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After careful and considered investigation and extensive review of the above paper by a duly constituted expert committee, the above paper has been found to be published in Ushus Journal of Business Management after a technical error in the publishing process from the side of the Journal. The article was retracted because there was a discrepancy between the manuscript published, the receipt of the consent of the published author in Ushus Journal of Business Management and another article which had similar content and was written by another author. We would like to put on record that none of the authors had any role to play in this error. The technical concern was taken with seriousness by the expert committee.

As per the editorial policy and ethical principles of Ushus Journal of Business Management and as per COPE guidelines, this requires that the article be retracted.We hereby retract this paper.

We would like to thank DrJacinta Chan Phooi M'ng, University of Malaya, Kuala Lumpur (UM) and Dr Mohd Rizal Palil, Universiti Kebangsaan Malaysia for bringing this regrettable error to our notice and the inconvenience this has caused.

We would like to reiterate that Ushus Journal of Business Management stands for ethical publication policies according to COPE guidelines.

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Adaptive Bands Z-Test-Statistics in Futures Markets: A New Technical Analysis Indicator

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Abstract

This paper presents a study of technical analysis trading rules that generate abnormal returns for futures prices. It reports abnormal returns above that of the passive buy-and-hold policy for FKLI, FCPO, Soybean Oil Futures, Soybean Futures and Corn Futures for year 2008 tested. This research devises a new technical analysis indicator, Adaptive Bands Z-Test-Statistics, using adaptive standard deviation. One of the most baffling issues that confronts market technicians for decades is the critical definition of when the market is trending and when it is ranging. Applying a trending algorithm trading system to a ranging market will result in whipsaws (false entry signals) that yield losses. To avoid some of these false entry whipsaws, this paper proposes to variate some technical analysis tools to suit the different market conditions. This research attempts to variate lagging technical indicators like moving average and standard deviation to trade with less whipsaws in ranging market and yet capture the new trends early. In a ranging market, longer moving averages and corresponding standard deviations are used to avoid some of the whipsaws. In a trending market, shorter moving

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averages and corresponding standard deviations are used to gain early entry and exit.

This paper presents a study of algorithm professional trading systems using some futures contracts to find high abnormal profits, in excess of the benchmark buy-and-hold policy's returns. The ultimate result of this research is a new adaptive technical indicator, Adaptive Bands Z-Test-Statistics (ABZ). Using daily data, this research investigates the profitability of ABZ and other algorithm trading systems on futures contracts from 15 December 1995 to 31 December 2008. Test results for ABZ indicate abnormal profits in excess of the benchmark buy-and-hold policy's return for all the contracts tested. In 2008, for FKLI, ABZ reports a profit of +463 index points against a buy-and-hold return of -562 index points.

Keywords: Technical analysis, Algorithm trading system, Systematic back testing, Technical indicators, Technical trading rules, Abnormal returns above the passive buy-and-hold policy and Adaptive Bands Z-Test -Statistics

Introduction

Technical analysis is a growing science because quantitative methods for evaluating price movement to make trading decisions have now become a dominant part of current market analysis (Kaufman (1998). Detecting new trends early using mechanical trading rules in technical analysis is one of the techniques that professional traders use to make abnormal returns above the benchmark return of the passive buy-and-hold policy. Taylor and Allen (1992) find in their survey of chief foreign exchange dealers based in London that more than half of the respondents place some importance on technical analysis.

An initial general survey reveals at least three conventional methods used by market practitioners to reap these high returns; Technical Analysis and Dow Theory, Fundamental Analysis and Random-Walk Theory. Other methods gaining popularity are Fractal Geometry and combinations of Artificial Neural Networks

and Genetic Programming with Technical Analysis. This research undertakes the time and effort to find these high returns by making use of technical analysis knowledge to design new technical indicators that take advantage of the trending nature of futures prices.

Technical analysis researches the properties of the price series data empirically for patterns or trends to make trading decisions. Technical analysis includes a variety of techniques such as chart analysis, pattern recognition, and seasonality and cycle analysis and algorithm technical trading systems. This research focuses on algorithm technical trading systems that can be expressed in mathematical formulae. Popular technical trading systems includes variations of Alexander's Filter Rules (Alexander 1961, 1964), Donchian's Trading Rules Breakout (Donchian 1960), and Moving Averages. This research concentrates on variations of Moving Averages like Simple Moving Averages (SMA), Moving Average Crossover (MAC), Kaufman Adaptive Moving Average (KAMA), B Band Z-Test-Statistics (BBZ), Optimised B Bands Z-Test-Statistics (Opt BBZ) and Adaptive Bands Z-Test Statistics (ABZ), after findings on selected data that these are the best six performers in terms of profit. This research proposes a new technical indicator, ABZ to suit either range market condition when prices are trading without direction between support and resistance areas, and trend market condition when prices are moving up in an uptrend or moving down in a downtrend.

