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Seeking Alpha: Practical Application of Modern Portfolio Theory through Technical Analysis

Submitted in response to a call for papers for the 2008 Charles H. Dow Award

Author Biography

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Abstract

Technicians can use the Market Model to estimate and chart alpha, an indicator that measures the strength of a security relative to its benchmark. This paper develops an alpha charting formula, a related exploration, and a system that ranks and trades a portfolio of NYSE listed stocks based on alpha rank. In a backtest covering the 2001 - 2007 market cycle, the system executed thousands of momentum-based trades resulting in statistically significant, portfolio level excess returns. We present analysis of the backtest results in statistical tables and through charts of the equity curve.

Introduction

In his influential book, *A Random Walk Down Wall Street,* Burton Malkiel makes his case for efficient market theory and passive investing all while excoriating technical analysis through straw man argument. About Beta he states, "Beta really looks suspiciously like a tool of technical analysis in academic drag – a bastard cousin of the technician's charts". We believe beta looks like technical analysis because it *is* technical analysis as is, by extension, alpha. To whit, alpha and beta estimates can be derived solely from historical price action of securities and indices. Moreover, alpha and beta are indicators that can be effectively analyzed by charts. Most important, it is apparent to us that alpha in particular has useful predictive properties for securities selection and portfolio construction.

Perhaps because it was academicians, generally hostile to technical analysis, that invented alpha and beta, prominent market technicians often overlook or ignore the utility of these indicators. A search through widely read industry books such as *Technical Analysis from A to Z* (Achelis), *Encyclopedia of Technical Market Indicators* (Colby), *Technical Analysis of Financial Markets* (Murphy), and T*echnical Analysis Explained* (Pring), reveals nary a mention on the use of alpha and beta as technical indicators.

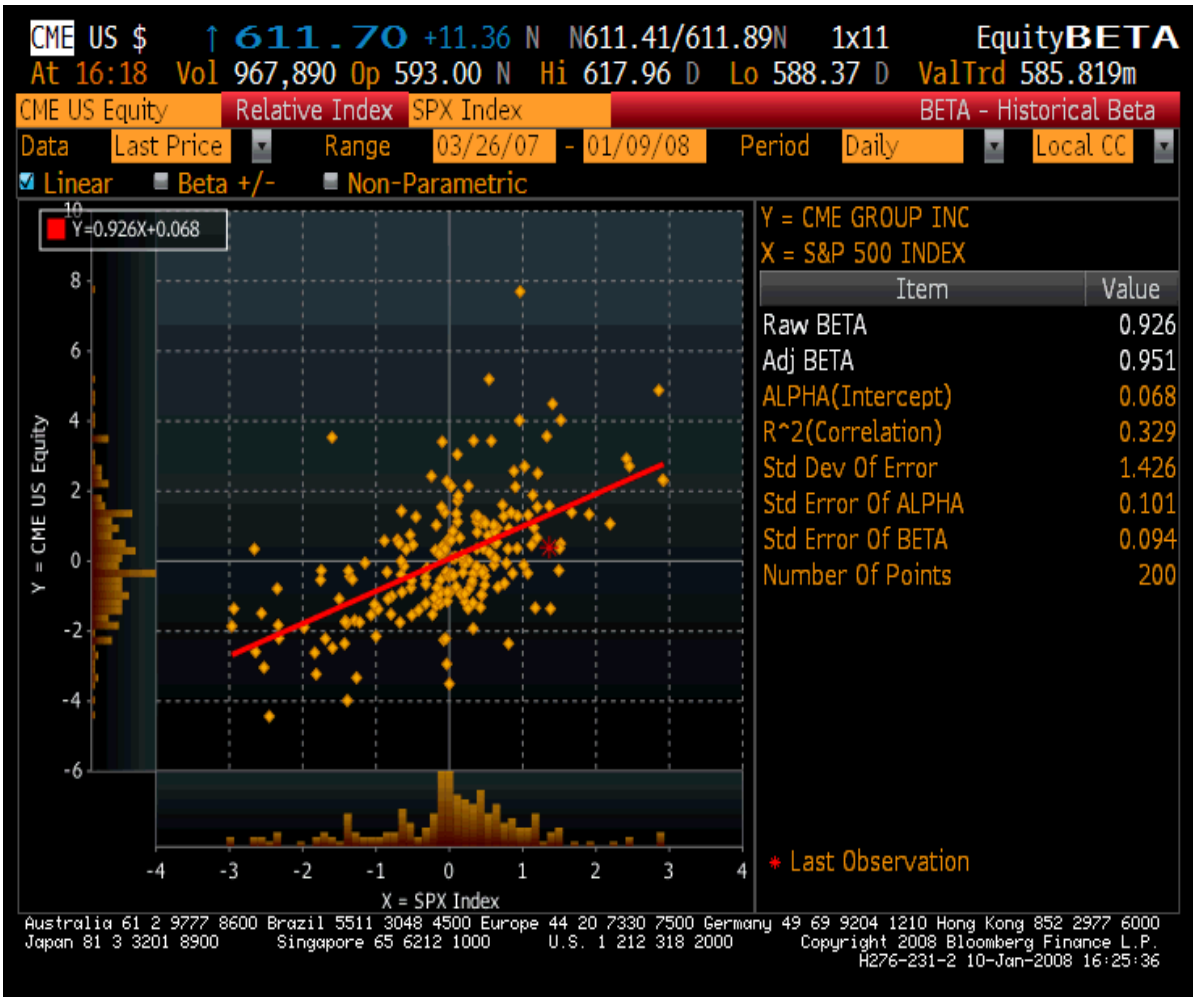
Estimating Alpha and Beta with the Market Model

