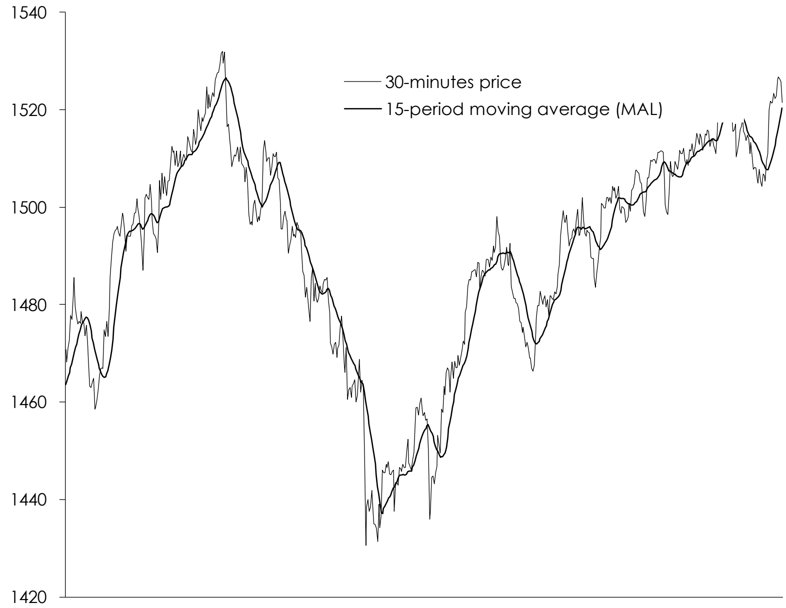
- Over the depreciation period A, there occurred less short exchange rate runs than under the RWH. At the same time, there occurred significantly more long downward runs, but significantly less upward runs than under the RWH.
- Also over the appreciation period C, the number of short lasting runs is smaller than expected under the RWH. Analogously to the depreciation period A, there occurred significantly more long lasting upward runs than under the RWH. At the same time there occurred less persistent downward runs.
- The overall number of upward and downward runs is in all but one case (period A/50 period MA) lower than expected under the RWH.

To conclude: The volatility of exchange rates based on intraday data, i. e., the frequency of short lasting ups and downs, is even higher when measured on the basis of intraday data than on daily data. In both cases the observed short-term volatility is higher than in the case of a random walk. However, in both cases the exchange rate fluctuates around an "underlying" trend. As a consequence, there occur less short lasting runs and more long lasting (persistent) runs when the exchange rate series is smoothed by moving averages. Persistent upward (downward) runs last longer during an appreciation (depreciation) phase than the counter-movements. Hence, the sequence of these runs results in a stepwise appreciation (depreciation) process, i. e., in long-term exchange rate trends.

This pattern in the dynamics of speculative prices conflicts with the most fundamental assumption of the "efficient market hypothesis". According to this concept any asset price reflects the fundamental equilibrium value of the respective asset. If new information arrives, actors will drive the price instantaneously to its new equilibrium. This (rational) behaviour assures that asset prices follow a random which in turn implies "weak market efficiency". This concept means that one cannot systematically make trading profits from exploiting just the information contained in past prices (as do the popular trading rules of technical analysis).[4])

Since the most popular trading technique in financial markets, the so called "technical analysis", is based on the (assumed) exploitability of asset price trends, I shall finally sketch the interaction between this trading practice and asset price dynamics.

Figure 4: Technical trading signals for the S&P500 futures contract, July and August, 2000



3. Technical trading and the trending of asset prices

Technical analysis tries to exploit price trends which "technicians" consider the most typical feature of asset price dynamics ("the trend is your friend"). Hence, these trading techniques derive buy and sell signals from the most recent price movements which (purportedly) indicate the continuation of a trend or its reversal (trend-following or contrarian models).[5]) Since technical analysts believe that the pattern of asset price dynamics as a sequence of trends interrupted by "whipsaws" repeats itself across different time scales, they apply technical models to price data of almost any frequency, ranging from daily data to tick data.

According to the timing of trading signals, one can distinguish between trend-following strategies and contrarian models. Trend-following systems produce buy (sell) signals in the early stage of an upward (downward) trend, whereas contrarian strategies produce sell (buy) signals at the end of an upward (downward) trend, e. g., contrarian models try to identify "overbought" ("oversold") situations.

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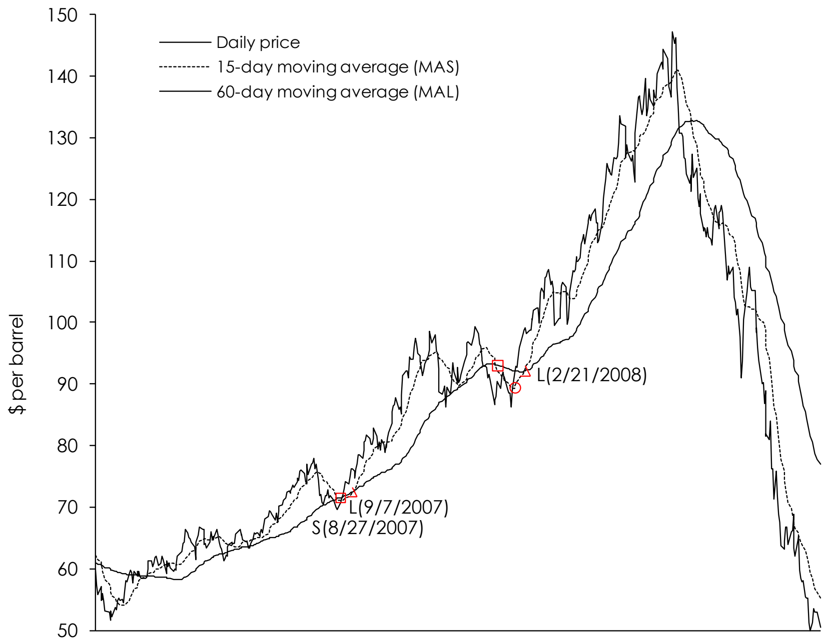
[4]) Recent contributions to the debate about the efficiency of asset markets are *Le Roy* (1989), *Shiller* (2003), *Lo* (2004).

