

IFTA Journal 08

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"...instead, what we can do is create a mathematical model that can mimic the real thing – can mimic how much a price varies, how quickly it rises or falls... And from it, you can develop a powerful new tool to study and work in the market."

Benoit B. Mandelbrot



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Letter From The Editor

Regina Meani ^{CFTe}
STA, ATAA, APTA

Striving for excellence and the vigilant search for new and innovative ideas is what brings together professionals in their chosen field. The International Federation of Technical Analysts provides several forums to bring together its professionals in our common goal to expand the field of Technical Analysis of the Financial Markets.

The 20th Annual IFTA conference, held in Sharm el Sheikh, Egypt this year, brings together Analysts from all over the world around the 2007 theme of *Middle East, Energy, Commodities and the Globalization of the Financial Markets*. Over a period of four days attendees from all continents will meet for presentations, discussions and network with leading Technical Analysts.

Professional Accreditation in any field is a mark of distinction. As a world-wide Federation for Technical Analysis, IFTA sponsors the single globally-recognized professional certifications in the field, the CFTe, and MFTA. Both the CFTe and MFTA designations set IFTA colleagues apart with standards of professionalism increasingly welcomed by investors, regulators and institutions.

In a two tiered process, IFTA colleagues may sit for two successive examinations which culminate in the award and professional qualification in Technical Analysis as a Certified Financial Technician (CFTe). The exams test not only technical skills knowledge, but also ethics and market understanding. In the second tier, IFTA's Master of Financial Technical Analysis (MFTA) candidates produce an original academic-style research paper proposing to add to the TA body of knowledge. This second tier is a severe test of professionalism in the global arena.

This brings us to the IFTA journal which is — through its global distribution to professionals in the field — now one of the most important forums to publish leading work in TA. In past years we have endeavored to present the most meritorious work by MFTA Candidates. In this 2008 edition of the IFTA Journal, we have published four MFTA research submissions. This body of work offers fresh ways of looking at the behavior of markets and is testament to the high standing of the MFTA designation.

As the new editor of the journal it is my pleasure to announce some changes in this edition. Our "call for papers," sent out earlier this year (and to be repeated every year), produced a commendable response and we present papers on trend analysis, and market behavior, market depth and time structure; on the dynamic MACD; and on the development of a TA tool-kit. Professor Hank Pruden follows up on his Wyckoff paper first published in the IFTA 2003 Journal.

Towards the end of the journal we introduce you to the writers in "Author Profiles" where you will find brief biographies. In future editions of the journal we plan a "Books" section where we will review and discuss ideas from recent and notable publications.

Finally, I would like to thank the Authors of the papers included in this journal, all of whom have made a contribution to the field of Technical Analysis; I am sure readers will benefit from your work. My grateful appreciation and thanks go to my team: Roberto Vargas and Dr. Rolf Wetzler who have been tireless, devoting many hours of their time to edit and produce a professional journal. For their help and advice in guiding me through my new role, I thank Larry Lovrencic (former editor) and Elaine Long Knuth (IFTA chairperson).

In Memoriam: John C. Brooks

Elaine Long Knuth

For all of us, there are some unique people we will never forget. John Brooks was such an individual. When he passed away this June, IFTA lost not only one of its founding members, but an exceptional person, a dear friend and teacher to many.

John was a veteran of Wall Street and of life; and he was neither fooled nor fool-able. Anyone who met John understood this about him immediately. John had values. He never put himself out front, but stood back and observed. He had a way of looking at the world and immediately taking its measure for what it was. Just like that — quick, sharp and with a glint in his eye. His lightning fast wit was always spot on, yet never with malice. This is what made him the clear perceptive analyst, and the special person.

In this spirit he was the honest friend and supporter we at IFTA came to know. I was lucky to know and be associated with John who would always — no matter how busy he was — answer his phone with a warm and welcoming “Brooklynese” “how are ‘ya Deaaer...” I can hear his voice now.

John worked at a number of firms in the canyons of Wall Street: Dominick and Dominick, Edwards & Hanley, Robinson Humphrey, and more recently at Lowry Research Corporation, where he served as Senior Vice President and Senior Analyst. John was absolutely dedicated to the professionalism of TA. He was the co-founder and Past-President of the Market Technicians Association (MTA). In 1985, he co-founded the International Federation of Technical Analysts (IFTA) that today includes thousands of members worldwide and continues to grow. He served as IFTA's Chairman from 1996-1998. As the long-time Chairman of the MTA Educational Foundation, John was instrumental in establishing accredited college-level courses in Technical Securities Analysis. His dedication to TA and to his colleagues did not stop there. In recent years, John co-founded the American Association of Professional Technical Analysts (AAPTA), a member society of IFTA. And in 2005 John authored the wonderful read, *Mastering Technical Analysis* published by McGraw-Hill.

John had a number of awards, and most recently — and one for which he was particularly proud — he was named a Fellow of the British Society of Technical Analysts. This award is not lightly given and was in recognition of his outstanding support of technical securities analysis throughout the world.

Let me end here, not with a greater list of John Brooks professional accomplishments, but with his own words sent to colleagues at the start of the year — good natured, lively and ever supportive:

“Hi All: As the year comes to a close I know a lot of folks will be busy doing other things. I wanted to take a moment to publicly say thank you and wish the best. I also would like to wish everyone a great holiday season. It's going to be a great 2007 for IFTA.” John C. Brooks

Trend Behaviour, Market Depth and Time Structure of Single Stocks within Stock Indices

by Rolf Wetzler

Abstract

The following work is a technical study of markets using the example of the German hDAX index. The paper attempts to answer questions on the stability and robustness of the prevailing trend using different technical tools. It takes advantage of a bottom-up approach to add a perspective from the point of view of single stocks within the total market. Classic technical tools are used as well as the new concept of the time structure. Emphasis is applied to the graphic compression of information for single stocks.

Introduction

Investors are generally interested in the strength of the current trend in the market if it has large market depth, and how up-to-date the price-driving factors are.

Most of the time, commentary on the stock market is based on the analysis of a particular index. This "top-down" analysis rescues the investor from the time-consuming work of analyzing individual stocks. He only needs to look at one aggregate figure, the index. Through this kind of analysis, however, valuable information on individual shares is lost.

Methods and Background

In contrast, this paper looks at the stock market with a "bottom-up approach," examining the individual shares. It describes the behavior of all the single stocks within the index and bundles this information to deliver an additional dimension on the total market. The paper analyses the hDAX index, an aggregated German index containing 110 stocks of the most popular German indices: DAX, MDAX and TecDax. It is a broad market index, covering the main stocks of the German Prime Standard. The challenge of using the hDAX was to extract information from the 110 single stocks into a few easy to read, yet informative graphics. The classic line chart of the hDAX is shown in *figure 1*.

In *figure 1*, the hDAX exhibits an extended uptrend from 2003. It recently formed new all time highs but, at the same time, appears to be overextended. The question is if this current trend is in jeopardy or not.

The analysis is based on data from July 12, 2007 and is created exclusively on MS Excel™ which can be easily reproduced. Additional charts illustrating different points in time are added to clarify or expand concepts presented. The study limits itself to technical data, i.e. prices, monthly and annual highs or lows, with the corresponding dates when these extreme values were traded in the market. Moreover, the market value of the respective share was processed.

As 110 single values are analysed, the analysis does not refer to the movement of a single share in time, but instead illustrates the technical constitution of all shares as a cross-section on a particular point in time.

The analysis consists of three parts: trend behavior (structure), market depth (breadth) and time structure.

Trend Structure for Single Stocks

The first step is to describe the trend behavior for every single stock by an indicator, and to plot it in a single graph. This serves as an overview of the market and allows us to discern which, and how many shares, support the current trend of the market.

To do this, two classic ideas from technical analysis are borrowed and combined together: Donchian's four week rule and the standard inputs using the Stochastic indicator. According to the rule of Donchian, a share that trades at its four week high should be purchased while a share that trades at its four-week low should be sold. The %k measurement of the Stochastic indicator describes the current market price as a percentage of the distance between the current price, and its four week low relative to the total range traded within the last four weeks.

$$\%k = \frac{C_t - L_{t-20}}{H_{t-20} - L_{t-20}}$$

C := closing price

L := lowest price

h := highest price

t := daily time index

Figure 1: HDAX price chart



This four-week %k coefficient is then determined for each stock within the market index. A value of zero means that the share has just formed a new low price, while a value of one signals a new high price. A value of 0.23 means that the share price has recovered 23% from its lowest low price of the last 20 trading days, relative to its trading range.

If we plot this coefficient for each single stock in the index, we create a *Range Distribution* chart. An example of a *Range Distribution* chart for the hDAX is shown in figure 2.

How should we read this chart? Every single point on the range distribution represents a share of the hDAX. The %k values of the respective stocks are shown on the y-axis. These values change daily. The chart does not consider time, but instead a cross-section of all shares in the index at a single point in time.

If this chart shows many points (stocks) at 0.75 or above, a variety of shares are approaching new highs. These shares are marked green in the chart as a symbol of their uptrend. If, on the other hand, the chart shows many stocks at 0.25 or lower, many shares are approaching new lows. These shares are marked red, representing a downtrend. Shares with a %k between 0.25 and 0.75 swing to and fro unenthusiastically in a trading range, exhibit a neutral trend behavior, and are marked in yellow. Shares that tend to go up or down in a directionless manner, are considered the motor for future trend behavior. If many of the yellow stocks become green or red stocks in the future, they will add to the ongoing trend. Usually, stocks that are already red or green will fall back into the yellow range after some time, but tend not to cross the whole area in one step.

In summary, the *Range Distribution* graph resembles a traffic light reflecting the trends of single stocks within an index. From this, it is possible to gain, at a glance, additional insight to the trend for the overall market. It contains all the trend information for the last trading month, not in absolute terms, but relative to each stock's trading history.

At the time of this analysis, 26 of 110 shares exhibit a %k over 0.75 in the trend mode, whereas 38 stocks trend downwards (%k less than 0.25). The remaining 46 shares are in a neutral condition ($0.25 <$

$\%k < 0.75$). The existing up-trend of the hDAX is therefore supported by a quarter of the index members and the downward trending stocks are not sufficient to turn the ship around. Many neutral shares are stabilizing the trend, but their future behavior remains unclear.

For another example, we show the *Range Distribution* of the Nikkei 225 for July 12, 2007 (figure 3). If we compare it with the hDAX, the Nikkei seems to be more distinct in its extreme values, with more green and red stocks at the top and bottom relative to the hDAX. Therefore, the yellow (neutral) stocks are not so cumulative. What is

astonishing is that within the group of down trending stocks, the majority traded at their relative low, with few trading at their relative high. This may be a sign that there is downward pressure on the Index.

The great advantage of the *Range Distribution* is its simplified representation of the trend behavior of all single values in the selected index. In addition, concrete ideas and analysis for single stocks may be derived from this tool.

It is simple to screen the %k coefficients of the individual shares in order to look for simple buy and sell candidates. Following the idea of combining Donchian and %k,

Figure 2: HDAX range distribution (July 12, 2007)

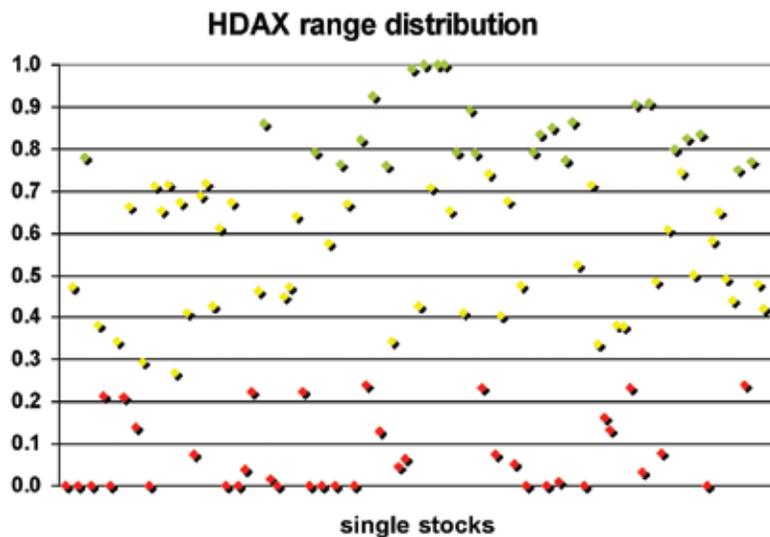


Figure 3: Nikkei 225 range distribution (July 12, 2007)

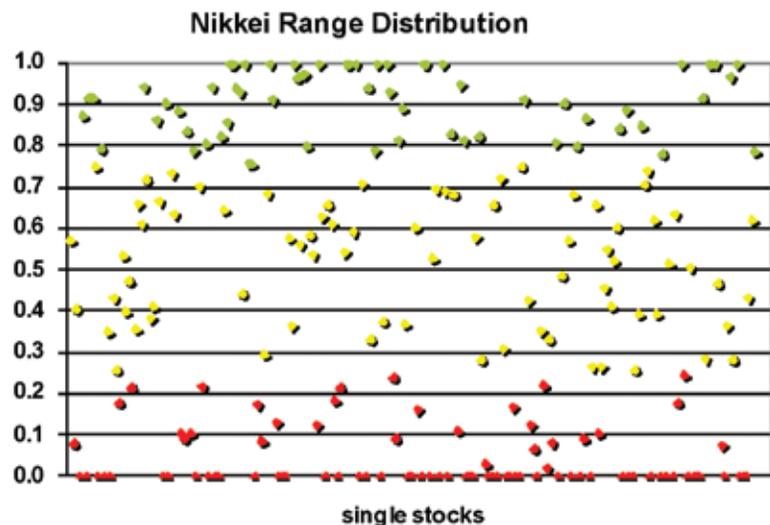


Table 1. “Green” HDAX single stock list (July 12, 2007)

NAME	P	High(20)	%k
JENOPTIK (XET)	7.78	7.78	1.000
KLOECKNER & CO (XET)	61.00	61.00	1.000
KONTRON (XET)	14.76	14.76	1.000
INFINEON TECHS. (XET)	12.94	12.95	0.992
HENKEL PREF (XET)	41.01	41.29	0.926
SGL CARBON (XET)	34.44	35.04	0.908
SALZGITTER (XET)	152.26	153.79	0.906
LEONI (XET)	37.56	37.98	0.892
PREMIERE (XET)	19.13	19.46	0.863
DOUGLAS HOLDING (XET)	48.89	49.10	0.960
PFEIFFER VACUUM (XET) TECH.	71.63	72.00	0.851
SYMRISE (XET)	21.79	22.11	0.836
NORDEX (XET)	33.38	34.63	0.834
STADA ARZNEIMITTEL (XET)	48.98	50.05	0.824
HEIDELB DRUCK (XET)	38.84	39.57	0.823
SOLARWORLD (XET)	36.75	37.87	0.800
KUKA (XET)	27.27	28.00	0.794
NORD AFFINERIE (XET)	33.75	34.85	0.794
FREENET (XET)	24.80	25.02	0.792
LINDE (XET)	89.30	91.36	0.788
AIXTRON (XET)	6.80	7.01	0.781
PRAK BAUHEIM.HLDG. (XET)	31.58	32.33	0.775
WACKER CHEMIE (XET)	177.16	180.60	0.771
GEA GROUP (XET)	25.80	26.66	0.764
BOSS (HUGO) PREF. (XET)	45.00	45.42	0.760
VOLKSWAGEN (XET)	120.74	124.12	0.751

Table 2. “RED” HDAX single stock list (July 12, 2007)

NAME	P	Low(20)	%K
AAREAL BANK (XET)	37.05	37.05	0.000
ADVA OPTC.NETWORK (XET)	6.82	6.82	0.000
ALLIANZ (XET)	167.77	167.77	0.000
ARCANDOR (XET)	23.92	23.92	0.000
BB BIOTECH (XET)	57.01	57.01	0.000
DEUTSCHE BANK (XET)	105.11	105.11	0.000
DEUTSCHE EUROSHOP (XET)	50.75	50.75	0.000
DEUTSCHE TELEKOM (XET)	13.45	13.45	0.000
FRAPORT (XET)	51.6	51.6	0.000
FRESENIUS MED.CARE (XET)	33.19	33.19	0.000
GAGFAH S A (XET)	16.05	16.05	0.000
HANNOVER RUCK (XET)	35.35	35.35	0.000
MUENCHENER RUCK (XET)	133.01	133.01	0.000
PATRIZIA IMMOBILIEN(XET)	12.55	12.55	0.000
PUMA (XET)	330	330	0.000
TECHEM (XET)	51.6	51.6	0.000
PFLIEDERER (XET)	22.57	22.55	0.011
DRAEGERWERK PREF. (XET)	66.78	66.7	0.018
SAP (XET)	36.61	36.56	0.031
DEUTSCHE POST (XET)	23.28	23.22	0.038
IDS SCHEER (XET)	16.79	16.7	0.045
MORPHOSYS (XET)	47	46.86	0.051
IKB DT.INDSTRBK. (XET)	26.19	26.1	0.065
COMMERZBANK (XET)	34.67	34.49	0.075
MERCK KGAA (XET)	100.9	100.44	0.075
SINGULUS TECHS. (XET)	9.78	9.68	0.078
HOCHTIEF (XET)	79.73	79.05	0.131
RHEINMETALL (XET)	68.34	67.7	0.132
BMW (XET)	47.58	47.24	0.140
QSC (XET)	4.68	4.57	0.162
AWD HOLDING (XET)	31.45	31.04	0.209
AMB GENERALI HDG. (XET)	112.97	112.39	0.214
DEUTSCHE POSTBANK (XET)	62.55	61.56	0.224
EADS (XET)	23.64	23.42	0.224
RWE (XET)	78.37	77.27	0.233
DEUTSCHE LUFTHANSA (XET)	20.46	20.31	0.234
HEIDELBERGCEMENT (XET)	110.66	108.85	0.239
VOSSLOH (XET)	86.72	85	0.239

we can generate a simple list of all stocks which are green in the chart, i.e. with a %k greater than 0.75. Below in *Table 1* is a daily list for the hDAX.

The same list can easily be generated for stocks in a downtrend, exhibiting a %k of 0.25 or less. These stocks are the “red” stocks in the *Range Distribution*. See below in *Table 2*.

With the *Range Distribution* and the corresponding screening lists, it is possible to quickly judge the health of the market.

Market Breadth of the Current Index Trend

The second part of the analysis is devoted to market breadth. So far, we have analyzed the current trend behavior of single stocks. Often, however, the question is if the trend in the index is broadly based, or if it is only supported by a few highly capitalized shares. Technicians will ask whether the trend is supported by market breadth or not. A well-known example of a trend supported by only a few stocks was the “tech bubble” in 2000-2003, when the German market was driven mainly by Telecom stocks.

In the example of the hDAX *Range Distribution*, we observed more down trending stocks (red) than up trending stocks (green). As the market is in an uptrend, either the market value of the rising issues must be more important than the market value of the falling issues, or the trading range of the falling stocks are tighter relative to the ranges of the rising issues. To include trading size into trend analysis, we can use the relative market capitalization of the single shares within the index, i.e. the index weight, as a proxy for volume.

For example, if we plot the *range distribution* as a bubble chart where the market capitalization defines the size of the single bubble, the picture of what is driving the market trend becomes clear (*figure 4*).

It can easily be seen that small issues exhibit bullish behavior, while the larger capitalized stocks are either trend-less or already in a downtrend. This illustrates that the risk of a market shift to the downside is a likely scenario.

To give more examples, we can compare the Nikkei on August 17 and 23, 2007. On August 17 the Nikkei was in a severe downtrend. This situation is exhibited in distribution chart (*figure 5*). One issue is

climbing, while most issues are falling. The entire market represented by capitalization is trading at its lows.

A week later, however, the situation dramatically changed as the Nikkei climbed by 1000 points from 15273 to 16248. What is even more interesting is that nearly all issues recovered from their lows and the majority of the market cap had changed into a trend-less state ($0.25 \leq \%k \leq 0.75$) as shown in *figure 6*.

As *figure 6* illustrates, analyzing only the trend behavior of a stock may not be sufficient, and that we may also need to consider the relative capitalization of the stock to capture a better understanding of market events.

The effect of market capitalization itself can be measured by a new indicator called, Market Cap Trends (MCT). This indicator explains the percentage of the market capitalization exhibiting a certain kind of trend behavior. It answers the question of which part of the market cap is in an uptrend, and which part is in a downtrend. In turn, the MCT measures the trend behavior in terms of the %k value of single stocks. From this value we ascertain where the stock in question is trading relative to its own four week trading range. Again, we can add the relative market cap of the issue to the trend information, and note that the relative market cap is nothing more than the index weight of the issue in question.

If one organizes all the shares of an index which are rising due to its %k values and subsequently sum up the relative market capitalization of the individual index members, we arrive at the MCT. It is an empirical distribution function, which starts at zero in the left part of the chart, and ends at one at the right upper corner of the chart. From this indicator we can read the percentage of the total market capitalization, which is exhibiting certain trend behavior (as defined by %k): for example finding out how much market cap has a %k coefficient of 60 (or less). This information can be extracted from the MCT chart as shown in *figure 7*.

The MCT is a now useful indicator. however, it shares the typical problem of all statistical distribution functions—it is neither read nor understood intuitively. The indicator becomes easier to read and more intuitive to interpretation if represented as a histogram.

To do this, we first built a number of

Figure 4. Size Weighted Range Distribution of 110 HDAXstocks (July 12, 2007)

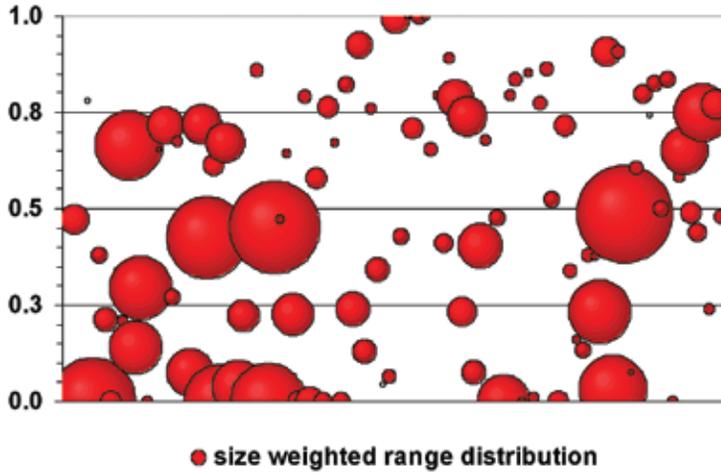


Figure 5. Size Weighted Range Distribution of 225 Nikkei stocks (August 17, 2007)

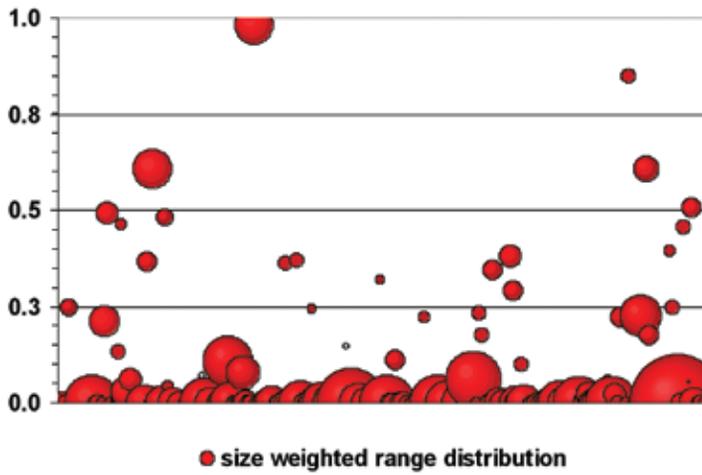


Figure 6. Size Weighted Range Distribution of 225 Nikkei stocks (August 24, 2007)

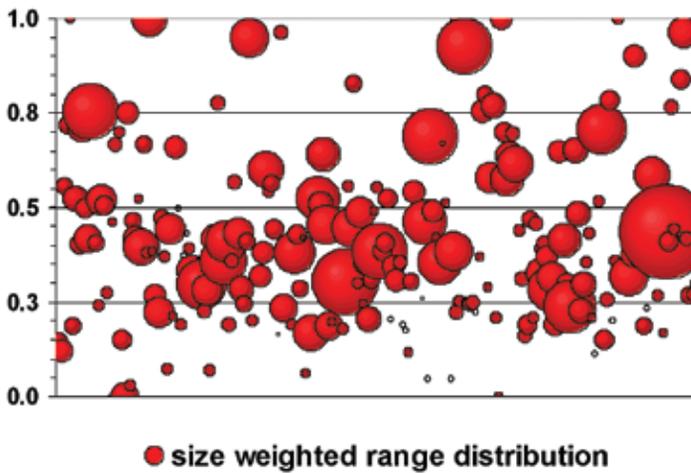


Figure 7. Market Cap Trends of the HDAX index (July 12, 2007)

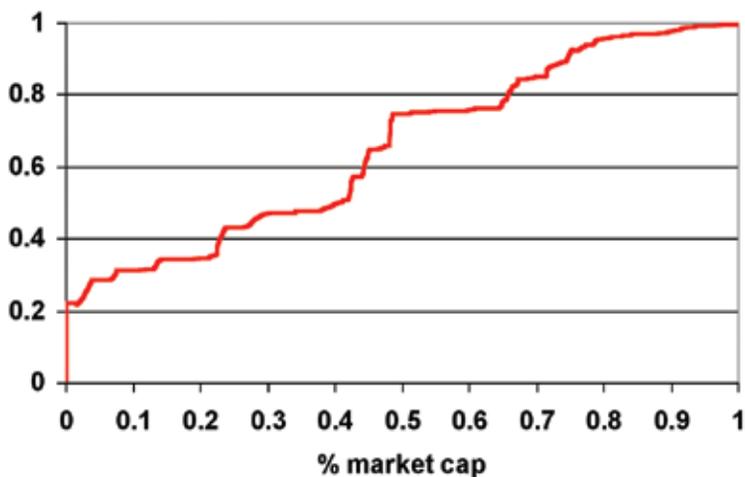


Figure 8. Market Cap Trends histogram of the HDAX index (July 12, 2007)

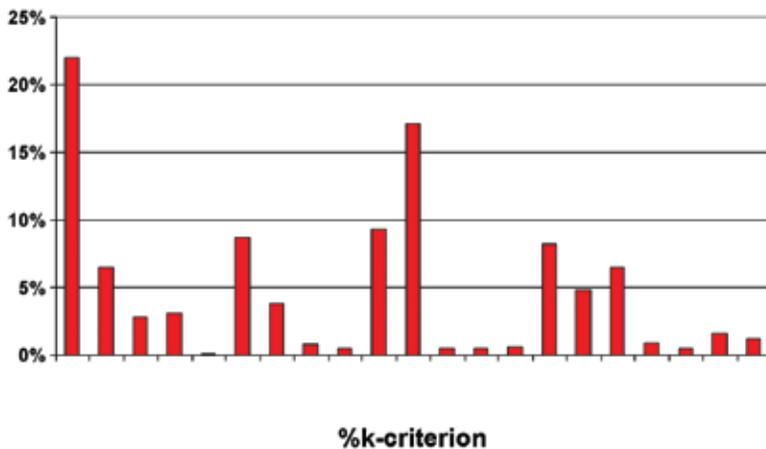
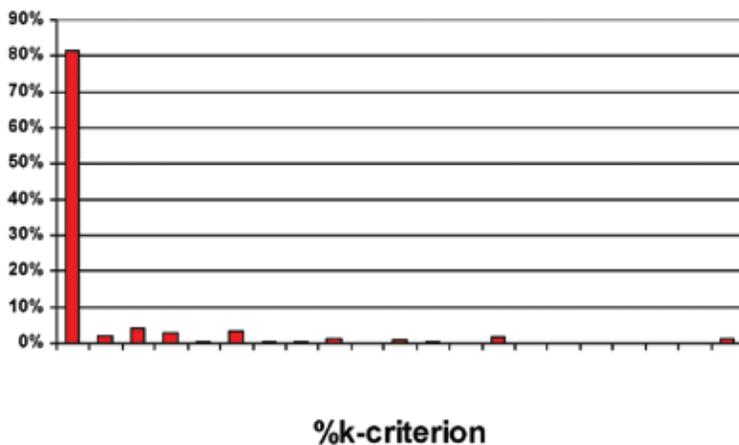


Figure 9. Market Cap Trends histogram of the Nikkei225 index (August 17, 2007)



quantiles for the %k values. In our example, the relative market capitalization of the hDAX is divided up into groups of %k values with 5% intervals each, i.e. 0, 0-5%, 5%-10%, etc. This leads to the following empirical density function (figure 8).

The message from both curves is identical: we can see that a huge part of the market cap is at the very low end of its own trading range. This tendency is balanced by the larger capitalized stocks with ranges in the middle of the scale. Stocks with a %k of 0.8 or more account only for about 20% of the total market cap. Because the market is still heading north, it would imply that these stocks are driving the market. This indicator, however, also indicates that the trend is, indeed, rather weak as it is not supported by large volume.

Overall, we cannot say that the market is overheating as if that were the case, we would see much more of the market cap moving to the right of the indicator. The MCT histogram might rather be interpreted as an early warning signal: more market cap may slip to the left and, therefore, create downward pressure on the index. For the moment, the market appears to be still in a balanced state.

To complete this part, we show the two MCT-histograms for the Nikkei. On August 17, the market was down and the trend supported by most of its market cap (figure 9).

It is evident that not all issues could continue to fall at the same time and, therefore, a recovery seemed to be more likely than not, as the subsequent MCT histogram for the next week confirmed.

Figure 10 demonstrates that most of the market cap shifted from the left side of the scale to the center. This indicated strong market recovery, supported by market breadth.

Temporal Movement Analysis

The last part of this analysis examines the time structure of trends in single stocks within the indices. For example, during the period of a year, the members of an index drift up and down marking new yearly highs or lows. If the stock is in a trend, these extreme values will pop up at the left end of the chart and their positions may be defended for a period. In a range market, stock prices typically form new highs or lows but then fall back into the old trading range, i.e. into the mass of trend-less

stocks. The typical characteristics of trendless markets are marked by extreme values far from the current date.

A new method, *Temporal Movement Analysis*, is based on the characteristics of the temporal occurrence of yearly high and low values. This is a representation in contrast to point & figure analysis, as it does not measure price movement itself, but instead measures *how much time has passed since the prices reached their extreme values*. This temporal behavior is analyzed for each single stock within the selected index. It is then aggregated and transformed into the *Temporal Movement Analysis* indicator.

The first step is to collect the dates when each single stock within the index traded at its highest high or lowest low within the annual period. Second, we measure which extreme value was reached last and how many weeks have passed since this event. In the third step, these distances are then divided into different classes, which are indicated by characters, along the following lines:

- A: = the last annual high was within the past 2 weeks
- B: = the last annual high was between 3 and 4 weeks
- C: = the last annual high or annual low is older than 4 weeks
- D: = the last annual low was between 3 and 4 weeks
- E: = the last annual low was within the past 2 weeks

In a final step, one counts how many of the 110 stocks of the hDAX index are allotted to the individual segments above. Plotting this information into a chart provides the following result, called *Movement Potential* (See figure 11).

In contrast to the two previous analyses, where we discussed if a stock is in a trend and where the market cap was trending, Temporal Movement Analysis focuses exclusively on the temporal dimension (or time limited dimension) of the market. *Figure 11* shows the temporal development of the extreme prices and, with that, the trend behavior of all 110 shares over a year. If currently all stocks are forming their annual highs or lows, there may be less likelihood or potential for the trend to continue.

In the sample above, about 40 percent of all shares in the hDAX had reached a new annual high within the past two weeks.

