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Systematic Elements in the Price Formation in Speculative Markets – A test of "The Mill Process"

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"The most beautiful thing that we can experience is the mystic. This is the source of all true science". (Einstein)

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Abstract.

Price formation in speculative markets is a focus for keen interest, for obvious reasons. The central paradigm in economic theory is "random walk", based upon Louis Bacheliers pioneering work at the turn of la st century. Most importantly, this paradigm precludes the existence of any systematic patterns in price history. However, most practitioners use some form of "technical analysis", a group of techniques originating in the stock market analysises of Charle s H Dow, a Bachelier contemporary. These techniques are based upon the belief that historical price patterns give important clues as to future price development. We are thus faced with a detrimental and emotionally charged conflict between science and actual practice.

However, developments over the past few years have given rise to a new avenue of research, "Behavioral Finance", open to scrutiny of the anomalies to the reigning paradigms.

More than 150 years ago John Stuart Mill described a typical speculator behavior pattern which demonstrates the. crucial influence of human psychology on price movements. The existence of this "Mill Process" is corroborated by a number of well-known present-day researchers.

It is likely that the "Mill Process" produces corresponding patterns in price behavior. In one particular instance proof is provided that this is indeed the case. It is suggested that the inherently unstable "Mill Process" and its consequences raise a number of new and intriguing que stions.

I. The Academic Tradition

The academic tradition dates back to the turn of last century. In March 1900 *Louis Bachelier* presented his thesis ”Theory of Speculation” for acceptance to the Faculty of Sciences of the Academy of Paris. Here he develops the view of price as being an equilibrium state between supply and demand with equal chance of going in either direction (fair game). He formulates his conclusion in the postulate:

> The mathematical expectation of the speculator is zero (Bachelier 1900, pg. 28).

This postulate, brilliant in its simplicity, is the main basis of all subsequent use of mathematics in this field.

This opportunity lay latent until the 1930-ties (triggered by the 1929 crash?), when *Holborn Working* published “A Random Difference Series for Use in the Analysis of Time Series” (Working, 1934). His focus was price differences over time, building on Bachelors pioneering work. He was the first to draw curves of accumulated price differences, the so-called ”Brownian motions”. Brownian motions have later been termed *”random walks”*. He declared to find traces of patterns in price movements, but attributed that to self-fulfilling trading practices.

A next benchmark achievement was *Maurice Kendall’s* 1953 published investigation ”The Analysis of Time Series: Prices”. He found *”no structure of any sort”* in the price material:

> It seems a waste of time to try to isolate a trend in data such as these. --The Stock Exchange, it would appear, has a memory lasting less than a week (Kendall 1953, pg. 18).

1959 *Harry Roberts* supports Kendalls conclusion. He proceeds to *generate* ”Brownian motions” from series of random numbers, and demonstrated their striking similarity to real price curves. The inference is that real prices may be generated by a similar, which is *random*, process. He concludes that:

> Judgement and intuition will proceed more soundly if not hindered by an unnecessary grappling with market ”patterns” (Roberts 1959, pg. 10)

The same year *MFM Osborne* published his article ”Brownian Motions in the Stock Market”. The conclusion of his 30-page paper comes very close to Bacheliers fundamental ”fair game” assumption, that is zero expectation of gain (Bachelier 1900, pg. 26):

> --the fundamental conclusions of this paper. It shows the essence of risk-taking --- and the symmetrical properties of the market ----as *a fair meeting ground* (my emphasis) between buyers and sellers (Osborne 1959, pg. 172)

1961 *Sidney Alexander* arrived with the paper "Price Movements in Speculative Markets: Trends or Random Walks". He made conscious efforts to find trends in the price material, trends that could be identified ahead of time. His conclusion aroused considerable interest at the time. Had he succeeded in disproving Bachelier?

> It must be concluded that there *are* trends in stock market prices, once the "move" is taken as the unit under study rather than the week or month.--- In speculative markets price changes appear to follow a random walk over time, but a move, once initiated, tends to persist (Alexander 1961, pg. 23 and 26).

However, 1964 he wrote a second paper with the same title, where he considerably modified his conclusion, albeit without quite disowning it:

> Maybe there just is a bit of persistence in the movement of stock price averages (Alexander 1964, pg. 45).