The Market Model makes the following predictions about expected returns on a given asset:

*Return on asset = Beta * Return on Market Proxy + Alpha.*

Beta measures the sensitivity of an asset return to changes in the market return. Higher beta indicates more risk. Alpha is that part of an asset return that is independent of market returns. Positive alpha indicates a very desirable attribute, excess returns to an asset relative to the amount of market risk incurred. To estimate the alpha and beta in the model, we use least squares linear regression on historical asset and market returns. The Bloomberg Professional Terminal easily makes these calculations. For example, entering CME <Equity> BETA <Go> into Bloomberg, generates the results shown in Figure 1.

Figure 1. Scatter Plot with Calculation of Alpha, Beta and R^2



The scatter plot shows the best fitting line drawn through 200 daily returns on CME stock vs. the returns on the S&P 500 index. The slope of this line is the Beta, estimated at .926. The daily Alpha (Y-intercept) estimate is .068%. We find it more intuitive to multiply the daily Alpha estimate, .068%, by the number of daily observations, .068% * 200 = 13.6%, to estimate the total Alpha for the period studied. R^2 reveals how well the model explains the historical data. R^2 can range from zero to one. R^2 equal to one means the model perfectly explained the historical returns. In that unlikely occurrence, all the plotted points would fall on a straight line.

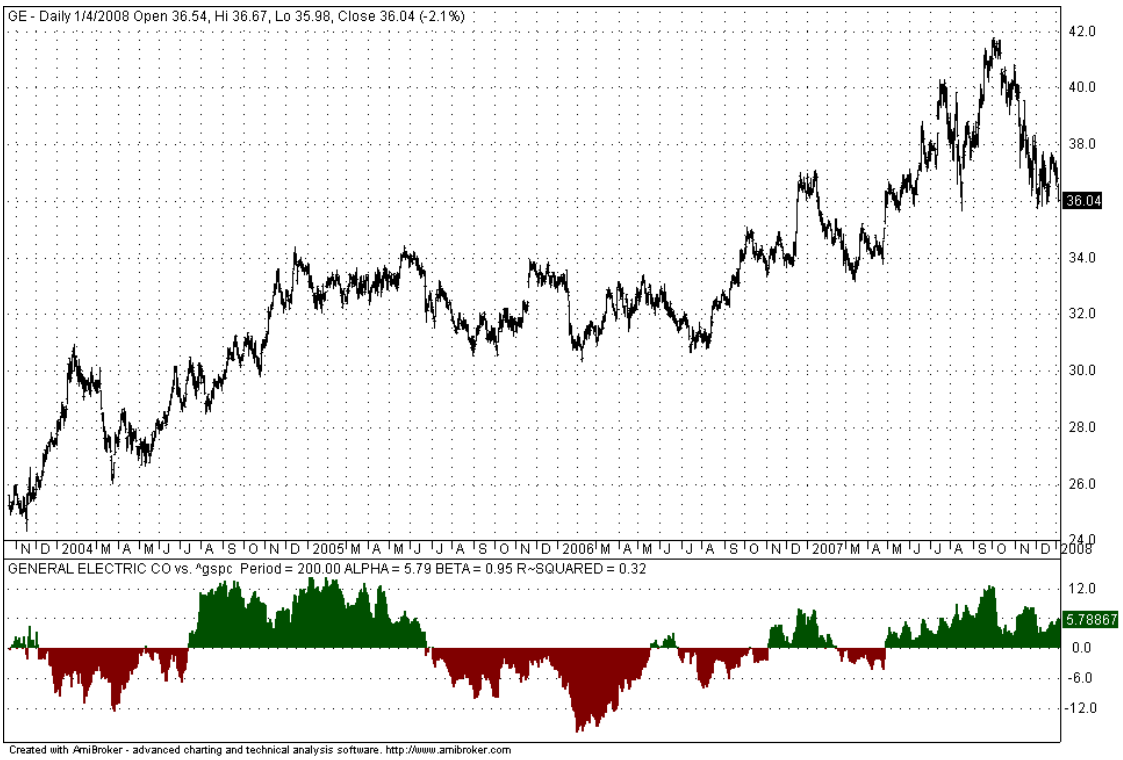
Alpha Persistence and Investor Error

Academic studies have noted the persistence of alpha in mutual funds and the existence of a momentum premium in equities. Mutual funds that have historically produced alpha versus their benchmarks tend to continue to do so. Stocks with price histories that demonstrate comparative relative strength tend to continue to outperform. What is the source of the momentum premium? Why might alpha persist? Researchers in the field of Behavioral Finance have identified what appears to be a recurring pattern of investor error referred to as the disposition effect. Concisely stated, investors are emotional and undisciplined. Seeking feelings of pride, they tend to sell their winning stocks too soon in an uptrend. Seeking to avoid feelings of regret, they hold losing stocks too long. The promise of technical analysis is that its disciplined application can help the user avoid making behavioral errors and to potentially exploit errors made by other investors.