Figure 10. Market Cap Tends histogram of the Nikkei225 index (August 23, 2007)

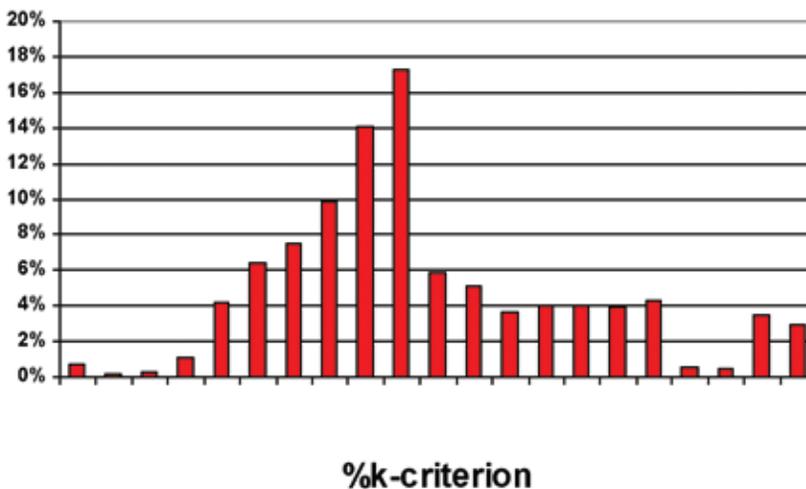


Figure 11. Temporal Extreme Value Distribution (static) of the HDAX on July 12, 2007

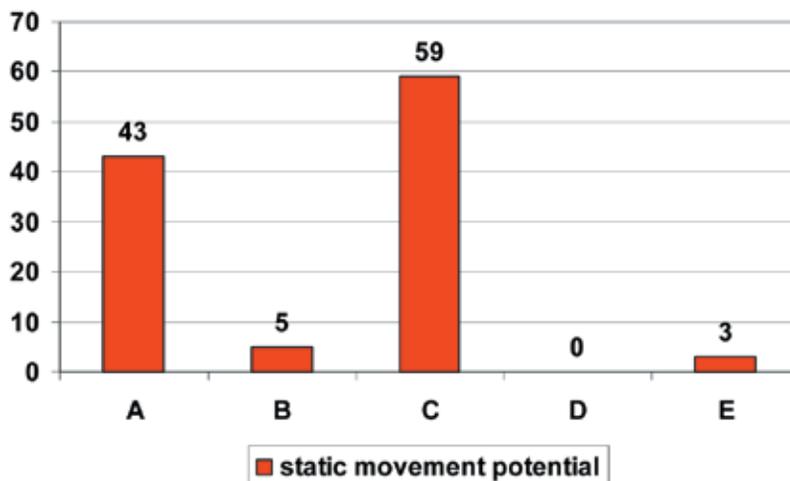
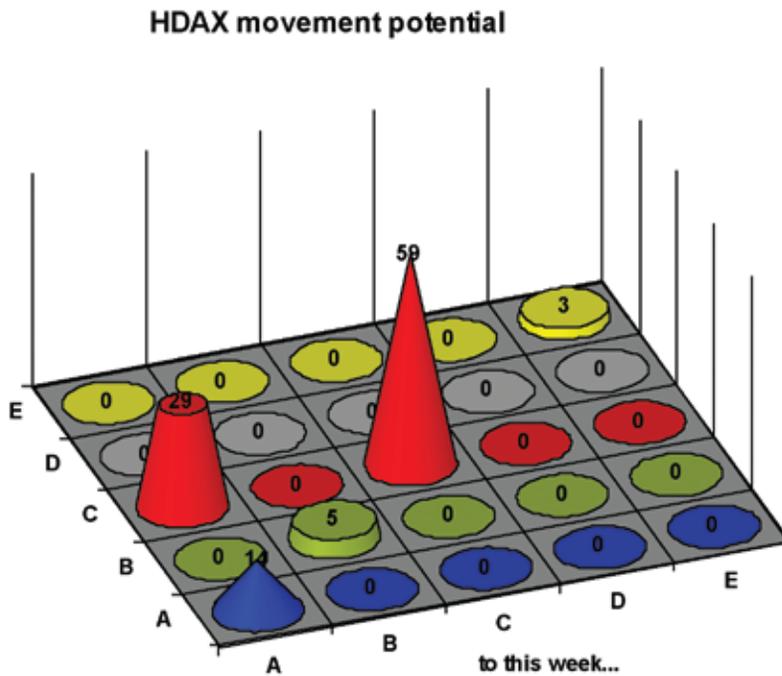


Figure 12. Temporal Extreme Value Distribution (dynamic) of the HDAX on July 12, 2007



This indicated a recent robust movement of the index. Additionally, only five shares (about 5%) made their annual high three to four weeks previously. This implied either that new highs were defended, and were therefore followed by higher highs; or that the market was exhibiting a new uptrend impulse move. This also illustrated that new stocks were making new highs, with only a small portion of the market in a prior uptrend. These stocks could not achieve new highs and are labelled "B" in the indicator.

More than half of all stocks in the index were trend-less within the last four weeks and did not reach new annual highs or lows, with only a very small portion touching new lows. A market with this characteristic appears stable, as there is no downward pressure, and there remains a big pool of stocks, which might form new highs, allowing room for stock or sector rotation. Additionally, a small portion of the market is "trendy" and moving the index. This analysis is conducted without looking at prices, only at time, and looks at the market from a bottom-up point of view through a section of all stocks.

So far, the *Temporal Extreme Value Distribution* is a valuable, yet static tool, presenting the market condition of one section at a very specific point in time. It does not show whether or not a temporal rotation of a group is about to take place. This static quality can be overcome by comparing two times periods. If we do this, a *Dynamic Movement Potential* arises, which is shown for the hDAX in *Figure 12*.

This is a rather abstract graph and may, upon first glance, not be easy to read. This graph is a portrait of the hDAX stock index, illustrating that the time structure of the index changed from last week to this week. For example, when adding up the letters in vertical axis "to this week" (i.e. for the letter A it is 14+29) you will arrive at the static diagram shown in *Figure 12*.

What does this tell us? Only fourteen stocks could defend their A position in the hDAX from one week to the next (they were A last week and remain A the following week). This could mean that there was either a new annual high or that the annual high was only a week-old in the previous week. Twenty nine stocks (out of 110) formed a new high during the last week, moving from the C group to A. There were no new B or C stocks during this period,

implying that the market defended its highs. Finally, the three stocks which were losing value in the previous week held their position as *E*.

With this graph one can vividly see the rotation taking place by stocks within the index. In this case, with new stocks moving to new annual highs, and no stocks weakening, the picture is of an overall stable condition of the stock market. In addition, during this period there is no downward pressure from new annual lows, while a large portion of the market is trend-less (*C* stocks), indicating room for development of new annual highs.

Conclusion

The analyses above examined the hDAX through a scrutiny of the individual shares. The technical market information of the single stocks was collected and bundled in different, partly new indicators and diagrams, at a specific point in time. In addition to the pure analysis, the objective was to give the Technical Analyst tools at his fingertips with which he can quickly attain a summary of the current market events in full breadth.

Making use of these tools in analysing the hDAX, we may infer here that while the index is at high levels, it remains in a stable trend environment. However, this condition is not supported by the market breadth. The bottom-up analysis demonstrated many shares are high relative to their own price history of the last four weeks. We note, however, that these stocks represent a small part of the total market cap, and the shares exhibit strength as they establish themselves at these highs. Nonetheless, there are clear risks that a falling market cap may break the current trend. [IFTA](#)

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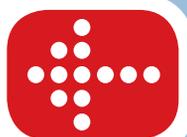
Your paper must meet the following criteria:

- > It must be original.
- > It must develop a reasoned and logical argument and lead to a sound conclusion supported by the tests, studies and analysis contained in the paper.
- > The subject matter should be of practical application.
- > It should add to the body of knowledge in the discipline of International Technical Analysis.



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Wyckoff Laws: A Market Test (Part B) — What has Actually happened?

By Henry (Hank) Pruden and Benard Belletante

The Original 2003 Prediction:

"... the point-and-figure chart reveals a base of accumulation for a potential rise of 7,200 points, when added to the low of 7,200 the price projects upward to 14,400... before the onset of the next bear market. If the Dow...comes within – or + 10% of the projected 7,200 points, we will accept the prediction as having been positive".

Pruden and Belletante, *IFTA Journal* 2004

The 2007 Result:

On June 1 and June 4, 2007 the DJIA recorded a print high in price of over 13,680. By reaching 13,680 the DJIA met the lower price objective that was predicted (i.e. $14,400 - 720 = 13,680$).

Conclusion:

The Wyckoff Law of Cause and Effect successfully passed its market test of DJIA of $7,200 \pm 10\%$ or $14,400 \pm 5\%$.

The authors noted in their article (Part A) that Wyckoff was a name gaining celebrity status in the world of Technical Analysis and Trading. Richard D. Wyckoff, the man, worked in New York City during a "golden age" for technical analysis that existed in the early decades of the 20th Century. Wyckoff was a contemporary of Edwin Lefevre who wrote *The Reminiscences of A Stock Operator*. Like Lefevre, Wyckoff was a keen observer and reporter who codified the best practices of the celebrated stock and commodity operators of that era. Around 1930 the results of Richard Wyckoff's observations, personal experience and journalism became known as the Wyckoff Method of Technical Analysis and Stock Speculation. In 2007, Pruden, a co-author of these articles, wrote a book on *The Three Skills Of Top Trading* that spot-lighted the principles and procedures of the Wyckoff Method.

Wyckoff is a practical, straight forward bar chart and point-and-figure chart pattern recognition method. Since the founding of the Wyckoff and Associates

educational enterprise in the early 1930s the Wyckoff Method has stood the test of time.

A Market Test

The authors, as academics, have been intrigued by the natural laboratory conditions provided by a stock market. A prediction study is the *sine quo non* of a good laboratory experiment. The Wyckoff Law of Cause and Effect seemed to us to provide an unusually fine instrument for conducting such an experiment, a "forward test". Parenthetically, it has been our feeling, shared by academics in general, that technicians have focused too heavily upon "backtesting" and not sufficiently upon real experimentation. The time series and metric nature of the market data allow for "forward testing". Forward testing necessitates making a quantitative prediction then followed by the empirical test of the prediction with market data that tell what actually happened. Thus, the first article that appeared in the 2004 issue of the *IFTA Journal* commenced a series of articles devoted to study Wyckoff and use the Law of Cause and Effect and Point-and-figure charts to answer the question of "how-far" will the 2003 onward bull market rise.

Wyckoff's Law of Cause and Effect – postulates that in order to have an effect you must first have a cause and that effect will be in proportion to the cause. The law's operation can be seen working as the force of accumulation or distribution builds up within a trading range and works itself out in the subsequent move out of the trading range. Point-and-figure chart counts can be used to measure this cause and project the extent of its effect.

Using the Inverse-head-and-Shoulders formation as the base of accumulation from which to take a measurement of the "cause" built during the accumulation phase of 2002-03, the point-and-figure

chart (figure 1) indicated 72 boxes between the right inverse-shoulder and the left inverse-shoulder. Each box had a value of 100 Dow points. Thus, the point-and-figure chart revealed a base of accumulation for a potential rise of 7,200 points. When added to the low of 7,200 the price projected

Figure 1



Price and Time Projections

In summary, U.S. equities are in bull market with a potential to rise to Dow Jones 14,400. The anticipation is for the continuance of this powerful bull market in the Dow Industrial Average of the U.S.A. through 2004. This market forecast is the "test" to which the Wyckoff Method of Technical Analysis is being subjected.

Part (B) of "Wyckoff Laws: A Market Test" will be a report in year 2005 about "What Actually Happened". As with classical laboratory experiments, the results will be recorded, interpreted and appraised. This sequel will invite a critical appraisal of the Wyckoff Laws and in particular a critical appraisal of the Wyckoff Law of Effort vs. Result. The quality of the author's application of the Wyckoff Laws will also undergo a critique. From these investigations and appraisals, we shall strive to extract lessons for the improvement of technical market analyses. Irrespective of the outcomes of this market test, we are confident that the appreciation of the Wyckoff Method of Technical Market Analysis will advance and that the stature of Mr. Richard D. Wyckoff will not diminish.

From Pruden and Belletante, *IFTA Journal* 2004

upward to 14,400. hence, the prediction was for the Dow Industrials to continue to rise to 14,400 before the onset of distribution and the commencement of the next bear market.

If the Dow during 2004-2005 comes within + or – 10% of the projected 7,200 points we will accept the prediction as having been positive.

Interim Report: Date Wrong Price Right

Calendar dates and cycle time frames were never included by Wyckoff in the Wyckoff Method of technical analysis. Essentially, Point-and-Figure Chart projections are valid until a market by its own action indicates that the direction of the price trend has reversed. Pruden's definition of a bear market would be confirmed mechanically by the major equity averages (DJIA, SPX and NASDAQ) falling and remaining under their respective declining 200-day moving averages. A good source for these indications can be found in the Investor's Business Daily newspaper.

The authors' anticipation that the DJIA 14,400 target zone would be reached by 2005 was clearly wrong. The DJIA did not hit the 14,400 target during 2005 nor did the U.S. Equities roll over into a bear market during 2005. Our time prediction was clearly inaccurate: The market did not reach the bull market price target near 14,400 until 2007. Moreover, the major equity indices remain above rising 200-day moving averages.

An honest test of the Wyckoff Law of Cause and Effect would be based upon price behavior and only price behavior. In that regard, the Wyckoff Method has once again proven its utility by reaching the minimum price objective predicted in 2003.

Possible Future Trend of the DJIA

We anticipate that the DJIA will continue to conform to the "Wyckoff Count Guide" for Point-and-Figure charts and the law of Cause and Effect. Please read the following Box for a statement of the Wyckoff Count Guide. For the trader or investor, mid-2007 for the DJIA is at what the Count Guide refers to as a "Stop, Look and Listen Point."

From the present position, three different scenarios for the future price trend of the DJIA are possible. The first scenario would be an extensive correction

in price or time. A price retracement would normally entail a one-half correction of the previous uncorrected advance. Judging from the Chart (*figure 2*), the DJIA could retrace to approximately 12,000 under this scenario. A second possibility envisioned under the Scenario One correction would be a sideways trading range of reaccumulation after which either the bull market trend could re-assert itself or the sideways could turn out to be distribution in preparation for a primary bear market.

The second scenario once again calls upon the Wyckoff Count Guide. If 15,120

DJIA is surpassed (14,400 ± 5%), that event would open the door for re-visiting the 2002-03 accumulation base in order to make a larger base count from a higher Last Point of Support. (Please refer to *figure 3*). Because the price breakout above the price resistance line in March 2003 was a sign of strength, a higher level count would be valid at point 4.

The Wyckoff Count Guide says that a more important Sign of Strength (SOS) followed by a more important Last Point of Support (LPS) is valid for taking a count. On the 2002-03 point-and-figure chart of the

The Wyckoff Count Guide: Up Count

After seeing a Sign of Strength, locate the Last Point of Support on a Reaction and count from right to left.

Detailed Count Guide – Up Count

After having identified a Sign of Strength (SOS) on the vertical line chart, locate the last point at which support was met on a reaction – the Last Point of Support – (LPS). Locate this point on your figure chart also and count from *right-to-left*, taking your most conservative count first and moving further to the left as the move progresses.

In moving to the left, turn to your vertical line chart and divide the area of accumulation into phases, adding one *complete* phase at a time. Never add only part of a phase to your count. Volume action will usually show where the phase began and ended.

As the move progresses, you will often see a lateral move forming at a higher level. Very often such a move will become a "Stepping Stone Confirming Count" of the original count. Thus, as such a level forms; you can often get a timing indication by watching the action of the stock as the potential count begins to confirm the original count. A resumption could begin at such a point.

For longer-term counts one should add his count to the exact low, or a point about one-half way between the low and the count line. You will thus be certain that the most conservative count is being used.

Counts are only points of Stop, Look and Listen, and should never be looked upon as exact points of stopping or turning. Use them as projected points where a turn could occur, and use the vertical line chart to show the action as these points are approached.

In case of a longer-term count often the Last Point of Support (LPS) comes at the original level of climax, and this level should be looked at first in studying the longer-term count. The climax itself indicated a reversal, with the subsequent action being the forming of the cause for the next effect. For the Last Point of Support (LPS) to come at such a level of climax usually makes it a more valid count. Very often the climax is preceded by preliminary support and the Last Point of Support often occurs at the same level as the preliminary support.

A no.3 Spring or the Secondary-test of a no.2 Spring, quite often constitutes the Sign of Strength and the Last Point of Support in the same action which is reached at the same point and at the same time. Usually a Spring will be followed by a more important Sign of Strength and the reaction following that Sign of Strength is also a valid Last Point of Support.

Frequently, long term counts on three and five point charts are confirmed by subsequent minor counts on the one point chart as the move progresses. Watch for this confirmation very carefully as it often indicates *when* a move will be resumed.

In the case of three point or five point charts, the same count line should be used as for the one point chart.

Source: Stock Market Institute, Basic Lecture no. 8

Figure 2

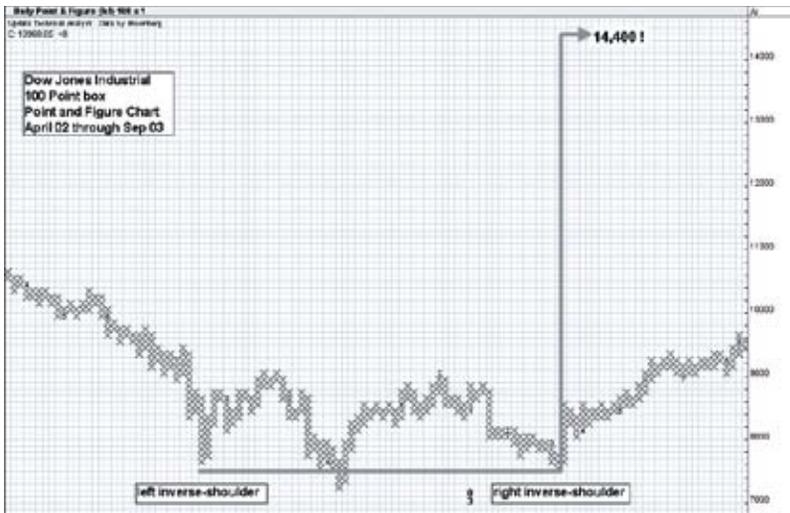
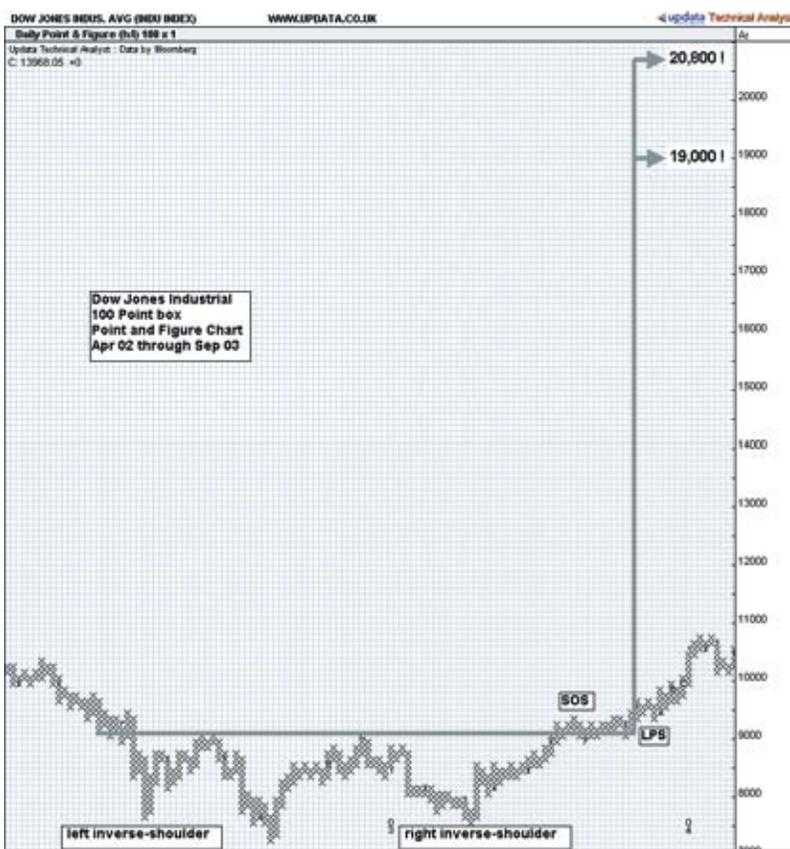


Figure 3



DJIA (figure 3) that SOS would have been the break-out above the neckline resistance level of the DJIA; the LPS would have been at the pullback on the chart to point 4. All nine of the Wyckoff & buying Tests would have been passed at that juncture or point 4 on the Chart (figure 3). The Count taken from that higher, more important P n F price level projects upward to 19,000 to 20,800. hence, if the DJIA should rise above and hold above 15,120 (i.e., 14,400 plus 5%). We would predict a continued rise until the 19,000-20,800 price range is reached by the DJIA.

Scenario Three from the present position envisions a reversal in the primary price trend of the DJIA from a bull market into a bear market. hence, no further price advances to a new high above 13,680 would emerge. Rather, a prolonged and persistent price decline of lower highs and lower lows would forthwith turn the prices of the DJIA, the NASDAQ and S&P 500 below their respective declining 200- day moving averages.

Appraisal of Wyckoff

Irrespective of which of the three foregoing scenarios eventuates, it is our considered judgment that the Wyckoff Method's Law of Cause and Effect passed a critical market test to further authenticate its effectiveness as a market analysis tool. Furthermore, the forecast of 14,400 not only provided the trader-technician with a tool of measuring comparative reward to risk, but it also furnished a flag, an anchor point in the future. The flagged Count on a point-and-figure chart is a powerful psychological anchor that helps to keep the trader and the technician focused on the probable future trend of the market. The projected target inspires confidence in the trader to patiently let the P n F count work out.

When the current bull market trend of U.S. Equities does reverse into a new primary trend bear market, the authors will report in Part (C) which of the three scenarios offered in this article finally does eventuate. [IFTA](#)

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4. Charts and data courtesy of Bloomberg and updata.

Dynamic MACD: Standard Deviation Embedded In The MACD Indicator For Accurate Adjustment To Financial Market Dynamics

by Gino Gandolfi, Monica Rossolini, Antonella Sabatini, Stefano Caselli

Abstract

A significant limit of technical analysis tools is their capability of providing useful trading signals in specific market conditions only. In particular, lagging indicators perform well mainly in trending markets, whereas leading indicators are useful and function better in trading market conditions. The new tool, illustrated herein, denominated Dynamic MACD (Dynamic Moving Average Convergence-Divergence), exhibits the peculiarity of functioning, both in trending and trading markets.

The latter indicator is constructed with the difference of two Vidya (Variable Index Dynamic Averages). Subsequently, the efficacy of the Dynamic MACD has been verified by empirical analysis on the daily time-series of market indices, stocks and exchange rates, in an eleven-year period, 1996-2006. The resulting data tests confirm the higher efficiency of the Dynamic MACD relative to the MACD and outline skillful returns.

Introduction

Technical analysis has been developing into more and more rigorous, quantitative and scientifically based approaches and research methods over recent years. During this development process, the typical graphical approach, mainly based on chart analysisⁱ, has been largely replaced by more computationally intensive and systematic methodologies, typical of the algorithmic technical analysis. However, technical analysis^{iii,iv} indicators still exhibit a limitation in terms of their capability of providing useful trading signals in specific market conditions only. Technical analysts categorize technical indicators into two major macro groups; each group is characterized by similar features: lagging indicators and leading indicators.^{v,vii}

Trend following indicators, or lagging indicators, are characterized by their capability to perform well in trending markets. In these market conditions, the trend of the market price dynamics is clearly either rising or decreasing. On the other hand, during non-trending market conditions, when market prices do not exhibit a clear direction, often lagging tools yield false signals. While leading indicators provide useful signals during trading (non-trending) market conditions, and generally fail to perform well in trending markets.^{viii,ix,x}

A classical problem in technical analysis is algorithms that function well either in trending phases or trading range phases of financial markets, but not in both situations. This problem, targeted as the typical and classical hurdle of technical analysis attracts a considerable number of technicians and researchers worldwide.

In literature, it is possible to outline two major contributions devoted to the development of forecasting models, based on the automatic adaptability to ever varying market "volatility": Kama^{xi} and Vidya.^{xii}

In this work "volatility" is defined as a measure of trending versus trading range behavior. High "volatility" indicates a strong trending market. By contrast, low "volatility" indicates the market is trading in a range.^{xiii,xiv}

Kama and Vidya are two particular moving averages derived from the exponential moving average. The exponential moving average formula is composed from a "volatility" indicator to yield Kama and Vidya. The functional composition allows the latter indicators to automatically decrease their length as the market trends as well as being able to increase their length in trading range markets.

Kaufman developed^{xi} a new model of

moving average, named "Kaufman Adaptive Moving Average". The term *adaptive* outlines the capability of such an indicator to automatically adapt its effective length to current "volatility" levels. In order to operate on the "volatility", Kaufman uses the Efficiency Ratio, a tool capable of indicating market "volatility" levels.

The Efficiency Ratio is defined, in a predetermined time period, by the ratio of the following quantities: the *net price movement* (determined by the difference between the last observation close price and the first observation close price in the time period) over the *total price movements* (determined by the sum of all absolute values of the returns in the same time period). This indicator approaches zero when the market dynamic is non-trending, and it approaches one during trending markets.

An Efficiency Ratio approaching zero indicates that the market is in a trading range; the market exhibits continuous variations of price levels both in amplitude and in direction (up or down). In this kind of market behavior it is necessary to use a long moving average, in such a way that the moving average is kept away from the time series by mathematical construction, avoiding numerous and frequent cross-overs (intersections) which would provide frequent false signals. An Efficiency Ratio, however, approaching unity indicates that the market has a trending behavior, it moves in a clear direction, it is characterized by low noise: prices tend to keep similar amplitudes and directions in their action. In these market conditions it is advisable to use a short moving average so that profitable trades can be obtained, by locking in positive returns.

Kaufman's idea consists of developing a model in which the Efficiency Ratio information is embedded in his model.

The model encompasses the construction of an exponential moving average able to automatically adjust its length, switching from a short moving average during trending markets to a long moving average during non-trending market conditions.

In addition to Kaufman's model, another contribution, appearing often in literature, is called Vidya (Variable Index Dynamic Average). This indicator also aims to overcome the problem of the limited adaptability of the commonly used technical analysis tools to trending/non-trending market conditions. The Vidya indicator was developed in the 90's by Tushar Chande who reformulated the exponential moving average.^{xii}

Chande's indicator by its definition and construction reduces or eliminates the analyst's discretionary decision process for the defining of the length of the moving average. The application of the indicator to historical time series has the effect of dramatically reducing false signals, relative to similar action, produced by the traditional moving averages, especially in trading range markets. The objective is to obtain a moving average capable of self-adjusting and varying its effective length relative to the current market "volatility".

Vidya is a dynamic indicator. It is essentially an exponential moving average that adapts its length to market "volatility". Market "volatility" can be defined and measured as follows: by taking a momentum indicator (i.e. Relative Strength Index [RSI]^{xv} or the absolute value of Chande Momentum Oscillator [CMO]^{xii} ranging between 0 and 1), operating on the standard deviation of the close^{xii}, or via the R^2 (ranging between 0 and 1).

If a 10-day simple moving average is calculated, market "volatility" is not taken into account. However, the error defined by the difference of current price and its moving average increases when the market changes direction abruptly and dramatically. By observing a 5-day moving average and a 10-day moving average, the weight of each sample included into the moving average is 20% and 10% respectively. The short moving average responds more quickly than the longer moving average because there is a greater weight given by the new data sample entering the calculation, and the gap between the last price and its moving average is small.^{xii}

This is the key point in support of the usage of the variable moving average: to automatically decrease the length upon an increment of market "volatility", and to automatically increase the length when "volatility" decreases.

For the construction of Vidya, Tushar Chande decided to use the exponential moving average as follows:

$$\text{Vidya}_t = \alpha * k * C_t + (1 - \alpha * k) * \text{Vidya}_{t-1}$$

Where:

- C_t = close at time t.
- Vidya_{t-1} = previous day Vidya.
- k is a "volatility" index that indicates when the price action is heating up or cooling down.^{xii}
- α determines the effective length of the exponential moving average that needs to be modulated. Chande's definition of $\alpha = 0.5$ (Please note: the analyst can set α to be equal to any value, but the quantity $(1 - \alpha * k)$ should always be positive).

If k exhibits a small value in the Vidya calculation only a small portion of new data is considered and the effective length of the average increases. If k approaches large values (very active market), the most recent data has a higher weight and the effective length decreases. This behavior allows the average to follow the quick price movement at its best. When k takes on relevant values, indicating high "volatility" in the market, the Vidya average, automatically, takes on shorter time periods. Therefore, more reactivity allows the average to follow the price movement more closely catching the trending dynamics. When k approaches zero, indicating a possible trading range phase, Vidya automatically increases its length, separating from its time series of prices, and reducing the number of intersections.

Vidya is the basic component used in the definition and construction of another indicator: the Variable MACD.^{xiii xvi} The objective of this indicator is to function as a tool able to provide profitable trading signals with the best accuracy possible both in trending and trading range phases of market dynamics. Variable MACD is essentially developed by using the same logic underlying the MACD. What distinguishes Variable MACD from MACD is in the definition of the difference of two moving averages. MACD

is defined by the difference of two exponential moving averages. Variable MACD is defined by the difference of two Vidyas.

The name "Variable MACD", was chosen in order to emphasize its ability to adapt to varying market "volatility" levels. K, being the "volatility indicator" embedded in the Vidya expression, was defined by the absolute value of the CMO. Empirical tests have shown that Variable MACD yields a better return with a smaller number of trades compared to the MACD.^{xiii}

The indicator should identify a trending market, supporting analysts and traders in taking profitable positions; as well as being able to avoid indications for unprofitable positions during trading range phases of the market.^{xvii}

The aim of this present work is to test and verify the efficacy of another indicator, similar in logical construction to the Variable MACD. This new indicator embeds in its Vidyas, another "volatility" indicator, namely the standard deviation of the close prices^{xii xviii} rather than the absolute value of the CMO. This novel indicator is called Dynamic MACD.

The Method

The Dynamic MACD is defined by the following algorithm: a difference of two quantities is taken, in a similar fashion to the MACD. The two quantities instead of being defined by exponential moving averages of 12 and 26 days in length are implemented by two Vidyas of 12-days and 26-days long respectively. The main characteristic of the indicator is its adaptability to market dynamics with improved returns over the MACD. Whereas the MACD, defined as a trend following indicator, tends to perform poorly in trading range market conditions, Dynamic MACD is able to adapt better to the market conditions.

The basic algorithm of this new indicator is as follows:

$$\text{Dynamic MACD} = 12_day_Vidya - 26_day_Vidya$$

In detail:

$$\text{Dynamic MACD} = [\alpha * k * C_t + ((1 - \alpha * k) * \text{Vidya}(12)_{t-1})] - [\beta * k * C_t + ((1 - \beta * k) * \text{Vidya}(26)_{t-1})]$$

Where:

C_t = close price at time t

$\text{Vidya}(12)_{t-1} = \text{Vidya}$ at time t-1 with time period (length) of 12 days

Vidya(26)_{t-1}= Vidya at time t-1 with time period (length) of 26 days

Given the algorithm definition for which n=12 and m=26 (where n indicates the length of the shorter (faster) Vidya and m indicates the length of the longer (slower) Vidya), the parameters α and β can be computed by simple algebra:

$$\alpha = 2 / (n+1); \text{ with } n=12 \alpha=0.154$$

$$\beta = 2 / (m+1); \text{ with } m=26 \beta=0.074$$

Since Vidya is a dynamic indicator, the effective length of the average at any time will not be constant, i.e. equal to 12 and 26. Instead, it will depend on the value of the "volatility" indicator. The effective length, at any time, indicated by the letters N (shorter Vidya) and M (longer Vidya) is given by

$$N = (2 - k * \alpha) / (k * \alpha) \text{ for the 12 day Vidya.}$$

$$M = (2 - k * \beta) / (k * \beta) \text{ for the 26 day Vidya.}$$

The improvement from the dynamic averages is the ability to have different lengths according to market conditions.

This differs from the Variable MACD,^{xiii} where k was defined as the absolute value of the CMO. In this work a diverse "volatility" indicator is being used, namely the well known and widely used standard deviation. In particular, the 10-day standard deviation of closing prices is calculated at each time t. The value is then divided by a parameter defined by the average of the standard deviation over a 50-day period. K at time t is, therefore defined as the ratio of the 10-day standard deviation of the closing prices divided by the 50-day average of the standard deviation of the closing price.^{xii} K outlines the excess "volatility" relative to its historical average value, at each time t.

To summarize, the Dynamic MACD's peculiarity is its adaptability and its ability to vary the velocity of the trading signals according to the different market phases. The averages become longer (and slower) during trading range markets and become shorter (faster) in trending markets.

The interpretation of the Dynamic MACD, similarly to the MACD, consists in analyzing the crossing of the indicator values from negative values to positive values and vice versa. Crossing from below the zero line indicates an uptrend.

Crossing from the positive region down to the negative side indicates a descending market.

Tests and Empirical Results

The empirical analysis has been performed to verify whether the Dynamic MACD is indeed more efficient than the MACD. The analysis has been conducted by using daily time series of prices over a time horizon of eleven years from 1996 to 2006. In particular, the time series used are from four market indices: China 1-2 Cp Index, Hang Seng Index, SMI, and DJIA; two exchange rate time series: the EUR-USD, and USD-JPY; and two stocks: Nokia and IBM. On every analyzed time series the MACD and the Dynamic MACD have been applied. In particular, the MACD has been defined as the difference between the 12 and 26-day exponential moving averages. It is assumed that for every "buy" signal (i.e. MACD crossing from below the zero line) a long position is entered, and for every "sell" signal (i.e. MACD crossing from above the zero line) a short position is entered, and then the return is calculated. A position is entered with the properties of stop and reverse. For every closed position (trade) the return is calculated. A cumulative return value is then calculated for the whole time horizon (eleven years). Then, a similar analysis was performed by using the Dynamic MACD. Again, the return per each trade was calculated and the cumulative 11-year return recorded.