"In all the years, I have spent developing and analyzing technical trading methods, I have yet to see any one system that is consistently profitable in all markets." J. Welles Wilder Jr (1978), the inventor of Relative Strength Index, states in his book, "New Concepts in Technical Trading Systems". It is every trader's quest to find a trading system that is profitable to all market conditions, or at least for the trend traders, the quest is to find a trading system that will not be subjected to range market whipsaws' losses. ABZ is this research's quest to find and develop a trading system that trades and is profitable in trend market, and not trade during range market, thus avoiding some of whipsaw losses.

A common typical problem in technical analysis is algorithms that function well either in trending market or trading range market, but not in both market conditions. "In all the years, I have spent developing and analyzing technical trading methods, I have yet to see any one system that is consistently profitable in all markets." J. Welles Wilder Jr (1978), the inventor of Relative Strength Index, states in his book, "New Concepts in Technical Trading Systems". Though this is a well known problem amongst In literature, according to Gandolfi, Rossolini, Sabatini and Caselli (2008), 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 and Vidya.

Literature Review

This study is based on the insight of Benoit Mandelbrot (2004)'s proof that market is not random. This view is opposite to Eugene Fama's (1965) Random-Walk theory. Mandelbrot (2005) reviews the validity of Random-Walk theory by Fama (1965). Fama (1965) states that if the Random-Walk theory is an accurate description of reality, then the various technical or chartist procedures for predicting stock prices are completely without value.

Other studies, including Bear and Stevenson (1970), Leuthold (1972), Nefti and Policano (1984), Sweeney (1986, 1988), Lukac, Brosen and Irwin (1988), Taylor (1992), Brock, Lakonishok and LeBaron (1992), Annuar, Ariff and Shamsher (1993), Levich and Thomas (1993), Silber (1994), Bessimbinder and Chan (1995), Neely (1997), Ratner and Leal (1999), Wong, Mansor and Chew (2003), Irwin and Park (2009), demonstrate otherwise. These studies show that the technical trading systems generally generate abnormal returns larger than those by the passive buy-and-hold policy. These studies test different algorithm technical trading systems and find evidence consistent with technical trading systems are able to identify trends for the purpose of trading profitably.

Brock et al. (1992), in their article "Simple Technical Trading Rules and The Stochastic Properties of Stock Returns", tests 10 variable-length-moving-average technical rules and 10 fixed-length-moving average rules and 6 trading-range-break rules using Dow Jones Industrial Average. Brock et al. (1992) rejects the hypothesis that the technical rules in aggregate have no predictive power for return. This finding is very significant because many others like Bessimbinder and Chan (1998) base their studies on the methods used by Brock et al. (1992) to test and achieve significant positive results. This study adopts a similar approach to that of Lukac et al. (1988) and uses some of the tests selected by Brock et al. (1992) and Bessimbinder and Chan (1988) with an improvised technique, ABZ to identify and trade trends for abnormal returns greater than those by the passive buy-and-hold policy.

ABZ (Adaptive Band Z-Test-Statistics) Algorithm Trading System

ABZ (Adaptive Band Z-Test-Statistics) algorithm trading system is a proprietary trend following system which attempts to address the some of the problems commonly encountered by trend following techniques such as:

1) There is a time delay to capture price trend movements early;

2) It is not realistic to predict future price movements by using the parameters optimised to maximize historical performance in the simulation (that is, the impressive simulation results sometimes deceive by using "optimised" parameters which maximise historical performance during the specified period); and

3) The trend-following systems like those based on moving averages make mistakes, encountering false entry whipsaws when the prices move sideways in trendless movements.

ABZ proposes to address some of the above problems by:

1) improving the lagging tendency in trends,

2) automatically adjusting the parameters according to the prevailing market conditions, and

3) trying to avoid some of the false entry whipsaws by using longer moving averages in range market.

ABZ is developed on the concept of adjusting the moving averages, employing the Efficiency Ratio as defined by Perry Kaufman. It is also referred to as Chande Market Oscillator by Chande Tuscher. The Efficiency Ratio is the ratio of the net price movement (determined by the difference between the last close price and the first close 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).

$$\text{Efficiency Ratio} = \frac{\text{Net Price Movement}}{\text{Total Price Movements}}$$

Efficiency Ratio approaches zero when the market is ranging and it approaches one when the market is trending. When the Efficiency Ratio is approaching zero, indicating that the market is not moving in any particular direction, long term moving averages and standard deviation bands can be used to try to avoid some of numerous false whipsaw signals. When the Efficiency Ratio is approaching one, indicating that the market is trending, short term moving averages and standard deviation bands can be used to try to gain earlier entry to the new developed trend.

ABZ adopts the term, "adaptive", in its name to describe its ability to automatically adapt the effective length of the moving average to the Efficiency Ratio. ABZ is constructed around a simple moving average and its standard deviation bands which are able to automatically adjust its length, switching from a short term moving average and its standard deviation bands during trending market to a long moving average and its standard deviation bands during range market.