Charting Alpha

Figure 2 shows a daily bar chart covering about four years for GE stock. We plot rolling 200-day alpha on a histogram in the lower pane. We plot negative alpha in red, positive alpha in green, this makes zero alpha crossovers easy to identify. The histogram allows us to analyze the value and trend of the alpha estimate generated by regressing GE stock on the S&P 500 index over a specified period. At the top of the lower pane after the full name of the stock is the ticker for the underlying market proxy, number of days observed and the estimated alpha, beta, and R^2 for the most recent bar. An analyst can click on the price bar for any given day to show Market Model estimates for that day.

Figure 2. Daily Bar Chart with rolling 200 day alpha in the lower pane.



Why Alpha beats Beta

Beta is cheap and easy. Index futures are a precise and efficient source of market beta. Rather than select and maintain a portfolio of high beta stocks, an investor desiring high beta can simply purchase stock index futures. Many portfolio managers face the far more challenging task of constructing and maintaining an equities portfolio that generates positive alpha relative to a benchmark. To meet this challenge, we suggest those managers monitor the alpha chart for every stock in their portfolio as well as the alpha chart on the portfolio itself. Likewise, a manager should review the alpha chart for any new buy idea. We also advise tracking rolling Beta and R^2 estimates with charts.

Comparison of Market Model Indicators versus Traditional Technical Indicators

Conceptually the Market Model alpha indicator is a form of risk-adjusted percent Rate of Change (ROC). Used in conjunction with beta and R^2, we believe alpha has superior predictive power. The alpha histogram that we use is similar to the relative strength line but provides more information: alpha adjusts for beta (market sensitivity) and the R^2 metric indicates "goodness of fit" or explanatory power of the model and the alpha estimation is directly comparable across stocks. Like traditional comparative relative strength, an analyst may use the alpha indicator to study the relationship between any pair of securities (not just a stock versus an index). In this paper, we use the Amibroker Formula Language (AFL) code shown in the text box that follows for charting, back testing, and exploring. This code is an adaptation and extension of a formula shared by Anthony Faragasso on the Amibroker.com website.

Custom Amibroker Formula Language (AFL) Code

```
//Alpha, Beta, R2 Formula
Ticker = ParamStr("MKT Ticker", "^VAY");
MKT = Foreign(Ticker,"C",1);
AP=Param("Alpha Period",200,100,300,5);
/*AP=Optimize("Alpha Period",200,100,300,5);*/
Beta=((AP * Sum(ROC( C,1) * ROC(MKT,1),AP)) - (Sum(ROC(C,1),AP) * Sum(ROC( MKT,1),AP)))
/ ((AP * Sum((ROC(MKT,1)^2 ),AP)) - (Sum(ROC(MKT,1 ),AP)^2 ));
Alpha=AP*(Sum(ROC( C,1) ,AP) - (Beta) * Sum( ROC(MKT,1),AP )) / AP;
R2=Correlation(MKT,C,AP)^2;

//Chart Settings
dynamic_color = IIf( ALPHA > 0, colorDarkGreen, colorDarkRed );
Plot(Alpha, "Alpha", dynamic_color, styleHistogram | styleThick );
Title= FullName() +
" vs. "+ ticker + "  Period = "+ WriteVal(AP,format=1.2) +  " ALPHA = "+ WriteVal(Alpha,format=1.2) +
" BETA = "+ WriteVal(Beta,format=1.2) + " R~SQUARED = "+ WriteVal(R2,format=1.2);

//System AND Backtest Settings
EnableRotationalTrading();
SetOption("worstrankheld",150);
SetOption("Maxopenpositions",52);
SetOption("allowpositionshrinking",True);
PositionSize = -2;
PositionScore =  100 + alpha ;
PositionScore = Max( PositionScore, 0 );

//Exploration Report
Filter = 1;
P=Param("Period",65,10,200,5,1);
Z= (C - MA(C,P)) / (StDev( C,P));
AddTextColumn(FullName(),"Description");
AddTextColumn( IndustryID(1), "Industry" );
AddColumn(Close,"Close",1.2);
AddColumn(Alpha,"Alpha",1.2);
AddColumn(Beta,"Beta",1.2);
AddColumn(R2,"R-squared",1.2);
AddColumn(Z,"Z-Score 3 month", 1.2);
AddColumn(StDev( ROC(C,1),30)*sqrt(256),"Volitility",1.2);
AddColumn(C/HHV( High, 256 ), "% 52 week high", 1.2);
AddColumn( ROC( Close, 256 ), "ROC(256)", 1.1 );
AddColumn(StochK( 256 ),"Stochastic(1yr)", 1.2);
```