In *Table 1* the results based on the described empirical analysis are reported. Every table illustrates the total cumulative 11-year return, the average yearly return and the number of long and short trades, for both MACD and the Dynamic MACD indicators.

As it can be inferred from *Table 1* relative to the tests performed on the exchange rate time series, Dynamic MACD return is better with a much smaller number of trades; similar results occur for the indices China 1-2 Cp and SMI, with results summarized in *Table 2*.

Table 3 illustrates the test results for the Hang Seng and DJIA indices. For these two indices the Dynamic MACD yields a poorer return relative to the MACD action, but the number of trades involved with the Dynamic MACD is dramatically reduced relative to the use of MACD. If transaction fees and costs were taken into account, MACD return would have been lower than illustrated in *Table 3*.

Outstanding results are illustrated in *Table 4* (Nokia and IBM): a small number of trades realize excellent returns for the Dynamic MACD.

Table 1

	EUR-USD			USD-JPY		
	Cumulative Return 1996-2006	Average Annual Return	Number of Trades	Cumulative Return 1996-2006	Average Annual Return	Number of Trades
MACD	-19.12%	-2.10%	1434	19.55%	1.80%	1442
Dynamic MACD	39.46%	3.38%	86	60.69%	4.86%	114

Table 2

	China 1-2 Cp Index			SMI		
	Cumulative Return 1996-2006	Average Annual Return	Number of Trades	Cumulative Return 1996-2006	Average Annual Return	Number of Trades
MACD	44.51%	4.18%	1049	60.74%	4.86%	1396
Dynamic MACD	178.58%	12.06%	58	152.06%	9.69%	91

Table 3

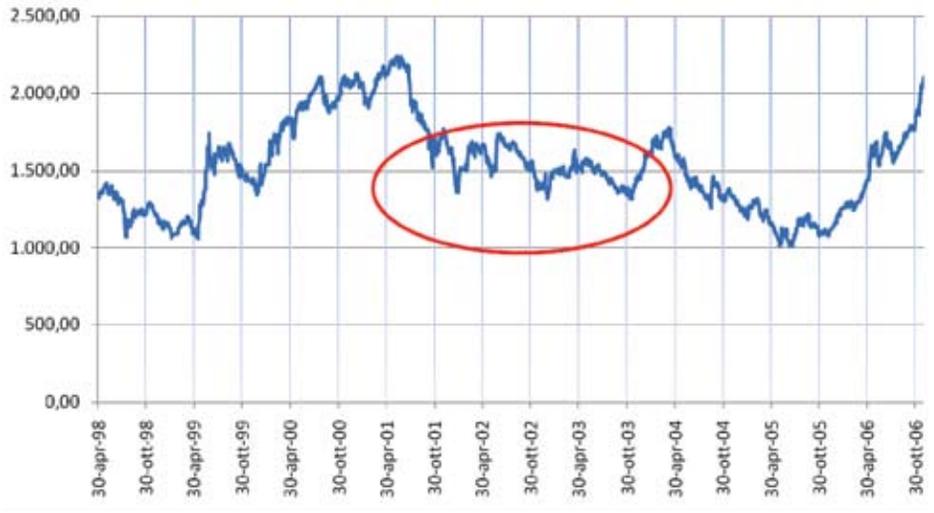
	Hang Seng Index			DJIA		
	Cumulative Return 1996-2006	Average Annual Return	Number of Trades	Cumulative Return 1996-2006	Average Annual Return	Number of Trades
MACD	283.71%	14.39%	1384	15.07%	1.41%	1379
Dynamic MACD	112.48%	7.83%	99	-26.56%	-3.04%	106

Table 4

	Nokia			IBM		
	Cumulative Return 1996-2006	Average Annual Return	Number of Trades	Cumulative Return 1996-2006	Average Annual Return	Number of Trades
MACD	-65.33%	-10.05%	1193	89.56%	6.60%	1241
Dynamic MACD	28.25%	2.52%	96	194.29%	11.40%	91

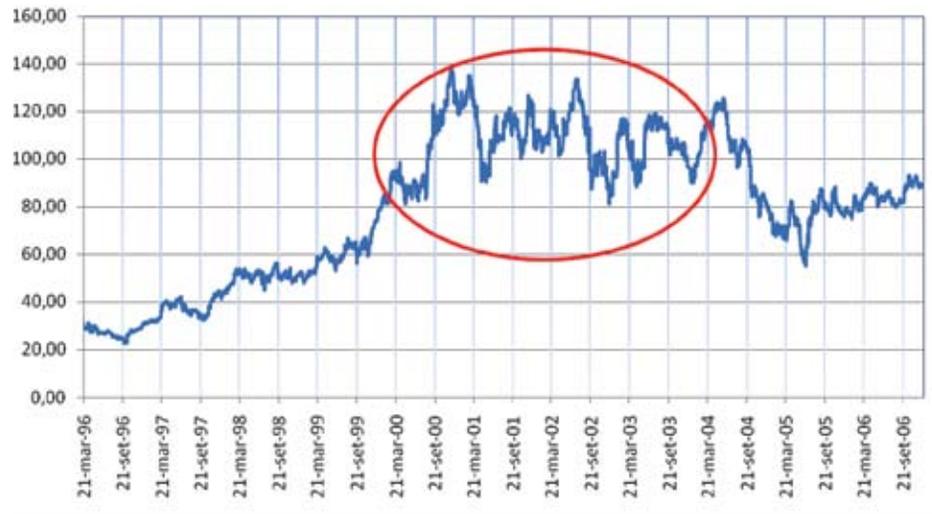
The following charts illustrate some examples of trading range markets, comparing the return realized from MACD and Dynamic MACD, denoting the importance of being able to manage trading range periods in order to improve overall return. *Figure 1*, China 1-2 Cp Index, highlights the period October 2001-September 2004 as a trading range period. In this specific period the Dynamic MACD yields a return of 44.51% whereas the MACD returns 20.48%. These results indicate that within a trading range, the Vidya are able to fatten more efficiently relative to the exponential moving averages, minimizing the number of false signals.

Figure 1. China 1-2 cp Index Time series



In *figure 2* a similar analysis is performed on IBM. In this case, during the long trading range period (June 2000- June 2004) the Dynamic MACD produces a better return relative to the MACD (56.40% and -70.89% respectively).

Figure 2. IBM time series



By analyzing the time series of the DJIA in *figure 3*, it is easy to note a trading range in the period from September 2003 to December 2004. During this time period the return from the MACD is -16.18% whereas the Dynamic MACD produces a positive result of +10.88%, which is very peculiar. In fact, during the whole 11-year period the Dynamic MACD return is worse than the MACD, but during trading range periods, the Dynamic MACD has performed better than the MACD.

Figure 3. DJIA time series



Conclusions and Future Research

The empirical result presented in this work outlines the differences between the use of the MACD and the Dynamic MACD applied to various financial time series. The Dynamic MACD is constructed similarly to the MACD as the difference of two quantities. The MACD employs the difference between two exponential moving averages. The Dynamic MACD embeds two Vidyas and calculates their difference. The results, produced by the tests over the period of eleven years, confirm the efficacy of the Dynamic MACD yielding better returns in most tests and with a considerably smaller number of trades. This peculiarity becomes evident if transaction fees and costs are taken into account. A limit of the Dynamic MACD is a slight delay making it lag the MACD indicator during trending periods. Future research will involve studies and comparisons between Variable MACD and Dynamic MACD aiming to determine which of the two novel indicators would be a better performer in both trading range and trending markets. Transaction fees and costs need to be evaluated to better assess the practical implications for the money management industry. [IFTA](#)

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^{xiv} this concept of "volatility" is different from the more commonly used definition in statistics and financial terms.

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^{xvi} presented to the 2006 IFTA Conference in Lugano (switzerland) and the Variable MACD has been programmed and implemented in Bloomberg tools.

^{xvii} the term "trading range" defines those market dynamics in which prices move in short and frequent oscillations in both directions, without exhibiting a definite up or down trend.

^{xviii} the calculation is different from the statistical concept of volatility used in finance and calculated by using standard deviation of returns.

An Exploration of the Nature of Bull Market Tops

by Paul F. Desmond

Almost every investor harbours the secret wish of being able to sell out on the exact top day of a bull market. The bragging rights would last a lifetime. But, exactly how does an investor identify the top day? An easy answer might be that it is the highest level reached by the Dow Jones Industrial Average (DJIA) before a major market decline. This is probably a reasonably good answer for historians studying the long-term trends of the stock market, but it is not a practical, working answer for investors, as it can only be known long after the top occurred. Another answer might be that the exact top of a bull market is the point at which the vast majority of stocks reach their highest price levels for many years to come. More than a few investors would say that the first answer and the second answer are synonymous; that the majority of stocks reach their peaks at the same time as the peak of the DJIA. But, is that actually the case? Do most stocks reach their price peaks in unison, and do they do so simultaneously with the major price indices? Does what seems so logical match actual experience?

There is a dearth of information about the nature of major stock market tops, and the sparse information that does exist is more theoretical than statistical. Stock market guru, Joseph Granville, once surmised that one-third of stocks reach their final bull market price peaks in advance of the DJIA's peak, one-third reach their highs in unison with the DJIA's peak, and one-third reach their peaks after the DJIA's peak. However, the sheer simplicity of Granville's theory suggests that it was based more on guesswork than on hard statistical analysis.

One thing that investors have known, if only in a very vague sense, is that major market tops are not the same as major market bottoms. Much more work has been done in defining the nature of major stock market bottoms than in understanding the nature of bull market tops. A 2002 Lowry study titled *Identifying Bear Market Bottoms and New Bull Markets*, showed that major market bottoms can often be

identified by evidence of panic selling (one or more 90% Downside Days) in which investors dump stocks with abandon. Then, with the desire to sell having been exhausted, buyers suddenly rush in to snap up the bargains (and cover short positions), resulting in a 90% Upside Day. The combination of panic selling across a broad spectrum of stocks, followed quickly by broad, enthusiastic buying, produces what might be described as a classic "V" pattern of prices at major bear market bottoms.

Bull market tops, on the other hand, tend to develop gradually over a long period of time. The reasons for this gradual process are easy to understand: It is the Law of Supply and Demand at work. Just as bull markets result from strong, persistent investor demand for stocks, bull market tops evolve when investors gradually stop buying. Some investors simply run out of new money to invest. Others begin to see individual stocks as being overvalued, and begin to hold back on new purchases. Whatever the reasons, the stock market cannot continue to advance without Demand exceeding Supply. The evolution of investor psychology from strong buying enthusiasm for stocks to passivity or complacency does not occur suddenly. Thus, bull market tops are commonly diffuse, possibly lulling most investors into inaction. Perhaps it is the slowness of the entire process that makes it difficult to recognize a bull market top.

However, beyond this vague and somewhat hypothetical supposition, little or nothing more is known about the nature of bull market tops. Despite our almost total lack of understanding of the subject, the end of a bull market and the simultaneous start of a new bear market is undoubtedly one of the most important moments in time for any investor. Many investors have experienced the frustration and anguish of making big stock market gains in a bull market, only to watch the gains turn into big losses during the subsequent bear market. Thus, the ability to avoid capital losses is, in many ways, a more important objective for investors than making big gains. Perhaps it is

our almost total lack of understanding about the end of bull markets that is responsible for investors' almost universal inability to avoid bear markets. A greater understanding of investor psychology near bull market tops might emit warning signs in the making, and allow at least some alert investors to be able to take defensive actions in advance of the devastating losses that typically occur in the subsequent bear market.

There are several helpful tools that Technical Analysts have used for many decades to warn of impending stock market tops, such as the Advance-Decline Line and the number of stocks recording new 52-week highs. History shows that these indicators often top out and begin to contract, as individual stocks fall by the wayside, months in advance of the final top in the DJIA. Therefore, it would not be a surprise to find that all stocks do not reach their peaks simultaneously or in unison with the DJIA. But, it is the degree and the intensity of the divergences of individual stocks from the DJIA that had never been measured before—until now.

Discoveries in science are frequently the result of happenstance rather than great scientific detective work. The discoveries to be related in this paper regarding bull market tops began in exactly that fashion. My firm, Lowry Research Corporation, had purchased rolls of microfilm of the Wall Street Journal covering the period from 1920 through 1930. Being able to step back in time, if only in recorded history, is a special experience. The first frame to be viewed in the microfilm reader, purely out of curiosity, was the page containing the New York Stock Exchange trading of September 3, 1929—the absolute top day for the DJIA prior to the 1929 Crash. It is ironic that 1929 is undoubtedly one of the most important dates in stock market history, and so little is known about the forces of supply and demand at work in the market during that period.

In simply looking around at the trading data from that day—at the many unfamiliar names of the companies traded, at the volume of trading, at the highest prices

for each stock—it became apparent that some stocks had traded that day at prices below their 1929 highs. Some stocks were considerably below their yearly high. That seemed strange for a day on which the DJIA was at the absolute highest point in history and at a level that would not be seen again for the next 20 years. Upon closer examination, it was difficult to find stocks that were at their highs on that fateful day.

Intuitively, something seemed to be very wrong. On a day when common sense would dictate that most stocks should have closed at their all-time highs, it was determined that very few stocks had closed at, or even near, their 1929 highs. Many stocks were down from their highs by 20% or more (Last price was lower than 1929 high price). Thus began a detailed examination of the trading of September 3, 1929. The results were most surprising.

On the day on which the Dow Jones Industrial Average reached its absolute high for the 1920s bull market, the percentage of stocks making new 1929 highs that day was not 80% or 75% or even 70%. It was 2.30%. Out of 826 stocks that were traded on the New York Stock Exchange that day, only 19 stocks made their highs. Equally surprising, only 15.62% of all issues traded on the NYSE were either at, or within 2% of their 1929 highs. In other words, about 84% of all stocks had topped out and had begun to decline at some time prior to September 3. In fact, it was determined that, on the same day that the DJIA reached its all-time high, 31.84% of the stocks traded on the NYSE had already declined by 20% from their 1929 highs. 18.77% of stocks had declined by more than 30%. Stocks at, or within 2% of their highs were dwarfed by the number that had already lost 20% or

more from their 1929 highs. Thus it became apparent that the absolute top for the vast majority of stocks had probably occurred months—perhaps many months—before September 3, 1929. And yet, there had been no single, outstanding day of rally prior to September 3 that investors could identify as the ideal point at which to shift portfolios to a more defensive composition.

The pressing question was whether the 1929 case was a total anomaly, or whether somewhat similar conditions would be found at other important bull market tops throughout history. Therefore, we expanded our study to include each of the fourteen major bull market tops, based on the Dow Jones Industrial Average, from 1929 through 2000 (table 2). Our basic assumption was that most stocks reached their highest prices in unison with the Dow Jones Industrial Average. But, our

Figure 1.

TRANSACTIONS										
1929.		Stock and Dividend Rate.	First.	High.	Low.	Last.	Net Ch'ge.	Closing		Sales.
High.	Low.							Bid.	Ask.	
577 3/8	38 1/8	Abitibi Power & Paper.	56	56	55	55	..	53	54 1/8	1,000
88 3/8	79	Abitibi P. & P. pf. (6)	84	84	84	84	- 1	84 1/4	84 1/2	100
750	389	Adams Express (h6)...	593	594	590	590	- 1	500	585	400
104 1/8	27	Advance Rumely	31 1/2	31 1/8	29	29	- 1 3/4	29	30	2,200
119	40	Advance Rumely pf....	43	43	41 1/8	41 1/8	+ 1/8	40 1/8	43	600
4 7/8	1 1/2	Anumada Lead	1 3/4	1 3/4	1 5/8	1 3/4	..	1 5/8	1 3/4	600
217	95 1/8	Air Reduction (3).....	216	217 1/8	212 3/8	216 3/4	+ 2	214 1/2	216 1/2	4,900
48 1/8	36	Air Way El. Appl. (2 1/2)	39	39	39	39	+ 1/4	39	40	100
11 1/8	4	Ajax Rubber	4 7/8	4 7/8	4 3/8	4 7/8	..	4 3/4	4 7/8	1,000
10 1/4	4 1/2	Alaska Juneau	8 1/2	8 3/4	8 1/2	8 3/4	..	8 5/8	8 3/4	4,500
25	12	Albany Perf. W. Paper	19	19	19	19	..	18	19	100
56 1/2	27 3/4	Alleghany Corporation.	54	56 1/2	53 1/2	56 1/4	+ 3 1/4	56	56 1/4	229,500
118 3/4	99 1/8	Alleghany Corp. pf. (5 1/2)	115	118	115	118	+ 3 3/8	116 1/2	118 1/2	1,700
118	100 3/8	Alleg. Corp. pf. rec. (5 1/2)	115	118	115	117 3/8	+ 2 3/8	116 1/2	118	3,900
86 1/2	80 1/4	Alleg. Corp. pf. xw (5 1/2)	82	82 1/4	80 1/4	80 1/4	- 3 1/2	80	81	2,500
85 3/4	80 1/4	Alleg. Cp. pf. rec. xw (5 1/2)	82	82 1/4	80 1/4	80 1/4	- 2	80	81	1,600
354 3/4	241	Allied Chem. & Dye (6)	352	354 1/2	348	354	+ 4	350	354	5,600
125	120 1/4	Allied Chem. & D. pf. (7)	122 1/2	122 1/2	122	122	..	122	122 1/2	200
330	166	Allis-Chalmers Mfg. (7)	317	317	316 1/2	316 1/2	+ 5	312 3/8	317 1/2	300
42 3/8	22 1/2	Amerada Corp. (2).....	27	27	27	27	..	27	27 1/8	400
23 3/8	10 3/8	Am. Agricult. Chemical	11 3/8	11 3/8	11 1/2	11 3/8	- 1	11 1/2	11 3/8	500
73 3/4	40 3/8	Am. Agricult. Chem. pf.	46 3/4	46 3/4	46 3/4	46 3/4	+ 1 3/4	45	46 1/2	200
155	110	Am. Bank Note (73)...	149 1/8	155	149	151	+ 1 3/4	150	151	11,400
73 1/4	40 1/4	Am. Bosch Magneto ...	66 1/2	67	66	66 1/8	- 1 1/4	66 3/4	66 1/4	4,900

source: Wall street Journal

Table 1. Examination of Trading on September 3, 1929.

BULL MKT TOP DAY	% STOCKS AT NEW HIGHS	% AT OR < 2% OF NEW HIGHS	% OFF 20% OR MORE	% OFF 30% OR MORE
09/03/1929	2.30%	15.62%	31.84%	18.77%

examination of each stock traded on the New York Stock Exchange, comparing their bull market highs to their closing prices on the peak days of the Dow Jones Industrial Average, showed an unexpected picture.

These findings defy the conventional wisdom about the nature of stock market tops. In each case, 11% or less of stocks (average 5.98%) were making new highs along with the new high in the DJIA—a generally accepted proxy for the broad list of stocks. Further, in nine of the 14 cases covered in this study, a significant number of NYSE-listed stocks (average 21.97%) had already dropped in price by 20% or more before the DJIA had reached its bull market peak.

The primary conclusion to be drawn from these fourteen cases is that the vast majority of stocks reached their bull market highs well before the peak of the Dow Jones Industrial

Average. If a portfolio manager had somehow been able to sell out on the absolute top day of the DJIA in each of the fourteen cases studied here, in most instances the portfolios would have already lost a considerable amount of value by that time. Investors who may have thought themselves lucky enough to sell all of their stocks on the exact top day of the DJIA could have actually suffered significant losses. The amazing similarity of the statistics in these fourteen cases suggests a pattern of deterioration at major market tops that investors cannot afford to ignore. In searching for a way to describe this phenomenon of market deterioration—the gradual process of hundreds of individual stocks rolling over into their own bear markets, one by one, over a period of many months—the picture of a feather emerged. We think that image is just about right (*figure 2*).

Our study appears to show that the Dow Jones Industrial Average is a less than ideal proxy for the broad list of stocks. For example, as shown in Table 3, in the 1929 case, none of the thirty component stocks were making new highs along with the Industrial Average on September 3, 1929. This is due to a large extent to the reporting of closing numbers for the Average on a theoretical basis.

The study also suggests that, even at that early time in the history of the 30-stock Average, the price weighting of the components was producing an undue influence on the movements of the DJIA. However, the bigger issue is that the evidence drawn from all fourteen cases suggests that the highest price levels for the vast majority of New York Stock Exchange listed stocks have tended to occur well before the final peak in the DJIA.

Table 2. Examination of Trading at Fourteen Peaks in the Dow Jones Industrial Average.

BULL MKT TOP DAY	% STOCKS AT NEW HIGHS	% AT OR < 2% OF NEW HIGHS	% OFF 20% OR MORE	% OFF 30% OR MORE
09/03/1929	2.30%	15.62%	31.84%	18.77%
03/10/1937	6.05%	21.34%	5.94%	1.06%
05/29/1946	8.59%	30.44%	6.30%	0.86%
04/06/1956	5.32%	23.36%	1.92%	0.42%
01/05/1960	1.60%	5.83%	23.25%	7.67%
12/13/1961	3.56%	11.83%	25.29%	11.60%
02/09/1966	9.66%	19.04%	9.52%	2.68%
12/03/1968	9.43%	20.12%	9.51%	2.36%
01/11/1973	5.30%	11.82%	34.22%	20.51%
09/21/1976	10.97%	22.88%	21.65%	10.09%
04/27/1981	7.09%	15.18%	28.01%	9.39%
08/25/1987	6.23%	15.23%	17.37%	7.44%
07/16/1990	5.35%	18.11%	37.31%	22.74%
01/14/2000	3.54%	6.31%	55.33%	32.45%
AVERAGE	5.98%	16.88%	21.97%	10.54%

The final days of a bull market are substantially different than the final days of a bear market. At most bear market lows, because fear and panic are the dominant emotional drivers, the vast majority of stocks tend to bottom in unison. At most bull market tops, where investors have been lulled into complacency, the vast majority of stocks seem to top out on an individual basis. This is not much different than observing that a farmer usually plants all of his seeds at the same time in the spring. However, not all of the fruit reaches the point of peak ripeness at the same time. The ripe fruit must be picked individually, rather than all at once. In the same way, investors must commit to buying stocks quickly after a major market bottom, but must sell stocks one by one, as they reach their individual peaks.

This simple study of bull market tops should have far-reaching implications for all investors. The conventional wisdom of what a major market top looks like must be completely revised. Every portfolio manager must create a new strategic plan as to how and when to take defensive action. And, new indicators must be devised to eliminate the current guesswork of where individual stocks are within the primary trend. Investors must be able to see, and have time to react to, the gradual deterioration of market breadth that precedes periods of substantial stock market losses.

We will leave it to other researchers and analysts to determine all of the various reasons why so few stocks have reached their bull market highs in unison with the Dow Jones Industrial Average. Our principal concern, at this point, is to alert investors to the conditions that have consistently occurred at important stock market tops. Future studies will address the need to develop new indicators and a new portfolio management strategy to deal with the challenging conditions revealed in this study. [IFTA](#)

Figure 2



Table 3 The Dow Jones Industrial Average components as of September 3, 1929.

DJIA Components	1929 High	Sept 3, 1929 Close
Allied Chemical	354 ³ / ₄	354
American Can	184 ¹ / ₂	181
American Smelting	129 ¹ / ₈	128 ¹ / ₈
American Sugar	94 ³ / ₄	81 ³ / ₄
American Tobacco	205	200
Atlantic Refining	77 ⁷ / ₈	65 ⁵ / ₈
Bethlehem Steel	140 ³ / ₄	136 ³ / ₄
Chrysler	135	71 ⁷ / ₈
Curtis Wright	30 ¹ / ₈	29
General Electric	403	391
General Foods	81 ³ / ₄	71 ⁷ / ₈
General Motors	91 ³ / ₄	71 ³ / ₄
General Railway Signal	126 ¹ / ₂	123 ¹ / ₂
Goodrich	105 ³ / ₄	73
International harvester	142	140
International Nickel	72 ³ / ₄	54 ¹ / ₂
Mack Truck	114 ³ / ₄	97
Nash Motors	118 ⁷ / ₈	84 ⁵ / ₈
National Cash Register	148 ³ / ₄	125 ³ / ₄
North American	186 ³ / ₄	184 ¹ / ₈
Paramount	74	72
Radio Corporation	114	98 ¹ / ₈
Sears Roebuck	181	171
Standard Oil N. J.	73 ⁷ / ₈	70 ³ / ₄
Texas Corporation	71 ³ / ₄	68 ¹ / ₂
Texas Gulf Sulphur	85 ¹ / ₄	72
Union Carbide	137 ⁷ / ₈	135 ³ / ₄
U. S. Steel	261 ³ / ₄	257 ⁵ / ₈
Westinghouse	295 ⁵ / ₈	285 ⁷ / ₈
Woolworth	100 ⁷ / ₈	99

Sentix: Behavioral Indices A Behaviourally Oriented Development of the TA Tool-Kit

by Manfred Hübner

Abstract

Behavioral Finance is the theoretical foundation of our discipline. The article shows, how Behavioral Finance and Technical Analysis are connected and why we demand better data for investor's sentiment. It introduces a new set of sentiment indicators, the Sentix indices, which enables anyone, without costs, to participate in a global project with sentiment data to various markets. Some examples are shown how to use this new indicator set.

Behavioral Finance as the Foundation of Technical Analysis

For most market participants, technical analysis is more of an art than a science. This is connected to many factors, especially the mostly visual concepts which are the basis of any technical analysis. The nature of markets is also an important factor. From the beginning, technical analysis was the attempt by practitioners to get to grips with the nature of financial markets. Be it the trend analysis (herd behaviour of market participants), the Elliott Wave Theory ("Nature's Law") or Japanese Candlestick-Charts—all these concepts have one thing in common: they base their statements on the psychology of individuals and of the masses and derive their forecasts from the realization that human behaviour repeats itself in certain situations and can, therefore, be prognosticated to a certain degree.

For a long time, this approach was considered unscientific, as Technical Analysts, being practitioners themselves, having little interest in writing scientific texts. It is also based heavily on the fact that at the very latest since the 1960s, the prevalent capital market theory painted a completely different picture of the markets

and its actors. The *homoeconomicus* prevailed and the efficient market hypothesis put technical analysis into question.

This changed completely twenty years ago. Since the crash of 1987, the picture of the rational investor faltered considerably, and again more recently, for example, after the meltdown of LTCM hedge fund and the tech bubble burst of 2000. The idea of efficient markets with rational investors could no longer be supported. This paradigm change is accompanied by a rise and development of a new scientific area, behavioral finance. In contrast to the classical capital market theory, behavioral finance places the individual and his (sometimes hardly rational) decision making procedure in the centre of attention. For technical analysts, the realizations that can be taken from here often read like a repetition of basic convictions that have long been internalised. And, nevertheless, this scientific work is of fundamental importance for our work. For the first time, basic assumptions of technical analysis are reviewed scientifically and (partially) corroborated.

A central concept of behavioral finance is for example the "prospect theory", for which Daniel Kahneman received the Nobel-Prize for Economics in 2002. His theory states that people experience losses much more than gains, and that we are more likely to behave loss-averse than risk-averse.

In this context, reference points and mostly the entry price, play a central role. Translated into the language of technical analysts, this states simply that bear markets have a different dynamic than bull markets and that resistance and support (as significant acting points in the market) play a central role. As technicians, we already

know this, but we have never been able to state it in such a skillfully scientific way.

Now, three main corner stones of a new, behaviorally oriented financial market theory have emerged:

- There are useable momentum effects on the markets (prices move in trends)
- In specific situations, investors tend to over-react (over bought—over sold conditions) or under-react (strengthening of trends)
- The perception of investors is a function of the price, the news flow as well as the prevailing positioning (sentiment can dominate fundamental factors)

From Laboratory Experiments to a Real Time Application

Most of these realizations have been gained in laboratory experiments or through tedious examinations and extensive data material. An analysis in real-time seemed impossible. Richard Thaler, one of the pioneers of behavioral finance, pinpointed the dilemma: "There are better data on prices than people!"¹

At this point, the strength of the technical analysis and its focus on practical requirements becomes apparent. Especially for the analysis of prices, technical analysis possesses a large pool of (more or less suitable) tools. Be it trend following systems, oscillators or the formation theory—we are armed. Specifically, however, in the field of sentiment analysis with the consideration of psychological factors, technical analysis has a gaping void. While asset prices and turnover can be considered to be standardized and comparable, there is nothing comparable concerning the sentiment, the expectations and the positioning of investors. "There are better data on prices than on people" is, therefore, also a valid maxim for Technical Analysts.

Emotions Cannot be Measured, Effects Can

We can say that dispositions in the proper sense of the word cannot be measured, as they arise from inside the individual. However, the effects, i.e. the manifestation of emotions in activity, can be measured. Now, an effect can also be a neglect or omission, and this is the reason why survey-based sentiment indicators have an advantage over turnover-based indicators such as the put-call ratio for the visualization of emotions. Survey-based indicators also mirror the sentiment of investors on the sidelines, who could create future supply and demand just like invested investors. On the other hand, most price- and turnover- based concepts are easier to standardize. With most capital markets surveys, one cannot be sure who is participating and what their underlying motivation is. Also, the results, which are usually directed towards very specific questions or markets, are difficult to compare due to a lack of transparency in the survey modalities. For this reason, inter-market statements tend to be highly impossible.

These preliminary thoughts were the basis of a new, behaviorally oriented concept in the year 2001. This concept came from commercial practice and was conceived for the practitioner to receive

better, standardized information on sentiment, expectations and activities of actors on the finance markets while satisfying academic standards. An extensive survey panel was to be established which would allow for comparisons between investment groups, markets and different time-periods. The information should be available promptly to allow for a portfolio regulation that oriented itself according to the published data.

Introduction to the Sentix Indices

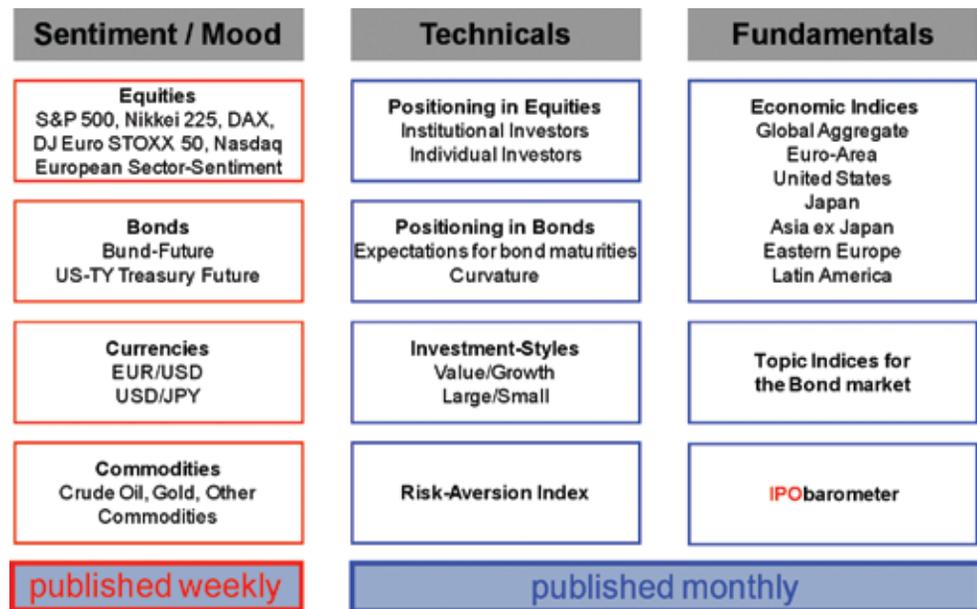
This idea gave birth to Sentix—behavioral indices which, for the first time, presents a comprehensive sentiment picture of a large number of investors and allows for a comparison of sentiments of different investor groups and nationalities, as well as different markets. Without the internet, such a project would have been impossible to realize. The combination of e-mail and internet based surveys gave us the opportunity to collect the answers from thousands of people in a very short time-span, to process this information and to make the results available. The central node of the project is the Sentix website (<http://www.sentix.de>), where anyone can register free of charge to participate in the surveys and the data. Since its introduction, it has been extremely

successful as a conduit to collect sentiment input. At present, over 2,500 investors have made use of this opportunity. Among the participants are more than 550 institutional investors, portfolio managers as well as analysts and economists. We receive sentiment data from more than 20 countries, especially from Europe. Additionally, Sentix is known and used in Asia, including Japan. Currently, more than 700 investors take part in Sentix surveys every week.

Methods: How Sentix Works

Every Friday, participants receive a mail with a link to our website, on which the survey is then conducted. Standardized questions include questions concerning the short- and medium- term expectations for twelve markets; for equity markets as well as bond-, FX-, and commodities markets. In this context, short-term defines a time horizon of one month, while a six month horizon is set for the medium-term view. The answers are calculated anonymously and turned into indices. In addition to the standard questions, participants are given topics that change on a weekly basis, such as preferred investment styles, sector assessments or positioning. *Figure 1* gives a schematic overview of the more than 400 individual indicators in the Sentix family.