ABZ tries to address some of the most common problems inherent in trend trading systems as highlighted by Schwager (2000).

1) **Too Many Similar Systems**. As ABZ is an original and not a known trading system, it does not generate many false

trading signals from a flood of similar orders from other common standard trading systems.

2) **Whipsaws**. ABZ experiences comparative less whipsaws than most trading systems because it is adaptive and has been designed to avoid as many whipsaws as possible.

3) **Failure to Exploit Major Price Moves.** Unlike other basic standard trend following systems that assume equal distance moves as those in history and thus miss out additional profit if the price movements are extended, ABZ rides on the profit from the time when the bands expand to the time when the bands contract. The risk of ABZ exiting too early is low as it adapts to the prevailing market condition. If ABZ exits falsely, it reenters into the original position at the signal to do so.

4) **Tendency of Nonsensitve (Slow) Systems to Surrender a Large Percentage of Profits.** ABZ is a fast system as it exits earlier at the standard deviation band than other trend trading systems that use moving average. ABZ is adaptive to exit earlier on change of trend.

5) **Lose Money in Range Markets**. ABZ is a trend trading system that does not make money in range markets. The bands are defined to avoid making some losses in range markets.

6) **Temporary Large Losses**. ABZ adapts by using longer term moving average and standard deviation when the market is flattish, thereby avoiding some of the losses. Moreover, the losses are small because of the mean reverting nature of time series.

7) **Parameter Shift**. ABZ is specifically designed to cater for parameter shifts between ranging and trending market conditions.

Methodology

Algorithm mechanical trend trading systems like moving averages, KAMA, BBZ, Optimised BBZ and ABZ can generate abnormal returns in excess of those by the passive buy-and-hold policy. The tests use:

1) the entire sample of 1995-2008 for Futures on the FBM Kuala Lumpur Composite Index; and
2) the sample period of 2008 for Crude Palm Oil Futures (FCPO), Soybean Oil Futures, Soybean Futures and Corn Futures.

A series of simulation tests confirm the validity of these trading techniques. The results of these tests are optimised. The aim of optimisation is to find the optimal parameters to construct the trading system that generates optimal results, that is, highest net profit with the least number of trade's especially unprofitable trades.

Metastock informs this study. System tester simulates the tests and spreadsheet calculations on Excel verifies the results.

The tests are:

1) Moving average (VMA (1, 21, 0%))
2) Moving averages crossover (VMA(21,34,0%))
3) KAMA
4) BBZ (21MA,1Stdev)
5) Optimised BBZ
6) ABZ

ABZ is calculated on excel spreadsheet as the parameter is not a constant and cannot be incorporated into Metastock's system tester.

Observations

An observation of the raw data in graphical from in figure 1 shows there are price patterns or trends in FKLI prices. A closer inspection of figure 1 reveals that these uptrends or downtrends occur at or near the Bollinger Bands [9]. Bollinger Bands, by default, is two standard deviations bands from 21 day moving average.

Fig 1: KLSE CI Futures Closes and Bollinger Bands

Observations from the figure 1 and figure 2 show that the trends seem to begin when the bands widen. Note that in figure 3 instead of using 2 standard deviations Bollinger Bands, using 1 standard deviation bands makes the trends more obvious and easier to define. Note that whenever the price crosses above the Upper Band, the prices tend to move up and whenever the price crosses below the Lower Band, the prices tend to move down. The technique of this study is to detect an expected uptrend when the price crosses above near 1 standard deviation upper band, and an expected downtrend when the price crosses below near -1 standard deviation lower band.

Fig 2: FKLI Daily Closes, 21 MA, +1 Stdev Upper Band, -1 Stdev Lower Band.

Hypothesis

This study ascertains the hypothesis that a trend begins when the price is more than near 1 standard deviation from the moving average. As ABZ is a algorithm trading system, the set of trading rules on when to buy and when to sell are:

1) **Buy (enter long)** when prices are **more** than 0.8 standard deviation;
2) **Sell (exit long)** when prices are **less** than 0.8 standard deviation;
3) **Sell (enter short)** when prices are **less** than -0.8 standard deviation;
4) **Buy (exit short**) when prices are **more** than -0.8 standard deviation.

By applying this set of trading rules, ABZ generates net profit above that of the passive buy-and-hold policy. The abnormal return from this set of trading rules confirms that the buy and sell signals appear near the 1 standard deviation bands to take advantage of the price trends.

The limitations of back-testing are that test results cannot account for:

1) Intra-day movements which give earlier entry signals which may result in more profits or more losses.
2) Any slippage (which is usually not a factor to be concerned with in liquid markets).

For comparison purpose, this study also includes testing of other trading models specified by Brock, et al.(1992).