I. Setting up the Backtest

The Alpha Rank and Selection Universe

The Alpha Rank is determined by ranking a specified group of stocks by Alpha. Our trading system ranks NYSE listed stocks, using the Value Line Geometric Index as the benchmark in the Alpha calculation. The backtest algorithm selects and maintains a portfolio of 50 stocks from the approximately two thousand stocks that constituted the NYSE Composite Index on January 1, 2003. We backdate the list to reduce look-ahead bias. A list of NYSE stocks exhibits less churn than other potential source lists such as the S&P 1500 Super Composite or the Value Line Composite 1700, reducing both potential survivor bias and look-ahead bias. A NYSE listing serves as an objective initial fundamental screen for investment quality, helping avoid heavily promoted "pump and dump" momentum stocks more prevalent on other trading venues. In addition, NYSE listed stocks offer excellent diversity (small and large caps, domestic and foreign stocks, new issues, spin-offs and turnaround situations) without undue concentration in any specific economic sector or industry group.

The Trading Algorithm

We choose a trend speed or "look-back" period of 200 days. To begin, on the first trade day of January 2001 the system purchased fifty stocks with the highest alpha rank in equal dollar amounts. The system trades long only and is always in the market holding little or no cash reserve. If a portfolio stock moves down in alpha rank and out of the set of 150 stocks with the highest alpha, the system sells that stock and invests the proceeds in the stock with the highest alpha rank that is not already in the portfolio. The system trades using end of day prices with a one day trade delay. Trade costs are

set to .1% of the dollar amount of each trade. The backtest covers a seven-year series of stock prices beginning 1/1/2001, ending 12/31/07 representing the most recent market cycle. For purposes of comparison, we also test the identical rules while using 200-day percentage rate of change (ROC) as the ranking metric.

Optimization

An Amibroker backtest allows an analyst to optimize (for profitability or other desired outcome) any number of system variables including trend speed, portfolio size, "worst rank held", etc. We noted robust profitability over a 100 to 300 day range of trend speeds. Our backtest settings are not the result of profitability optimization.

II. Backtest Results and Analysis

The results of our backtest are presented in tables one and two. The data in Table 1 shows that the alpha strategy outperformed the ROC strategy, which in turn outperformed a passive buy and hold strategy. In Table 2, we analyze the monthly differences in return between the simulated alpha strategy portfolio and the Value Line Geometric Composite Index. We use the Value Line Index rather the NYSE index because the Value Line is an equal weight index as is our backtest portfolio. The NYSE index is capitalization weighted. There is substantial overlap of index members and the correlation between the two indexes is very high.

The Alpha strategy produced an information ratio of 1.12 over the backtest period. The information ratio divides the value added excess return by the tracking risk (standard deviation of excess return). Investment management consultants generally consider information ratios of greater than one to be an excellent result. With a p-value equal to .01, the information ratio on the Alpha strategy is also statistically significant.

Table 1. Backtest Results 2001-2007 on NYSE Stocks (excludes dividends)

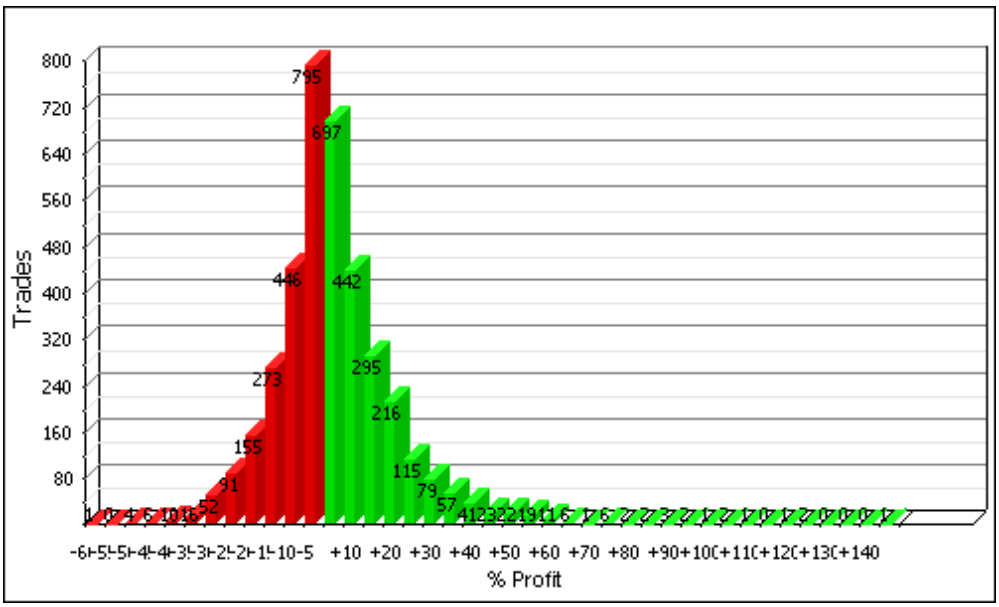
	ROC	ALPHA	Buy/Hold
Initial Capital	$ 100,000	$ 100,000	$ 100,000
Ending Capital	$ 431,184	$ 664,709	$ 204,481
Annual Return %	23.2%	31.1%	10.8%
Total Trades	3,994	3,896	1
Trade Average Profit/Loss %	2.1%	2.8%	104.4%
Average Trade Days Held	23.8	24.4	1758
Percent Winning Trades	51.5%	52.5%	100.0%
Winners Average Profit %	12.3%	13.0%	104.9%
Losers Average Loss %	-8.6%	-8.5%	N/A
Maximum System Drawdown %	-29.4%	-26.4%	-37.4%