Figure 1. Overview of the sentix indicator family



The Indicators

In the following, we would like to introduce some of the Sentix indicators and to point out appliance possibilities. We would like to start with the mother of all sentiment indices, the Sentix Sentiment Index. This displays investor sentiment in the form of a classic bull-bear index. Participants can give one of four possible answers: bullish, neutral, bearish and no opinion. The index is then computed from the balance of bullish minus bearish answers in proportion to the number of answers (excluding no opinion).

$$\text{sentix} = \frac{\text{Bulls} - \text{Bears}}{\text{All Votes}}$$

Should there be, for example, for a short-term assessment of the DAX-index, 120 bullish, 80 bearish and 45 neutral answers, the sentiment index would result in +16.32%. The Sentix Sentiment Indices are, therefore, valued between -100% and +100%.

Figure 2 shows an example of the short-term sentix sentiment for the DAX index. The index behaves in the same way as other classical sentiment indices. It can be seen that investor sentiment is strongly influenced by the development of market prices. However, in comparison to "normal" technical indicators, these oscillators possess one very significant advantage: they adapt themselves automatically to the respective market dynamic. A variation of the parameters to adjust to the specific market surroundings is not necessary. A further result of our research is that an upper trend turnaround differs significantly from a lower one. Market bottoms usually come about against the background of a very bearish sentiment, while bull markets hardly ever die in euphoria. Mostly, upper turnarounds follow precursory sentiment divergences which—just as with technical indicators—don't support new price highs with accordingly bullish sentiment. The bull camp, therefore, must fall apart "sentimentally" before a trend turnaround is probable. This is also confirmed by Sentix Sentiment data, namely that bull and bear markets are structurally different.

It is also interesting to smooth out indices, to statistically standardize them as so-called Z-scores. Figure 3 shows a short-term Sentix sentiment for the DAX which has been standardized in this fashion. In

Figure 2. Sentix-Sentiment for the DAXIndex (short term)

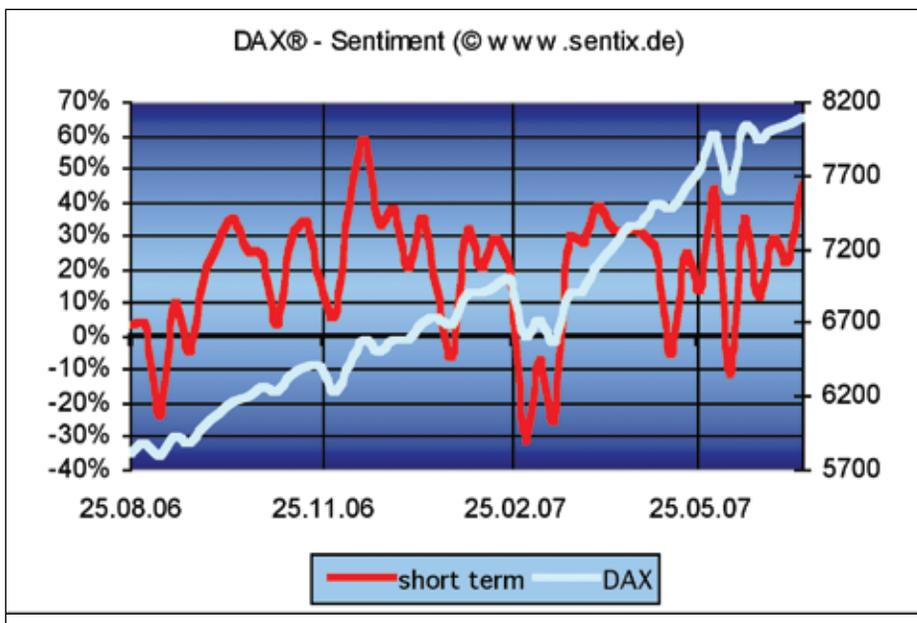
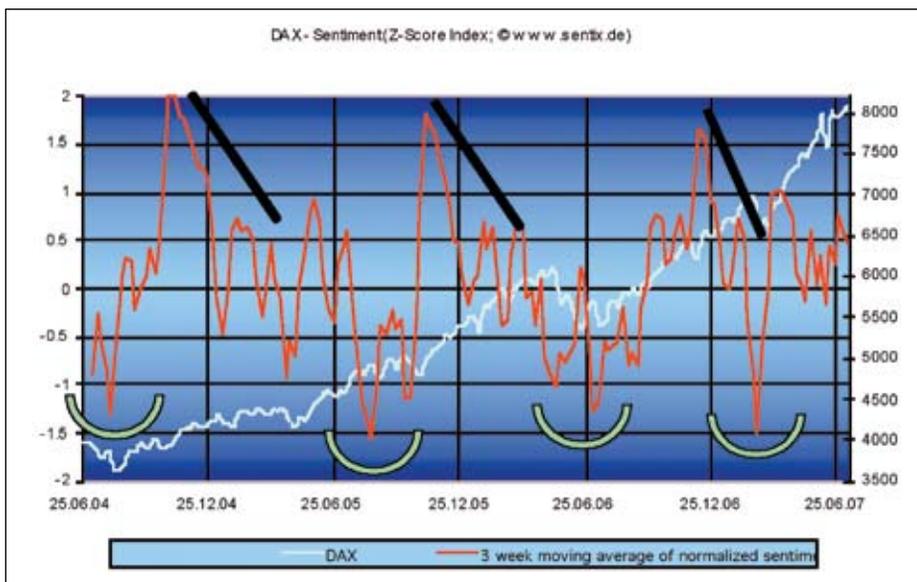


Figure 3. Short-term DAX-sentiment as Z-Score-Index



this case, the sentiment divergences as well as the lower extremes are even more easily recognizable.

Different Behaviour of Sentiment in Bull Markets and Bear Markets

This assessment of the market sentiment shows us that activity against the predominant sentiment must be well considered. In a bull market movement, one should not go against the herd too

soon. Often, activity with a trend which has developed from a gradual transformation from bear to bull, is more promising.

As we stated earlier, we survey market expectations on a short and medium-term basis, and we also divide according to individual and institutional investors. Interestingly, medium-term investor assessment shows completely different patterns than short-term assessments. A study conducted by the University Maastricht² showed that medium-term

expectations of those investors surveyed by Sentix are suitable as a basis for forecasts. While short-term sentiment behaves like a price-based oscillator, medium-term expectations better mirror the assessment of the market. Institutions especially show clear anti-cyclical tendencies. Professionals demonstrate a relatively sound feeling for overpriced or underpriced markets. Therefore, Sentix data does not only deliver insights into market sentiment, but also into the valuation assessment of securities from the viewpoint of investors.

Neutrality Counts: How to Profit from Uncertainty

In the following, we introduce two other indicators. The first is the so-called Sentix

Neutrality Index. This index represents the quota of neutrally positioned investors over time. A high neutrality index means that many investors have no clear view on the market. One could also call this situation an "irritation". A low quota of neutrally positioned investors means that almost everyone has a clear opinion. This could point to a situation of "overconfidence". Figure 4 shows the short-term Neutrality Index for the Euro-Bund-Future (Z-score index).

Turn-around points on this index in the vicinity of +/- 1.5 standard deviations are regularly accompanied by turn-around points in the market. It is more interesting to note, however, that after a phase of low neutrality, only small changes in absolute price value tend to follow and that volatility

tends to go down. The opposite is the case when irritation (high neutrality) is predominant amongst investors. In the aftermath, high absolute value changes are probable, as well as rising volatility.

Table 1 shows the statistical processing of future absolute oscillations of the Bund Future depending on the value of the Sentix Neutrality Index. "No. of. occ." means the number of observations in the Sentix database.

European Sector Sentiment Allows Sentiment Arithmetic

A significant advantage of the Sentix indicator family is that data from a wide range of markets can be surveyed with a comparable underlying set of principles and with the same survey clients. Once a month, investors are asked for their assessment of a range of equity sectors (18 sectors; STOXX system). As currently the majority of survey participants are based in Europe, this is a European sector sentiment. Every equity sector can be rated on five levels from strongly over average (++) to strongly under average (-). For the calculation of the index, the answers are average-adjusted and statistically normalized as Z-scores. Figure 5 shows, as an example, the relative sentiment for European telecom values in comparison to the relative performance of this sector to the overall market.

Comparable sentiment data for equity sectors did not exist until now; the utility, however, is evident. Extreme readings in the sector sentiment are a precursor for future relative price movements in the sector.

Sometimes, as a group, investors do not accept a dominant price trend. This

Figure 4. Medium-Term Neutrality Index for the Euro-Bund-Future (Z-Score)

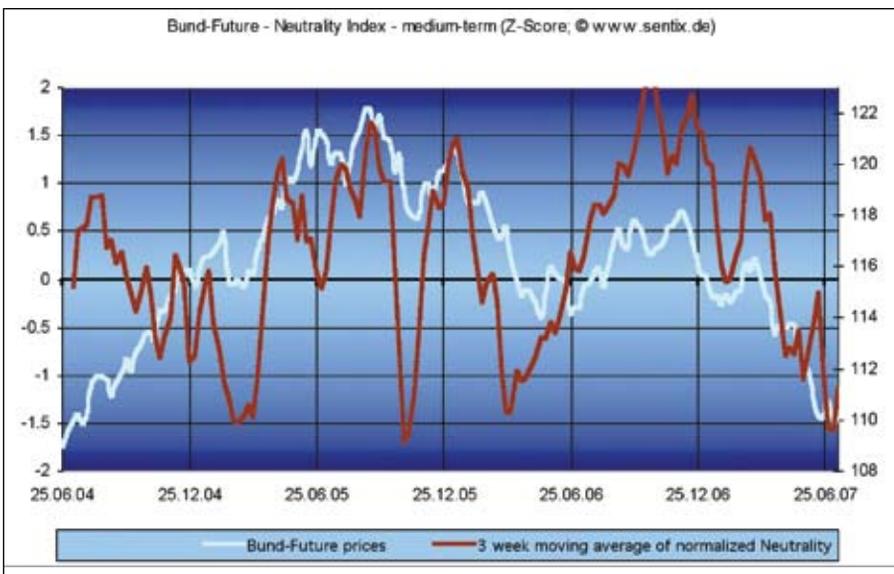


Table 1. Medium-Term Neutrality Index and future Bund-Future price movements

sentix Neutrality medium term	Absolut movement of Bund-Future prices in the next xxx weeks					No. of occ.	%
	1 week	2 weeks	4 weeks	8 weeks	12 weeks		
Neutrality Idx > 0.5	0.67%	1.02%	1.35%	2.02%	2.40%	5	1.54%
Neutrality Idx > 0.45	0.57%	0.77%	1.23%	1.67%	1.86%	35	10.80%
Neutrality Idx > 0.42	0.52%	0.73%	1.09%	1.61%	1.94%	62	19.14%
Neutrality Idx > 0.4	0.52%	0.71%	1.07%	1.64%	1.92%	103	31.79%
Neutrality Idx > 0.38	0.53%	0.72%	1.06%	1.58%	1.86%	158	48.77%
Neutrality Idx < 0.38	0.25%	0.40%	0.61%	0.86%	1.02%	166	51.23%
Neutrality Idx < 0.36	0.22%	0.32%	0.51%	0.70%	0.83%	112	34.57%
Neutrality Idx < 0.34	0.16%	0.23%	0.37%	0.51%	0.61%	65	20.06%
Neutrality Idx < 0.33	0.11%	0.17%	0.29%	0.39%	0.48%	44	13.58%
Neutrality Idx < 0.3	0.03%	0.03%	0.08%	0.13%	0.18%	12	3.70%

Figure 5. Telecom sector sentiment and relative Performance of Telecoms versus STOXX600

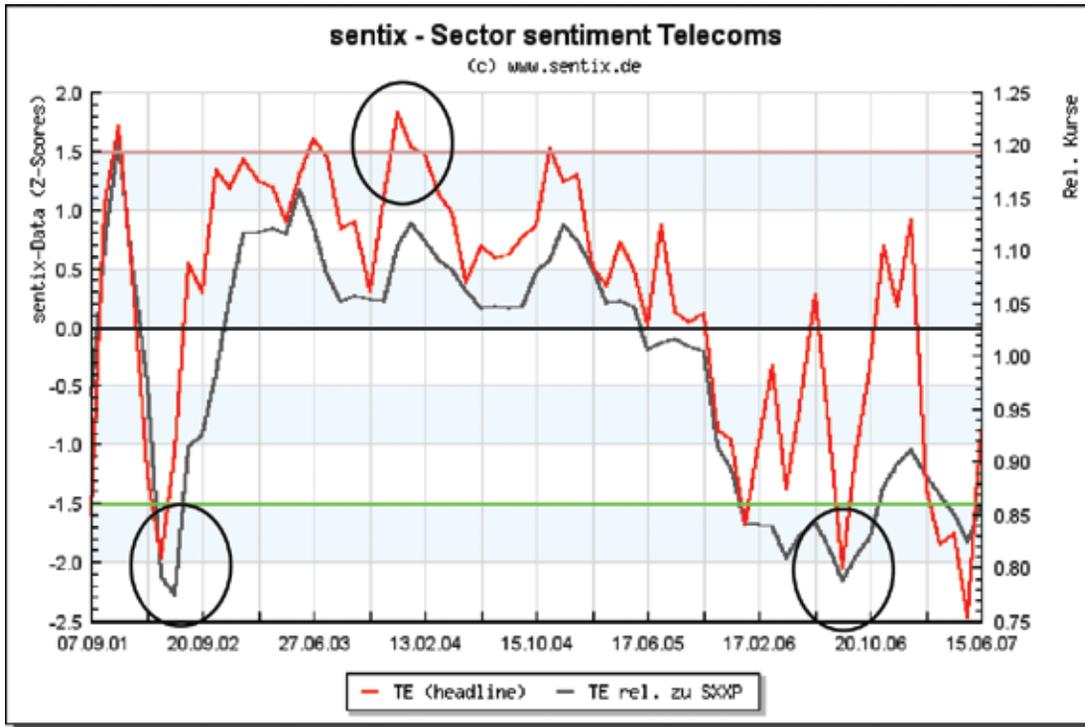
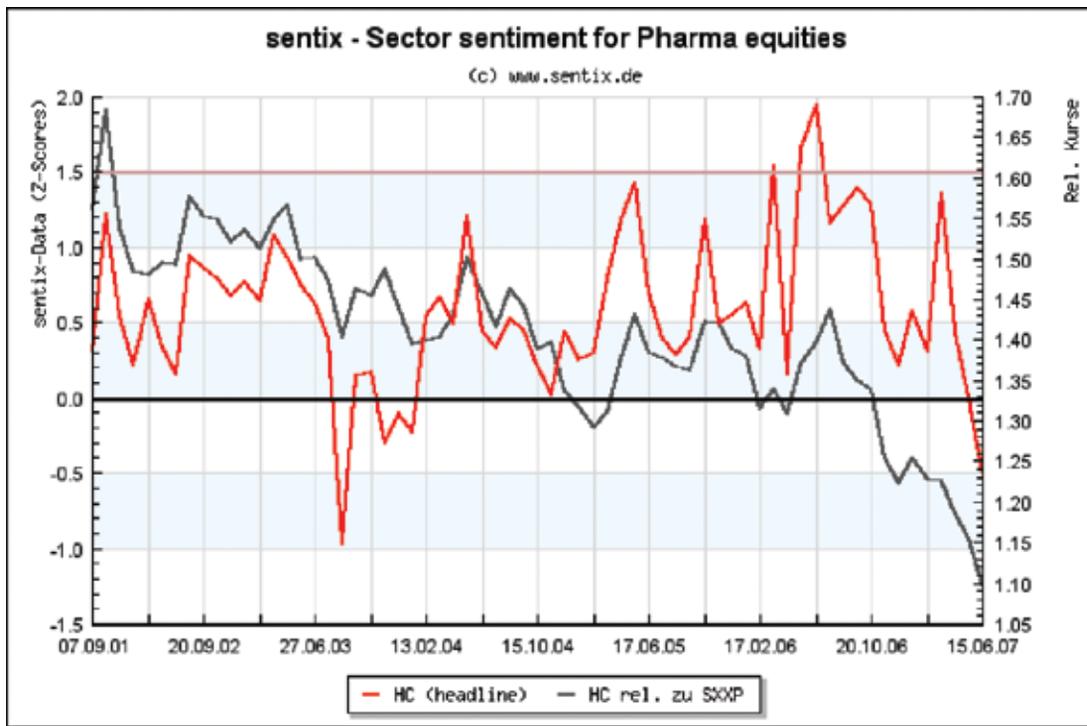


Figure 6. Pharma sentiment stays bullish and price declines go beyond “fair values”



happens, for example, if the valuation case seems to favour the sector. The price and sentiment development in the European pharmaceuticals sector is such an example. Figure 6 illustrates the relative weakness of the sector compared to the bullish sentiment, which dominates for a relatively long time.

As all Sentix indices are surveyed on a comparable basis, one can also work with them and, for example, determine the relative sentiment between telecom and energy values. Figure 7 shows the difference in sentiment between both sectors as well as relative performance. here, one can see the completely new appliance functions for which this data allows.

One could also combine the sector sentiment with the Crude Oil sentiment. The bullishness for Oil in the summer of 2006 compares nicely with the strong bullishness for Energy stocks and gives additional hints on a coming weakness in the relative performance of BP & Co.

Practical Considerations

What should one take into consideration when using the Sentix data in practice? First, and especially, short-term indicators may be used as classical sentiment indicators. however, the analyst should use caution with the assumption that a bull market dies in a phase of optimism. We have regularly observed the break-up of bull camps before the actual course summit. Medium-term investor expectations also fall backward long before a top is achieved. In a bear market, it is often worth grabbing the falling knife with conviction and confidence in the face of highly pessimistic values. Bear markets are simply different.

It is always important for us to inspect sentiment data according to which psychological state they represent. If behavioral finance theory defines cognitive dissonance to be events going other than what was expected, then this corresponds with a falling market with a high level of investment positions. In this case, the theory allows the expectation that investors will use suppression methods. This, in turn, can be reviewed with the help of Sentix indicators in the fundamental group, which measures those topics which are favoured by investors.

Another example of how to spot behavioral anomalies in real time is the

discussion of the all time high in the DAX Index. As expected, the medium-term sentiment declines near the top of 2000. That shows that the imagination of investors did not go beyond that point. A higher willingness to take profits was therefore expected.³ And indeed, as official flow statistics showed, investors behaved in a loss-averse manner and pulled the money from the table. It's clear that as soon as new highs are confirmed, regret will dominate investor's feelings and people will have to buy into their underinvested portfolios.

Sentix: A Unique Project with Global Reach

The Sentix indices are a unique project to survey investor sentiments and investor activities. They possess the potential to give "better data on people". Without appropriate data, which also needs to be available in real time, a systematic implementation of the insights of behavioral finance would not have been possible. For technical analysts, the Sentix indices are an important supplement to our tool box. *Every investor can actively participate in the surveys and get free access to the results.* If many investors from around the world take part in this project, we can gain a completely new global perspective. [IFTA](http://www.sentix.de)

Richard Thaler

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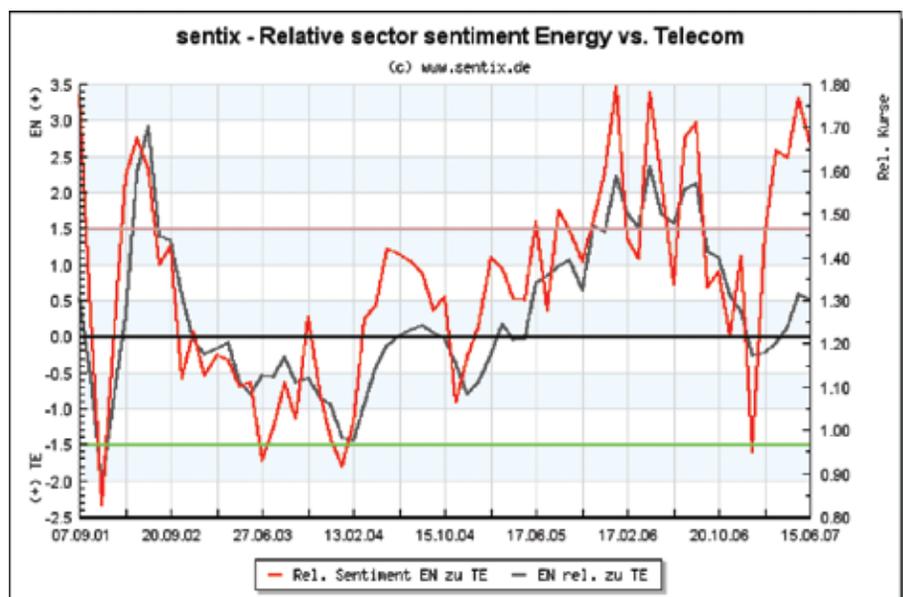
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5. <http://www.sentix.de/index.php?pagename=knowhow.htm>

Figure 7. Relative sentiment—Energy sector vs. Telecom sector and the relative performance between the two sectors



Using A Color Spectrum To Represent Changes In The WAKO Volume Ratio On Candlestick Charts

by Stewart Gault, MFTA

Introduction and Abstract

Recently an increasing number of articles have claimed volume and indicators derived from it are underutilized. The fact that volume indicators are independent and often leading evidence of a potential price trend reversal is well documented. Disregarding volume data seems illogical when integrating it into a strategy is not a difficult task. Like price indicators, volume indicators come in many different forms from indicators which only input volume, such as Joe Granville's On Balance Volume and Volume Moving Average, to indicators that combine both price and volume, for example the Money Flow Index and the Volume Weighted MACD.

This paper will introduce a still-unfamiliar volume indicator, originating in Japan, the WAKO Volume Ratio. After focusing on three factors that affect this indicator, an original charting method that combines price and indicator data on a single chart will be introduced and applied to the WAKO Volume Ratio. If you are not using a volume indicator, are searching for another indicator to test and possibly add to your strategy, or are looking for a unique new charting method, you may find this article informative.

Background: WAKO Volume Ratio

The WAKO Volume Ratio (WVR) represents the difference between distributive volume and accumulative volume as a percentage of the total volume for a defined period. In 1974, Yukiharu Abe who worked at WAKO Securities Co. (merged with Shin Nihon Securities in April 2000 to form Shinko Securities) developed the ratio as a timing mechanism for the medium and long-term trading of stocks. It is based on the theory that price movements are formed by a cycle of distributive and accumulative energy. The total daily or weekly volume is defined as distributive when the closing price at the end of the period is higher than the opening price at the beginning of the period. On the

other hand, the daily or weekly volume is defined as accumulative when the closing price at the end of the period is lower than the opening price at the beginning of the period. Variations in the magnitude of the energy and the actual level of the WVR estimate the market phase. Rising prices represent energy being distributed into the market, whereas falling prices represent energy being stored in the market.

Calculation

The general equation to calculate the WVR is as follows:

$$\text{Wako Volume Ratio(\%)} = \frac{\text{Total volume of the periods in which prices advanced (Distributive Energy)} - \text{Total volume of the periods in which prices fell or levelled off (Accumulative Energy)}}{\text{Total volume of all periods}} \times 100$$

The method of calculating the following weeks is the same as that used for calculating the value of a moving average: delete the oldest week's total volume from the denominator and add the newest week's total volume. For the numerator, add or subtract the oldest week's period volume if the oldest week's energy was accumulative or distributive respectively, then add or subtract the newest week's volume if it is distributive or accumulative respectively. For easier comparison with price movements, WAKO suggested plotting the WVR, with a range from -100% to +100% and centered on a zero reference line, on top of the price chart (see figure 1).

Interpretation and Rules

As the WVR generally oscillates around the zero reference line, identifying the WVR level and phase is essential. The WVR cycle, and hence the market, can be broken down into phases as shown in figure 2.

When the distributive and accumulative energy are equal the WVR will be zero. As prices increase, so too will the distributive

energy to a level where the market can no longer sustain more distributive energy. The WVR then enters a phase of decreasing distributive energy, and prices decrease. Prices usually hit a top towards the end of the phase of increasing distributive energy, or early in the phase of decreasing distributive energy. As the WVR passes over the zero reference line, a phase of increasing accumulative energy begins. When the market can no longer store any more energy, prices start to rise and a phase of decreasing accumulative energy begins. It is around this time that prices normally hit a bottom.

Abe proposed the following six rules when using his WVR with stocks:

1. When prices are in the low or high price zone, as seen from a medium or long-term perspective, the WVR hits its significant bottom or top.
2. Although the depth of the bottom will differ depending on the stock, generally when the WVR reaches -40% to -60%,

prices stop falling indicating a low price zone. More popular stocks however tend to have a shallower bottom, around -20% to -30%. Based on previous bottom levels, one can buy if the WVR has increased from below -20% for two consecutive weeks (13-week WVR) or when the WVR has stayed in negative territory for several periods and shows signs of a reversal.

3. When the WVR increases to around +60%, the rising price movement slows down, indicating a high price zone. WVR levels exceeding +80% signify a high probability of prices falling. Before selling, one must make a distinction between this rule and Rule 4, otherwise, the stock could be sold too early. High WVR levels, above +60%, should be taken as a warning sign that a reversal may be imminent. One may consider selling if the WVR has decreased from above +60% for two consecutive weeks (13-week WVR) or prices have crossed under a short-term moving average. For short-term buying opportunities, look for stocks whose WVR exceed +40% and continue increasing. The risk of buying a top is significant, so sound money management strategies are essential.

4. In the case where the WVR increases rapidly in a single period due to a sudden increase in volume, Rule 3 does not apply. In fact, this indicates the start of an advancing market, and a possible buying opportunity.

5. A bullish signal forms when the WVR follows a declining trend and prices are either steady or increasing. Subsequently, prices start rising or continue rising for a while indicating a possible buying opportunity.

6. When the WVR moves from minus(-) to plus(+) and prices are trending higher from an earlier bottom, prices continue to rise further. Contrary to this, stocks where the low price can be determined from past WVR levels, scale-down buying can be performed. Buy the first lot when the WVR crosses from positive to minus, a second lot when the WVR falls below -20% and a final when below -40%.

Usage Today

Other than in the English version of the

Table 1: Calculation of a 14-day WVR

National Australia Bank (NAB) in AUD									
Col.	A	B	C	D	E	F	G	H	I
Line	Date	Open	Close	Volume	Energy Type	Total + Volume	Total - Volume	Total Volume	WVR (%)
3	07 Mar 96	1217	1214	30350	-				
4	08 Mar 96	1218	1216	18130	-				
5	11 Mar 96	1187	1163	30430	-				
6	12 Mar 96	1187	1192	34780	+				
7	13 Mar 96	1191	1177	38410	-				
8	14 Mar 96	1181	1172	25800	-				
9	15 Mar 96	1179	1187	20050	+				
10	18 Mar 96	1186	1187	13900	+				
11	19 Mar 96	1197	1183	35640	-				
12	20 Mar 96	1181	1167	19000	-				
13	21 Mar 96	1164	1182	24440	+				
14	22 Mar 96	1181	1182	31890	+				
15	25 Mar 96	1180	1186	15080	+				
16	26 Mar 96	1192	1193	13520	+	153660	197760	351420	-12.55
17	27 Mar 96	1197	1175	40450	-	153660	207860	361520	-14.99
18	28 Mar 96	1165	1155	76230	-	153660	265960	419620	-26.76
19	29 Mar 96	1153	1140	51060	-	153660	286590	440250	-30.19
20	01 Apr 96	1135	1133	34360	-	118880	320950	439830	-45.94
21	02 Apr 96	1145	1140	48970	-	118880	331510	450390	-47.21
22	03 Apr 96	1143	1137	27090	-	118880	332800	451680	-47.36
23	04 Apr 96	1140	1129	15280	-	98830	348080	446910	-55.77
24	09 Apr 96	1120	1125	24480	+	109410	348080	457490	-52.17
25	10 Apr 96	1125	1110	60740	-	109410	373180	482590	-54.66
26	11 Apr 96	1110	1108	37750	-	109410	391930	501340	-56.35
27	12 Apr 96	1111	1107	36280	-	84970	428210	513180	-66.88
28	15 Apr 96	1114	1130	28350	+	81430	428210	509640	-68.04
29	16 Apr 96	1141	1135	28160	-	66350	456370	522720	-74.61
30	17 Apr 96	1135	1126	23900	-	52830	480270	533100	-80.18
31	18 Apr 96	1124	1110	40940	-	52830	480760	533590	-80.20

Col. E:
if Open > Close
then Energy Type = + (Distrib.)
else Energy Type = - (Accum.)

Col. F:
sum of + energy volume during
14-day period

Col. G:
sum of - energy volume during
14-day period

col. H:
sum of all volume during 14-day period

Col. I:
F-G / H x 100

Figure 1: NAB (daily) with 14-day WVR overlaid

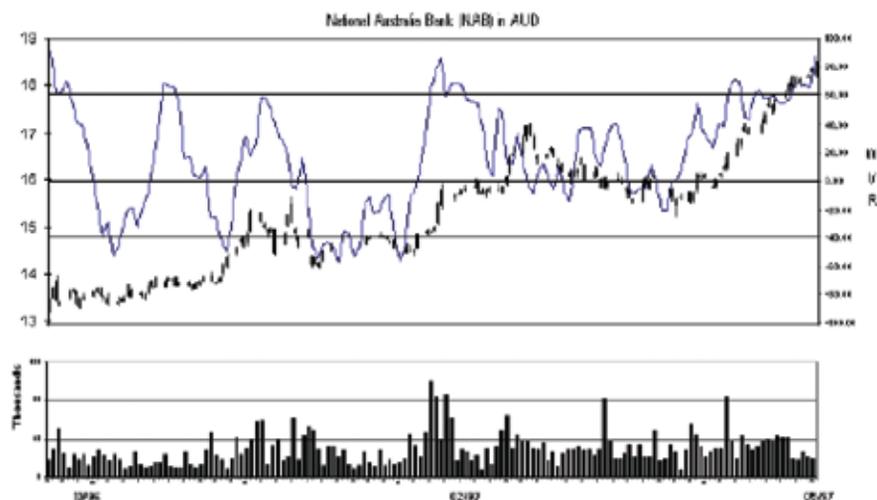
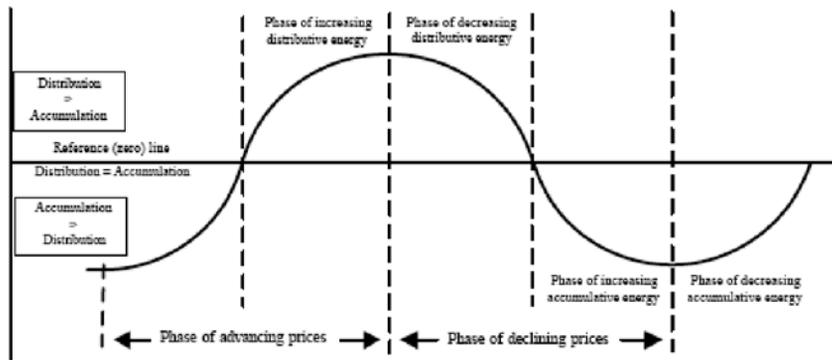
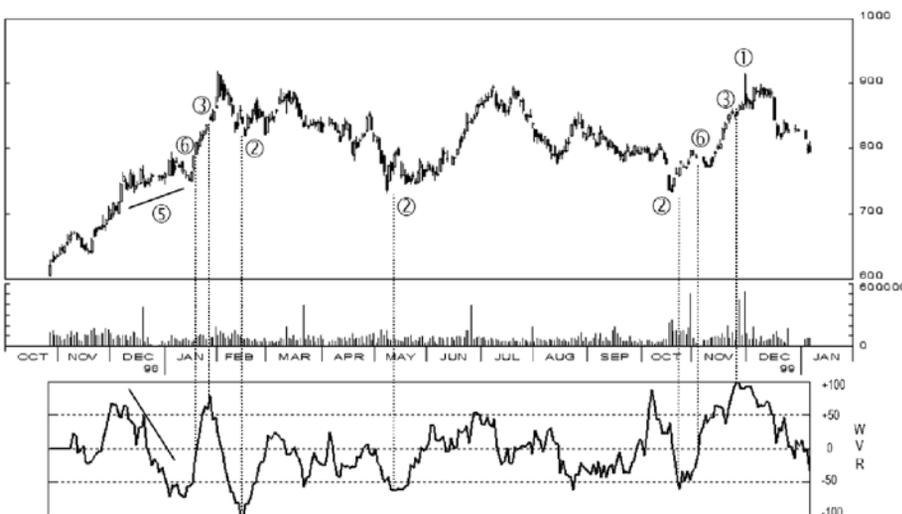


Figure 2. WVR Cycle and Phases



Nippon Technical Analysis Association's (NTAA) book titled *Analysis of Stock Prices in Japan*, finding English literature on the WVR is very difficult. Determining the usage of WVR amongst analysts in Japan is not easy but likely to be limited. In addition, research does not reveal widespread use of the WVR outside Japan. A small number of books, in Japanese, cover the indicator and a few Japanese technical analysis software programs include the indicator. In the past, methods like Candlesticks and Ichimoku Equilibrium, took some time to reach, and be adopted by, analysts outside Japan, and the WVR will hopefully add to this list of useful indicators reaching the West.