Tests

Moving Average (VMA (1,21,0%))

The most common algorithm trend trading system is the simple moving average which Brock et al. (1992) refers to as Variable Moving Average (1,21,%). The method to construct this simple moving average trading system is to calculate the average of 21 daily closes and compare that to the current close. If the current close is above the 21 day moving average,

then the signal is to buy. If the current close is below the 21 day moving average, then the signal is to sell.

Moving Averages Crossover (VMA(3,21,0%))

Another common trading system is the moving averages crossover system which Brock et al. (1992) refers to as Variable Moving Average (3,21,0%). The method to construct this moving averages crossover trading system is to calculate the average of 3 daily closes and the average of 21 daily closes. If the 3 day moving average is above the 21 day moving average, then the signal is to buy. If the 3 day moving average is below the 21 day moving average, then the signal is to sell.

KAMA

Both these systems are fixed length moving averages and the lengths, 3 and 21 are arbitrary chosen. In order to vary these moving averages according to market conditions, Kaufman[29] proposes to apportion weights to the current data and past smoothened data series according to Efficiency Ratio in accordance to the formula below:

KAMAt= a ER Ct + (1-a ER) KAMAt-1

Where a=[(ER x (2/3-2/31))+2/31]^2

ER = (Ct - Ct-n)/Absolute Sum of (Ct – Ct-1)

When ER is large in a trending market, more weightage will be given to the current Ct. When ER is small in a ranging market, more weightage will be given to past KAMAt-1.

However, these moving averages trading systems are turn and reverse a system, which means that the trader trades all the time, even in range periods when the trader gets a lot of whipsaws.

BBZ (21,1)

To avoid trading unprofitably during range periods, part of this study proposes BBZ, to trade when the price moves above +1 or below -1 standard deviation band.

The method to construct BBZ is to calculate the 21 day moving average and 1 standard deviation. The next step is to add 1 standard deviation to the 21 day moving average to get the upper band and to deduct 1 standard deviation from the 21 day moving average to get the lower band. If the close is above the upper band, then the signal is to buy and when the close is below the upper band, the signal is to exit long. If the close is below the lower band, then the signal is to sell and when the close is above the lower band, the signal is to exit short.

The instructions to programme into the trading system are:

1) Under System Tester, key in the name BBZ.
2) (Program "Enter Buy" to be: "Close>BbandTop(Close, 21, Simple, 1)
   (Program "Exit Buy" to be: "Close<BbandTop(Close, 21, Simple,1)
   (Program "Enter Sell" to be: "Close<BbandBot(Close,21,Simple,1)
   (Program "Exit Sell" to be: "Close>BbandBot(Close,21,Simple,1)
3) Run "Simulation Tests" on the data.
4) View "Results" after the test to check for
   a) amount of profit,
   b) no of trades, profit versus unprofitable trades,
   c) average gain versus average loss per trade,
   d) maximum consecutive gains versus maximum consecutive losses.

Diagram 1: Instructions for system tester for BBZ

Optimised BBZ

However, fixed length BBZ(21,1) produces result that only favours trends that begin when prices move beyond the 1 standard deviation bands from the 21 period simple moving average. For other periods when market is moving very fast and not moving at all, 21 period and 1 standard deviation may not be the most optimal parameters to use. Therefore optimisation is done to find the optimised parameters that produce the best results. Optimisation is a series of simulations with different parameters with the intention of selecting the most optimal parameters that

generate the most net profit with the least number of consecutive losses.

To improve result of BBZ (21MA,1Stdev) test, optimization tests are conducted for each year. System tester then generates the most optimized moving average and optimized standard deviation. In system tester, rerun steps 1) to 4) replacing 21 with "Opt1" and 1 with "Opt2".

1) Under System Tester, key in the name Opt BBZ.
2) (Program "Enter Buy" to be: "Close>BbandTop(Close, Opt1, Simple, Opt2)

   (Program "Exit Buy" to be: "Close<BbandTop(Close, Opt1, Simple,Opt2)

   (Program "Enter Sell" to be: "Close<BbandBot(Close,Opt1,Simple,Opt2)

   (Program "Exit Sell" to be: "Close>BbandBot(Close,Opt1,Simple,Opt2)
3) Run "Simulation Tests" on the data.
4) View "Results" after the test to check for
   a) amount of profit,
   b) no of trades, profit versus unprofitable trades,
   c) average gain versus average loss per trade,
   d) maximum consecutive gains versus maximum consecutive losses.