[5]) *Kaufman* (1987) provides an excellent treatment of the different methods of technical analysis. For a short description of the most important trading rules see *Schulmeister*, 2007A).

Technical analysis is omnipresent in financial markets. In the foreign exchange market, e. g., technical analysis is the most widely used trading technique (for recent survey studies see *Cheung – Chinn - Marsh*, 2004; *Gehrig - Menkhoff*, 2006; *Menkhoff - Taylor*, 2007). It seems highly plausible that technical analysis plays a similar role in stock (index futures) markets as well as in commodity futures markets (*Irwin-Holt*, 2004, provide evidence about the popularity of technical analysis in futures markets).

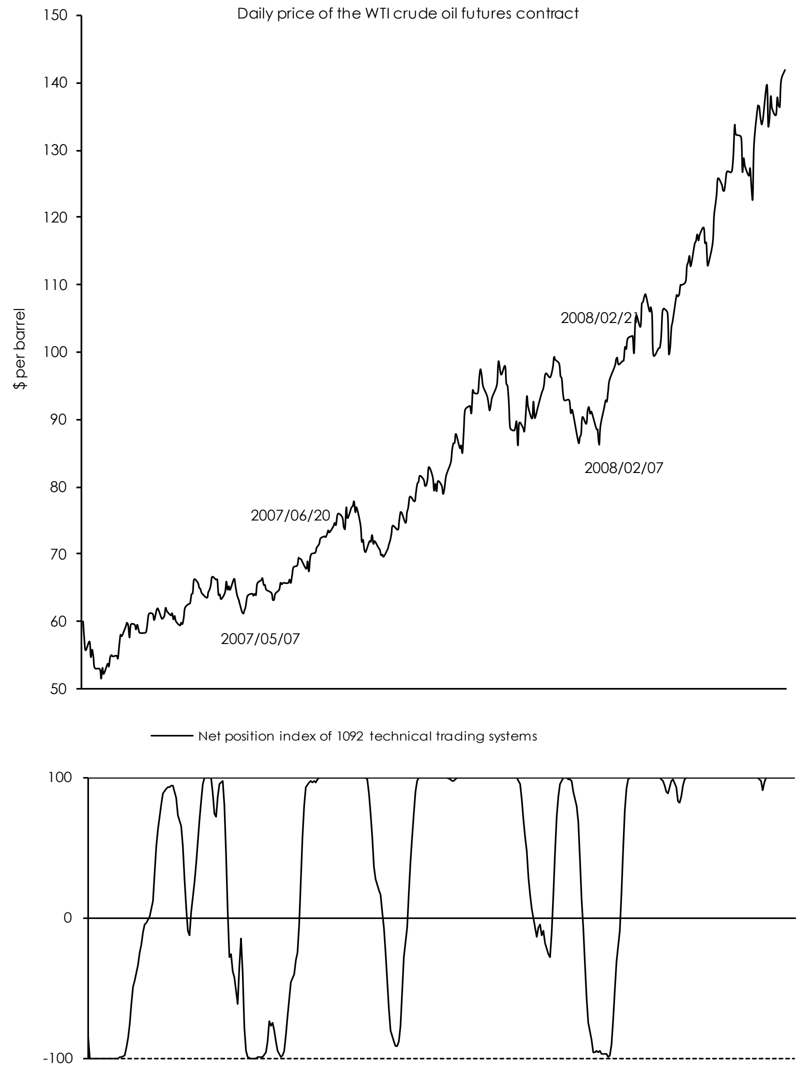
Figure 5: Technical trading signals for WTI crude oil futures contract 2007 - 2008



Many factors have contributed to the popularity of technical trading systems among practitioners. First, these systems can be "universally" used, i. e., they can be applied to any kind of price data frequency. Second, these price data have become easily available (at ever falling costs). Third, computer software has been continuously improved (and got cheaper at the same time). Fourth, the internet has enabled traders (professionals as well as amateurs) to trade in real time on all important market places in the world.

Figures 2, 3, 4, 5 show how simple MA models based on different data frequencies operate in the dollar/euro market, the stock index futures market and the oil futures market (if a model uses two moving averages, then their crossing indicates a trading signal). There is one universal property of the performance of technical trading systems in asset markets of all kinds: These models produce (much) more often single losses than single profits, however, profitable positions last on average three to four times longer than unprofitable positions which causes the models to (often) produce an overall profit. This profitability pattern reflects the fact that technical trading systems focus on the exploitation of price trends (for a detailed analysis of profitability of technical models in different asset markets see *Schulmeister*, 2008A, 2008B, 2009A, 2009C, 2009D).

Figure 6: Aggregate trading signals of 1092 technical models and the dynamics of oil futures prices, January 2007 to June 2008



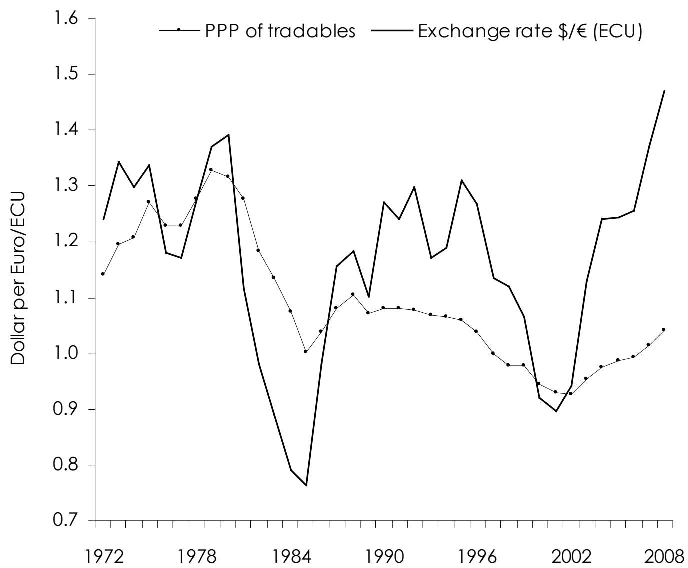
There operates an interaction between the "trending" of asset prices and the use of technical models in practice. On the one hand, many different models are used by individual traders aiming at a profitable exploitation of asset price trends, on the other hand the aggregate behaviour of all models strengthen and lengthen price trends. Figure 6 documents this interaction, it compares the change in the aggregate position of 1092 technical models in the oil futures market to the movements of the oil futures price (a value of +100 (-100) of the net position index means that 100% of the models hold a long (short) position).