Figure 3 Telstra (daily) with 10-day WVR highlighting rules

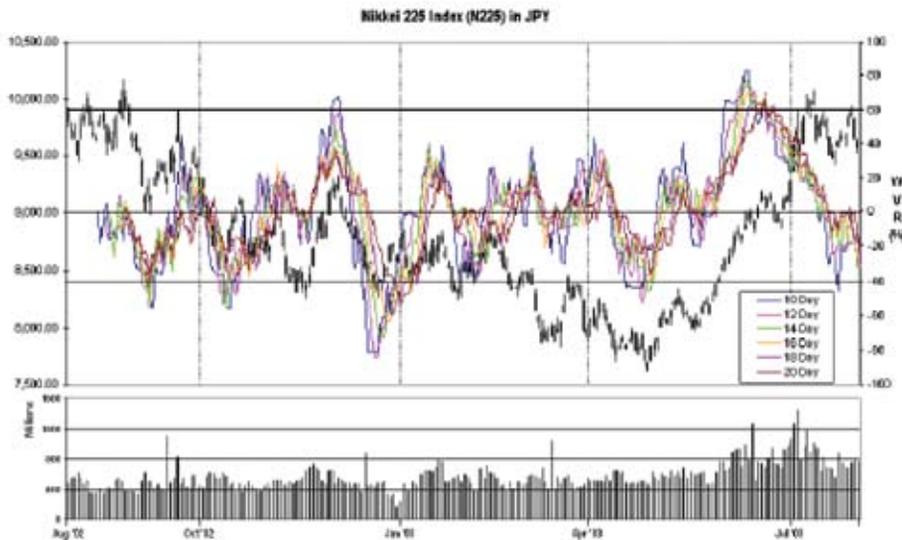


WAKO Volume Ratio: Factors to Consider

Time Frame: WVR was originally developed with medium to long-term investment in mind, however as shown here, the WVR can successfully be applied to shorter time frames as well. *Figure 4* compares six different WVRs from 10 days to 20 days. All WVRs respond to significant price moves, late November 2002 (+60%) and mid Dec 2002 (-80%), and do not deviate too much from each other. The short WVRs (10 and 12-day) respond faster to changes in energy and reach more extreme levels in both distributive and accumulative energy, however with additional noise.

The longer 18 and 20-day WVRs generally respond more slowly, but in some cases (see *Figure 5*) will reverse on the same day as the short WVRs. The WVR curve appears smoother albeit more attenuated. From mid-January to June 2003, the WVR oscillated in a narrower range, between -40% and +40%, which suggests a possible change in market direction.

Figure 4: Multiple WVR periods for Nikkei 225 Index



A closer examination of the short 10-day WVR and the longer 20-day WVR shows the attenuated longer WVR occasionally (late November and mid-January) picking up reversals quickly, but at other times (mid-October and mid-December) not indicating the change from increasing accumulative to decreasing accumulative energy until seven days later.

During the 90's bull market, the short 10-week WVR crosses the +60% line eight times, but only crosses the -40% line twice. The September 1998 correction generated the first significant crossing of the -40% line in more than six years. For

the following 34 months, the short WVR crossed the +60% line less frequently, and accumulative energy increased. Interestingly, during this period the bull market slowed and later reversed.

As with any other indicator, back testing and optimization of the WVR are necessary to determine the appropriate period for a balance between too many buy/sell signals and not enough. Periods of 10, 14 and 20 days or weeks all seem to produce useful signals, which should allow easy integration with other indicators like RSI and Bollinger Bands.

Market Direction: While studying many charts, the influence of the market's trend on the WVR became apparent. During a sideways market the energy equilibrium point is at or very close to the zero reference line. As the market trends up or down, the equilibrium line moves up or down producing higher highs and lower lows respectively in the WVR. These observations allow technicians to adjust their rules accordingly and take advantage of important moves.

During the S&P 500's short downtrend (Figure 7), the 10-day WVR spent 60 days above and 68 days below the zero reference line. Also, the 10-day WVR spent one day above the +60% line, but 25 days below the -40% line.

Throughout the S&P 500's short sideways trend (Figure 8), the 10-day WVR spent 61 days and 62 days above and below the zero reference line respectively. Also, the 10-day WVR spent 2 days above the +60% line, and 3 days below the -40% line.

During the S&P 500's short-term uptrend (Figure 9), the 10-day WVR spent 73 days and 55 days above and below the zero reference line respectively. Surprisingly, even though the WVR crossed above the +60% line three times and below the -40% line once, the 10-day WVR remained a greater time (10 days) below the -40% line than above the +60% line (9 days), which could suggest the current uptrend was slowing.

Low Volume: Even though the WVR calculation normalizes volume, very low or widely varying volume may reduce the correlation between price and WVR. Two stocks each with relatively low daily volume and small market capitalization were chosen to study this phenomenon.

AT Cross (AMEX:ATX, figure 10) had an average daily volume for the period shown

Figure 5. Nikkei 225 Index comparing 10 and 20-day WVRs

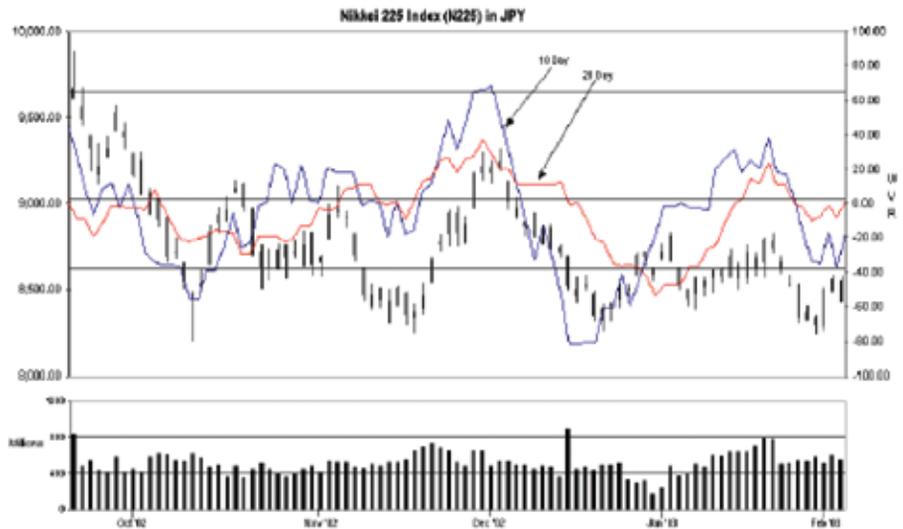
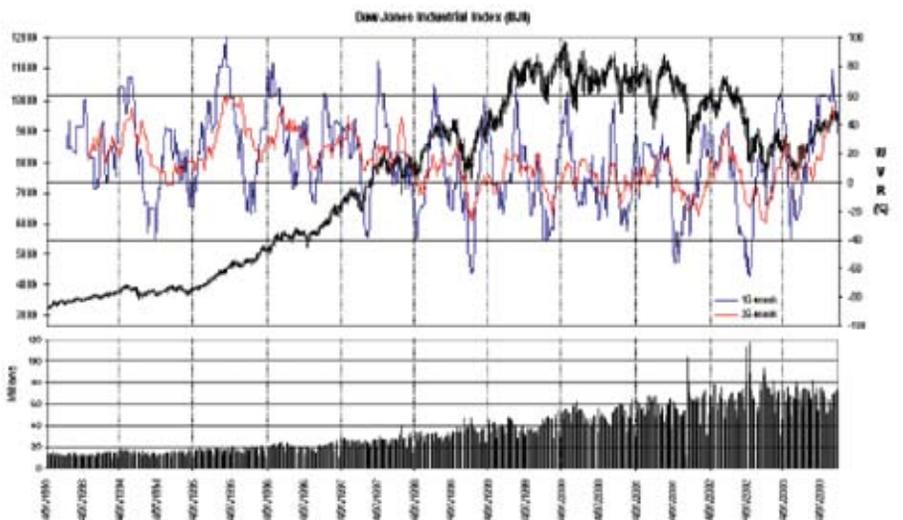


Figure 6. Dow Jones Industrial Index comparing 10 and 26-week WVRs



of 17,609 and a market capitalization of US\$95.62 million. Although a strong downtrend is not evident, the accumulative energy considerably exceeds the distributive energy. In late March, ATX closed lower for twelve consecutive days, which resulted in the 10-day WVR hitting the -100% level for three days. Such a low level indicates a very high probability that price will increase, which it did. The same situation occurred again in late July, and again the price increased.

Skyline Corp (NYSE:SKY, figure 11) had an average daily volume of 8,671 for the period shown and a market capitalization

Figure 7. S&P 500 (GSPC) Downtrend



Figure 8. S&P 500 (GSPC) Sideways Trend



Figure 9. S&P 500 (GSPC) Uptrend



Figure 10. AT Cross (AMEX:ATX)

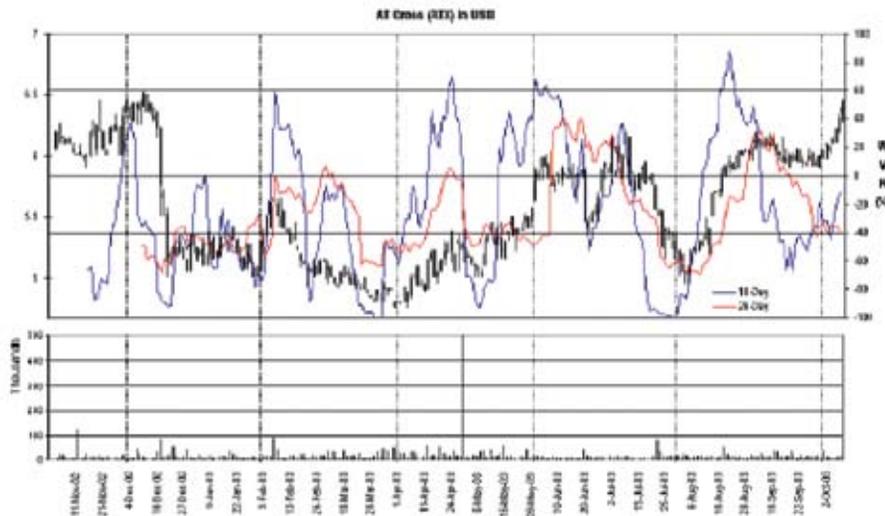
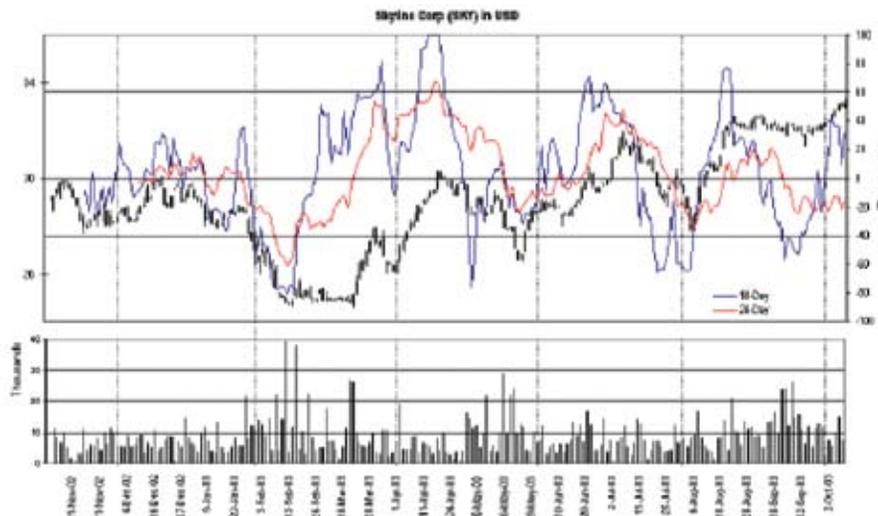


Figure 11. Skyline Corp (NYSE:SKY)



of US\$277.74 million. Interestingly, in this chart the short 10-day WVR generates some useful signals (mid-February, mid-April and late July), but the smoothed 26-day WVR also reaches the +60% and - 40% lines at the same time without as much noise.

WVR can generate some reliable signals when used with low-volume stocks; however increased volatility must be taken into account. A longer WVR can avoid some of the false signals, but may not reach the trigger lines, so adjust the rules accordingly.

Modification of the WAKO Volume Ratio

The MACD concept of finding the difference

between a fast and slow average was applied to the WVR, subtracting a 20-day WVR from a 10-day WVR (Figure 12). Unfortunately, this idea did not yield results any better than normal WVR usage and was therefore not pursued. The noise on both WVRs, which could be reduced by additional smoothing, contributes to the volatility and false signalling of the difference curve.

Spectral Candlesticks

In basic chart construction, time and price are represented on the x-axis and y-axis of a 2D graph respectively, and volume is recorded as a histogram at the bottom of the chart under its corresponding price

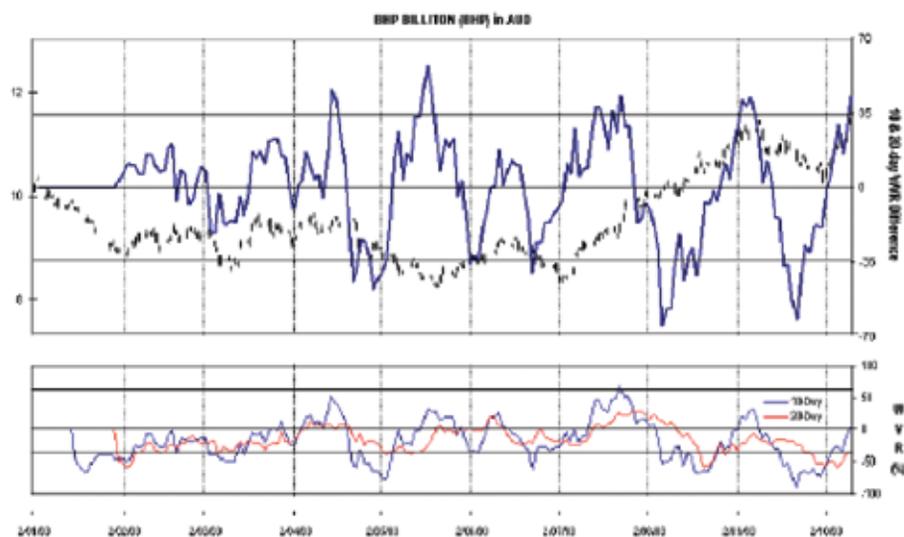
bar (or candlestick). Charts have changed significantly from the early 1800's when hoshi-feet (Asterisk) were plotted in a time series to represent rice prices in Japan's Dojima rice market. Today, analysts employ various indicators based on price and volume in an attempt to achieve the most out of their trading strategies. The increasing number of sub-charts, and their decreasing size, tends to reduce their significance, if only physically. Can these indicators, correlated or uncorrelated, be combined with price data and displayed at the same level on the same chart? Many fields, like finance, electronics and aeronautics, use numerical analysis techniques such as FDM, FEM and BEM to display results in 3D using a range of colors, which highlight areas of significance. Representing standard OhLCV data in this 3D form may be unnecessarily computer intensive; still the concept of using color variations to represent changes in indicator values seems practical. Color by itself can add another dimension to the price chart without a significant increase in computation time. Candlesticks, which have a larger physical (body) area than bar and line charts, will be used to clarify the colors.

It should be noted that even though the concepts presented here apply to other volume and price indicators, this report focuses on WVR indicator applications.

Similar Concepts

The use of color on charts to represent rising or falling prices is hardly new. In fact, Japanese colored upticks on Ikari-ashi (Anchor Foot) charts were used around 1900 to distinguish from downticks, and not long after candlesticks with colored bodies became popular because of their increased clarity and ease of use. Today's usage of green and red candlesticks, a common combination, to represent rising and falling prices is useful for quickly identifying a large number of consecutive up or down periods in addition to identifying other market conditions. Yet the limited number of colors does not show subtle changes in average price, momentum or sentiment. Most popular charting programs allow users to define basic color settings, however research has not uncovered any usage of color spectra like that presented here.

Figure 12. BHP Billiton (ASX:BHP) with a 10 and 20-day WVR difference



Calculation

For stocks daily volume can range from zero to the number of stock issued. however, depending on several factors, such as the size of the company, industry and number of stock issued, volume varies significantly. Using a normalized volume indicator such as the WVR, simplifies the calculation. Plotting this was performed in MATLAB, a technical computing program.

After determining the indicator's range, the number of colors in the spectrum used to represent the indicator can be chosen. The number of colors the human eye can distinguish is finite and ranges from one to several million depending on light conditions. Due to technical limitations, computer and television screens cannot produce all visible colors, especially most saturated colors. In addition, the amount of light falling on the screen can also reduce the number of colors we can discriminate.

The minimum difference in magnitude between two colors a person can perceive is defined as the difference threshold, or 'just noticeable difference'. For example, on a screen with uniform luminance L, if the luminance in an area is increased to L+D, then the smallest detectable increase D is the 'just noticeable difference' at L. A 19th century German experimental physiologist, Ernst Weber, found that the size of the difference threshold is a constant proportion of the original stimulus magnitude. This relationship, known as Weber's Law, can be applied

to other sensory thresholds, such as line length and mass.

The color on the left (135) and the one to its right (134) may look very similar or even the same. They are, however, slightly different. Distinguishing the colors on the right (130 and 122), which have a greater difference, is much easier (Figure 13). Using thousands of colors with unrecognizable differences would provide little extra benefit to the analyst and would only increase computation time. For the WVR, which ranges from -100% to +100%, 201 points (or one for each integer between -100 and +100) seems to be a logical choice.

Many computer programs use a RGB (Red Green Blue) color code to specify the intensities of the red, green and blue components that make up color. Depending on the application, the value used to specify the intensity varies with common ranges between 0 and 1, and 0 and 255 (an 8 bit number). The highest value (1 or 255) specifies the highest intensity of red, green or blue, and the lowest value (0) specifies the lowest intensity of the corresponding color. For example, [0 0 0] represents black, the minimum intensity of each color, while [255 255 255] represents white, the maximum intensity of each color.

The analyst can define the color range and even highlight levels of interest, such as +60% and -40% for the WVR. Figure 14 shows some examples of user defined spectra.

In MATLAB the spectrum is defined by a 3-by-201 matrix, in which each column

represents the red, green and blue values, and each row, the 201 colors (see figure 15). Due to the length of the matrix, only the first and last few values are shown.

The charting program first calculates the WVR value for the period then finds a color in the spectrum matrix closest to the indicator value (Figure 16). To simplify programming, the WVR values were calculated in Excel and imported into MATLAB. Assuming the indicator value is +50.2%, since we selected 201 points the program rounds this to the nearest integer (+50%), which equates to a RGB value from the above table of [1.000, 0.5000, 0] or orange.

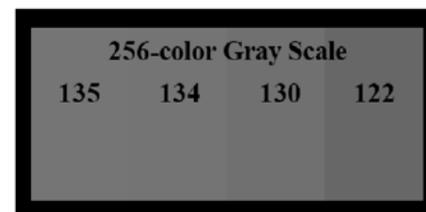
The MATLAB code in Figure 17 plots the candlestick in two stages; firstly the wick, and secondly the body. The conditional statement decides whether the candle has a clear or colored body before drawing the candlestick on the screen.

Coloring Candlestick Charts with WAKO Volume Ratio-Based Spectra.

Figure 18 is the same as Figure 3, however the WVR has been converted into a color spectrum and the candlestick colors changed accordingly. On January 28, 1999 (WVR = +78.42%) and November 22, 1999 (WVR = +100%) dark red indicates a very high level of distributive energy, and according to Rule 3, suggests a possible trend reversal that actually occurred several days later. The extreme low on February 15, 1999 (WVR=-100%) indicated by dark blue did not see the prices increase significantly, however the May 11, 1999 and October 19, 1999 lows saw prices increase to previous highs.

A possible price decrease in the Dow Jones Industrial Index (Figure 19) was indicated by the 10-week WVR crossing the +60% line in the week of March 16,

Figure 13. Weber's Law Applied to Colors



1998 and again two weeks later. Although not immediately, prices fell to a low, as indicated by the solid dark blue candlestick on September 14, 1998, and then quickly rose over 1000 points. This increase slowed after distributive energy peaked at +60.30% on November 23, 1998.

The 11-month daily chart of Boeing (Figure 20) shows distributive energy reaching high levels in early June (WVR = +69.04%) and early September (WVR = +84.46%), which are soon followed by downturns. The January 29 low of -61.13% did not signal the expected price rally, however the ten days from February 28 remaining below -40% was an early indication prices would rise.

This daily chart (Figure 21) uses a different spectrum from the earlier charts. Three white bands in the spectrum, +57 to +63%, -3 to +3% and -43 to -37%, were used to highlight the important +60%, 0 and -40% levels. When the WVR fell quickly after July 8 it skipped the -40% band, because -44.06% on July 15 was just outside the band's width. The subsequent rise showed a white candle on August 11 at the zero level and two at +60% on August 18 and 19. For shorter, more volatile WVRs consider using wider bands (~10%) or else a smoother, longer WVR.

Conclusions and Further Study

Although the WAKO Volume Ratio provides some practical signals in all time frames for large and small stocks, using it to confirm signals with other indicators, especially price indicators, is highly recommended. The WVR is relatively simple to program and interpret, so integrating it into a trading system for back testing should be easy. Another modification of the WVR that will be explored is a weighted WVR for longer periods in an attempt to increase response time but not noise.

The spectral candlestick method, though visually appealing, does not instantly provide quantitative information usually required for trading decisions. The full range of applications has not yet been explored. At this point the method seems most useful when quickly scanning large numbers of stocks. A major drawback is programming this method. Technical software like MATLAB can perform the task but not as effortlessly as most analysts may require. A future task will be to develop a user-friendly plug-in to Excel or a stand-

Figure 14. Possible Spectra

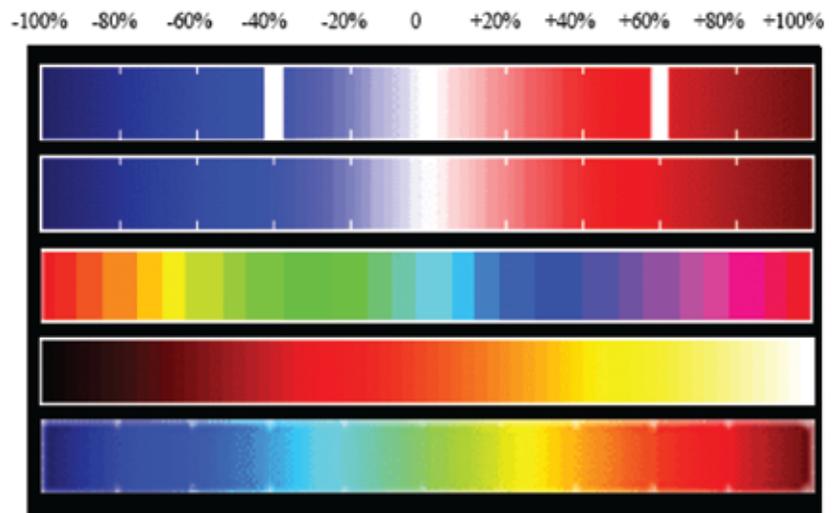


Figure 15. Defining the spectrum in MATLAB

```
% Define WVR spectrum
spectrum = [0      0      0.5000;
            0      0      0.5100;
            0      0      0.5200;
            0      0      0.5300;
            ...    ...    ...;
            0.5300 0      0;
            0.5200 0      0;
            0.5100 0      0;
            0.5000 0      0];

% Set background color of graph
whitebg([0.5 0.5 0.5])
```

Figure 16. Finding the closest color

```
% Adjust the WVR matrix to range from 1 to 201 for correct
indexing
wvrvalueadj = wvr + 101;

% Determines color for each candlestick
if isnan(wvrvalueadj(index))
    % If the WVR value is not valid, set candle color to white
    candlecolor = [1 1 1];
else
    % Round WVR value to the nearest integer and retrieve the
    corresponding RGB component values from 'spectrum' for
    plotting
    e = round(wvrvalueadj(index));
    candlecolor = [spectrum (e) spectrum (e+201) spectrum
                  (e+402)];
end
```

alone C program. Another area of interest is combining a price indicator and the WVR indicator, into a single indicator then using that as the base for spectral candlesticks to quickly identify potential investments.

Acknowledgements. There are two people who deserve mention for providing guidance and support while completing this article; Hiroshi Okamoto, who introduced the WAKO Volume Ratio and kindly lent me several books, and Yukiharu Abe, the WVR developer who answered more specific questions about his indicator. IFTA

Figure 17. Plotting spectral candlesticks

```
% Plot candlestick wick
plot(indhilo(i:i+2),hilo(i:i+2),'Color',candlecolor);

% Plot candlestick body
if open(i-j) <= close(i-j) % Clear body
boxes(i-j) = patch([xbot(i-j);xbot(i-j);xtop(i-j);xtop(i-j)],...
[ytop(i-j);ybot(i-j);ybot(i-j);ytop(i-j)],[0.5 0.5 0.5],...
'edgcolor',candlecolor);
else open(i-j) > close(i-j) % Colored body
boxes(i-j) = patch([xbot(i-j);xbot(i-j);xtop(i-j);xtop(i-j)],...
[ytop(i-j);ybot(i-j);ybot(i-j);ytop(i-j)],candlecolor,...
'edgcolor',candlecolor);
end
```

Figure 18. Telstra (in AUD) with a 10-day spectral WVR

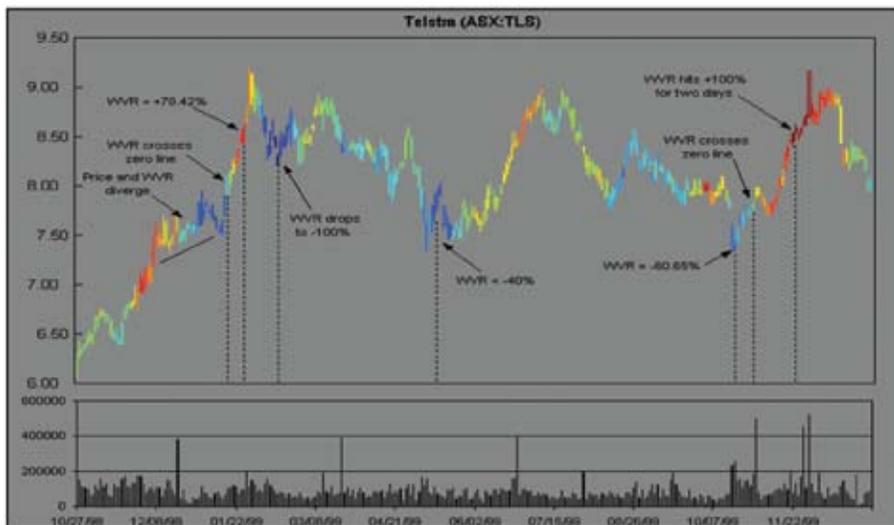


Figure 19. Dow Jones Industrial Index (DJ) with a 10-week spectral WVR

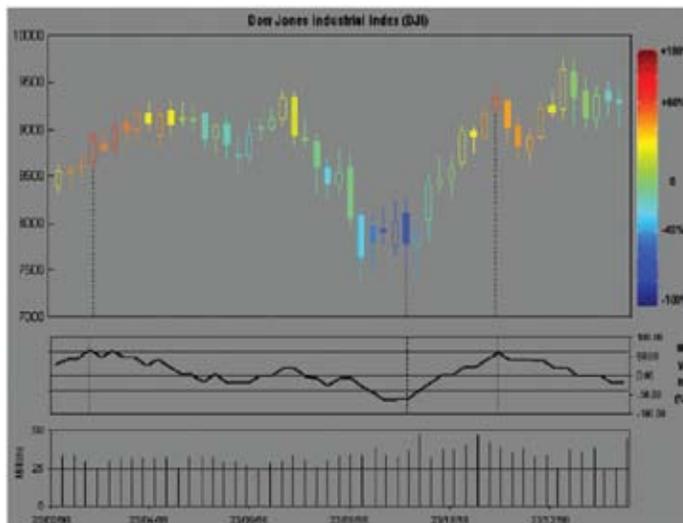


Figure 20. Boeing (NYSE:BA) with a 10-day spectral WVR

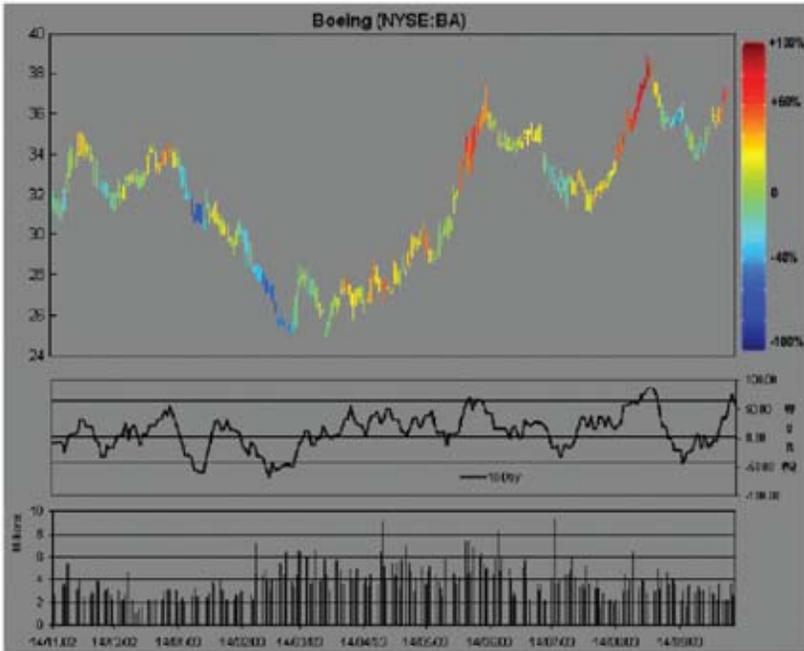


Figure 21. AT Cross (AMEX:ATX) with a 10-day spectral WVR



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how Well do Traditional Momentum Indicators Work?

by Cynthia A. Kase, MFTA

Introduction

Most market technicians believe traditional momentum indicators, such as the Stochastic, RSI and MACD “work.” But hard quantitative evidence is rare. Most support for the efficacy of these indicators is anecdotal, based on traders’ experience or empirical, based on an indicator’s performance when embedded in a trading program. In this research paper, hard evidence of how these three well-known indicators perform is presented. For purposes of this study, stops based on True Range, as detailed in the Appendix were used to measure reversals. Two aspects of indicators were studied. These were (1) whether a divergence took place preceding stops being hit or not, and (2) whether or not following a divergence, the market turned sufficiently to hit the stops.

The data used for this study included the most actively traded futures contracts per the July 2006 issue of *Technical Analysis of Stocks and Commodities* magazine. In all, a total of 43 commodities and six FOREX pairs were used: the Australian Dollar, Canadian Dollar, Swiss Franc, British Pound, and Japanese Yen, against the US Dollar. This data extended back fifteen years, where available, otherwise the maximum data available was used. The data was provided courtesy of www.GenesisFT.com, and the format employed was back-adjusted normalized data. Back adjusting takes the difference between the first and second nearby contract prices upon expiration and adjusts all previous price points by that difference to remove any rollover gaps. The raw data stream, when normalized in this manner, may have negative numbers so Kase wrote a program to identify which streams had negative values and adjusted them upwards to ensure that this was no longer the case. As it turned out there was an average of about thirteen years of data per instrument, or about 630 years of data studied.

Stops Hit and True Range Excursions

In performing this study the first step was to determine the behavior of the stops regardless as to whether a divergence

took place. This was done by finding all the instances of the average stop being hit. To translate, the “average stop being hit” is determined as follows: (1) Moving averages of 10 and 21 were calculated. (2) If the fast moving average was above the slow moving average, the market is assumed to be rising, and if below falling. (3) If the market was considered to be rising, and then declined by an amount equivalent to the average of a two bar True Range, as defined in the sidebar below, plus one tick, the average stop was considered to have been hit, and vice versa for a declining market. Once the average stop was hit, the stops based on that bar were frozen so that the remaining stops based on those in place at the same time of the average stop hit could be evaluated. The key is that because the stop is based on True Range, which varies over time and is based on volatility, a trailing stop can change even if a new high or new low was not made. This can happen because the value of the amount added to a low or subtracted from a high itself changes due to the change in volatility, even though the high or low didn’t change. This is why the stop levels are frozen at the time the average stop is hit. Having stops that don’t change is important for purposes of the study because the stops in place at that moment in time that the average stop is hit are all the analyst has to work with, as opposed to future stop points that may change due to changes in volatility. The process ended under these conditions: one, if the market closed beyond a stop based on 3.6 standard deviations of a double True Range excursion (referred to as Stop 3 hereinafter); two, if the peak or low dip just prior to the

average stop that was hit was exceeded or moving averages (the 10 and 21 referred to above) crossed; and three, the average stop in the opposite direction was hit.