Diagram 2: Instructions for system tester for Optimised BBZ

6) ABZ

However, optimisation can only be performed on past data, after the event. Before the event, it is necessary to predict which length of simple moving average to use. So from the range of results from optimised BBZ, ABZ is designed to variate to the optimal length of moving average and standard deviation according to market conditions. If the market is ranging, that is Efficiency Ratio is small, then long term moving average and standard deviation are used. This is to prevent some unnecessary whipsaws that are characteristics of short term moving average. If the

market is starting to trend, that is Efficiency Ratio is big, then shorter term moving average and standard deviation are used. This is to permit earlier entry into the new trend at more favourable price.
ABZ = MA ((1/ER)*K)+ Stdev((1/ER)*K)

Test Results on FKLI

Table 1: Profit Results for FKLI for 2/1/1996-31/12/2008

FKLI	Buy & Hold	1)SMA	2)MA Cross	3)KAMA	4)BBZ	5)BBZ Opt	6)ABZ
1995	5.5						
1996	232.2	89.6	98	69.7	-34.6	88(34,1.0)	75.4
1997	-642.2	213.7	152	-52.9	211.9	392(30,0.8)	294.2
1998	-7.2	235.8	-20	34.4	59	188(34.08)	-44.8
1999	231.1	229.2	321.8	299.3	257.8	305(26,1.0)	215.5
2000	-129.5	232.3	-93.6	73.8	-41.9	362(8,0.8)	239.6
2001	9.8	173.1	114.8	282.6	196.1	256(28,0.9)	259.2
2002	-45.1	78.9	53.7	99.7	18	122(31,0.9)	61.4
2003	145.9	-12.4	-42.8	65.6	111.3	125(20,1.1)	80.8
2004	111	74.5	54	92.5	137	175.5(27,0.8)	134
2005	-6.5	28	89	67.5	49.5	92.5(23,0.9)	59
2006	196	147.5	108.5	71	67.5	128.5(34,0.9)	105
2007	351	159.5	-174	-182	-196.5	44(10,1.0)	-94.5
2008	-562	433.5	367	498.5	213.5	366(34,0.8)	463
Total	-110.5	1764	1028.4	1419.7	1048.6	2644.5	1848.3

Simple Moving Average (VMA (1,21,0%))

Figure 3 depicts the chart for this moving average system. Observe that the trends begin when the price cuts the moving average. If the price closes below the moving average, then the trend is a downtrend. If the price closes above the moving average, then the trend is an uptrend.

Fig 3: FKLI Daily Closes versus 21 Moving Average

The result of this test of buying when the daily close is above the moving average line and selling when the daily close is below the moving average line is a net profit of 1,764 points after transaction costs compares to the passive buy-and-hold policy which gives negative return of -110.5 points. Table 1 tabulates the results of simple moving average (SMA).

Moving Averages Crossover (VMA(21,34,0%))

Figure 4 depicts the chart for this moving averages crossover trading system. Observe that the trends begin when the shorter term moving average cuts the longer term moving average. If the shorter term moving average cuts from above the longer term moving average to below, then the trend is a downtrend. If the shorter term moving average cuts from below the longer term moving average to above, then the trend is an uptrend.

Fig 4: FKLI Daily Closes, 3 Moving Average versus 21 Moving Average.

The result of this moving average crossover test is a net profit of 1,696.6 points after transaction costs. Compare this result with the passive buy-and-hold policy which yields a negative return of -110.5 points. Table 1 shows the results of using moving average crossover (MAC).

KAMA

Figure 5 depicts the chart for KAMA trading system. Observe that the trends begin when the price cuts KAMA. If the price closes below KAMA, then the trend is a downtrend. If the price closes above KAMA, then the trend is an uptrend.

Fig 5: FKLI Daily Closes and Kaufman Adaptive Moving Average (KAMA)

The result of this adaptive moving average test is a net profit of 1,419.7 points after transaction costs. Compare this result with the passive buy-and-hold policy which yields a negative return of -110.5 points. Table 1 tabulates KAMA's results.

BBZ (21MA, 1Stdev)

Figure 6 depicts the chart for BBZ trading system. Observe that the trends begin when the price is below the lower band or above the upper band. If the price closes below lower BB, then the trend is a downtrend. If the price closes above upper BB, then the trend is an uptrend.

Fig 6: FKLI Daily Closes, +1 and -1 Standard Deviation Bands from 21 Day Moving Average

The result of this test of buying long when prices are above the upper band and selling short when prices are below the lower band is a net profit of 1,048.6 points after transaction costs. Compare this to the passive buy-and-hold policy which yields a negative return of -110.5 points. Table 1 tabulates BBZ(21MA,1Stdev) results.

Optimised BBZ

Figure 7 depicts the chart for most optimised BBZ trading system for the year 2008. Different year will have different optimised parameters to produce the best result.

Fig 7: FKLI Daily Closes, +0.8 and -0.8 Standard Deviation Bands from 34 Day Moving Average

The combined profit increases significantly to 2,644.5 points after transaction costs. Table 1 tabulates optimised BBZ (BBZ Opt) results. Compare this to the passive buy-and-hold policy which yields a negative return of -110.5 points. By optimisation, net return increases by another 150% for this period.