Table 2. Information Ratio and Statistical Significance

Statistical Significance of Risk-Adjusted Returns on the Alpha Strategy	
Number of Monthly Returns	84
Monthly Value Added (mean)	1.44%
Annualized Value Added	17.28%
Monthly Tracking Risk	4.44%
Annualized Tracking Risk	15.37%
Monthly Information Ratio	0.3245
Annualized Information Ratio	1.1241
T-Statistic Annualized	2.9740
T-Statistic (not annualized)	2.9740
Degrees of Freedom	7
P-value	0.0103

In Figure 3, we display the dispersion of trade profitability in a histogram that groups every trade by percent profit. The largest winning trade returned + 144.6% over a span of 63 trading days. The largest losing trade returned -67.3% over 32 trading days.

Figure 3 . ALPHA system trades grouped by percent profit



Analyzing Simulated and Real Investment Performance with Charts

Caution: portfolio strategies (and hedge funds) aggressively short real or imbedded options may look impressive on a chart only to later "blow up" with little warning. An analyst should understand the underlying investment process before analyzing performance by looking at a chart. Nonetheless, when it comes to investment performance, a chart of the equity curve (portfolio valuation) is usually most revealing. To start, in Figure 4, we plot the comparative relative strength (equity value/index value) of the Alpha strategy equity curve versus the Value Line Composite. We highlight the periods of significant underperformance between red vertical bars.

Figure 4. Equity Curve Relative Strength

Charting the drawdown of a portfolio provides an excellent measure of historical risk over a relevant rolling time horizon. Rolling annual (52 week) drawdown is plotted in the lower two panes of Figure 5. The second pane plots drawdown lines for both the Alpha strategy and the (buy and hold) Value Line Composite. The custom AFL Code for the second pane follows:

```
Mkt = ParamStr("Base Ticker", "^VAY");
F = Foreign(Mkt,"C",1);

Plot ( 100*(Close / (HHV( Close,52)) -1 ),
"System % Drawdown 52 week", colorBlack );
Plot(0,"",colorDarkGreen,styleDashed);

Plot (100*(F / (HHV( F,52)) -1), "MKT % Drawdown 52 week",
colorGrey40);
```

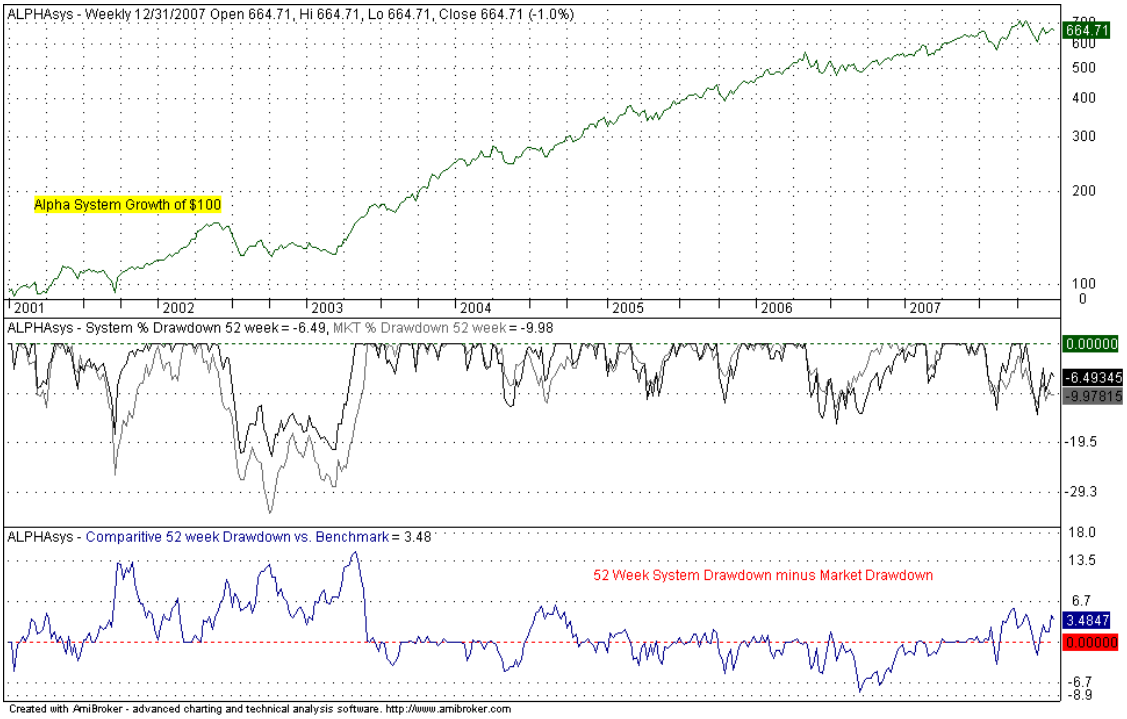
The custom AFL Code for the Relative Drawdown indicator line plotted in the third pane of figure 5 follows below.

```
Mkt = ParamStr("Base Ticker", "^VAY");
F = Foreign(Mkt,"C",1);

Plot ( 100*(Close / (HHV( Close,52)) -1 )-(100*(F / (HHV( F,52)) -1)),
"Comparative 52 week Drawdown vs. Benchmark",colorDarkBlue);
Plot(0,"",colorRed,styleDashed);
```