Figure 1 shows an example of the count being stopped based on a close beyond a stop having a reversal value of 3.6 standard deviations of True Range, Stop 3. The chart shows a valid bearish divergence as marked by the cyan dotted lines. Two bars later a new high was made and so the program stopped looking at stops being hit for that divergence at that point. At the new high, another valid bearish divergence took place. Then the market turned, prices dropped and the program counted the stops until the market closed below Stop 3, as shown by the blue arrow.

Figure 2 shows a case where the program stopped counting the stops. This occurred because the stops were “flipping” based on the underlying moving averages crossing and the average stop being hit in the opposite direction. The chart shows a valid bullish divergence, marked by the dark red lines. One bar after Stop1 was hit the moving averages underlying the stop placement crossed at which point the stops flipped from short to long, as shown by the red arrow. After the stops flipped from short to long, the average stop was hit, which was by definition in the opposite direction of the initial count. At this point, shown by the dark red arrow, the count was stopped.

It was found that of the 157,206 bars of data, the average stop was hit a total of 14,582 times, or about 9% of the time, approximately once every eleven bars. Once the average stop was hit, the follow through

Calculating Two Bar True Range

h = highest high of two consecutive bars

L = lowest low of two consecutive bars

C = close of the most recent bar

Two Bar True Range = TBTR = maximum of absolute value $h - L$, $h - C$, $C - L$.

Average TBTR = average over n bars (default 30) of TBTR

Standard deviation TBTR = standard deviation over n bars (default 30) of TBTR

to the remaining stops was evaluated. Specifically reversals were defined as magnitudes equal to Stop1, Stop 2 or Stop 3, where the Stops are defined as reversals of 1, 2.2 and 3.6 standard deviations above the mean of a two bar True Range, as defined in the sidebar. Once the average stop is hit, the probability of hitting the other stops can be estimated as well, as shown in Table 1. For example, if the average stop is hit, there is a 63% chance that Stop 2 will be hit. Follow through based on other stops can be calculated also. In such an event if Stop 3 is hit, there is an 84% chance that there will be a close beyond that stop. The probabilities can be used both for forecasting purposes and for risk control.

Indicator Functionality

The next aspect of the study involved identifying when divergence took place on each of the three indicators noted above, and to measure if there was follow through in the form of a statistically significant move in the direction of the divergence (down for bearish divergence following an up market and up for bullish divergence following a down market).

For purposes of this research, statistically significant moves were defined by evaluating divergences in two directions. This required coding a divergence identification algorithm; given that none of the canned “divergence” programs that are available in the public domain on charting packages meet an appropriately strict definition of technical analysis.

To find divergence signals, first peaks in price and in momentum were defined and identified. A peak was defined as a high in price or momentum such that the day on which the high took place was preceded and followed by lower values. The program allowed for peaks to be formed as plateaus that consist of up to three equal bars preceded and followed by lower values. The reverse logic was used for dips. Once peaks and dips were identified, if price peaks took place on the same bar as momentum peaks, or within a tolerance of plus or minus two bars of momentum peaks, a matching pair was found. The inverse was true for dips. The charts below show examples of within tolerance and outside of tolerance, using the Stochastic as the momentum indicator. Figure 3 shows a divergence in which both peaks in price matched the peaks on the Stochastic exactly.

Figure 1. Methods of Stopping Stop Hit Count, Corn Continuation

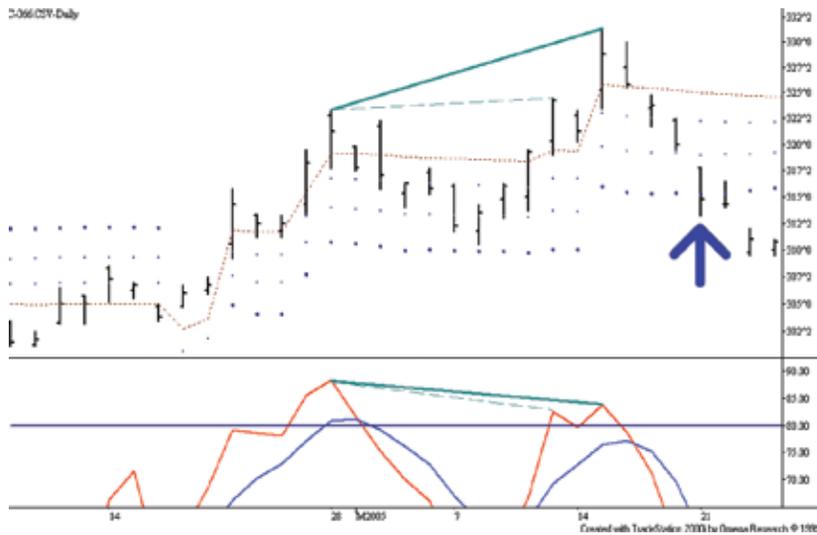


Figure 2. Methods of Stopping Stop Hit Count, Soybeans Continuation

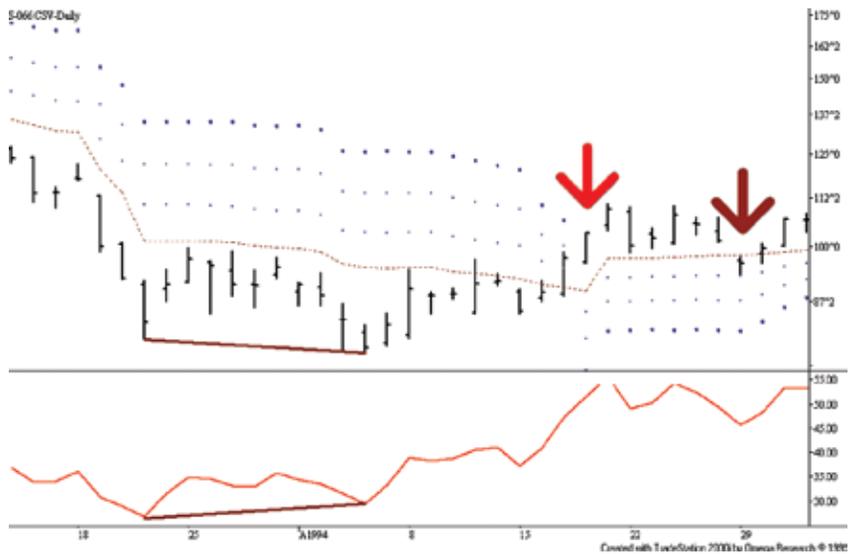


Table 1. Stop Hit Follow Through

Measure	Number	Follow Through >>				
		Total	hit	hit	hit	hit
Total Bars	157206					
Average Stop	14582	9	hit			
Stop1	11601	7	80	hit		
Stop2	9174	6	63	79	hit	
Stop3	7075	5	49	61	77	hit
Close Beyond	5914	4	41	51	64	84

Figure 3 Divergence on Stochastic, Corn Continuation

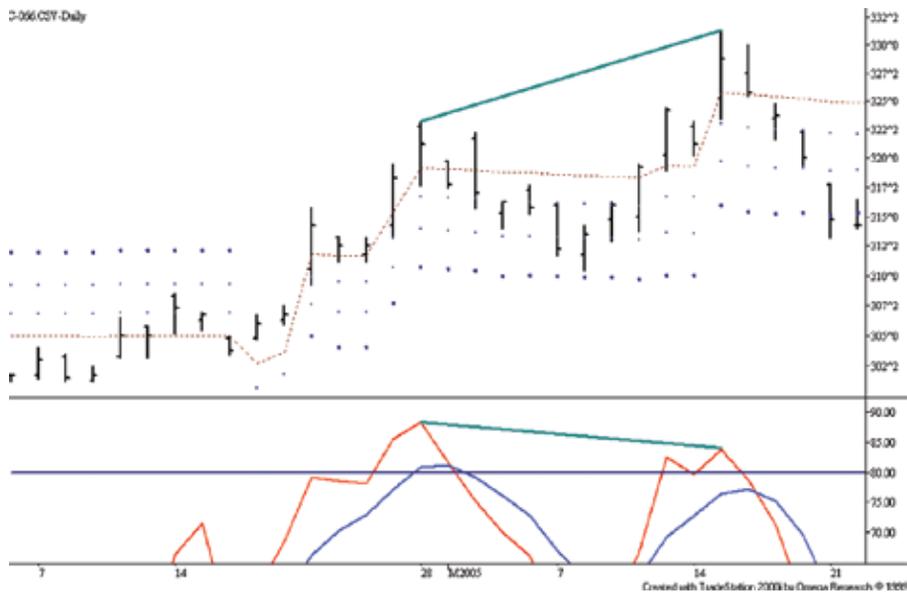


Figure 4. Divergence on Stochastic, Gasoline Continuation

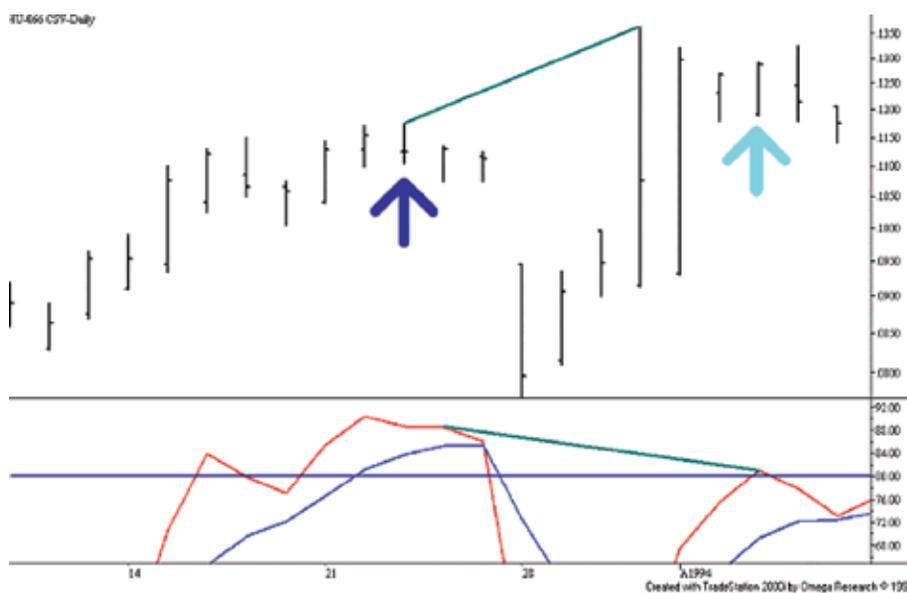


Figure 4 shows examples of peaks defined “within” and “outside” of tolerance. The first peak on the left, as shown by the blue arrow is within tolerance because the peak in price is followed one bar later by a peak in momentum. The peak in momentum does not match the peak in price shown by the cyan arrow until three bars later, and therefore, with a two bar tolerance, was breached.

Once a matching set of peaks or dips was found, the algorithm looked up to 100 bars back for an earlier pair of lower

peaks or higher dips. The two pairs of matching peaks or dips were then checked for divergence. In this study bearish divergence was defined as a higher or equal peak in price matched by a lower or equal peak in momentum, and bullish divergence as a lower or equal dip in price matched by a higher or equal dip in momentum.

Divergence Preceding Stops

Once all divergences were found, the next step was to see how often each average stop

hit was preceded by a valid divergence on each of the three indicators studied, as well as when combinations of the indicators were used. Table 2 shows that the results indicate that divergences found on all three of the indicators studied, preceded a turn that hit the average stop about the same percentage of the time: 18% for the Stochastic and RSI and a slightly lower 16% for the MACD.

It is very interesting that there was a significant increase in the turns caught when the Stochastic and RSI were combined. An improvement of 11 percentage points from 18% to 29%, resulting in 60% more turns being caught as demonstrated in Table 3. Adding the MACD to either the RSI or Stochastic did not improve the results as much, only improving performance by about four percentage points. This indicates that there must be a fairly high degree of overlap relative to the MACD for the Stochastic and RSI, and much less overlap between the latter. Combining all three indicators versus just using the Stochastic and RSI only yields a marginal two-percentage point improvement. Thus, the conclusion is that using the Stochastic and RSI is warranted, with the addition of the MACD, in cases where a trader might be looking at one chart on a position basis or if using a computerized model where the work involved in adding the MACD is insignificant. Table 3 also shows the percent of each stop that was caught by a particular indicator. The overall pattern remains the same, and the values are roughly the same regardless as to what stop is viewed, with a slight peak at the Stop 2 (set at a reversal value of 2.2 standard deviations of a two bar True Range). While it is outside of the scope of this study to determine why there is variation, the most likely explanation has to do with minor variations in the degree of skew relative to the log normality of the distribution of range.

Stops Hit Following Divergence

The next aspect of the study had to do with follow through. This means that once the average stop is hit, how often there is a continuation against the direction of the trend such that the more distant Stops 1, 2 and 3 (at one, 2.2 and 3.6 standard deviations) are hit, and/or if a close beyond Stop 3 takes place.

The second column in Table 4 indicates the number of times a particular stop was hit, and when a close beyond Stop 3

took place. The percent column shows the corresponding percent of the time, relative to the average stop being hit that follow through took place. So for example, 80% of the time that the average stop was hit, there was follow through with Stop 1 being hit, and 41% of the time the market continued against the original direction to an extent that a close beyond Stop 3 took place. This was then compared to the follow through that took place after a divergence. The results indicated that follow through in terms of all three indicators studied was about the same so a representative column is shown as "Indicator." What is interesting here is that the follow through of all the stops was slightly less, with the follow through on a close beyond Stop 3 slightly higher. Though the differences are not large it could mean that the indicators have a slight bias to finding a somewhat larger number of reversals that are of larger magnitude.

Table 5 shows the percent of the time each stop was hit based on each individual indicator and their combinations. Each individual indicator has similar follow through, which is consistent not only with the average stop, as noted above, but also with the other stops. If a signal is received on the MACD and either the RSI or Stochastic at the same time, there was no significant difference. The same is true for all three, but the lack of differentiation may be due to the very small number of signals. If a signal took place at the same time for the Stochastic and RSI, the likelihood of hitting the average stop and Stop 1 increased, but the results for the lower stops remained the same. The implications of this may be that if a trader has stops set at the average stop or Stop 1, the odds of being hit are slightly larger so a slightly more aggressive exit strategy may

Table 2. Average stop Hits Caught or Missed

Average stop	Number	Caught	Missed
Total hits	14582	–	–
Stochastic	2601	18	82
RSI	2657	18	82
MACD	2885	16	84
Stochastic and RSI	4206	29	71
Stochastic and MACD	3177	22	78
RSI and MACD	3280	22	78
All Three Indicators	4502	31	69

Table 3. Percent of Time Stop Caught by Indicator or Combination

Stop>>>	Average	Stop1	Stop2	Stop3	Close
Stochastic	18	17	16	17	18
RSI	18	17	17	18	20
MACD	16	16	16	17	19
Stochastic and RSI	29	26	25	27	31
Stochastic and MACD	22	20	19	21	24
RSI and MACD	22	20	20	22	25
Any Indicator	31	28	27	29	34

Table 4. Follow Through after Hitting Average stop

Stop	Number	All	Indicator
Stop1	11601	80%	76%
Stop2	9174	63%	58%
Stop3	7075	49%	48%
Close Beyond	5914	41%	44%

Table 5. Percent of Time Indicator Hit Reversal

Stop	# Signals	% Signals	Average	Stop1	Stop2	Stop3	Close Beyond
Stochastic	2601	25	85	63	47	39	35
RSI	2657	26	82	61	47	39	36
MACD	2354	23	83	65	51	43	38
Stochastic RSI both	1325	13	90	67	49	42	40
Stochastic MACD both	472	5	86	62	48	42	40
RSI MACD both	544	5	85	62	48	41	39
Improvement		–	–	4	3	2	3 4
All Above, same time	342	3	85	62	48	40	39

Figure 5. Divergence on Stochastic, Gasoline Continuation

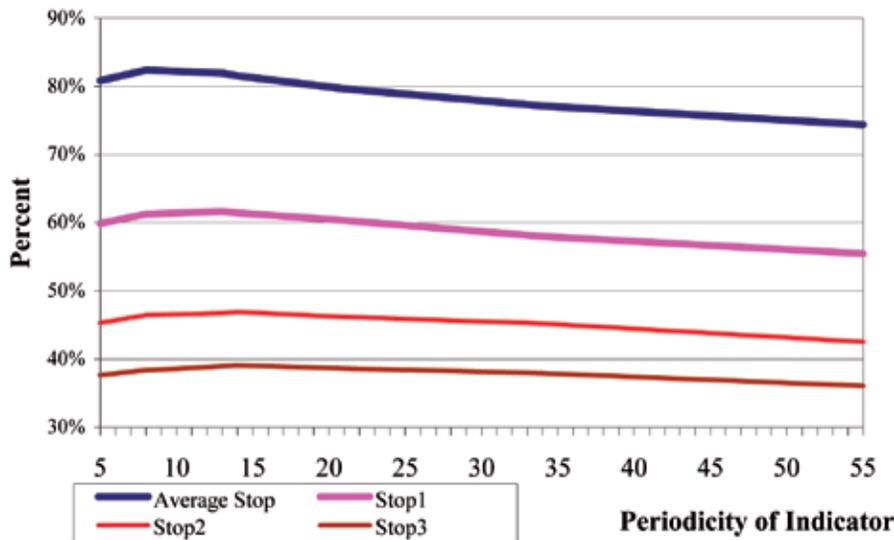


Figure 6. Divergence on Stochastic, Gasoline Continuation

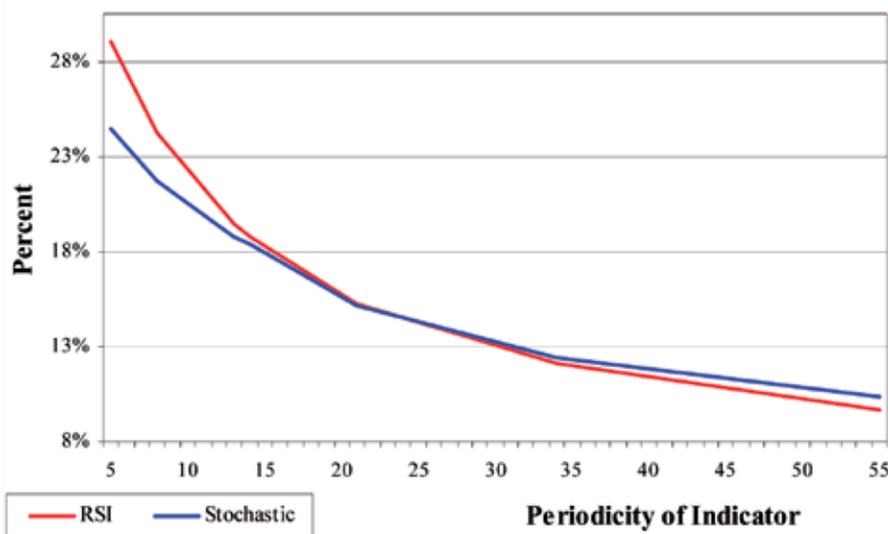


Table 6. Average stop Hits Optimized vs. Default Indicators

Average Stop	# Optimal	% Optimal	% Default	Δ Points	Δ %
Stochastic	3490	24	18	6	33%
RSI	4165	29	18	11	61%
Stochastic and RSI	6118	42	29	13	45%
Stochastic and MACD	4381	30	22	8	36%
RSI and MACD	4921	34	22	12	55%
All Three Indicators	6450	44	31	13	42%

be warranted. however, if the stops are set at Stop 2 or greater, no change in strategy is justifi ed. In the writer’s opinion the change is not large enough to call for modification of trading strategies.

Another implication of the results is that the indicators predict average stop hits about 9.2 times as frequently as random. The odds of hitting an average stop are about 83% following an indicator divergence signal, versus 9% for random hits. The Stochastic/ RSI combination is ten times more frequent than random.

Impact of Optimization

In this portion of the study, the periodicity of the Stochastic and RSI was varied, using values of 5, 8, 13, 21, 34 and 55 in addition to the eSignal® defaults to determine if there was any improvement in functionality as periodicity varied. As reflected in Figure 5, there was only a slight degradation in the percent of the average stop was hit and follow through after a divergence took place. The major difference was found when evaluating the performance of the indicator from the opposite direction. Meaning the rate of the average stop was hit, how often was it preceded by a divergence signal, or to put it another way, how many of the hits did the indicator catch. here the performance more or less increased as periodicity decreased, making the RSI and Stochastic set at the smallest reasonable setting, the best choice.

Figure 6 shows the relationship between the percent of the time the average stop was preceded by a Divergence, with the relationship clearly one in which the accuracy of the indicator declines as the periodicity increases.

Table 6 shows the detail of the optimal indicators versus the defaults in table format. While it makes sense that the shorter the periodicity, the more accurate the indicator, one might expect that there would be a degradation in the amount of time the average stop was hit after a divergence. That is, one might have expected an increase in false signals as a trade-off for fewer stops being missed. As shown in Figure 6 and discussed earlier this was not the case. The table summarizes the difference between the indicators when using a periodicity of five versus the default settings at 14. Again, the best combination of two indicators is the Stochastic and RSI, with a 13 point improvement for the 5 versus 14 period indicators, a 45% improvement overall.

Variation Among Markets

The last part of the study was conducted to determine if there was any significant difference in the performance of the indicators among commodity or instrument types. Thus, approximately 2,000 data points for each of six FOREX pairs of US Dollar to Australian Dollar, Canadian Dollar, Swiss Franc, Euro, British Pound and Japanese Yen was compared to the six most active agricultural commodities, also based on approximately the 2,000 most recent data points. These included Corn, Cotton #2, Soybeans 5000 bushels, Sugar - World #11, Soybean Meal, and Wheat - Soft Red.

As shown in *Table 7* there was little difference found. When comparing FOREX to the agricultural commodities, the average stop hit percentages were about two percent better, and the close beyond Stop 3 one percent worse. Comparing the FOREX to all the data contained in the entire study the results were one percent better and four percent worse, and for agricultural products two and one percent worse, respectively. These minor differences can be attributed to small variations in market activity, such as fewer trend reversals, than any factors inherent in either market segment.

In evaluating performance in the reverse direction, that is, relative to how often a turn was preceded by a particular signal, no differences were found on average between all the data and FOREX. Agricultural products scored two percent worse, which is again considered a minor variation.

Conclusions

This study has shown that momentum indicators can predict market turns that are of sufficient magnitude to generate an average double-bar True Range reversal in increasing rates of accuracy as indicator periodicity decreases, from about 18% for a single indicator with eSignal® default settings to 44% using all three indicators with optimized settings. Combinations of the Stochastic and RSI are far better than either indicator combined with the MACD. Once the average stop has been hit, there is no significant variation in follow through between instances in which a stop was hit and not preceded by a divergence or in cases in which a divergence did take place. Finally, no significant variations between markets, specifically in the cases of FOREX and agricultural products, were found. **IFTA**

Table 7. Percent of Follow Through after Signal Difference Between FOREX and Agricultural Average Stop and Close Beyond Stop3 (Italic)

	All	FOREX	Ags	All	FOREX	Ags
Stochastic	85	88	83	35	33	30
RSI	82	81	81	36	32	36
MACD	83	82	81	38	38	39
Stochastic RSI both	90	91	91	40	33	34
Stochastic MACD both	86	88	83	40	37	33
RSI MACD both	85	84	79	39	32	38
All Above, same time	85	86	86	39	33	38

Table 8. Percent Stops Preceded by Signal Average Stop and Close Beyond Stop3 (Italic)

Average Stop	All	FOREX	Ags	All	FOREX	Ags
Stochastic	18	19	15	24	23	22
RSI	18	17	18	29	29	27
MACD	16	15	15	16	15	15
Stochastic and RSI	29	28	26	42	42	39
Stochastic and MACD	22	22	20	30	29	29
RSI and MACD	22	22	23	34	33	32
All Three Indicators	31	30	29	44	43	42

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- soFt War E and dat a all code used in this study was programmed in-house by Kase and Company, inc. data courtesy of www.genesisFt.com, esignal 8.0, esignal, hayward, Ca Ms off ce 2000 standard Edition, Microsoft Corporation, redmond, Wa t radestation 2000i, t radestation securities, inc., plantation, Fl

harmonic Ratios as Applied To Commodity Market Technical Analysis

by George Alexander MacLean, MFTA

Abstract

This research paper tests if further retracement levels can be found and usefully applied in technical analysis in addition to the existing retracement systems such as Gann and Fibonacci which are already successfully used. In addition, if early signals from penetration of a nearby retracement could give warning of reversal moves developing.

The author believes that financial markets act as a natural system, in that not only do prices have a relationship with time (Gann theory) and with each other (broad technical analysis) but also display a mathematical relationship to recent highs and lows (harmony).

Constraints set by this examination allow for research in this paper to be restricted to one broad area (agricultural commodities). The author believes, however, that research done in other markets (MacLean, 2005) would give similar results. This paper will use the inverse decimal value of harmonic ratios (the size of the musical interval from one note to another) as a test of whether this hypothesis is valid.

Introduction

Prices in financial markets reflect pressures on trader's activity in that the price of a commodity at a point in time is the result of the action of buyers and sellers. This paper tests if financial markets display some harmonics, in that harmonic support or resistance lines will be evident where price moves are seen. Gann, Fibonacci and Elliott Wave studies look at price moves over very large vertical (price) scales and whilst this has a place in traditional technical analysis, my experience of intraday market analysis sees these as longer term objectives, often too far away from current market action and thus not of great utility for short term benefit to intraday and other short term traders.

Although Gann and Fibonacci studies

are excellent predictors of target objectives and of stop-loss levels in short term trading, I believe the importance of choice of origin of a move is often overlooked. Gann insists that the lifetime high/low is critical to his analysis and intra-day traders often forget this. It would be more beneficial if support and resistance levels much closer to the current price action could be applied. Whilst important retracements are undoubtedly key target objectives, it could be many days if not weeks before the price comes anywhere near these levels, e.g. using the 1974 low for a Gann retracement may see great distances between levels. I found this to be a significant drawback in intraday or very short term technical analysis. My research into finding retracements which have a "natural" basis, e.g. Fibonacci ratios, where the 1, 1, 2, 3, 5... sequence and the ratio 61.8% occur so frequently in nature, has led me to consider musical harmonics.

The search for derived or "synthetic" ratios (MacLean 2005) is often a laborious and thankless task. Le Corbusier, in his search for architectural proportion, for example, fudged the issue when creating the Modulor (Le Corbusier, 1954) by ignoring the average height of a Frenchman and instead took the total height of an Englishman wearing a hat in order to arrive at the proportions on his Red and Blue Modulor scale.

It is my intention to look for such a universal measure of proportion, one coming from a natural source: that of music. I have developed in this paper work I started in my book *Fibonacci and Gann Applications in Financial Markets* (MacLean 2005) which examined Pythagorean musical harmonic periods. As in the work of Gann and Fibonacci analysis, I followed the basic rule that a significant high or low followed by a reversal move as my starting point. However, instead of looking only at the Diatesseron, Diapente and Diapason as I did in my published work, I now turn to

modern tuning in addition to these three ratios.

First, a description of the three Greek terms in the previous paragraph. Taking a string of any length and bisecting it and then plucking one of the lengths will give a note exactly one octave higher than that heard from plucking the original length. This is normally accredited to Pythagoras, listening to the different sounds of hammers hitting anvils. As his starting point, the halving of a string length gave a note exactly one octave higher and this he called the Diapason. Other divisions of the original length such as dividing in the ratio 4:3 gives Diatesseron and in the ratio 3:2, Diapente. These will be seen in tables of harmonic ratios. It is my hypothesis that the relationships on a musical scale i.e. the ratio of one to another, can also be applied to charts as an additional technical tool. This paper will investigate the success of this hypothesis.

There is a branch of Technical Analysis which looks at harmonics as derived from the motion of heavenly bodies such as the planets, moons and comets. This is on a very grand scale. I am instead going to focus on harmonics on a much smaller scale, while retaining some of the natural characteristics of my starting point: that of music and harmony. In this paper, I shall concentrate on Western music especially that of notation and harmony described since 1290. This Western tuning, as seen in Table 1 through Table 3 is called Lydian Mode, from Mode V of the Gregorian Chant of the early Classical Period which is now the most common Pythagorean tuning mode. Other modes, such as Equal Temperament (where the difference in notes is measured by frequency (hertz, Hz) and measured in cents, are not discussed as these are derivatives of the initial 440 Hz measure for Middle C and have no "natural" basis. The other Gregorian Modes are detailed in the Appendix.

Table 1. Harmonic Ratios

Ratio	Interval	Decimal	Inverse Decimal	Traditional Name
10:01	Unison	1.00	1.00	
2187:2048	Major chorma	1.07	0.94	
09:08	Major second	1.13	0.89	
32:27	Minor third	1.19	0.84	
81:64	Major third	1.27	0.79	Ditone
04:03	Perfect forth	1.33	0.75	Diatesseron
729:512	Diatonic tritone	1.42	0.70	
03:02	Perfect f fth	1.50	0.67	Diapente
6561:4096	Minor sixth	1.60	0.62	
27:16	Pythagoreran major sixth	1.69	0.59	
16:09	Minor seventh	1.78	0.56	
243:128	Major seventh	1.90	0.53	
02:01	Octoave	2.00	0.50	Diapason

The Harmonic Ratios and an Introduction to Musical Harmony

This paper uses the term “harmony” to describe proportions which are linked and derived from a much larger measure. The measure is an Octave (a musical notation having eight parts) and used as the distance from a low to a high (or a high to a low) as is the case in measuring Fibonacci and Gann retracements. however, by avoiding the pitfalls of using signi f cant highs/lows as is necessary on Gann (lifetime high or low in that case), and as in the case of Fibonacci where looking at a move that may have taken some time to develop, the use of “harmonics” will take only localised signi f cant highs or lows and a nearby extreme. This makes it useful in very short timeframes.

Table 1 is constructed as follows: Taking the original measure (1:1) as a starting point and then adding a perfect f fth will give 3:2, the second harmonic. Applying a f fth onto this measure, we get 9:4 (multiplying the ratio 3:2 by 3:2) but this will take us out with the scale being greater than two (an octave) so we move down an octave from 9:4 which results in 9:8 (9:4 multiplied by 1:2). This results in the third harmonic. We now have the series 1:1, 3:5, 9:8. The f fth column (Table 2) is the standard musical notation, starting at the F below Middle C (C’).