ABZ

However, it is not possible to know in advance what is the optimal parameters to use. Therefore, using Efficiency Ratio, ABZ will vary the moving averages and standard deviations according to prevailing market conditions. Figure 8 depicts the chart for ABZ trading system. Observe that in range period, the bands are larger to avoid some unnecessary whipsaws. In trend period, the bands are tighter to allow earlier entry.

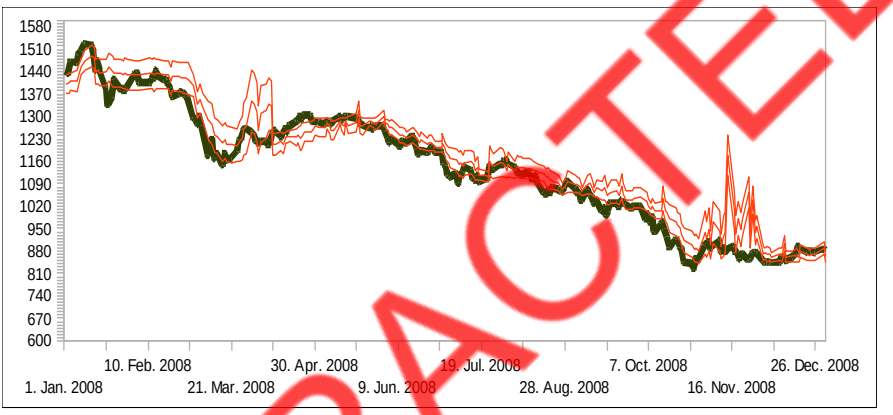

Fig 8: FKLI Daily Closes, +0.8 and -0.8 Standard Deviation Bands from Adaptive Moving Average

The result of this adaptive bands test is a net profit of 1,848.3 points after transaction costs. Compare this result with the passive buy-and-hold policy which yields a negative return of -110.5 points. Table 1 tabulates ABZ's results.

DAILY TEST RESULTS on FCPO, Soyoil Futures, Soybean Futures and Corn Futures

Table 8.4: Test Results for FCPO, Soyoil Futures, Soybean Futures and Corn Futures from 2/1/2008 to 31/12/2008

Contract	Buy & Hold	1)SMA	2)MA Cross	3)KAMA	4)BBZ	5)BBZ Opt	6)ABZ
FCPO	-1387	820	948	-456	672	1119 (170.9)	1246
Soyoil	-16.49	19.69	29.22	29.64	14.41	27 (19,0.8)	30.6
Soybean	-23.4	540.8	558.2	604	15.2	522 (9,1.2)	176.8
Corn	-49.2	134.6	52.8	-31.6	121	328 (26,0.9)	240.8

Crude Palm Oil Futures contract (FCPO)

For tests on Crude Palm Oil Futures, compared to the buy-and-hold policy which yields a negative return of -1,387 for 2008,

1) Moving Average (21) gives a return of 820;
2) Moving Average Crossover (3,21) gives a return of 948;
3) KAMA gives a negative return of -456;
4) BBZ (21MA,1Stdev) gives a return of 672;
5) Optimized BBZ(17MA,0.9Stdev) gives a return of 1,119; and
6) ABZ gives a return of 1,246.

After taking into consideration transaction cost of RM50 (USD14.29 at the exchange rate of USD1=RM3.5000) per way and value per point of RM25, compared to the buy-and-hold policy which gives a negative return of -RM34,675 (-USD9,907) for 2008,

1) Moving Average (21) gives a return of RM17,900 (USD5,114), ranking 4th;
2) Moving Average Crossover (3,21) gives a return of RM22,300 (USD6,371), ranking 3rd;
3) KAMA gives a return of RM14,400 (USD4,114), ranking 6th;
4) BBZ (21MA,1Stdev) gives a return of RM14,300 (USD4,085), ranking 5th;
5) Optimised BBZ(17MA,0.9Stdev) gives a return of RM25,575 (USD7,307), ranking 2nd; and
6) ABZ gives a return of RM28, 350 (USD8,100), ranking 1st.

It is profitable to use any of these algorithm trading systems to trade FCPO on a daily basis. All these algorithm trading systems yield better returns than the buy-.and-hold policy. For comparison note, the risk free rate (the rate of return for a 10-year Malaysian Government Securities) as of 30 June 2008 is 4.770.

Soyoil Futures

For tests on Soyoil Futures, compared to the buy-and-hold policy which yields a negative return of -16.49 for 2008,

1) Moving Average (21) gives a return of 19.69;
2) Moving Average Crossover (3,21) gives a return of 29.22;
3) KAMA gives a return of 29.64;
4) BBZ (21MA,1Stdev) gives a return of 14.41;
5) Optimized BBZ(19MA,0.9Stdev) gives a return of 27; and
6) ABZ gives a return of 30.6.