Figure 6 shows the gradual adjustment of the 1092 technical models to oil futures price movements between January 2007 and June 2008. On February 7, 2008, e. g., all models hold a short position due to a preceding decline in oil futures prices. The subsequent price rise causes the models to gradually switch their position from short to long, the "fast" models at first, the "slow" models at last. On February 21, all models hold a long position. During this transition period from short to long, technical models exert an excess demand on oil futures since any switch implies two buy transactions, one to close the (former) short position, and one to open the (new) long position.

Studies on the aggregate trading behaviour of the many different models, based on daily as well as on intraday data and operating in different markets reveals the following (Schulmeister, 2006, 2009A, 2009C, 2009D). First, most of the time the great majority of the models is on the same side of the market. Second, the process of changing open positions usually takes off 1 to 3 days (or 30-minute intervals) after the local futures price minimum (maximum) has been reached. Third, it takes between 10 and 20 trading days (or 30-minute intervals) to gradually reverse the positions of (almost) all models if a persistent price trend develops. Fourth, after all technical models have adjusted their open positions to the current trend, the trend often continues for some time.

One can therefore conclude that the widespread use of technical trading systems strengthens and lengthens short-term asset price trends (runs). At the same time, the sequence of price runs accumulates to long-term trends when an expectational bias ("bullishness" or "bearishness") prevails in the market. Hence, the technical trading together with the frequent predominance of a "market mood" can be considered the most important causes of the overshooting of asset prices. I shall present some empirical evidence on this phenomenon.

Figure 7: Dollar/euro exchange rate and purchasing power parity

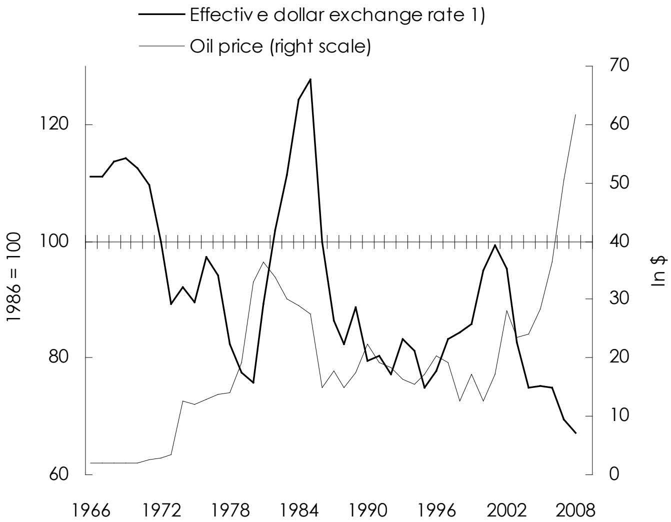


Source: OECD, WIFO, Schulmeister (2005).

4. Overshooting of asset prices

Figure 7 shows the wide fluctuations of the US-dollar/Euro(ECU) exchange rate around its theoretical equilibrium level, i.e., the purchasing power parity (PPP) of internationally traded goods and services (for the calculation of PPP based on tradables see *Schulmeister*, 2005).

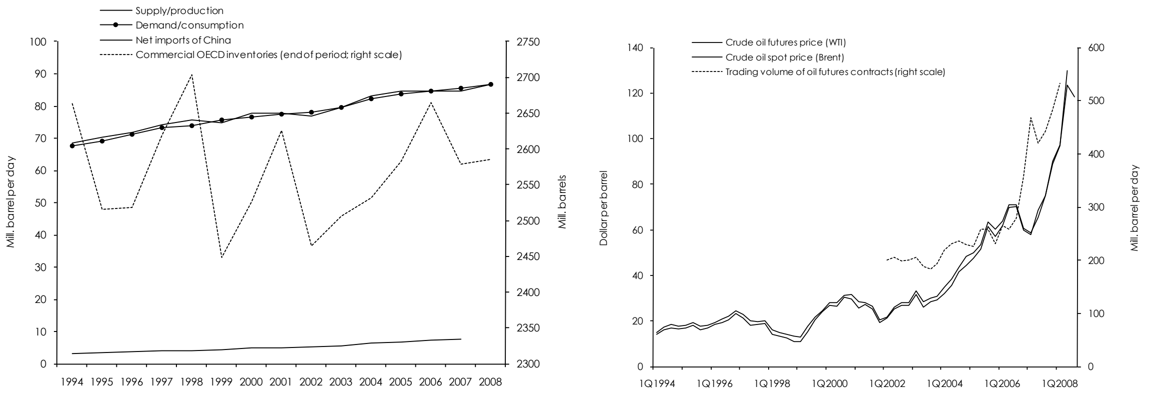
Figure 8: Dollar exchange rate and oil price fluctuations



Source: OECD, IMF. - 1) Vis-a-vis DM, Franc, Pound, Yen.

Figure 8 displays the sequence of booms and busts of the US dollar exchange rate and of the crude oil price since the late 1960s. Even though one can hardly quantify the fundamental equilibrium price of crude oil, it seems implausible that the latter fluctuates as widely as the market price (figure 8). It is much more plausible that oil price overshooting is the result of the interaction between news-based trading and technical trading in oil futures markets.