The intervals from this table result from the relationships within the ratios. For example, taking the Fourth B-E’ is the difference between F-E’ and F-B. As we divide to get the interval, this means (243:128)/ (729:512) = 4:3 and this is

Table 2. Creation of the Octave from F below Middle C (C’)

Measure	Note	Action	Result	Note
1:1	F	Add a Fifth	3:2	C`
3:2	C`	Add a Fifth	9:4	
9:4		Subtract an Octave	9:8	G
9:8	G	Add a Fifth	27:16	D`
27:16	D`	Add a Fifth	81:32	
81:32		Subtract an Octave	81:64	A
81:64	A	Add a Fifth	243:128	E`
243:128	E`	Add a Fifth	729:256	
729:256		Subtract an Octave	729:512	B
1:1	F	Add an Octave	2:1	F`

Table 3. Ordering of Table 3

Putting these in order

Note	Measure
F	1:1
G	9:8
A	81:64
B	729:512
C` (middle)	3:2
D`	27:16
E`	234:128
F`	2:1

Figure 1
 Corn: Daily Continuation chart with comparison Fibonacci retracement

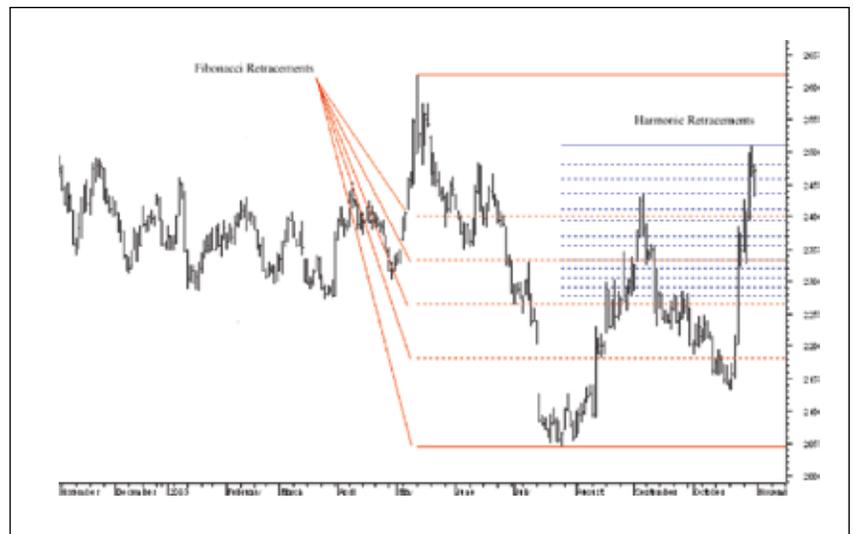


Figure 2
 Corn: Continuous, Longer-term Fibonacci retracement and shorter term Harmonic retracement

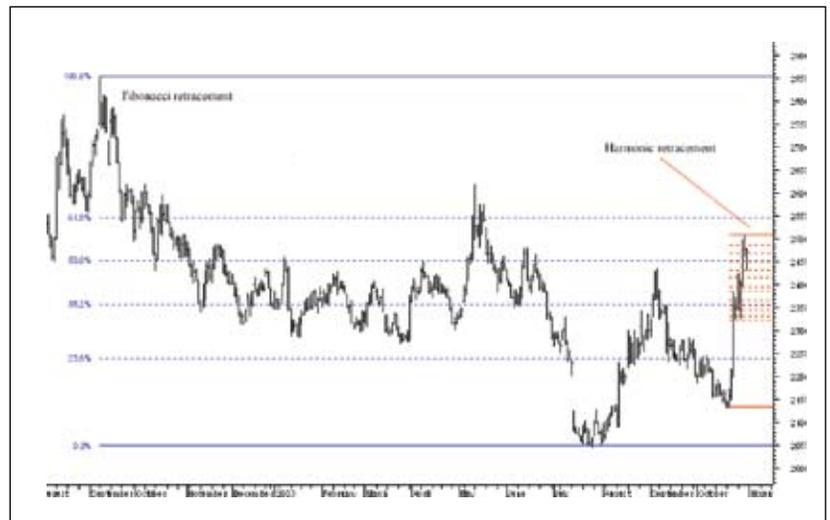
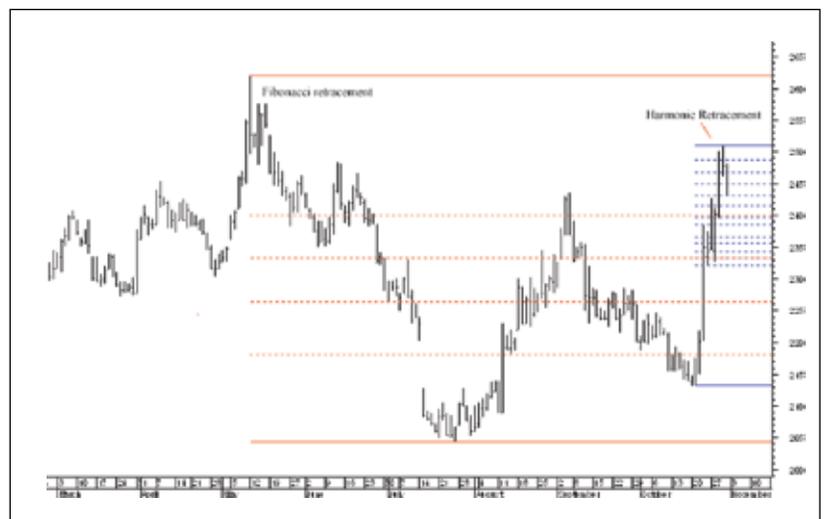


Figure 3
 Corn: Continuous Figure 1 Fibonacci retracement and Figure 2 Harmonic retracement combined



repeated throughout the scale (A-D' – 27:16/81:64 = 4:3). Other differences will give the missing ratios from Table 1. Note that this calculation method does not give rise to values less than 50% (from Table 1, Inverse Decimal), but does for the Decimal value. This paper will look at the inverse decimal values only as testing is beyond the scope of this paper. As with Fibonacci and Gann analyses, I look for a nearby significant low (high) and start my measurement. This would then need a high (low) to act as the next "octave", being the extreme of the rally (fall). From there the retracements would correspond to the reciprocal levels in Table 1 (0.94, 0.89, 0.84...) counting from the high or the low. For deeper retracements the original decimals from Table 2 would need to be tested.

Application of Harmonic Retracements to Commodity Markets

Agricultural markets by their very nature are influenced by various natural forces, from the effect of seasons, weather, rainfall, disease, yield, consumer demand and so on. Despite the spread of countries growing various commodities these various factors combine to make supply difficult to calculate from one growing season to another. This effect of natural pressure should make analysis using other natural

tools more sympathetic and in line with the development of Gann analysis as applied to commodity markets in the early part of the last century. The initial area to study will be the Grains Market, where chart analysis will be given and the harmonic result of success or failure discussed.

Corn

In *Figure 1*, the sharp move in late October saw key resistance levels taken out. Applying the harmonic retracements from the July low at 204.50 to the October 251.00 high shows that 2nd and 3rd retracements (245.83/243.73) acted as good support in a retracement. A break of the 4th at 241.24 will be significant, as this will also see the break of congestion from the September high and the top of minor congestion from October. The oscillation about the 1-3rd retracements is significant here as it is forming a potential bull flag although in traditional pattern recognition technical analysis it is still too early to confirm.

Comparing this with Fibonacci retracements confirms that the current action is consolidative about the 50% retracement of the 285.50/205.00 down move at 245.00 from which a price recovery appears difficult.

Applying harmonic retracements to the low of October gives a better picture. The current local price action finds support at the 4th harmonic at 243.08. This will be

key, as a break there would trigger a move to the 5-6th 241.56/239.75 congestive area and lower. This is the ideal test for harmonic supports as the contract has moved from traditional narrow range trading to a more violent period where volatility has substantially increased. This change of contract behaviour should draw attention from analyst and trader alike as there can be opportunities for profit in this environment. Using harmonics here gives key early triggers and should be useful for nearby entry trigger levels and price objectives.

Rough Rice

The rally from the October low saw traditional congestive resistance levels successfully taken out. This is an ideal time to apply harmonics, as a minor pullback has occurred from the previous session high. To confirm that the rally has not run out of steam the 1st harmonic has to be taken out at 7.54. Although this is under attack, a convincing intraday break is needed; otherwise the threat is slippage back through the 3-4th harmonic at 7.47/43. However, as long as the bull channel support is not penetrated and harmonic support levels do not come under pressure, the recovery should continue. A break of the 1st harmonic on a significant basis will be required before calling for the extension to develop.

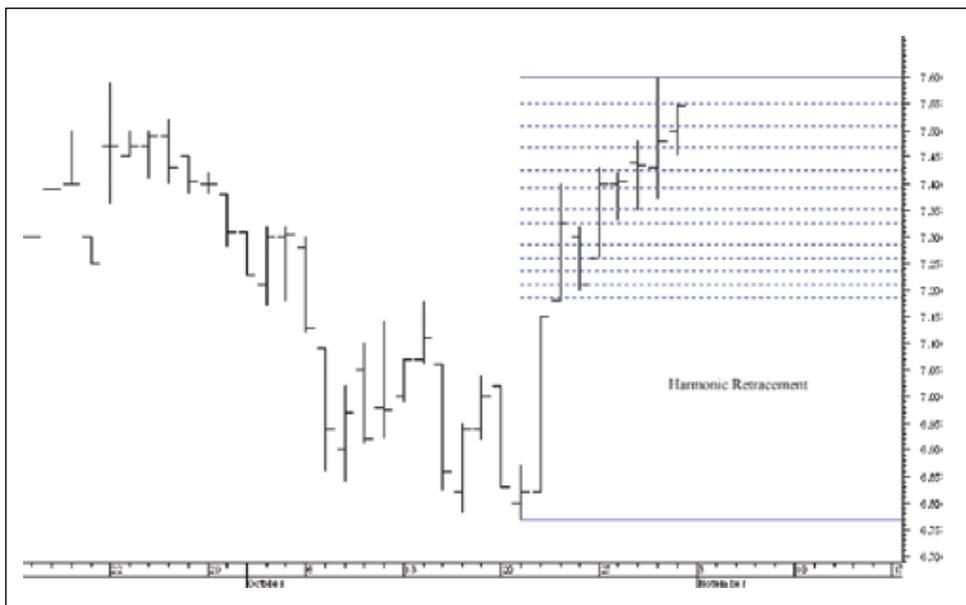
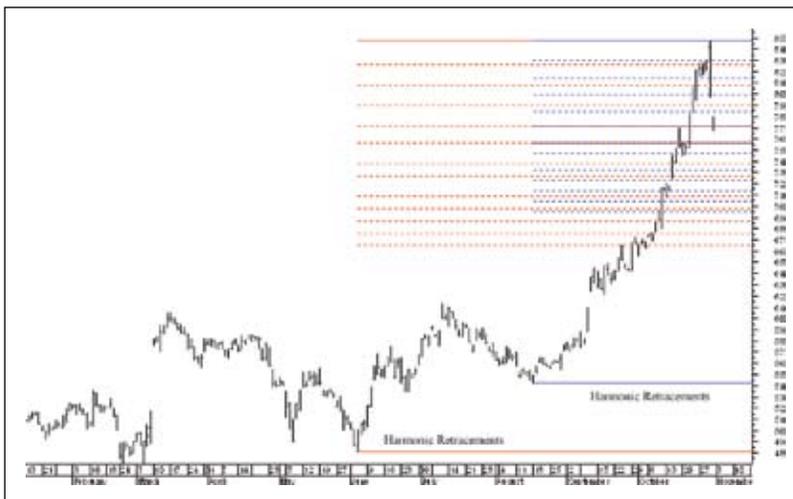


Figure 4.
Rough Rice: Continuation chart and Harmonic retracement

Figure 5
2nd line and harmonic retracement



Figure 6
Cotton: Continuation chart and two harmonics



Cotton

In *figure 5* recent sharp rally in Cotton looks to be over with a bearish outside week followed by a gap down. The gap through the 2nd harmonic at 78.84 and pressure building on 3rd at 76.43 should convince that the steep rally from late August was overdone. The target from *figure 5* looks to be at the 4th harmonic at 73.55, which is at the base of the small congestion before the gap in September. The current move is seen as more than a pullback on modest profit taking as with the bearish outside day and week occurring in the previous session and the gap lower, a major change in market sentiment is seen. This should see the contract continue through the 3rd harmonic and lower.

Looking at the long-term chart, it is

clear that the move from the late August Gap has been overdone. The traditional bull channel (top of channel shown as a trendline) which existed for the previous year was penetrated on a spurt of price action but looks to have over extended. This slide should bring the contract back within a more “normal” bull channel and at that point further analysis should be applied. The top of the old channel comes in at 72.42, which is close to the 5th harmonic at 71.40. In this chart the contract has broken out of the 1-3rd harmonic retracement levels and with the bullish outside day, followed by a gap shows in both harmonic retracements that a major reversal move looks convincing and is in an advanced state.

Combining two harmonics on *figure*

6 from the Jun 48.15 low and the August 54.30 low confirms current price action is at a key level. This is the conjunction of the 4th harmonic from the June low at 77.11 and 5th from August at 77.18 with the joint harmonic of 5th (June at 75.64) and 6th (Aug at 75.72) looking threatened. Again with harmonics it is clear that the downside is favourable from here and key support levels and targets are seen at 6th (Jun at 73.89) and 7th (Aug at 74.63).

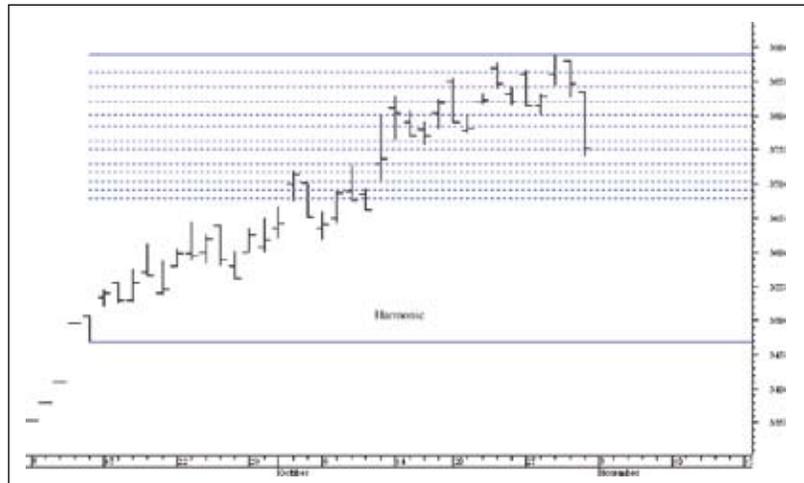
Cocoa (London)

Again combining two harmonics on the daily chart confirms the importance of the current congestion. The last week has seen consolidation about the 1st and 2nd from the 1135 high at 854.07 and 868.33 and the 1st and 3rd from the 1075 high at

Figure 7
Cocoa: Continuous chart and two harmonic systems



Figure 8
Rapeseed: Continuation chart and harmonic



850.25 and 872.50. In traditional technical analysis the current congestion is forming a bear flag, yet with a suggestion that recovery moves from the fairly strong base, formed above the 835.00 low. This will be confirmed with the current bullish outside day succeeding in breaking the 2nd harmonic of the 1075 measure at 861.67, and from there to attack 3rd at 872.50 and move higher. Until then, however, there is little to suggest that this consolidation is going to end. This is a good example of the conjunction of harmonic retracements. The close proximity of the harmonic lines to each other increases the value and importance of each level and in addition will give early confirmation of a recovery move should one develop. This is the key. An early signal is needed in order to participate

in a recovery move but as the contract is oscillating about the 1-3rd harmonics, it would be appropriate to wait for a break of the base or of the 3rd harmonic retracement in the 2nd harmonic system (just above the 2nd harmonic in the 1st harmonic system) before taking a position.

Figure 8 shows a rather stringy Rapeseed contract with a very sharp turn down on the last bar. This has seen key support levels taken out as far as harmonics are concerned, with confirmation of the end of the rally on a break of the 2nd harmonic at 382.58. The sudden move though the 3rd and 4th harmonic at 380.01/376.96 has seen acceleration in the decline and there is now evidence of a potential move to the congestion about the 6th at 371.96.

Figure 9 compares a shorter harmonic

with a longer-term Fibonacci retracement pattern. Again the sharp slide has seen key harmonics taken out and with the pressure building the 7th harmonic at 374.87, which is close to the 23.6% retracement at 374.64, this area is going to be key. A break of this support zone will then trigger a move to the 9th harmonic congestion at 371.75.

These close levels to the significant high are useful as confirmation of the downtrend developing. In traditional technical analysis a break of the 23.6% support is needed before confirmation of a downturn is seen (although other techniques could have supplied the necessary negative evidence before then if the analyst is using traditional techniques). The significant break out of the 1-3rd congestive harmonics would have been the

Figure 9.
Rapeseed: Continuation chart and Fibonacci retracement

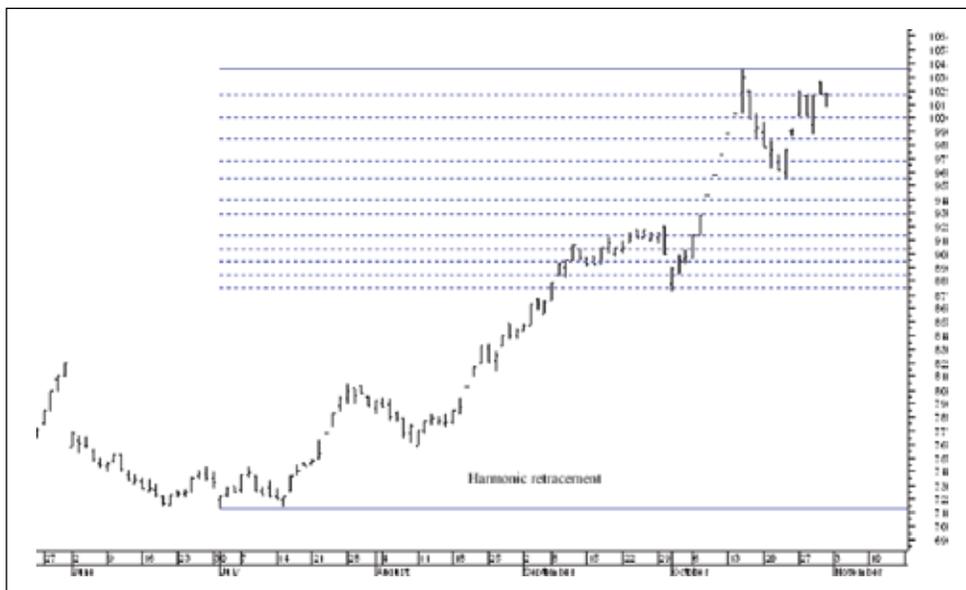


trigger for taking a reversal position. The purpose of harmonics is to give early and confirmable triggers that a reversal move is developing, long before more traditional measures are called into play and in this case the failure to continue the rally through the recent high and the subsequent slippage through the 3rd harmonic (382.32) should be enough warning that a downturn is ahead. With the break of congestion at the 3rd and 4th harmonic (382.32/380.06) confirmation is seen and the next bearish move has confirmed the downturn, putting key congestion under pressure ahead of the 8th harmonic and the 23.6% Fibonacci retracement at 373.08 and 374.64 respectively. The final area of study is to sample and analyse the Meats market.

Live Cattle

Figure 10 shows the contract at the peak of an extended rally. Current action is trying to recover but the 1st harmonic at 101.55 is acting as a very strong resistance level. Previous moves have seen the contract slide to test and bounce from the 5th harmonic at 95.54, but there is some doubt that the subsequent recovery move can be sustained as the contract has oscillated within the 2nd and 3rd harmonic (100.02/98.56) before failing to push significantly higher on the bounce after filling the gap. Bulls would need to see a significant attempt to break through the 1st harmonic on a sustained basis. Until this happens at 101.55 the contract is likely to be moving sideways, at best. Support here comes at the 2nd harmonic and if that breaks a move back lower is likely. The break of the 3rd harmonic support did not see the contract reversing significantly, but as the reversal was followed by a bounce from the 5th with a series of gaps, taking a recovery position should have been suggested. Again there is a threat of a near double top developing which needs confirmation. An early confirmation would occur on another break of the 3rd harmonic.

Figure 10.
Live Cattle: Continuation chart and Harmonic retracement



Frozen Pork Bellies

Figure 11 illustrates another example where the recovery move from the 83.05 low is struggling. Despite the bullish outside day the contract is straining against the 12th harmonic (50% retracement). Until there is a break of the 50% retracement level, consolidation should continue. Noted should be the identified support at 86.50 (the 7th harmonic). Looking at the warning signals from the harmonic penetration with the bullish outside day, we see a move out of character—the contract had moved only within three harmonics on a daily basis. Once the bullish outside day broke through the 4th harmonic at 85.22, this suggested a change in character in the contract, keeping the focus on the upside throughout the day. Indeed, the move through the 7th harmonic should have confirmed that the contract was in a recovery move.

Figure 11.

Pork Bellies: Continuation chart and Harmonic retracement



Conclusion

The purpose of this submission paper was to discover if there were additional levels that could be used to determine likely price reversals. The initial supposition was that Fibonacci and Gann vertical retracements were useful but that 1/8th or major Fibonacci levels (38.2%) were too far away from the reversal start. This meant that some profit had to be foregone before confirmation of the reversal move was given. Futures markets, by their nature change rapidly; when a reversal move is developing, acting on it could be critical to maximisation of profits.

I have suggested that the use of relationships developed from another natural system, musical harmonics, could be used. My premise was that the basis of Fibonacci numbers, and by extension retracements, fans, etc., was on naturally occurring proportion. Musical harmony, another natural proportion, with its resultant levels may give significant help in a trading environment. I applied the harmonic to recent price moves, moves from a local high or low. The results have confirmed my hypothesis: The natural proportions seen in Musical harmony can be used to identify change early at an early stage of a price trend move.

In some of the tests above, the 1st-3rd

harmonic are very close to the origin of the reversal move. Constant, building pressure on these levels should keep the trader's attention focused and once there is a break of the 3rd harmonic this will confirm that a reversal move is developing. It is my suggestion that 1st-3rd harmonics be used as the warning area, similar to the warning lines as seen in Lane's Stochastics or the Welles Wilder RSI. The trigger should then come on a break of the 3rd harmonic. This close congestive grouping, not only of price action but also of harmonics, has been a good indicator of market sentiment in the above tests. From the results of this research, this looks to be a successful method of applying harmonic Proportion to agricultural commodity markets. [IFTA](#)

appEndiX

gregorian plainsong

g lareanus (1547) standardised the Modes into the following classifications (Modes iXii).

Mode i 1:1 9:8 32:27 4:3 3:2 27:16 16:9 2:1 (dorian) d E F g a B C d

Mode ii 1:1 9:8 32:27 4:3 3:2 128:81 16:9 2:1 (hypodorian) a B C d E F g a

Mode iii 1:1 256:243 32:27 4:3 3:2 128:81 16:9 2:1

(phrygian) E F g a B C' d' E'

Mode iV 1:1 256:243 32:27 4:3 1024:729 128:81 16:9 2:1

(hypophrygian) B C d E F g a B

Mode V 1:1 9:8 81:64 729:512 3:2 27:16 243:128 2:1

(lydian) F g a B C d E F

Mode Vi 1:1 9:8 81:64 4:3 3:2 27:16 243:128 2:1

(hypolydian) C d E F g a B C

Mode Vii 1:1 9:8 81:64 4:3 3:2 27:16 16:9 2:1

(Mixolydian) g a B C d E F g

Mode Viii 1:1 9:8 32:27 4:3 3:2 27:16 16:9 2:1

(hypomixolydian) d E F g a B C d

Mode iX 1:1 9:8 32:27 4:3 3:2 128:81 16:9 2:1

(aeolian) a B C d E F g a

Mode X 1:1 256:243 32:27 4:3 3:2 128:81 16:9 2:1

(hypoeolian) E F g a B C d E

Mode Xi 1:1 9:8 81:64 4:3 3:2 27:16 243:128 2:1

(ionian) C d E F g a B C

Mode Xii 1:1 9:8 81:64 4:3 3:2 27:16 16:9 2:1 (hypotionian) g a B C d E F g

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aCKnoWl EdgEMEnt s

Charts from in this paper are created with Metastock of of r euters pl C.

بلوم مصر لتداول الأوراق المالية

BLOM EGYPT SECURITIES



Alteration of Price Movement Dynamics on a Chart via Quantization of the Change in Closing Prices.

by Mohammed El Saiid, MFTA

Introduction

Part one introduces a method which proposes a new technical analysis (TA) tool. This TA tool is primarily applied to market indices and averages, and is generally used for market forecasting. This method will be referred to here on as “the application.”

The introduction also presents two fundamental concepts related to TA, namely the concept of pre-manipulation of data, and the concept of left and right translations in cycles. These two concepts form the core idea of the application.

1.1 Pre-Manipulation of Data

Through the past decades, various techniques, methods and applications were introduced to the field of technical analysis. Most of them were based on observations of characteristics of price (value) action on charts. Some of these observations were later developed into concepts defining market movements. Nevertheless, all of these observations led to numerous forms of interpretations of price motion. Such interpretations were successfully translated and represented graphically on charts through various methods of pre-manipulating price action data.

Some of these pre-manipulation methods provided different forms of graphical representation. Such graphical representations resulted in various means for displaying price data as alternative types of charting techniques. One common type—the point and figure charting—utilizes the same price action data used for representing line or bar charts. However, this technique displays such data differently by focusing only on significant price changes, while disregarding the element of time.

Another data pre-manipulation method sought for alternative means of price scaling. A common example to that is the graphical conversion of an arithmetic scale chart to a semi-log scale chart. This particular example of data pre-

manipulation had proven very useful in the visualization of long-term trends.

Several other methods of data pre-manipulation resulted in various useful market indicators and oscillators, such as the Momentum indicator, and the Stochastic and RSI oscillators.

1.2 Left and Right Translations in Cycles

As commonly known within the subject of time cycles, all trends of the market are regarded as a series of interacting cycles with troughs and peaks. An ideal peak should occur exactly halfway through the cycle's period. In practical life, however, ideal peaks seldom occur. What does occur is that cycle peaks tend to behave differently with respect to the major trend of the market (or larger cycle). In other words, during positive trends, peaks of cycles tend to shift from the midpoint of the cycle period to its right side. On the other hand, during negative trends, peaks tend to shift to the left side of that midpoint. When we put this into perspective, the concept of left and right translation from a cycle's midpoint states that the market spends more *time* in the *direction* of the ongoing major trend and therefore, less *time* correcting from it.

Quoting John J. Murphy's book, *Technical Analysis of the Financial Markets*, he discussed the topic of time cycles, “Stop to think about it, all we're saying is that in a bull trend, prices will spend more time going up than down. In a bear trend, prices spend more time going down than up. Isn't that the basic definition of a trend?”

The key words used by Murphy here are “up” and “down,” which define the direction of motion. In general, it holds true that the basic factors determining price movement dynamics over time are amplitude and direction of motion. Nevertheless, the concept of left & right translation of cycle peaks provides a key to better understanding of the nature of price

motion through a single implication. This concept implies that it is essential to study the direction of price motion over time separately (in isolation) from the amplitude of price motion over time.

Accordingly, this particular implication provides leeway to searching for new methods of data representation. The main aim of such methods is to somehow display the direction of price motion over *time*, while isolating or at least reducing the effect of amplitude changes in such motion. And hence, the application presented in this research is intended to provide a method for pre-manipulating price movement data through a form of a quantization process. The core idea is to take into consideration only the direction of the change in closing prices (Δ closing prices) over *time* while totally disregarding the amplitude of this change.

The aim of this pre-manipulation method is to graphically create an alteration in price movement dynamics appearing on a price chart. Through this alteration, better visualization will be achieved on the chart providing new information that may better aid in predicting future price trends.

Part Two: Methodology

Part two presents the method used for the construction and implementation of the application. This method is conducted through a two-stage process, namely the quantization of data (Δ closing prices), and the alteration of price movement dynamics on a chart. Within this method, the second stage (process) is considered to be the resultant or by-product of the first stage.

2.1 Quantization of Data (Δ Closing prices)

Quantization, by definition, is the process of limiting (approximating) the possible values of a continuously progressive data in nature and varying in magnitude to a discrete (separated) set of values (or

symbols) of restricted amplitude, rather than varying continuously.

In other words, a group of progressing values are reorganized by being placed into new categories or sets. Each of these sets is separated from the others in such a way that any specific value from the original data would belong exclusively to one category or set but none of the rest.

A most common example to the quantization process is the approximation of numbers (the process of rounding-up or down numbers). By approximating any one (or more) digit value to the nearest decimal place, we are somehow creating two discrete categories or sets.

Extreme quantization is one form of quantization in which we limit the possible values of a continuously progressive data in nature, and varying in magnitude to the *least* discrete set of values (or symbols) possible.

Extreme quantization applied to data (Δ closing prices):

As previously mentioned, the continuous movements or Δ closing prices over time are expressed by amplitude and direction of motion. Nonetheless, by applying extreme quantization, these Δ closing prices become categorized with respect to the direction of motion only. Such categories (or sets) represent the *least and only*

possible outcomes that define price motion regarding direction, namely UP, DOWN and FLAT.

Accordingly, any change between two consecutive closing prices resulting in either a positive, negative or neutral change (no-change) is categorized as UP, DOWN or FLAT respectively. The new categories are then each assigned to a positive, negative one, and zero values also respectively (according to the direction of price change).

The following example is a table representing the steps used for the calculation and construction of the application. Note that the percent change is calculated to the nearest two decimal places.

Column two represents a 10-day closing values sample of an index.

Column three represents the change (in percentage) between each two consecutive closing values of the 10-day sample. The results (as shown) are either positive, negative values of different amplitudes, or neutral (no-change).

Column four represents the process of categorizing the data of column three (the changes in closing values) into the new sets previously referred to as UP, DOWN and FLAT. Each set is replaced by a letter (symbol), for which the letter "U" represents "UP", "D" represents "DOWN" and finally "F" represents "FLAT".

Positive, negative "one" and "zero" values are then assigned to each of their corresponding symbols as shown in column five.

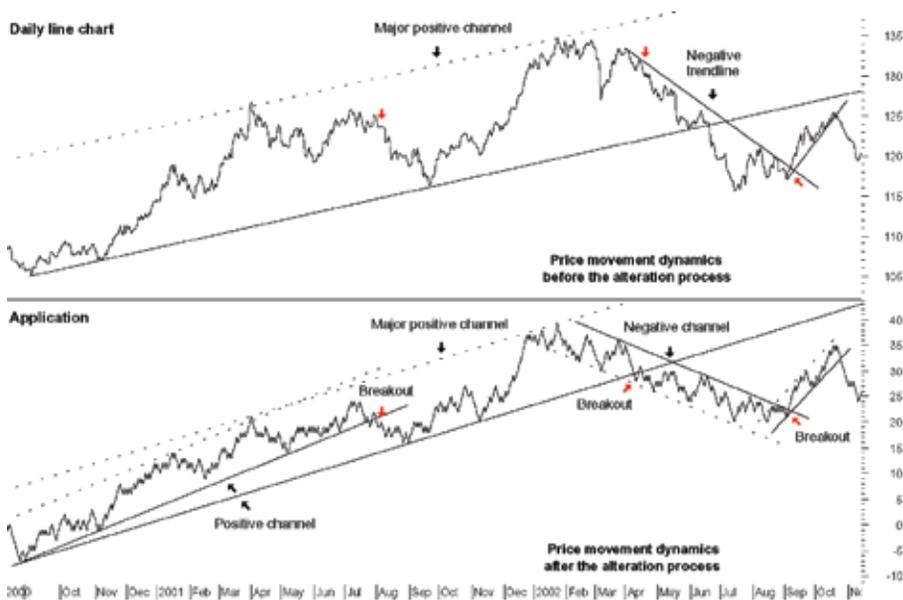
And finally the last step before presenting the data graphically, the new values of column five are accumulated as shown in column six.

The phrase "Price movement dynamics" used in the heading of the research refers to the nature by which prices tend to progress. Hence the issue of visually altering such nature will be fulfilled through the following subject matter (the second stage process).

Table 1.

Days	Closing Values	Percent Change	Extreme Quantization (in Symbols)	Extreme Quantization column 5	Accumulating The product of
1	1271.47				
2	1279.24	0.61%	U	+1	+1
3	1340.77	4.81%	U	+1	+2
4	1340.72	0.00%	F	0	+2
5	1392.27	3.84%	U	+1	+3
6	1400.55	0.59%	U	+1	+4
7	1397.07	-0.25%	D	-1	+3
8	1379.05	-1.29%	D	-1	+2
9	1421.84	3.10%	U	+1	+3
10	1421.80	0.00%	F	0	+3

Figure 1. USD vs. Japanese Yen, from August 2000, to November 2002



2.2 Alteration of Price Movement Dynamics on a Chart

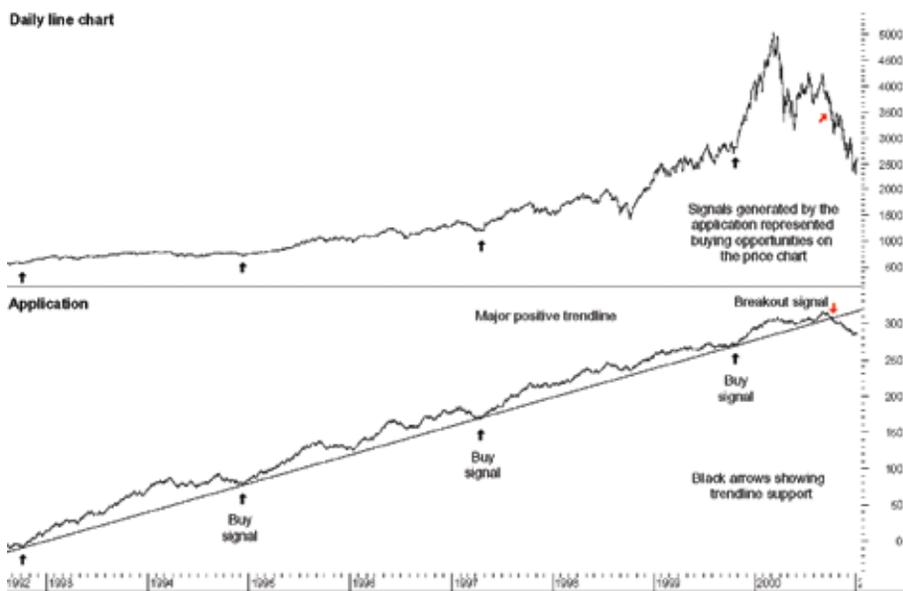
As a method of pre-manipulation, the quantization process applied to Δ closing prices provided a different interpretation of data. When presented graphically, such interpretation created an alternative means of visualization. And the result was an alteration in the price movement dynamics of the original price chart. This result (or by-product) represents the second and final stage process.

The following chart (Figure 1) displays a sample period from the US dollar vs. Japanese yen currency chart (upper window), accompanied by the application (lower window).

The purpose of this example is to graphically represent and explain how data (closing price action) is interpreted after being subjected to the pre-manipulation process. Thus visually compare that graphical representation to the basic price chart.

As shown in Figure 1, the graphical representation of the application (lower window) displays the same progression of the price action (upper window) in synchronicity (with respect to time) to the price chart. However, the visual interpretation of the price action through the application appeared somewhat altered.

Figure 2. The NASDAQ composite, from September 1992 to March 2000



Part Three: Testing the Application

Part three provides the results of using the application on market averages and indices as well as other major currency charts in the foreign exchange market. This section also intends to tackle the possibility of implementing this application on individual stocks and securities, as well as displaying the results of such implementation.

The following basic TA tools will be tested on the application:

- Trend and channel lines for both major and minor trends.
- Continuation patterns, such as the ascending, descending and symmetrical triangles, rectangle formations, and flags.
- Major reversal patterns, such as the head and shoulders formation, and double tops.