1965 Nobel Price winner *Paul Samuelson* contributed to the discussion with his paper *"Proof that Properly Anticipated Prices Fluctuate Randomly"*. This article is by many people regarded as the final word in the discussion of *"random walk"*, and a main support of the *"efficient market"* hypothesis. It should be noted, however, that the proof refers to "properly anticipated prices", *not* the actual prices themselves. The paper is mathematically highly sophisticated. Complex mathematics may often be hard to interpret. Samuelson frankly says that:

> The theorem is so general that I must confess to having oscillated over the years in my own mind between regarding it as trivially obvious (and almost trivially vacuous) and regarding it as remarkably sweeping (Samuelson 1965, pg. 102).

These are just examples of the formidable parade of scientist that has come out in support of the "random walk" paradigm. All of them, with the possible exception of Working, agree that it is not possible to find any kind of patterns in prices. So we may have some understanding for the prevailing stubborn resistance to any idea of important systematic elements in the formation of speculative prices.

But, is the fact that a phenomenon has not been found a proof that it does not exist?

II. "Chartists" and Scientists

At the end of the 19th century the Bachelier contemporary Charles H Dow started commenting about the stock market in the Wall Street Journal, a paper of which he was a cofounder. The basis for Dow's reasoning is the concept of the *trend*. The set of rules that he developed for gauging the market is the eponym theory, still often cited today.

This was the origin of what since has been termed "Technical Analysis" or "Chartism" (in the following TA) and which has persisted and has been further developed over more than one hundred years at most considerable aggregate efforts. In spite of these efforts, none of even the most renown of its practitioners, Dow, Hamilton, Rhea, Elliott, Gann, Schabacker, Magee, and others, have made an attempt to scientifically prove any of their tenets.

These "technicians" (or "chartists") are a highly heterogenous group of people, charlatans included, each having more or less his own special approach (Allen and Taylor 1989, pg. 18). Common to all different approaches, however, is the fundamental Dow concept of the *trend*, that rising prices engender further rises, and vice versa.

Today there is a lively and increasing interest in TA. Most practitioners. do in some way or other practice TA. It is hard to see how this broad acceptance should come about unless traders find some confirmation of its rules and tenets.

It is therefore unfortunate that the academic community has consistently and vehemently refused to give TA serious consideration. The "random walk" paradigm is firmly entrenched. The general attitude is that price variations in speculative markets have once and for all been proven to be predominantly random. Whatever systematic influences that might be found are proven to be negligible and by no means sufficient to form a basis for a trading strategy.

This conflict between "technicians" and "scientists" has developed to a point where it has become rather emotional. TA is viewed by the academic community as a kind of sorcery and an activity that it would be compromising for a respectable scientist to show serious interest in. A typical comment is that *"Technical Analysis is some sort of astrology, and every bit as scientific"*.

This has created unfortunate tensions. It is also a very unproductive situation, because like in other fields, science should be able to profit from the experience of practitioners. There are signs, however, that change is underway as the anomalies to the "random walk" paradigm are becoming apparent. The shock of 1987, where the New York Stock Exchange dropped more than 20% in a single day without any significant news, has been an important catalyst. Since then

"Behavioural Finance" – "open-minded finance" - has been established and is gaining momentum (Thaler, 1993).

III. Anomalies* to the "Efficient Market"Hypothesis. Behavioral Finance

Over the past years the *anomalies* of the "random walk" paradigm and the "efficient market" hypothesis have come under closer scrutiny. No doubt the stock market crash of 1987 has been an important catalyst.

On Monday the 19th of October 1987 the broad S&P Stock Index fell by 20.47%, without any important news to trigger it. This was a shock to the market, and beyond anything the "efficient market" hypothesis and the universal rationality that it implies could explain. (The explanation that the crash was not "very forecastable" and thus did not violate "efficient market" conditions, has failed to convince).

Questions are being raised as to the general validity of the "efficient market" hypothesis and the "random walk" paradigm. A number of anomalies are currently under scrutiny, such as:

- The Capital Asset Pricing Model (CAPM). The CAPM and its "beta" seem to have little predictive power.
- The enigma of closed-end funds. Why do the shares of such funds so often sell for prices that differ considerably from the assets that the fund owns, for no obvious reason?
- "The IPO puzzle". Why are IPOs (Initial Public Offerings) consistently overpriced?
- "The forward discount bias" in exchange rates. The difference between spot and forward rates should imply a prediction of future rates. Surprisingly, rates seem consistently to move in the opposite direction of this implied forecast. Why?
- "The take-over puzzle". Stockholders in the acquiring firms do not appear to make any money. Why then take over?
- "The small firm effect". Why have small firms a consistently lower price-earnings ratio than would be rationally expected?
- "The calendar effect". Why does January usually come out better than other months?
- And so forth.