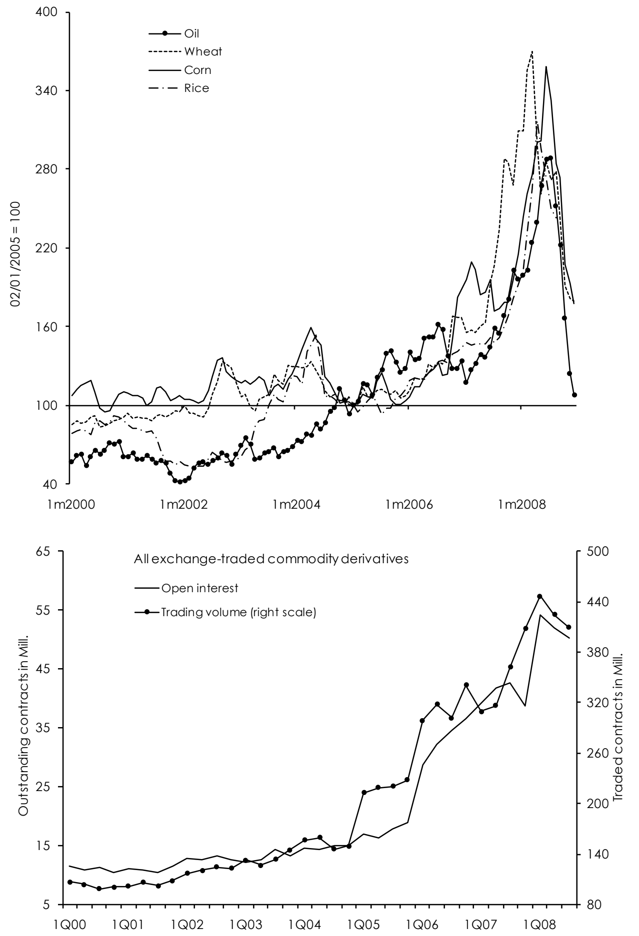
Figure 9: World market for crude oil, oil futures trading and oil price movements



This presumption is confirmed by the development of supply and demand in the market for physical oil as well as by the expansion of trading activities in the oil derivatives markets (figure 9). During the oil price boom between 2002 and 2008, oil production rose slightly stronger than demand, causing inventories to rise. The demand for oil of China – often quoted as the most important single cause for the oil price boom – can hardly explain the extent of the oil price increase. Net oil imports of China account for only 9% of global demand (China still produces roughly half of its oil consumption). Moreover, China's net oil imports have expanded very continuously over the past 15 years (figure 9).

The tremendous increase in trading activities in oil futures markets since 2003 suggests that (technical) speculation might have contributed significantly to the oil price boom (figure 9). This presumption gets support from the fact that also the boom of other commodity prices coincided with a spectacular rise in trading of commodity derivatives in general, in particular since 2006 (figure 10).

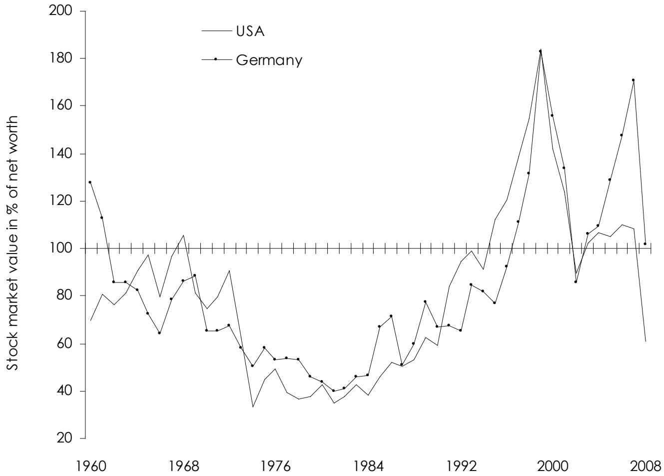
Figure 10: Dynamics of commodity futures prices and derivatives trading activities 2007 - 2008



Source: New York Mercantile Exchange (NYMEX), Chicago Board of Trade (CBOT), BIS.

Figure 9 also suggests that the overshooting of the dollar exchange rate and the overshooting of the oil price are inversely related to each other, at least during periods of marked “bull markets” and “bear markets”. Since the dollar serves as global key currency, crude oil is priced in dollars (like all other commodities). As a consequence, any dollar depreciation devalues real oil export earnings. This valuation effect in turn strengthens the incentive for oil-producing countries to increase the price of their most important export good. If their market power is strong, oil exporters are able to put through oil price increases which by far overcompensates them for the losses due to the preceding dollar depreciation. The oil price "shocks" 1973/74, 1978/80 and 2002/2007 are the most impressing examples for the inverse relationship between dollar depreciations and subsequent oil price movements (see also *Schulmeister*, 2000).

Figure 11: Stock market value and net worth of non-financial corporations



Source: Fed, Deutsche Bundesbank, Schulmeister (2003)

Figure 11 shows that stock prices in the US and Germany became progressively undervalued over the 1960s and 1970s: The stock market value of non-financial corporations strongly declined relative to their net worth (real assets at goods market prices minus net financial liabilities[6]). This development can be explained by the fact that during this the striving for profits focused on the real side of the economy. As a consequence, real capital accumulation was booming und stock prices rose comparatively little (partly because corporate business financed investments through increasing the supply of stocks).

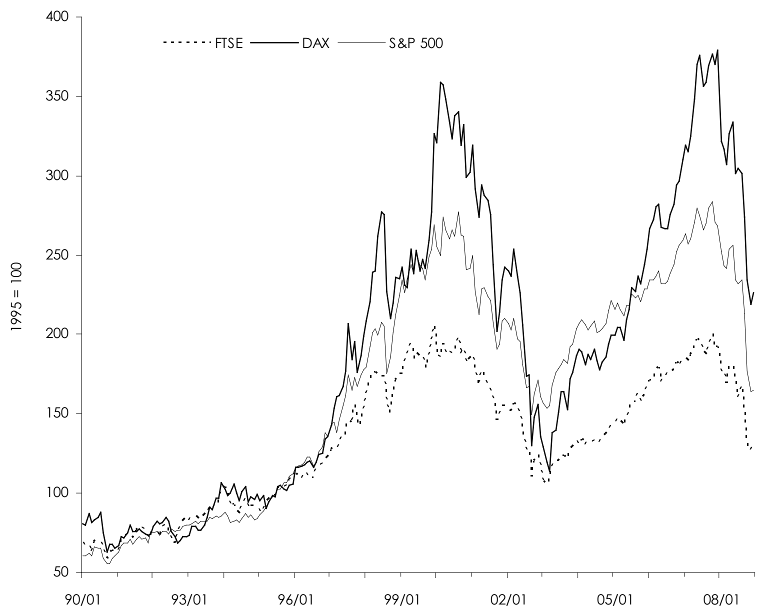
The stock market boom of the 1980s and 1990s and the slow-down in real investment dynamics caused stock prices to become progressively overvalued. By the end of the 1990s the stock market value of corporate business in the US as well as in Germany was roughly 80%

[6]) The relation depicted in figure 11 is an estimate of Tobin’s q. For the data series and the method to calculate this relation see *Schulmeister*, 2003.

higher than its net worth. This discrepancy was the most important cause of the "tilt" from a "bull market" into a "bear market" in 2000.