A line plotting above zero is favorable and means the drawdown on the benchmark index (^VAY) exceeds the drawdown on the backtest portfolio.

Figure 5. Weekly Growth of $100 with Comparative Drawdown Analysis



Volatility (annualized standard deviation of returns) is a cornerstone of Modern Portfolio Theory (Markowitz Mean-Variance Analysis). Volatility may be a superior forward-looking indicator of risk than drawdown. We plot rolling 65-day volatility charts in the lower two panes of Figure 6. The second pane in Figure 6 shows relative volatility, defined as the volatility of the equity curve divided by the volatility of the Value Line Composite, set to a base of 100. Readings above 100 mean the historical

volatility exceeds the volatility on the benchmark. The custom AFL code for Relative Volatility follows:

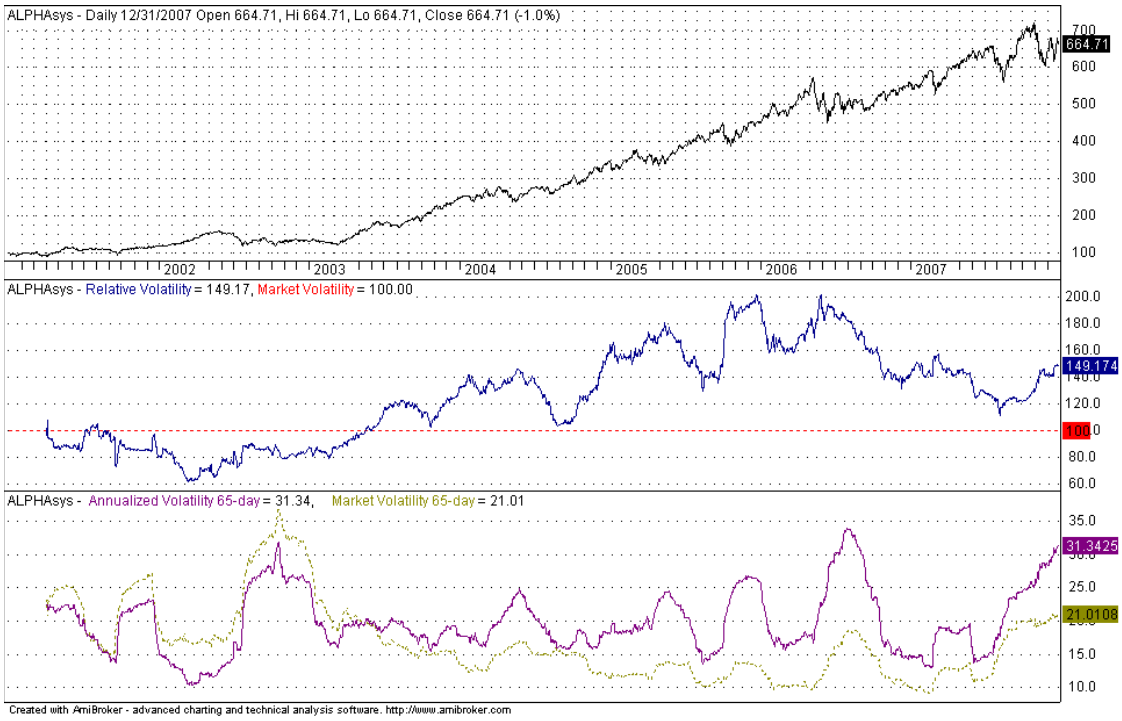
```
P = Param("lookback period",65, 1, 360, 1 );

Mkt = ParamStr("Base Ticker", "^VAY");
F = Foreign(Mkt,"C",1);

RV = 100 * ( StDev(ROC(C,1),P)*sqrt(256) ) / ( StDev( ROC(F,1),P)*sqrt(256) );

Plot(RV,"Relative Volatility", colorDarkBlue, styleLine);
Plot(100,"Market Volatility",colorRed,styleDashed);
```