*"Anomaly" used in the sense "deviation from expected value according to the accepted paradigm", in this case "random walk".

The most serious objection to the "efficient market" hypothesis (EMH) than any single anomaly is the fact that stock values as calculated by EMH, based upon reasonable assumptions, does not correspond very well neither to actual stock values nor to stock value variations. "Expected value"* is a very stable number that has not changed very much over the past decades, implying a similar stability of stock prices. A number of studies (Robert Shiller(1989), De Bondt & Thaler (1986), and others) have shown that actual price variations are most considerably larger. It is also not very difficult today to find stocks priced beyond any "expected value", based upon reasonable assumptions as to rates of discount, growth, earnings, dividend policy, etc.

The "efficient market" hypothesis makes the assumption that "irrational" and emotional behaviour in the market would be corrected by "rational" arbitrageurs, who because of their superior rationality would dominate the market. This catalogue of anomalies, however, shows that this hardly is the case. The rationality assumption will have to be modified in order to arrive at more realistic models of market behavior.

The efforts in this direction have been termed "Behavioral Finance". Professor Richard H Thaler of Chicago University has collected some of the key works in this area under the title "Advances in Behavioral Finance". Here he broadly defines "Behavioral Finance" as:

> A concern with real world problems and a willingness to consider all explanations in the search for understanding. I think of behavioral finance as simply "open-minded finance" (Thaler 1993, pg. xvii)***.

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* The "expected value" is a forecast of the present value of future forecast dividends, discounted at riskfree rate plus risk premium. Normally the returns to the investor are calculated as dividends *plus* capital gains. Especially over the past years there has been a tendency to view returns *only* in terms of capital gains. "Expected value", however, is a concept which views capital gains as expectations of future dividends, up to a point in time where discounted value of dividends become insignificant.

** According to Kuhn there is a strong tendency to interpret anomalies to a paradigm in terms of the very same paradigm:

> - we have already seen what scientist do when confronted with an anomaly. They will devise numerous articulations and *ad hoc* modifications of their theory in order to eliminate any apparent conflict (Kuhn 1992, pg 78).

We meet the same problem in finance:

> The faithful of the ruling paradigm have marginalized behavioral finance by making it the "anomalies litterature". But even proposed proponents of behavioral finance are marginalizing themselves by clinging to the underlying tenets, forms and methods of what is now called modern finance. (Frankfurter and McGoun 2000a, pg 2)

IV. "The John Stuart Mill Process"

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The Bachelier postulate is beautiful in its simplicity. It is the foundation of "modern finance", stringent in its clinical rationality and mathematical consequence. But where are the emotions? An academic can overlook the emotional element, a practitioner cannot afford to. As the old saying bluntly states: "Wall Street is greed and fear. The rest is bullshit". A lifetime of work with company forecasts has taught me that *if there is a conflict between emotion and reason, emotion usually wins.*

More than 150 years ago John Stuart Mill wrote a vivid description of speculative market behaviour:

> "The inclination of the mercantile public to increase their demand for commodities by use of all or much of their credit as a purchasing power, depends on their expectation of profits.
>
> When there is a general impression that the price of some commodity is likely to rise, from an extra demand, a short crop, obstruction to importation, or any other cause, there is a disposition among dealers to increase their stocks, in order to profit from the expected rise.
>
> This disposition tends by itself to produce the effect which it looks forward to, a rise of price; and if the rise is considerable and progressive, other speculators are attracted, who, so long as the price has not begun to fall, are willing to believe that it will continue rising.
>
> These, by further purchases, produce a further advance: and thus a rise of price for which there were some rational grounds, is often heightened by merely speculative purchases, until it greatly exceeds what the original grounds will justify.
>
> After a while this begins to be perceived; the price ceases to rise, and the holders, thinking it time to realize their gains, are anxious to sell.
>
> Then the price begins to decline; the holders rush into the market to avoid a still greater loss, and, few being willing to buy in a falling market, the price falls much more suddenly than it rose." (Mill 1848, pg.)