Between spring 2003 and summer 2007 stock prices were again booming, in Germany even stronger than in the US. At the same time real investment expanded in the US much stronger than in Germany. Hence, the discrepancy between the stock market value of non-financial corporate business and its net worth rose much stronger in Germany than in the US (figure 11). Unsurprisingly, since summer 2007 stock prices have fallen much stronger in Germany as compared to the US.

Figure 12: Stock price fluctuations in Germany, the United Kingdom and the US



Q: Yahoo Finance (http://de.finance.yahoo.com/m8).

Figure 12 shows the two "bull markets" and two "bear markets" which developed since the mid 1990s. The amplitude of the irregular cycles is much higher in the case of Germany as compared to the traditional market places in the US and the UK. Also this observation confirms the presumption of a systematic overshooting of asset prices: The real economy in Germany fluctuated less than in the US or the UK (the German economy was stagnating most of the time since the mid 1990s), and also the recovery between 2003 and 2007 was much weaker in Germany than in the US or the UK.

Equilibrium economics under rational expectations cannot account for wide fluctuations of asset prices around their fundamental equilibrium. This is so because conventional theory can only explain two types of equilibrium paths, either convergence towards the fundamental equilibrium or a bubble. Hence, exactly that phenomenon, which can most easily be observed in real life and which practitioners call sequences of "bulls" and "bears", remains unexplained in mainstream economics.

Empirical exchange rate studies, e. g., conceive the "purchasing power parity puzzle" primarily as the (unexplained) low speed at which an over- or undervalued exchange rate returns to its fundamental equilibrium. The preceding process of "overshooting" is simply attributed to "shocks" and, remains unexplained (*Rogoff,* 1995; *Sarno – Taylor,* 2002; *Taylor – Taylor,* 2004). This kind of perception prevents conventional economists from looking at the interdependency between upward trends and downward trends in asset price dynamics.

Empirical stock market studies focus in most cases on specific "anomalies" like the "momentum effect" (caused by the "trending" of stock prices) or the "reversal effect" (caused by trend reversals). However, these phenomena are not analyzed in the context of the irregular cyclicality of asset prices (for surveys of empirical stock market studies see *Campbell*, 2000; *Cochrane* 1999; *Lo – MacKinlay,* 1999; *Shiller,* 1999). An important reason for this "myopic" perception lies in the fact that the relatively new and popular school of "behavioural finance" uses equilibrium concepts as the reference or benchmark models, too. As a consequence, observations which contradict equilibrium models can only be perceived as "anomalies".[7])

5. Development of the current crisis

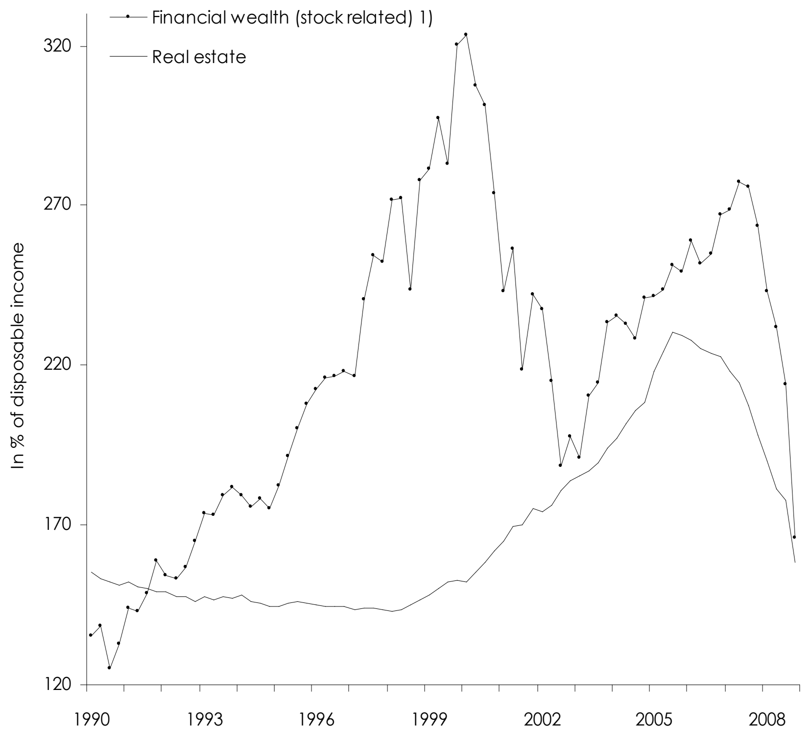
The sequence of "bull markets" and "bear markets", and, hence, the overshooting of exchange rates, commodity prices and stock prices, affects the real sphere of the economy through many channels, e. g., by increasing uncertainty, by producing waves of positive and negative wealth effects (strengthened by the rising importance of pension and college funds), by inflating and deflating the balance sheets of financial institutions and by redistributing trade earnings between consumers and producers of commodities:

- The boom of stock prices in the 1990s and again between 2003 and 2007 as well as the boom of house prices between 1998 and 2005 stimulated the US economy through positive wealth effects (figure 13). At the same time, however, the "twin booms" led the ground for the subsequent "twin busts". The related devaluation of financial as well as housing wealth will depress consumption and investment for years (figure 13).
- After the outbreak of the sub-prime mortgage crisis the third "bull market", i. e., the commodity price boom, accelerated, mainly driven by speculation of financial investors in commodity derivatives markets (figures 5, 6 and 10). This development further deteriorated global economic prospects.

[7]) *Schulmeister* (1987) and *Frydman – Goldberg* (2007) offer models which explain asset price dynamics as a sequence of systematically overshooting upward and downward trends ("bulls" and "bears"). For the "long swings" of the dollar exchange rate see *Engel – Hamilton*, 1990.