As a separate example, a final case will be provided demonstrating how well this application lends itself to the concepts of support and resistance.

It should be noted that throughout this

research, the application will only be tested on the daily end-of-day closing values or prices. Both line and bar charts will be used to represent the daily price charts.

Within the examples presented in this section, several cases were spotted displaying divergence between the prices and the application. Consequently, these divergences were pin pointed and discussed along with the basic TA tools tested on the application.

During the analysis of the cases presented in part three, the need for applying similar basic TA tools to the original price chart was required only for comparative and supportive means.

The primary aim is to point out how the *nature, type, phase and duration* of these TA tools and patterns tested on the application had varied from that of the basic price charts.

3.1 Trendlines and Channels

The following charts (*figures 2, 3 and 4*) represent examples of long-term trend lines, and channels.

Figure 2 displays a daily line chart of the NASDAQ composite (upper window) representing a period of the bull trend from 1992 till 2000. This same trend was visualized graphically on the application (lower window) as a series of reaction lows progressing upwards represented by a major positive trend line.

Four black arrows are plotted on the application indicating significant trend line support points. Another four black arrows are also drawn on the NASDAQ Composite chart showing corresponding points to those of the application. These corresponding points are regarded as major bottoms and/or critical levels of the NASDAQ Composite during the major long-term bull trend. Thus, such points represent buying opportunities for the market as suggested by the application.

Finally, the breakout from the major trend line constructed on the application also provided a decisive signal for the termination of the bull market (see red arrows).

The following example (*Figure 3*) represents a comparison between two major long-term trend lines regarding time of duration, phase difference and termination of each.

In this example, two major trend lines are displayed on both the application (lower window), and the price chart (upper window). A phase difference of four

Figure 3 The XETRA DAX Index, from February 1996 to September 2001

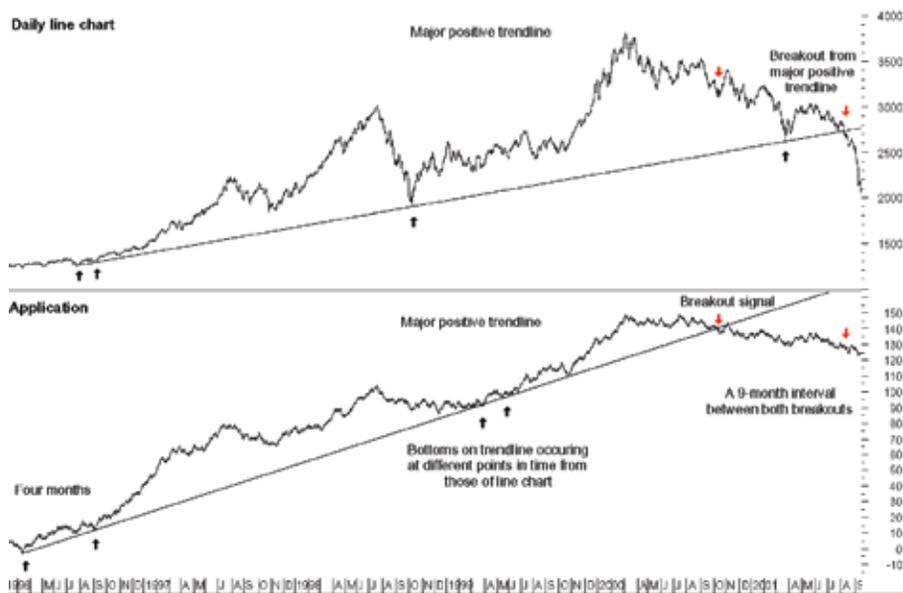


Figure 4. The Egyptian Co. for mobile serv. (EMOB.CA), from November 1998 to August 2000



Figure 5. The NASDAQ composite, from January to November 1993



months was spotted between the starting points of both trend lines constructed on the application and the price chart respectively.

Accordingly, a nine-month phase difference was observed between the breakout of prices from one trend line (upper window), and the breakout signal of the corresponding trend line of the application. This breakout signal generated by the application provided an earlier warning to the termination of this major bull trend in the market

Note that the bottoms occurring on the trend line of the application (lower window) were at different points in time from those marked on the line chart (see black arrows). Taken as an advantage, more buying opportunities (entry points) to the market are accessible.

The following bar chart (*Figure 4*) displays a local Egyptian telecom stock (upper window), accompanied by the application (lower window).

Figure 4 shows a major positive channel on the application (lower window), as well as a major positive trend line on the price chart (upper window).

It was noticed that the time durations of both the trend line and the channel are somewhat equivalent (15 months). The phase difference between both durations, however, was about three months.

Due to this phase difference, an early breakout from the channel on late March 2000 was signaled on the application. Subsequently, the actual breakout of prices from the trend line (upper window) occurred three months later (June), and the termination of the bull trend was confirmed.

During the bull trend, all peaks reaching the upper channel line on the application coincided with several critical peaks on the price chart (see black arrows). These peaks (lower window) provided short-term selling opportunities, or reducing—position signals to the previously held long positions.

3.2 Continuation Patterns

(A) Triangle formations:

Figure 5 represents a case where an ascending triangle was recognized on the application (lower window). However, this triangle was formed during a testing period of the NASDAQ composite to a critical resistance level in the market (upper window).

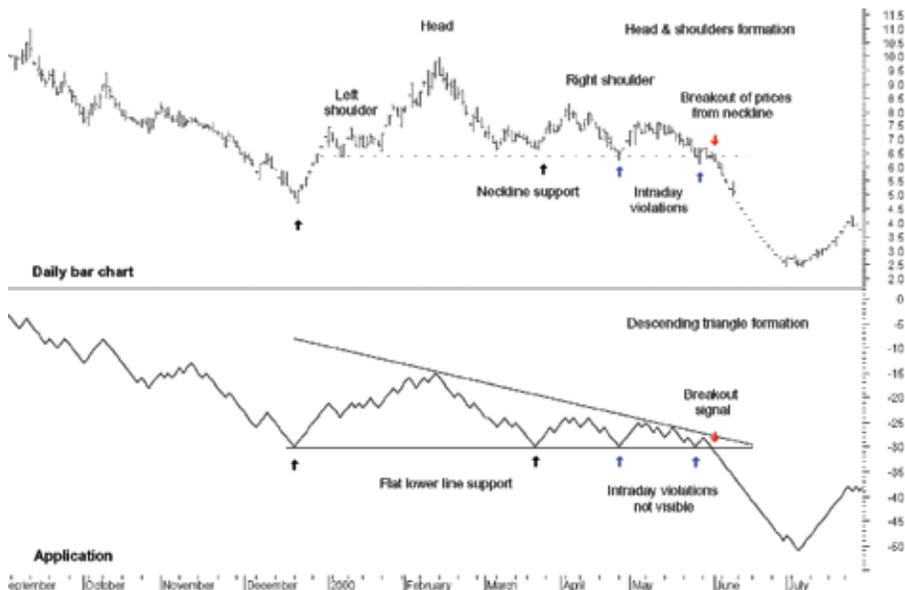
The breakout signal generated by the application and the actual breaking of the resistance level on the NASDAQ chart occurred at the same time.

The ascending triangle (lower window) provided a target projection equivalent to a value of 750 points on the NASDAQ chart (upper window).

After the breakout signal from the triangle, the subsequent trend progression of the application took the form of a channel.

In this example, a bullish divergence was realized when prices fell from the previous market high forming two consecutive lower lows. The application formed a low followed by a second higher low. This divergence was confirmed later when the NASDAQ Composite turned upward, forming new highs beyond the previous market high.

Figure 6. Arab International Contractors Co. (AICR.CA), from September 1999 to August 2000



The next example is of an issue traded in the Egyptian stock exchange against the application.

In the above example (Figure 6), a descending triangle formed on the application (lower window), and a head & shoulders formation (h & Sh) of similar time duration formed on the price chart (upper window).

Regarded as support levels, the fat lower line of the triangle (lower window) appeared corresponding to the neckline of the h & Sh (upper window). This fat lower line was precise and definite to a large degree resulting in all the intraday price violations occurring on the corresponding neckline of the price chart to be not visible on the application (see blue arrows).

It was also observed that the breakout signal of the triangle occurred exactly at the same time as the actual breakout of prices from the h & Sh formation (see red arrows). Nevertheless, the breakout signal of the triangle was more decisive and clear.

Figure 7 represents a third case with a triangle formation (symmetrical triangle) observed on the application.

Figure 7. NASDAQ 100 TRUST. (QQQ), from June 1999, to December 1999

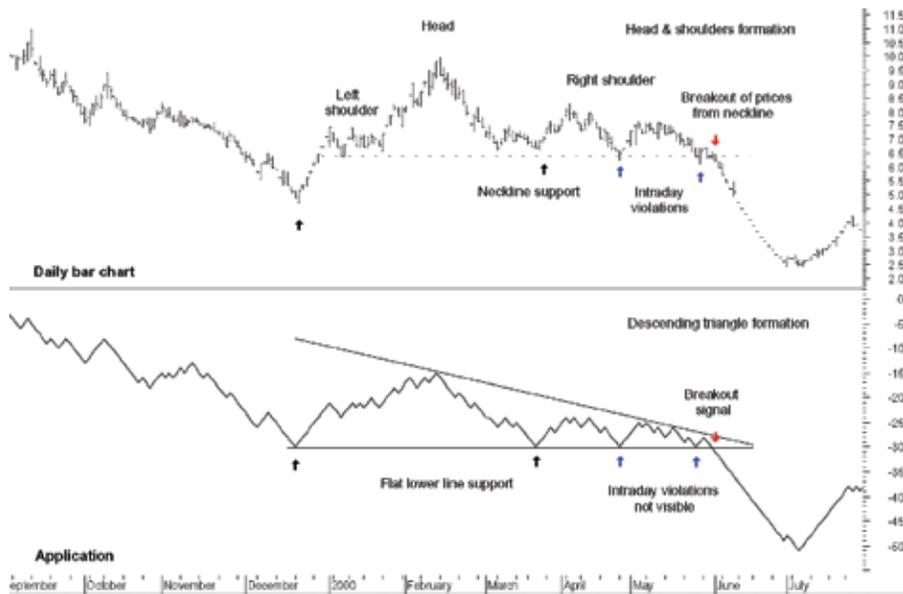


The time duration of the triangle (lower window) occurred slightly before, and continuing through a period of congestion in prices (upper window) from mid August till October.

The breakout signal generated from the triangle (lower window) led prices to a new high (target) almost at \$65. This breakout was followed by a series of higher lows on the application but prices fell to a new low. hence a positive divergence was realized and confirmed later when the prices turned upward, breaking above the resistance of the congestion area (upper window).

The breakout of prices from the congestion area was confirmed three days later by the breakout of the minor resistance appearing on the application.

Figure 8. Cairo Housing Co. (ELKA.CA), from December 1999, to August 2000



(B) Rectangle formation

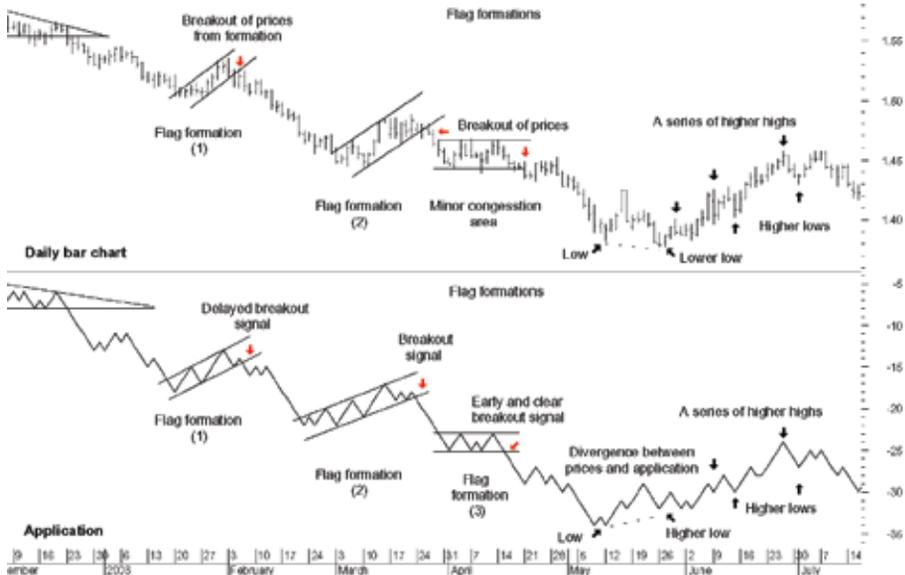
The following example (*Figure 8*) shows a daily bar chart (upper window) of an issue traded in the Egyptian Stock Exchange, accompanied by the application chart (lower window).

Figure 8 shows a rectangle formation formed on the application (lower window) during a period of sideways movement on the price chart (upper window).

The upper and lower boundaries of the rectangle (lower window) appeared to be corresponding to the resistance and support levels observed on the price chart and were well defined. For that matter, any violation (or penetration) of prices to the corresponding resistance (or support) levels on the price chart were not confirmed by the application (see blue arrows).

Another result due to the well defining of the rectangle boundaries is that the breakout signal of the rectangle appeared very definite and clear, as well as early. This signal was confirmed three days later when a breakout of prices occurred from the support level on the price chart (see red arrows).

Figure 9. EUR vs. GBP, from December 2002, to July 2003



(C) Flags (minor continuation patterns)

Figure 9 shows several examples of minor continuation patterns (flags) appearing on both the price chart (upper window) and the application (lower window).

A similarity was noticed between the duration time of all three minor continuation patterns on the price chart to the corresponding ones on the application.

A breakout of prices from flag formation (1) (upper window) was followed by a three-day delayed breakout signal from the corresponding flag formation (1) of the application. The delay serves as additional confirmation to the actual breakout of prices.

The breakout signaled from flag formation (2) (lower window) occurred in synchronicity with the actual breakout of prices from the corresponding flag formation (2) on the price chart. On the other hand, the breakout signal observed from flag formation (3) was regarded as an early, definite and clear one. Both signals provided from the flag formations (2 & 3) of the application suggest a confirmation and an early indication to the price movement (upper window) respectively.

Another bullish divergence was realized in this example as prices broke out from the final minor congestion area forming two successive lower lows. Alternatively, the application formed a low (bottom) followed by another higher low. This divergence was confirmed later in June when prices moved upward forming a series of higher highs and lows.

Figure 10. Cairo Housing Co. (ELKA.CA) from August 2000 to July 2001

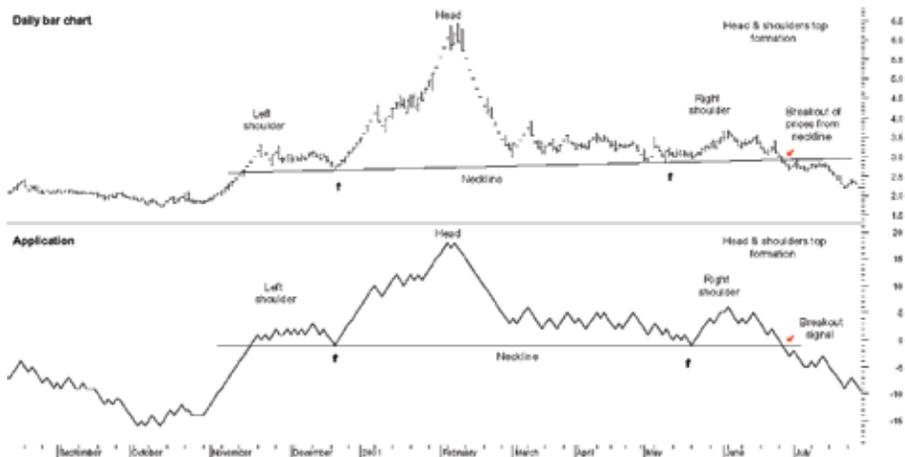
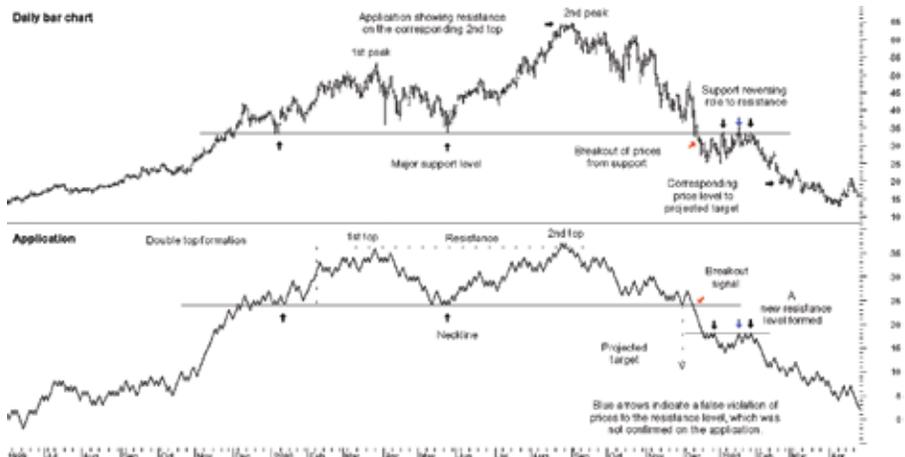


Figure 11. Sun Microsystems Corp (SUNW) from June 1999 to April 2001



3.3 Major Reversal Patterns

(A) Head and shoulders formation

This example provides a case at which a head and shoulders pattern was formed on both the price chart (upper window) and the application (lower window). This pattern appeared remarkably identical to both (price chart and application) with respect to time of duration, breakout, and symmetry of pattern components (i.e. head and left/right shoulders).

(B) Double top formation

Figure 11 shows a twelve-month major double top formation (DT) on the application (lower window). A similar duration was observed between the first and second peaks of the price chart (upper window) and their corresponding double tops appearing on the application. The neckline of the DT formation corresponded to the major support level of the price chart.

The first top of the DT formation (lower window) provided resistance to the second top and as a result both tops of the DT formation appeared equal in amplitude.

It should be noted that the breakout signal from the neckline of the DT formation occurred two days earlier than the breakout of prices from the major support level.

3.4 The Concepts of Support and Resistance and the Application

Figure 12 displays a daily price chart of an issue (upper window) in a bear trend. During this trend, four significant price lows were recognized on the price chart. Similarly four corresponding lows were also observed on the application (lower window).

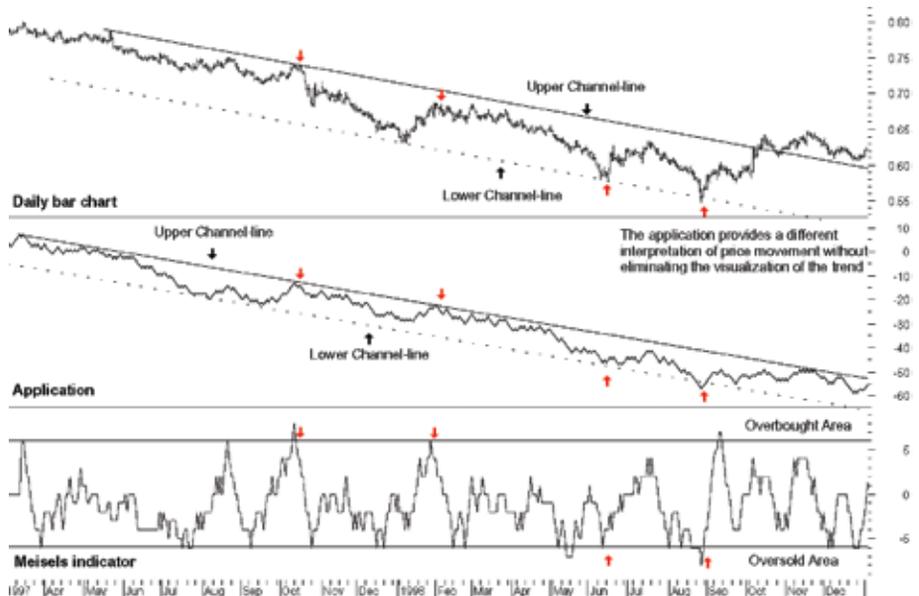
An early breakout from the first low of the application was signaled. Later, a breakout in prices occurred, followed by a minor up-correction on the price chart, coinciding with the end of the pullback to the first low of the application.

Notice how the price breakout from the second low on the price chart was not confirmed by the application, and prices drifted away through a small price range. It was only through the second breakout signal generated from the application that the prices actually broke out and fell within the negative trend.

Figure 12. Orascom Construction Company (ORTE.CA), from February 2001 to April 2002.



Figure 13. USD - \$ vs. Australian-Dollar, From March 1997 to December 1998



Part Four: Discussion and Conclusion

The final part of the research intends to provide a general discussion of a few basic characteristics of the application. An overall assessment of the potential advantages and limitations of the application will *in turn* follow this general discussion.

There will be a discussion as to whether the application is considered to be a trend leading or trend following device.

Finally, there will be an overview of the basic similarities and differences between the application and the Meisels indicator followed by a conclusion to this research.

4.1 Characteristics or Features of the Application (Advantages and Limitations):

In this section there will be an explanation of the general characteristics or features of the application. The features basically describe how the application reacts (its nature of motion on the chart) during the continuous price changes in bull, bear and fat trends.

One important feature of the application is that it recognizes motion in terms of direction only and not amplitude. In other words, it only reacts to the changes in closing values regardless of the amplitude of such changes.

Another important feature was noticed through the process of construction of the application. Within the calculation process, the application considers or interprets fat (or no-change) movements between any two consecutive closing prices as an absolute zero value. In that sense, any difference resulting only in an absolute (0.00%) value is regarded as a fat move, and accordingly any other result would be regarded as otherwise.

As a result of that feature, a fat (or a no-change) movement between any two closing values is rarely observed through the pre-manipulated data (after the quantization process). Consequently, fat movements are seldom witnessed when the application is visualized graphically (on a chart).

Through the different cases previously presented in part three, several advantages were observed on the application. Some of which led to a visualization enhancement of price movements on charts. Others provided a confirmative view to price movements.

And all of which (one way or the other) suggested useful trading signals.

An overview of the advantages provided by the application:

- The usage of trend line and channel analysis appeared to be of significant value. In general, the application succeeded in providing better visualization for major long-term trends. One case displayed the ability of the application to visualize a significant long-term trend line within a specific time period. Given this same time period, however, the actual price chart could not support the construction of such trend line. Another case displayed a major trend line constructed on the price chart corresponding to a major channel on the application which provided more useful information.

- The significance of various types of pattern formations tested on the application proved to be of crucial value. Some cases displayed an ability to identify specific pattern formations on the application at times when no pattern formations could be recognized on the price chart. Other cases showed similar or different pattern formations (of similar or different durations and phases) appearing on both the price chart and the application.

The definitive accuracy in the formation of the trend lines and patterns appearing on the application lead to other advantages:

- The precision of breakout points from trend lines, channels and pattern formations lead to significant (and valid) buy/sell signals.
- Accuracy in measured and projected targets
- A filtering method or technique provided during periods where false breakouts (violations) or indecisive penetrations from critical levels would appear on the price chart (such whipsaws would not be visible on the application).

Limitations were also found using the application:

- At certain times, observed through the calculation process, price changes could be very minor, and of no true significant value. During such times, the application would interpret these minor (insignificant) changes as up or down moves, rather than fat moves. In other words the application would regard them as significant changes, and therefore would appear to be deceptive (or provide false signals).

- The application does not respond sensitively to highly volatile (sharp), minor or sudden price movements. Consequently through such movements, the application does not usually provide timely (useful) signals when tested upon with basic T.A. tools.

- At rare times the application can appear misleading. This limitation only occurs at times when prices rise (or fall) in the direction of the trend. However these moves (in the trend direction) are accompanied by high volatility and occur over a relatively shorter duration than when prices correct from such moves (on lower volatility). It is only during these rare cases that the prices would progress to higher highs and lows (or lower highs & lows) whilst the application would progress elsewhere.

Nevertheless, these cases may describe the basic nature or constitute the main form of price movements of one individual issue (security), or—at least—during a certain time period of price movement history of the issue. To reiterate from part three: this application was primarily intended for the major market indices and averages that basically reflect the overall major market trends so such cases seldom occur and are rarely observed on the major market indices or averages.

4.2 Is the Application a Trend-leading or Trend-following Device?

Throughout the cases previously presented in part three, a rather interesting feature was noted on the application. It was observed that—generally and in most cases—the application was considered to be trend-leading in nature. However during other cases the application appeared to be trend-following or perhaps sometimes trend-confirming in nature.

The application appeared to be trend-leading during cases where:

- Earlier breakout signals were generated from the TA tools used on the application, as compared to the actual breakout of prices, when such tools were applied on the price chart. These early signals provided early warnings and pre-confirmations to the price breakouts occurring on the price chart.
- Positive (or negative) divergences occurred between the price chart and the application, providing early warnings for a reversal in price trend direction.

The application appeared to be trend-confirming or trend-following during cases where:

- Breakout signals generated from the TA tools used on the application occurred during the same time, or later than the actual breakout of prices, when these tools were also applied on the price chart (given the same time period under study).

4.3 The Application vs. the Meisels Indicator

This section provides the results of a comparison between the application and the Meisels Indicator. The basic points of comparison include the goals to be accomplished by each of these two tools, as well as the methods of calculation used for each. Within this comparison, a few points are worth mentioning:

The goal of the application is to visualize the price movement over *time* in terms of direction only, disregarding the amplitude of the direction but most importantly, without eliminating the visualization of the trends appearing on the price chart.

On the other hand, the purpose of the

Meisels Indicator is to graphically display when the Δ closing prices are considered to be overextended after a particular move. However, this indicator regards all changes in closing prices also in terms of *direction only*. Therefore at a primary stage, the Meisels Indicator assigns positive and negative values for each up and down trading day respectively. As a result, this stage becomes identical to the process of quantization of the Δ closing prices of the application. Then a moving period (usually 10-days) is suggested in which the sum of newly assigned positive or negative values within each moving period is calculated. Finally, the result for each period is plotted as either a positive or negative value on the chart.

By doing so, the Meisels Indicator created a by-product. This by-product produced graphically an interesting and accurate oscillator that signals when price moves have reached their extremes (with respect to direction). Thus, this oscillator completely eliminated the visualization of trends appearing on the price chart. From that, the basic discrepancy between both the application and the Meisels Indicator lies within the final representation of each one graphically. [IFTA](#)

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Author Profiles

Technical analysis has been developing into more and more rigorous, quantitative and scientifically based approaches and research methods over recent years. Gandolfi et al., p. 14

Part one introduces a method which proposes a new technical analysis (TA) tool. This TA tool is primarily applied to market indices and averages, and is generally used for market forecasting. El Saiid, p. 32

If you are not using a volume indicator or are looking for a unique new charting method, then the concept of using color variations to represent changes in indicator values may seem practical. Gault, p. 32

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Bernard Belletante is Dean and Professor of Corporate Finance of the Euromed-Marseille Ecole de Management in Marseille, France. Dr. Belletante received his doctorate from the University of Lyon. He has published numerous books and articles and has headed the Financial Observatory of Medium-Sized companies in France.

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Since the crash of 1987, the picture of the rational investor faltered... the idea of efficient markets with rational investors could no longer be supported. The paradigm change is accompanied by the rise and development of a new scientific area, behavioral finance.

Hubner, p. 26

The Wyckoff Law of Cause and Effect successfully passed its market test of DJIA of 7,200 + 10% or 14,400 + 5%. We anticipate that the DJIA will continue to conform to the "Wyckoff Count Guide" and mid 2007 is a "Stop, Look and Listen Point" with three different scenarios for the future price trend.
Pruden and Belletante, p. 13

The financial markets act as a natural system, in that not only do prices have a relationship with time and with each other but also display a mathematical relationship to recent highs and lows (harmony) using an inverse decimal value of harmonic ratios (the size of the musical interval from one note to another).

MacLean, p. 48

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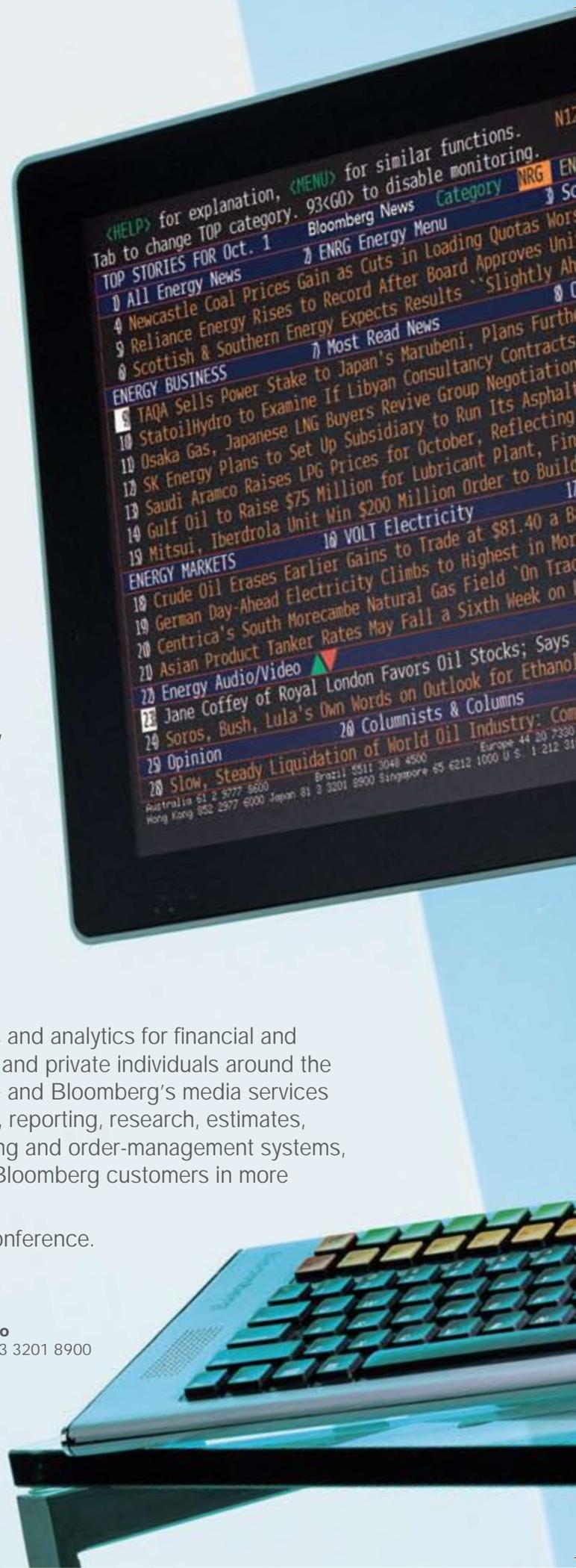
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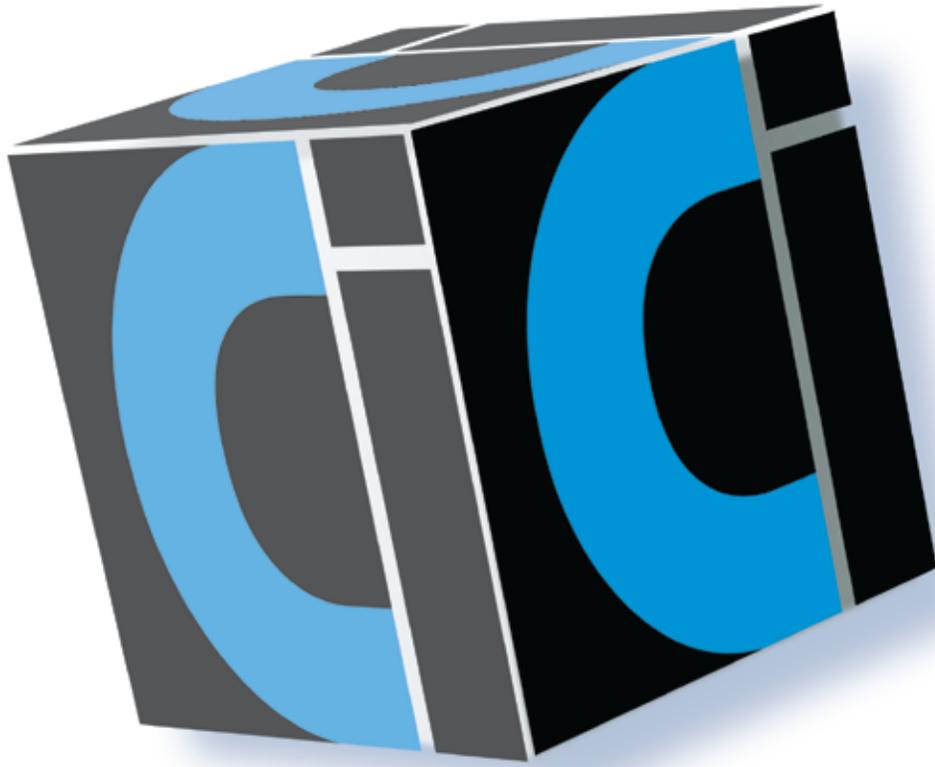
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