This is a typical chain of events that will be readily recognized by market practitioners. It is a process that feeds on itself, and where the news input is the actual price action. This goes on until we reach a point of exhaustion, whereafter we get the same process in reverse.

The importance of this "Mill Process" as a major psychological force in economic life is corroborated by a number of well-known scientists.
Artur Pigou, the father of the "Cambridge School of Economics", saw such psychological processes as the main driving forces behind general boom and bust

cycles (Pigou 1927, chapters IV-VIII). The German-born banker/economist, Professor Albert Hahn, expresses it this way:

> A rise in price leads entrepreneurs to expect further rises. Consequently, they make new investments and build inventories, which in turn operate to boost prices further. The moment the stimulus of rising prices is exhausted, the cumulative boom spiral reverses its direction. Since there is no new stratum of buyers on whom the bulls can unload, the downward movement gains momentum (Hahn 1949, pg. 167).

In his introduction to the 1997 reprint of his classic "The Great Crash 1929" John Kenneth Galbraith describes the process in these terms, related to the present market situation:

> That we are having a major speculative splurge as this is written is obvious to anyone not captured by vacuous optimism. There is now far more money flowing into the stock market than there is intelligence to guide it. … *But there is here a basic and recurrent process* (my emphasis). It comes with rising prices, whether of stocks, real estate, works of art or anything else. This increase attracts attention and buyers, which produces the effect of even higher prices. Expectations are thus justified by the very action that sends prices up. The process continues; optimism with its market effects is the order of the day. Prices go up even more. Then, for reasons that will be endlessly debated, comes the end. The descent is always more sudden than the increase; a balloon that has been punctured does not deflate in an orderly way. (Galbraith 1954, pg. xii)

The same thing is confirmed by Robert J Shiller's investigation of the 1987 crash (Shiller, 1989). He found that the *initial price drops themselves* were the most important news that triggered the crash, against a growing general feeling that enough was enough: "stocks were overpriced", "too much indebtedness in the economy", "program trading has changed the rules", etc. In his latest book Shiller arrives at a description of a market mechanism which is in full agreement with John Stuart Mill:

> "The amplification mechanisms (of the markets) work through a sort of feedback loop. --- Investors, their confidence and expextations buoyed by past price increases, bid up stock prices further, thereby enticing more investors to do the same, so that the cycle repeats again and again, resulting in an amplified response to the original precipitating factors". (Shiller 2000, pg. 44)[**]

[*]Shiller compares the market feedback loop to a "Ponzi process", after the 19th century Boston defrauder. This is only part of the story. Ponzi was a criminal, and the Ponzi operation was a one-off affair which ended in bankruptcy. The "Mill process", however, is a fundamental psychological mechanism that works at all levels, and that occasionally erupts in a full-blown crash.

Shiller is also careful not to challenge present doctrines:

> I do not purport to present a wholly new conception of financial market behaviour. This book is a work neither of economic theory nor of econometrics, although it partakes in both. (Shiller 2000, pg. xiii)

In another publication Shiller goes as far as to say that:

> Mass psychology may well be the dominant cause of movements in the price of the aggregate stock market. (Shiller 1984, Thaler 1993, pg 167)

A further factor which accellerates price deterioration once initiated is the widespread use of "stoploss" orders. These are orders where the price action itself directly and automatically generates market sell orders, once the price breaks a predetermined level. The development of fast electronic communications further increases the risk of abrupt and incontrollable selloffs in the market.[**]

George Soros views the inherent instability of the financial markets with concern:

> The search for an equilibrium price turns out to be a wild goose chase, and the theories about equilibrium price can themselves become a fertile source of bias. (Soros 1994, pg 45)

He even sees instability as part of a serious potential threat to our society (Soros, 1998). Shiller shares George Soros' concern about the potential consequences of market instability:

> How we value the stock market now and in the future influences major economic and social policy decisions that affect not only investors but also society at large, even the world. (Shiller 2000, pg xii)

And what about the practical significance of the concept of a rational "expected value"? *John Kenneth Galbraith* says in his description of the 1929 crash:

> At some point in the growth of a boom all aspect of property ownership becomes irrelevant except the prospect for an early rise in price: income from the property, or enjoyment of it's use, or even it's long run worth are now academic (Galbraith 1954, pg 18):

[**]There are indications that the US Administration and the Federal Reserve are acutely aware of these risks. In the summer of 1997 the then Secretary of Finance Rubens declared that: "We see it as our task to have mechanisms in place to prevent that a decline in the stock market will create disturbances in our whole financial system". In a closed Congress committee meeting on 16 September last year he is reported to have stated that: "We have long recognized that helping to prevent extreme market fluctuations from generating *self-fulfilling losses* of confidence that could unneccesarily destabilize the real economy is an appropriate objective of government policy. We also recognize that government action is often required to create conditions for markets to work at their best" (Schultz 2000, pg 1). So much for the practitioners' faith in the "efficient market" hypothesis.