- Since mid 2008 the devaluation process of stock wealth, housing wealth and commodity wealth is globally "synchronized" (as was the preceding "triple booms"). This – in part still ongoing – process sets free several contraction forces, not only through wealth effects and balance sheet compression but also via import reductions on behalf of commodity producers (commodity prices fell by roughly 60% within 4 months – figure 10).
- The fall of stock prices and commodity prices has been strengthened by trend-following technical trading via taking huge short positions in the respective derivatives markets. Due to the extraordinary strength of these "bear markets", hedge funds using these models (in many cases "automated trading systems") reported higher returns than ever before (figure 16).

Figure 13: Wealth of private household in the US

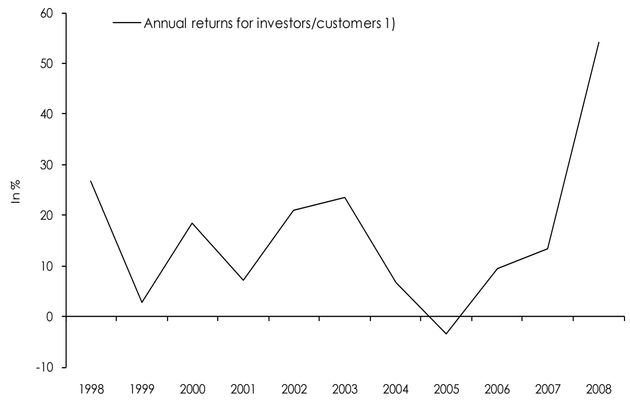


Qu: Federal Reserve Board, OEF. - 1) Stocks, Investment funds, Pension funds.

The "epicenter" of the "financial tsunami" is the threefold wealth devaluation process (the last time when stock wealth, housing wealth and commodity wealth collapsed simultaneously was between 1929 and 1933). The extent of this devaluation process was made possible through the preceding overvaluation through the simultaneous boom of stock prices, house prices and commodity prices. The three "bull markets" and the three "bear markets", are the result of "business as usual" in modern financial markets (I do not need exceptionally greedy bankers etc. to explain how the potential for the crisis was built up).

Many feed-back processes strengthened the process of wealth devaluation (e. g., the fall in house prices caused more and more homeowners to default on their mortgage, the subsequent foreclosures depressed house prices further). One feed-back process is most typical for modern "finance capitalism" (figure 14): Trend-following hedge funds opened huge short positions in the markets for stock and commodity derivatives in reaction to the price decline in these markets (in particular after the default of Lehman Brothers). This "bear speculation" became extremely profitable for these hedge funds due to the steepness of the asset price fall. At the same time, this strategy strengthened the asset price decline and, hence, the devaluation of the savings of 100 million people all over the world.

Figure14: Profitability of trend-following hedge funds



Source: www.turtletrader.com 1) Unweighted average of the returns net of fees and transaction costs of 17 hedge funds using trend-following technical trading systems.

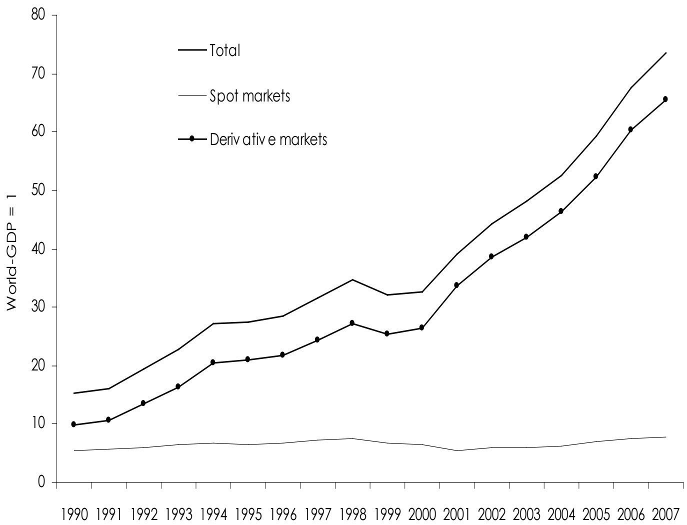
The transformation of financial markets and institutions from a sector servicing the "real economy" to an (dominant) sector to which the "real economy" has to adjust, can only be understood in the context of the latest "long cycle" (*Schulmeister*, 1998).

The trough of this cycle was the Great Depression of the 1930s. The learning process enforced by this crisis resulted in a new macro-economic theory (Keynesianism), an active economic policy focusing on stable growth and full employment, a stable international monetary system ("Bretton Woods"), de-regulation of goods markets (e. g. though the GATT rounds), but strict regulation of financial markets. The essential characteristic of the system was the following: The driving force of capitalist development, the striving for profits, was systematically directed towards activities in the "real economy" (hence, I termed this regime "real capitalism" – *Schulmeister*, 2004). Under these conditions the "Golden Age" of capitalism was realized over the 1950s and 1960s.

The "monetarist counterrevolution" of the late 1960s got support from "big business" because permanent full employment had strengthened trade unions as well as the welfare state. The stepwise realization of the monetarist/neo-liberal demand for de-regulation of financial markets changed the "rule of the capitalistic game" fundamentally. Under the condition of widely fluctuating exchange rates and commodity prices, and of a high interest-growth-differential (until the late 1970s interest rates had been kept lower than the rate of economic growth), financial and non-financial business shifted activities from the "real economy" to financial investment and short-term speculation ("finance capitalism"). This shift was supported by the tremendous amount of financial innovations (i. e., derivatives of all kinds) which have been realized since the 1980s as well as by the rising instability of asset prices. Both factors provided more and more chances for making huge speculative profits from short-term trading.

The expansion of financial transactions is therefore one of the most typical characteristics of the late phase in a "finance-capitalistic" development (together with the rising instability of those asset prices which are most important for the "real economy" like exchange rates, commodity prices and stock prices).