Figure 6. Equity Curve Relative Volatility

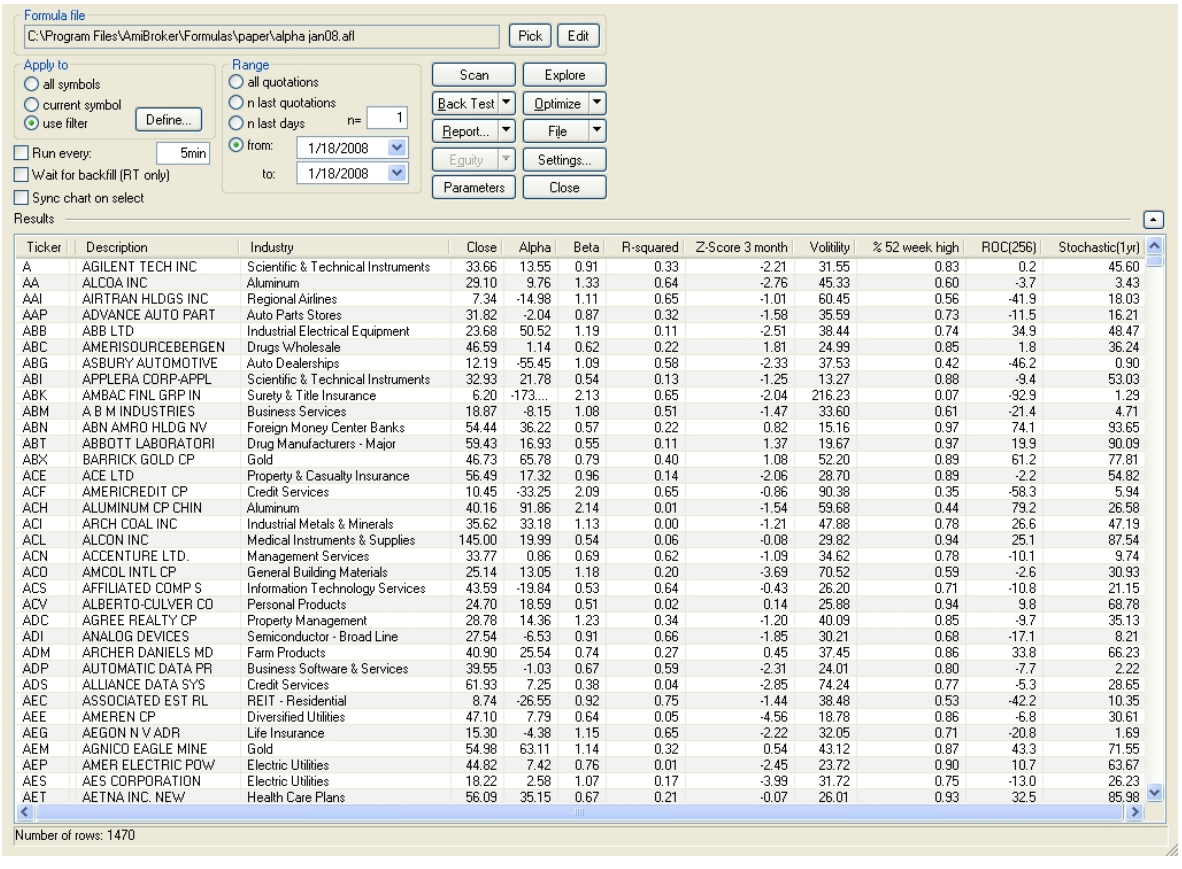


IV. Using the Amibroker Alpha Exploration Report

The objective quantitative nature of a backtest gives an idea of the usefulness of an indicator or system but by design, it leaves no room for trader discretion. A technical analyst, in contrast to a hard-core "quant", might consider this limitation a

sub-optimal way to invest. We would tend to agree. To construct a real world, high performance alpha seeking portfolio, a manager could utilize the Amibroker exploration report shown in figure 7. The user can sort the report by clicking on the relevant column. Clicking a ticker in any row automatically produces a chart facilitating rapid visual inspection of the stock. Analyzing the chart allows application of other technical indicators to assess potential levels of support/resistance, short-term overbought/oversold oscillators, candle patterns, reaction to news, etc. An Amibroker exploration report easily exports to Excel for more in-depth quantitative analysis of the total list of stocks. We advocate using both charts and spreadsheets while applying sound technical analysis and discretionary judgment with respect to actual order placement and asset selection.