What is then "rational behavior" in an environment dominated by irrational expectations? It is a situation governed by it's own perverse logic. If prices are rising beyond normal "expected values" should the "rational" operator then quit? But what if prices notwithstanding have still further to go? Remember that consensus after the 1987 crash was that "stocks were overvalued", with DJIA at a quarter of its value today. Can a responsible fund manager miss out on such unbelievable price increases? With a few notable exceptions – Berkley Hathaway, the Tiger Fund and others – the investors have followed suit, "rational" or not.

Major booms and crashes are rare events. But there are similar boom-and-bust processes going on at all levels in the speculative markets, as illustrated by the parlance of the traders: "The trend is your friend", "Cut your losses short" etc.

Once we accept the "Mill Process" as a fact, we are faced with a dillemma. The Mill Process is *an unstable process* , very far from the equilibrium postulated by Bachelier and the "efficient market" hypothesis. Can the two be reconciled?

It is no denying that such fundamental and unresolved conflicts are taking their toll on the credibility of economics as a legitimate science. In a recent article in the Economist on the future of economics, the harsh question is asked: *"In the long run, is the subject dead?"*. Further in the text, economics is referred to as *"the dismal science"* (Economist 2000, 4 March pg. 90).

V. Do Trends Exist?

Would it not be logical to assume that a psychological force of such strength as the Mill Process would leave recognisable patterns in the prices generally?

What the Mill Process essentially says, is that a rise in price tends to stimulate demand, and conversely that a falling price tends to discourage demand. This in fact is near to identical with the definition of *a trend*, offered by Charles H Dow at the end of the 19th century:

> Buy when the market is making higher tops and higher bottoms which shows that the main trend is up. Sell when the market is making lower tops an lower bottoms wehich indicate that the main trend is down. (Gann 1949, pg.12).

The implication is that once such a succession of prices develops, there is a more than equal likelihood that it continues in the same direction.

According to Richard Shiller this was precisely the case in the 1987 crash:

> -the initial price drops themselves were the most important news that triggered the crash; the timing of the crash is not explained as the reaction to any particular news break at the time. (Shiller 1989, pg 371)

thereby initiating selling, thereby pressing prices still more, then more selling, - and we have a steep downtrend feeding on itself.

The concept of a"trend" is in obvious conflict with the Bachelier "zero expectation", "fair game" and "equilibrium" postulates, and the consequent "efficient market" hypothesis. As a result there has been no serious effort since Alexander (Alexander, 1961 and 1962) to study this question. There are in fact warnings against doing so:

> - the more we scrutinise a fixed collection of data, the more likely are we to find interesting (spurious) patterns. Since stock market prices are perhaps the most studied quantities to date, financial economists must be particularly vigilant about such "data-snooping" biases (Lo and MacKinley 1997, pg 6).

In its way the warning is well justified. The general experience is that once you start expressly looking for such price patterns, you start seeing them everywhere. Not only is there one trend, there are many. There are main trends, secondary trends, trend channels, symmetrical patterns, - a fascinating and bewildering picture. Could it be the product of pure chance?

Let me give an exampl. **Figure I** shows daily high-low-close values for the DJIA over a period of several months. A trendline **A** can be drawn that with considerable accuracy connects the top values of the curve. This could of course be pure by pure coincidence. Then we find a parallel trend curve **B** that with similar accuracy connects extreme values at a lower level. For about half a year values oscillate within what may be called a "channel". Again, this could still be coincidental. But then we find still another parallel trend curve **C** at a still lower level and further down still another, **D**. The latter is not as well defined as the other three, but it has another quality. Taking curve **A** and **D** we find that curve **B** lies precisely in the middle of the two, **B** being some sort of symmetry axis. It could still be coincitental. However, meeting with such coincidences time and time again, justifies suspicion that there may be systematic forces at work.