Figure 15: Overall financial transactions in the world economy



6. Dynamics of financial transactions

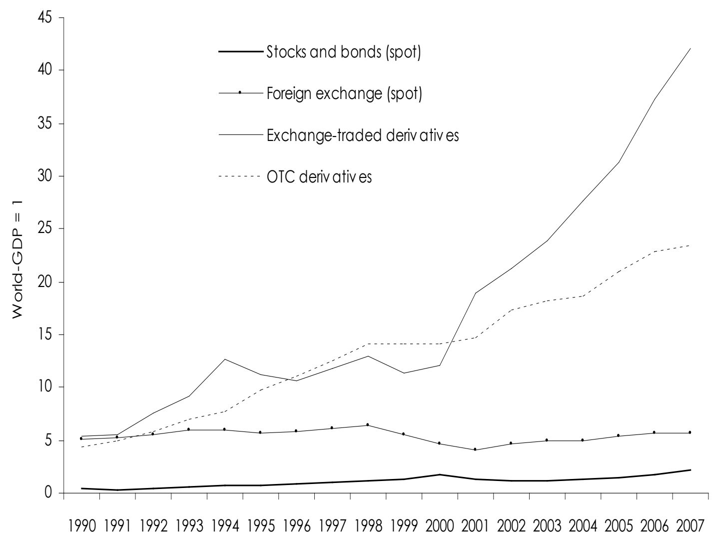
Trading activities in financial markets have exploded over the past 20 years:[8])

- There is a remarkable discrepancy between the levels of financial transactions and the levels of transactions in the "real world". In 2007, the former was roughly 74 times higher than nominal world GDP. This discrepancy has risen tremendously since the late 1990s (figure 15).

[8]) A comprehensive estimate of financial transaction in the global economy, differentiated by types of instruments and regions, is provided by *Schulmeister – Schratzenstaller – Picek*, 2008.

- Trading in derivatives markets has expanded significantly stronger than trading in spot markets, this holds true for any kind of asset/instrument. In the world economy, derivatives trading volume is roughly 66 times higher than world GDP, whereas spot trading amounts to "only" 8 times world GDP (figure 15).
- Trading of futures and options on organized exchanges (which is open to the general public) has risen stronger than "over-the-counter"-transactions (which are restricted to professionals), in particular since 2000 (figure 16).
- These developments are particularly pronounced in Europe where the volume of financial transactions was more than 100 times higher than nominal GDP.
- Given the spectacular level of derivatives trading only a comparatively small share of transactions stem from hedging activities. The greatest part of transactions is related to speculative trades between actors with heterogeneous price expectations.

Figure 16: Financial transactions in the world economy by instruments



7. Stabilizing effects and revenue potential of a general financial transaction tax

A small financial transaction tax would dampen the fluctuations of exchange rates, stock prices and commodity prices over the short run as well as over the long run. At the same time, such a tax would yield substantial revenues.

A general FTT would specifically dampen very short-term oriented and destabilizing trading in derivatives markets. There are two reasons for that. First, a FTT makes trading the more costly the shorter its time horizon is (e. g., technical trading based on intraday data). Second, a FTT will dampen specifically derivatives trading since the tax rate refers to contract value (e. g., the effective tax on the margin "invested" is by the leverage factor higher than the tax relative to the value of the transaction).

Derivatives transactions for hedging purposes as well as "real-world-transactions" (spot) would hardly be affected by a low FTT between 0.1% and 0.01%.

Assuming that trading declines due to the introduction of a FTT of 0.01% (1 basis point) by roughly 30%, overall tax revenues would amount to 0.529% of world GDP or 287.3 bill. $ (based on 2007 data – table 5). More than half of the revenues (164.4 bill. $) would stem from derivatives transactions on exchanges (these transactions could be taxed most easily due to the use of electronic settlement systems). Taxes on spot transactions would amount to only 11.6 bill. $.

In Europe (EU27 plus Norway and Switzerland) a FTT at the (low) rate of 0.01% would yield roughly 130 bill. $ or 0.734% of nominal GDP (table 1).

Table 5: Hypothetical transaction tax receipts in the global economy 2007

	World		Europe		North America		Asia and Pacific	
	In % of GDP	In Bill. $	In % of GDP	In Bill. $	In % of GDP	In Bill. $	In % of GDP	In Bill. $
Spot transactions on exchanges	0.0214	11.6	0.0253	4.4	0.0311	4.8	0.0342	2.2
Derivatives transactions on exchanges	0.3027	164.4	0.3232	56.9	0.6007	91.7	0.2202	14.1
OTC Transactions	0.2049	111.3	0.3889	68.5	0.1501	22.9	0.2937	18.8
All transactions	0.5290	287.3	0.7374	129.8	0.7820	119.4	0.5482	35.0

The introduction of a general FTT could help to overcome the current economic crisis and to prevent similar crises in the future. This is so for several reasons. First, such a tax addresses one of the most important factors of building up the potential for the ongoing devaluation of financial and commodity wealth, i. e., the "manic-depressive" fluctuations of stock prices, exchange rates and commodity prices. Second, a low FTT of 0,01% would specifically dampen short-term and destabilizing transactions in derivatives markets. Third, the revenues of a FTT are substantial (even at a rate of only 0,01%), and this would help governments to consolidate their fiscal stance.

References

Campbell, J. Y., Asset Pricing at the Millennium, Journal of Finance 55, 2000, pp.1515-1567.

Cheung, Y. W., Chinn, M. D., Marsh, I. W., "How do UK-Based Foreign Exchange Dealers Think Their Market Operates?", International Journal of Finance and Economics, 9 (4), 2004, pp. 289-306.

Cochrane, J. H., New Facts in Finance, NBER Working Paper 7169, June 1999.

De Grauwe, P., Grimaldi, M., The Exchange Rate in a Behavioural Finance Framework, Princeton University Press, Princeton, New Jersey, 2006.

DeLong, J. B., Shleifer, A., Summers, L. H., Waldmann, R. J. (1990A), "Noise Trader Risk in Financial Markets", Journal of Political Economy, 98(4), 1990, pp. 703-738.

DeLong, J. B., Shleifer, A., Summers, L. H., Waldmann, R. J. (1990B), "Positive Feedback Investment Strategies and Destabilizing Rational Speculation", Journal of Finance, 45(2), 1990, pp. 379-395.

Engel, C./Hamilton, J.D., Long Swings in the Dollar: Are They in the Data and Do Markets Know It?, In : American Economic Review 80 (4), 1990, pp.689-713.

Fama, E. F., "Efficient Capital Markets: A Review of Theory and Empirical Work", The Journal of Finance, 25(2), 1970, pp. 383-417.