After taking into consideration transaction cost of USD12 per way and value per point of USD600, compared to the buy-and-hold policy which gives a negative return of -USD9,894 for 2008,

1) Moving Average (21) gives a return of USD11,334, ranking 5th;
2) Moving Average Crossover (3,21) gives a return of USD17,220, ranking 2nd;
3) KAMA gives a return of USD17,064, ranking 3rd;
4) BBZ (21MA,1Stdev) gives a return of USD8,070, ranking 6th;
5) Optimised BBZ(19MA,0.8Stdev) gives a return of USD15,696, ranking 4th; and
6) ABZ gives a return of USD17,784, ranking 1st.

It is profitable to use any of these algorithm trading systems to trade Soyoil Futures on a daily basis. All these algorithm trading systems yield better returns than the buy-.and-hold policy.

Soybean Futures

For tests on Soybean Futures, compared to the buy-and-hold policy which yields a negative return of -23.4 for 2008,

1) Moving Average (21) gives a return of 540.8;
2) Moving Average Crossover (3,21) gives a return of 558.2;
3) KAMA gives a return of 604.0;
4) BBZ (21MA,1Stdev) gives a return of 152;
5) Optimized BBZ(9MA,1.2Stdev) gives a return of 522; and
6) ABZ gives a return of 176.8.

After taking into consideration transaction cost of USD12† per way and value per point of USD50, compared to the buy-and-hold policy which gives a negative return of -USD11,700 for 2008,

1) Moving Average (21) gives a return of USD26,632, ranking 3rd;
2) Moving Average Crossover (3,21) gives a return of USD27,574, ranking 2nd;
3) KAMA gives a return of USD29,552, ranking 1st;
4) BBZ (21MA,1Stdev) gives a negative return of -USD8, ranking 6th;
5) Optimised BBZ(9MA,1.2Stdev) gives a return of USD25,140, ranking 4th; and
6) ABZ gives a return of USD8,024, ranking 5th.

Except for BBZ (21MA, 1Stdev), it is profitable to use any of these algorithm trading systems to trade Soy oil Futures on a daily basis. All these algorithm trading systems yield better returns than the buy-.and-hold policy.

Corn Futures

For tests on Corn Futures, compared to the buy-and-hold policy which yields a negative return of -49.2 for 2008,

1) Moving Average (21) gives a return of 134.6;
2) Moving Average Crossover (3,21) gives a return of 52.8;
3) KAMA gives a negative return of -31.6;
4) BBZ (21MA,1Stdev) gives a return of 121.0;

5) Optimized BBZ(17MA,0.9Stdev) gives a return of 328.0; and
6) ABZ gives a return of 240.8.

After taking into consideration transaction cost of USD12‡ per way and value per point of USD50, compared to the buy-and-hold policy which gives a negative return of -USD2,60 for 2008,

1) Moving Average (21) gives a return of USD6,082, ranking 3rd;
2) Moving Average Crossover (3,21) gives a return of USD2,160, ranking 5th;
3) KAMA gives a negative return of USD2,492, ranking 6th;
4) BBZ (21MA,1Stdev) gives a return of USD5,378, ranking 4th;
5) Optimised BBZ(26MA,0.9Stdev) gives a return of USD15,920, ranking 1st; and
6) ABZ gives a return of USD11,272, ranking 2nd.

Except for KAMA, it is profitable to use any of these algorithm trading systems to trade Corn Futures on a daily basis. All these algorithm trading systems yield better returns than the buy-.and-hold policy. The tests show that they generate excess returns across these randomly selected products. Therefore, these tests infer that trends exist in these time series as well because algorithm trading systems like ABZ are able to capture these trends and profit from them.

Trading Issues Not Taken into Consideration in Back-tests

The trading issues that are not taken into consideration in the back-tests are:

1) When the prevailing signal is still on and the current month is expiring, rolling over the current month contract to the next month is necessary. Sometimes, rolling over to the next month results in a windfall gain of several points if the rolls are in favour of excess return. At other times, rolling over to the next month results in a loss of several points if

the rolls are against the trader. In any event, rollover to the next month results in additional transaction costs of closing the current month position and opening the next month position.

2) Instead of using the closing price, the current price is used which means that a position is entered into the moment that current price exceeds the defined standard deviation band. Sometimes, entering earlier at the current price results in excess return because the position entered into earlier is better than the closing price. Sometimes, entering earlier at the current price results in an additional unnecessary trade and loss when the price moves back to within the bands for closing.

3) Slippages in execution are not taken into account, which means that sometimes the trades are executed at one or two ticks more, by taking the prevailing market prices. Stop loss orders also sometimes do not get executed at the trigger price but one or two ticks away from the trigger price.

This study concludes that all the algorithm trading systems tested above are robust mechanical algorithm trend trading systems that are ready to be implemented live. The trading issues are part of trading and should be taken into account when trading.