This simple example illustrates three observations commonly made when analysing price charts:

?? Trendlines may be drawn, at times with astonishing accuracy.
?? Parallel trendlines form channels
?? Patterns tend to be symmetric.

In their classic work on technical analysis Edwards and Magee thus comment on the amazing regularity of stock trends:

> Not only the smaller fluctuations but frequently also the great primary swings of several years duration appear on the charts as though their courses had been plotted with a straight-edge ruler. This phenomenon is, in truth, the most fascinating, impressive and mysterious of all that the stock charts exhibit (Edwards and Magee 1948, pg 235).

This phenomenon, however, so obvious to the intelligent observer, has surprisingly escaped the formidable array of scientists that have researched speculative prices. How come that for instance Kendall, one of the most brilliant statisticians of his time, found *"no structure of any sort"* in the price material? Are we at a point where pure mathematics has exhausted its usefulness? Frankfurter and McGoun has this observation:

> Yet, we seem to prefer the mathematical "explanation" of social phenomena, and the more complex the explanation, the better. Our relentless quest for intricate mathematical models (to imitate physics) turns into a sort of academic joust, in which one seeks to confirm,one's claim to knighthood (Frankfurter and McGoun 2000b, pg 27).

It must be admitted, however, that there is precious little to show in the way of proof of the existence of trends. One of the few efforts in this direction is the work of Mrs. H.L. Allen and M.P. Taylor sponsored by Bank of England and prompted by the widespread use of charts in foreign exchange trading. Comparing chartist- to other forecasting approaches, the study concludes that:

> Comparison of chartism with other forecasting approaches show that it is more than a naive "eyeball Box-Jenkins" method. The better chartists can in fact outperform a random walk (Allan and Taylor 1989, pg 18).

VI. Confirmation

In July 1997 I made a thorough analysis of the DJIA (Dow Jones Industrial Average Index) over the past century. Fortunate circumstances makes this an example of trend confirmation that cannot be ignored (Sødahl 1997).

Figure II show monthly high-low-close logarithmic values for DJIA over the century. The trend which I at the time judged to be the dominant long-term influence is drawn in with 5 separate trendlines.

A trend can be defined by its *trend multiplier*, which is the factor by which to multiply the immediate trend value to get the trend value one year hence. The multiplier can be computed choosing any two points on a trendline using this relationship:

- with trend values(V), elapsed time (t = t – t) and trend multiplier (M). The points used in **figure II** are A and B. The calculated trend multiplier is 104,73%.

As will be seen most of the price action in the century lies within the core trend channel defined by trendlines 2 and 4, with trendline 3 as symmetry axis. One notable exception is the late 20-ties, where price after a couple of years of attack at trendline 2 breaks through and rises steeply until culmination in October 1929. Then we get a steep fall in price and we experience the same overshoot on the downside. The price finally breaks through trendline 4 on the downside and culminates in the bottom of July 1932.

Next time we experience a breakout of the main trend channel is in February-March 1995. Also after some years of attack, trendline 2 is broken on the upside, followed by a steep price accelleration. According to the logic of trends it would certainly be possible, but by no means certain, that *trendline 1 would again act as a turning point.*

I wrote at the time:

> The study---indicates that we are approaching a limit which on the basis of historical analogy may prove to be a final upper limit for the price advance. ---- These indications have to be treated with caution. I believe, however, that it would be foolish not to see these indications as realistic possibilities (Sødahl 1997, pg 3)
>
> Until the assumptions and arguments of this study have been proven wrong, I believe it is wise not to discard the possibility of the scenario described, and to prepare for that possibility. As Secretary of Finance Mr. Rubens recently said: "We see it as our task to have mechanisms in plasce to prevent that a decline in the stock market will create disturbance in our whole financial system" (Sødahl 1997, pg 9)

Because of its sinister implications, I took the step of registering the study with the Notary Public.

We now have the answer. The price advance was in fact arrested in April 1998, see **figure III**. If we now adjust trendline 1 from the line that was forecast (**figure II**) to the line connecting the top in October 1929 to the point of price arrest in May 1998, we find the trend multiplier of the corrected trendline to be 104,78%, *only insignificantly different from the one forecast.*

Figure IV shows a close-up of the development April 1998 to March 1999, in daily high-low-close prices. An exact computation of the trend multiplier at this level yields a result almost identical to the forecast value. The slight deviations on either side probably are inherent in the precision of the method of drawing as well as the choice of reference points for the trend.