Frankel, J. A., Froot, K. A., "Chartists, Fundamentalists, and Trading in the Foreign Exchange Market", AEA Papers and Proceedings, 80(2), 1990, pp. 181-185.

Friedman, M., "The Case for Flexible Exchange Rates", in Friedman, M., Essays in Positive Economics, Chicago, University of Chicago Press, 1953.

Frydman, R./Goldberg, M. D., Imperfect Knowledge Economics: Exchange Rates and Risk, Princeton University Press, Princeton, New Jersey, 2007.

Gehrig, T., Menkhoff, L. (2006), "Extended Evidence on the Use of Technical Analysis in Foreign Exchange", International Journal of Finance and Economics, 11(4), 2006, pp. 293-284.

Hommes, C., "Heterogeneous Agent Models in Economics and Finance", in Judd, K. L., Tesfatsion, L. (eds.), Handbook of Computational Economics, Elsevier, II(23), 2006, pp. 1109-1186.

Irwin, S. H., Holt, B. R., The Impact of Large Hedge Fund and CTA Trading on Futures Market Volatility in Gregoriou, G. N., Karavas, V. N., L'Habitant, F. S., Rouah, F. (eds.), Commodity Trading Advisers: Risk, Performance Analysis and Selection, John Wiley & Sons, New York, 2004, pp.151-182.

Kaufman, P. J., The New Commodity Trading Systems and Methods, John Wiley and Sons, New York, 1987.

LeRoy, S. F., Efficient Capital Markets and Martingales, in: Journal of Economic Literature, Vol. 27 (4), 1989, pp.1583-1621.

Lo, A., "The Adaptive Market Hypothesis: Market Efficiency from an Evolutionary Perspective", Journal of Portfolio Management, 30 (1), 2004, pp. 15-29.

Lo, A. W./MacKinlay, A. C., A Non-Random Walk Down Wall Street, Princeton University Press, Princeton, New Jersey, 1999.

Menkhoff, L., Taylor, M.P.,: The obstinate passion of foreign exchange professionals: Technical analysis, Journal of Economic Literature, 45(4), 2007, pp. 936-972.

Rogoff, K., The Purchasing Power Parity Puzzle, Journal of Economic Literature, Vol. 34, 1996, pp.647-668.

Sarno, L.,/Taylor, M. P., Purchasing Power Parity and the Real Exchange Rate, IMF Staff Papers, Vol. 49 (1), 2002, pp.65-105.

Schulmeister, S., An Essay on Exchange Rate Dynamics, Wissenschaftszentrum Berlin, 1987. Download: http://stephan.schulmeister.ac.at/

Schulmeister, S., Globalization without Global Money: the Double Role of the Dollar as National Currency and as World Currency, in: Journal of Post Keynesian Economics, Vol. 22, No. 3, 2000, pp.365-395.

Schulmeister, S., Aktienkursdynamik und Realkapitalbildung in den USA und Deutschland, WIFO-Studie, Wien, 2003. Download: http://stephan.schulmeister.ac.at/

Schulmeister, S., Der Finanzkapitalismus, die Wachstumskrise und das Europäische Modell, in: Hein, E., Heise, A., Truger, A. (eds.), Finanzpolitik in der Kontroverse, Metropolis-Verlag, Marburg, 2004, pp.23-69.

Schulmeister, S., Purchasing Power Parities, Exchange Rates and International Price Competitiveness, WIFO-Studie, Wien, 2005. Download: http://stephan.schulmeister.ac.at/

Schulmeister, S., "The interaction between technical currency trading and exchange rate fluctuations", Finance Research Letters, 2, 2006, pp. 212-233.

Schulmeister, S., The Profitability of Technical Stock Trading has Moved from Daily to Intraday Data, WIFO Working Paper, 2007. Download: http://stephan.schulmeister.ac.at/

Schulmeister, S., (2008A) "Components of the profitability of technical currency trading", Applied Financial Economics, 2008, 1-14.

Schulmeister, S., (2008B), Profitability of technical currency speculation: the case of yen/dollar trading 1976 – 2007, WIFO Working Paper 325, 2008.

Schulmeister, S., (2009A), Trading Practices and Price Dynamics in Commodity Markets and the Stabilizing Effects of a Transaction Tax, Study of the Austrian Institute of Economic Research (WIFO) commissioned by the Ministry of Finance and the Ministry of Economics and Labour, Vienna, January 2009. Download: www.wifo.ac.at/wwa/servlet/wwa.upload.DownloadServlet/bdoc/S_2009_TRANSACTION_TAX_34919$.PDF

Schulmeister, S. (2009B), "Aggregate Trading Behavior of Technical Models and the Yen/Dollar Exchange Rate 1976-2007, Japan and the World Economy", 21, 2009, pp. 270-279.

Schulmeister, S. (2009C), "The Profitability of Technical Stock Trading: Has it Moved from Daily to Intraday Data?" Review of Financial Economics, in press, available online www.science-direct.com.

Schulmeister, S. (2009D), Technical Trading and Trends in the Dollar/Euro Exchange Rate, Study by the Austrian Institute of Economic Research (WIFO), supported by the Anniversary Fund of the Österreichische Nationalbank, Vienna, September 2009.

Schulmeister, S., Schratzenstaller, M., Picek, O., A General Financial Transaction Tax – Motives, Revenues, Feasibility and Effects, Study of the Austrian Institute of Economic Research (WIFO) commissioned by Ökosoziales Forum Österreich and co-financed by the Ministry of Finance and the Ministry of Economics and Labour, Vienna, April 2008. (http://www.wifo.ac.at/wwa/jsp/index.jsp?fid=23923&id=31819&typeid=8&display_mode=2).

Shiller, R. J., "From Efficient Markets to Behavioral Finance", Journal of Economic Perspectives, 17(1), 2003, pp. 83-104.

Shiller, R. J., Human Behavior and the Efficiency of the Financial System, in Taylor, J., Woodford, W., Handbook of Macroeconomics I, Amsterdam, North-Holland, 1999.

Taylor, A. M., Taylor, M. P., The Purchasing Power Parity Debate, in: Journal of Economic Perspectives, Vol. 18 (4), 2004, pp.135-158.

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