Conclusion

The main conclusion from these tests is that trends exist in time series. This conclusion supports Mandelbrot (2005). This research begins by identifying the main trading research problem as the search to find the ideal trading system that can handle both trend and range trading. According to Gandolfi et al. (2008), literature contributions to date has been limited to two major ones: KAMA by Kaufman (1998) and VIDYA by Chande (1997). This research therefore adds to existing literature by presenting a new adaptive algorithm, ABZ. In literature review, although there are many studies on technical trading systems on foreign exchange, stock markets and futures market, there is one of the first, if not the first

to identify abnormal profits using technical trading systems on FKLI. I

This research reviews the background of algorithm trading in professional model trading desk, followed by the development of technical analysis from Dow Theory to Fractal Geometry and combination trading systems using genetic algorithm programming and neural networks. As noted by Kaufman (1998), after more than a century of technically analysing graphical charts to decipher price patterns, quantitative methods for evaluating price movement to make trading decisions have become a dominant part of current market analysis. This research reviews the profitability of technical trading systems in the literature review and acknowledges the contributions made by Lukac, Brorsen and Irwin (1988) regarding testing procedures, and in particular on producing statistically significant returns. It notes down the profile of an ideal algorithm trading system.

The development of algorithm trading in professional model trading desk demands for computational adaptive evolution of fast and robust algorithm trading systems. The most important elements in the set up of the professional model trading desk is the superior algorithm(s) that is robust and profit maximising, executed efficiently in a low risk, controlled environment with fully computed online risk monitoring and management. Daily compliance and audit by top management follows the tick risk monitoring to avoid financial loss disasters, like those reported. For Fama's challenge of testing directly different mechanical trading rules to see whether they provide abnormal returns greater than a naïve buy-and-hold policy, 20 Day Moving Average, Moving Average Crossover (3Day, 20 Day), KAMA, BBZ, Optimised BBZ and ABZ. To achieve the base results that are statistically significant abnormal returns, this research accepts the original approach proposed by Fama (1965) for anyone with more than a passing interest in stock price behaviour using the method employed by Lukac et al. (1988) and the trading systems used by Brock et al.(1992).

The theoretical framework proposed by Fama (1965) involves using common statistical tools and testing directly different mechanical trading rules to see whether they provide abnormal returns greater

than a naïve buy-and-hold policy. Lukac et al. propose testing the abnormal returns for statistical significance that gross returns, returns after transaction costs and returns adjusted for transaction costs and risks. Brock et al. (1992) test 10 Variable-Length-Moving-Average, 10 Fixed-Length-Moving Average and 6 Trading-Range-Break technical trading rules using Dow Jones Industrial Average from 1887 to 1986 and becomes the industry's standard of technical trading rules studies on which many other researches such as Bessimbinder et al. (1994) follow. To test for robustness across different contracts, FCPO, Soy oil Futures, Soybean Futures and Corn Futures all show positive abnormal returns above the buy-and-hold policy.

The results of this research show:

1) Optimised BBZ ranks first and ABZ ranks second amongst the 6 selected trading systems based on moving average in terms of gross abnormal profits for FKLI for the period 1996 to 2008.

2) First, the gross mean return for ABZ is significantly different from zero for a 95% confidence level two-tailed t-test. Second, the net mean return after transaction cost for ABZ is significantly greater than zero for a 95% confidence level one-tailed t-test. Third, Jensen's method of calculating net returns adjusted for transaction costs and risk using CAPM method results in a statistically significant positive regression intercept of 1.37. This confirms that the net return of ABZ after taking into account transaction costs and risk is positive.

3) For testing robustness across markets, FCPO, Soy oil Futures, Soybean Futures and Corn Futures all show positive abnormal returns above the buy-and-hold policy. Optimised BBZ ranks first and ABZ ranks second in terms of profit in USD, after taking into account transaction costs.

4) The 2008 returns for optimised BBZ (parameters optimised to 34 day moving average and 1.2 standard deviations) is 366 points and for standard BBZ (parameters set at 21 day moving average and 1 standard deviation) is 213.5. The

returns for the period 1996 to 2008 for optimised BBZ (different for each of the years) is 2,644.5 points and for standard BBZ is 1,048.6; making Optimised BBZ is the best performing system out the 6 selected systems and BBZ the worst.

This study demonstrates that:

1) FKLI price changes are not random,
2) Some mechanical trend trading systems like moving average(s), KAMA, BBZ and ABZ can outperform the passive buy-and-hold policy, and
3) ABZ is a robust algorithm trend trading system gives better results than most of the other trading systems tested.

The application of these findings is to programme the algorithm and trading rules for ABZ into an algorithm trading system that compute mechanically generated trading signals and executes the trades automatically. Algorithm trading programme are popularly employed by professional model trading desks of large financial institutions. The possible direction for future research is to train the data to provide the optimized parameters ahead of time.

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