We now know that the price was not finally turned down by trendline 1. It was only arrested there for most part of a year, during which we had the most serious downturn since the breakout in March-April 1995. But thereafter the market recovered, and after a couple of attacks on trendline 1 price finally broke through on 5 March 1999. **Figure V** shows the minute-by-minute action that day. Price rapidly rose up to the trend in the first half-hour of trading, and then remained there most of the day, attemptin to break through. It finally succeeded in the very last trading hour.

We can be thankful that we have been spared a major market downturn, at least for now. But my postulated trendline appeared precisely as forecast, a trendline that was *indicated by market action more than 68 years earlier*.

I offer this as proof that this trend does exist.

V. Reflections

This case does not qualify as a general confirmation of trend existence. I am currently exploring alternative ways of arriving at such a proof. But the facts of the case should carry enough weight to demonstrate that the trend concept definitely has to be taken seriously.

Now, if we do just that, a number of new and puzzling questions emerge.

As pointed out, the "Mill process" provides a general explanation of the trend phenomenon. The process describes how presumably independendent operators act in concert, creating price movements for which there is slight or nonexistent objective justification. But how do we account for the astonishing precision we often find in trend formation (cf. **Figure I** and Edwards & Magee 1948)

The explanation commonly offered is that this is the result of a self-fulfilling process. Traders everywhere, the reasoning goes, tend to draw the same trendlines, thus generating this astonishing precision (Working 1934). The explanation is hardly satisfactory, for a number of reasons. One is that chartist methods are not very uniform (Allen and Taylor, 1989). And how do we then explain the fact that we see the same behavior in indexes, which are composed of a number of trading objects? This even goes for indexes for which there is no derivative trading. Who for instance would have been interested in drawing trendlines for DJIA? DJIA derivatives have only been traded for the last couple of years of the last century. And how do we explain trends that exert their influence over time spans covering generations of traders?

And what about the trend concept itself? The word "trend" or "trend channel" is generally used to describe the outer confines of price movements. But further scrutiny will indicate that price histories not only contains dominant "outer trends", but also a great number of lines *inside* the price picture showing the typical trend characteristics. We also find junctions where one of these secondary "inner trends" becomes a dominant "outer trend" (**Figure IV**). Chartists have at all times been looking for signs of such changes of trend. Different types of signs have been named, such as "triangles", "wedges", "flags", "pennants", "head and shoulders", etc. This has been looked upon as part of the metaphysics of "technical analysis". However, could these formations be explained as products of just trend conflicts? An example may be the triangle formation from October 1987 to May 1990 (**Figure II**).

In more general terms a trend, "inner" or "outer", may be described as a *force,* striving to contain the price. What strenghtens this impression of forces at work, is the observation that when the price finally breaks a strong trendline, it often does so with a certain energy. These "forces" correspond to the familiar chartist concepts of "support" and "resistance".

When price meets such a "force" there are two possibilities, either it will be contained by the force, or it breaks through (Cf. **figure V**). Which way it goes, may be determined by seemingly insignificant factors, as compared to the size of the move (cf. John Stuart Mill). As mentioned earlier professor Shiller even ventures that:

> Mass psychology may well be the dominant cause of price movements in the stock market (Thaler 1993, pg 169).

This is a situation which associates the "bifurcation" concept of Chaos Theory. A bifurcation is just a point of two way choice, where the outcome is determined by impulses that are insignificant compared to the consequences of the outcome (Gleick, 1988). To what extent can the stock market be described as a "chaos situation"?

Take the famous crashes of 1929 and 1987. In 1929 we had a strong market rebound after the initial crash, recuperating about half the loss. We had a similar rebound after the 1987 crash. The difference is that in 1929 the market thereafter resumed the downfall, whereas in 1987 prices continued to rise. To all appearances we had a strong economy in the 1920-ties, fuelled by a number of important innovations. Why did the boom then come to such dramatic stop? And why did we have this spectacular recovery following the 1987 crash? *[*]

* GM Director Raskob is credited with, in the summer of 1929, triggering the final acceleration of the bull market by declaring that GM stock should be selling at not less than 12 times earnings. Today a company like Cisco sells at 121 times eamings (!).

Once we try to penetrate the “Mill process” and its consequences, these and other questions come to the forefront. We are faced with the fascinating mystique of the unknown.

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