Figure 7. Amibroker Exploration Report



Ticker	Description	Industry	Close	Alpha	Beta	R-squared	Z-Score 3 month	Volitility	% 52 week high	ROC(256)	Stochastic(1yr)
A	AGILENT TECH INC	Scientific & Technical Instruments	33.66	13.55	0.91	0.33	-2.21	31.55	0.83	0.2	45.60
AA	ALCOA INC	Aluminum	29.10	9.76	1.33	0.64	-2.76	45.33	0.60	-3.7	3.43
AAI	AIRTRAN HLDGS INC	Regional Airlines	7.34	-14.98	1.11	0.65	-1.01	60.45	0.56	-41.9	18.03
AAP	ADVANCE AUTO PART	Auto Parts Stores	31.82	-2.04	0.87	0.32	-1.58	35.59	0.73	-11.5	16.21
ABB	ABB LTD	Industrial Electrical Equipment	23.68	50.52	1.19	0.11	-2.51	38.44	0.74	34.9	48.47
ABC	AMERISOURCEBERGEN	Drugs Wholesale	46.59	1.14	0.62	0.22	1.81	24.99	0.85	1.8	36.24
ABG	ASBURY AUTOMOTIVE	Auto Dealerships	12.19	-55.45	1.09	0.58	-2.33	37.53	0.42	-46.2	0.90
ABI	APPLERA CORP-APPL	Scientific & Technical Instruments	32.93	21.78	0.54	0.13	-1.25	13.27	0.88	-9.4	53.03
ABK	AMBAC FINL GRP IN	Surety & Title Insurance	6.20	-173....	2.13	0.65	-2.04	216.23	0.07	-92.9	1.29
ABM	A B M INDUSTRIES	Business Services	18.87	-8.15	1.08	0.51	-1.47	33.60	0.61	-21.4	4.71
ABN	ABN AMRO HLDG NV	Foreign Money Center Banks	54.44	36.22	0.57	0.22	0.82	15.16	0.97	74.1	93.65
ABT	ABBOTT LABORATORI	Drug Manufacturers - Major	59.43	16.93	0.55	0.11	1.37	19.67	0.97	19.9	90.09
ABX	BARRICK GOLD CP	Gold	46.73	65.78	0.79	0.40	1.08	52.20	0.89	61.2	77.81
ACE	ACE LTD	Property & Casualty Insurance	56.49	17.32	0.96	0.14	-2.06	28.70	0.89	-2.2	54.82
ACF	AMERICREDIT CP	Credit Services	10.45	-33.25	2.09	0.65	-0.86	90.38	0.35	-58.3	5.94
ACH	ALUMINUM CP CHIN	Aluminum	40.16	91.86	2.14	0.01	-1.54	59.68	0.44	79.2	26.58
ACI	ARCH COAL INC	Industrial Metals & Minerals	35.62	33.18	1.13	0.00	-1.21	47.88	0.78	26.6	47.19
ACL	ALCON INC	Medical Instruments & Supplies	145.00	19.99	0.54	0.06	-0.08	29.82	0.94	25.1	87.54
ACN	ACCENTURE LTD.	Management Services	33.77	0.86	0.69	0.62	-1.09	34.62	0.78	-10.1	9.74
ACO	AMCOL INTL CP	General Building Materials	25.14	13.05	1.18	0.20	-3.69	70.52	0.59	-2.6	30.93
ACS	AFFILIATED COMP S	Information Technology Services	43.59	-19.84	0.53	0.64	-0.43	26.20	0.71	-10.8	21.15
ACV	ALBERTO-CULVER CO	Personal Products	24.70	18.59	0.51	0.02	0.14	25.88	0.94	9.8	68.78
ADC	AGREE REALTY CP	Property Management	28.78	14.36	1.23	0.34	-1.20	40.09	0.85	-9.7	35.13
ADI	ANALOG DEVICES	Semiconductor - Broad Line	27.54	-6.53	0.91	0.66	-1.85	30.21	0.68	-17.1	8.21
ADM	ARCHER DANIELS MD	Farm Products	40.90	25.54	0.74	0.27	0.45	37.45	0.86	33.8	66.23
ADP	AUTOMATIC DATA PR	Business Software & Services	39.55	-1.03	0.67	0.59	-2.31	24.01	0.80	-7.7	2.22
ADS	ALLIANCE DATA SYS	Credit Services	61.93	7.25	0.38	0.04	-2.85	74.24	0.77	-5.3	28.65
AEC	ASSOCIATED EST RL	REIT - Residential	8.74	-26.55	0.92	0.75	-1.44	38.48	0.53	-42.2	10.35
AEE	AMEREN CP	Diversified Utilities	47.10	7.79	0.64	0.05	-4.56	18.78	0.86	-6.8	30.61
AEG	AEGON N V ADR	Life Insurance	15.30	-4.38	1.15	0.65	-2.22	32.05	0.71	-20.8	1.69
AEM	AGNICO EAGLE MINE	Gold	54.98	63.11	1.14	0.32	0.54	43.12	0.87	43.3	71.55
AEP	AMER ELECTRIC POW	Electric Utilities	44.82	7.42	0.76	0.01	-2.45	23.72	0.90	10.7	63.67
AES	AES CORPORATION	Electric Utilities	18.22	2.58	1.07	0.17	-3.99	31.72	0.75	-13.0	26.23
AET	AETNA INC. NEW	Health Care Plans	56.09	35.15	0.67	0.21	-0.07	26.01	0.93	32.5	85.98

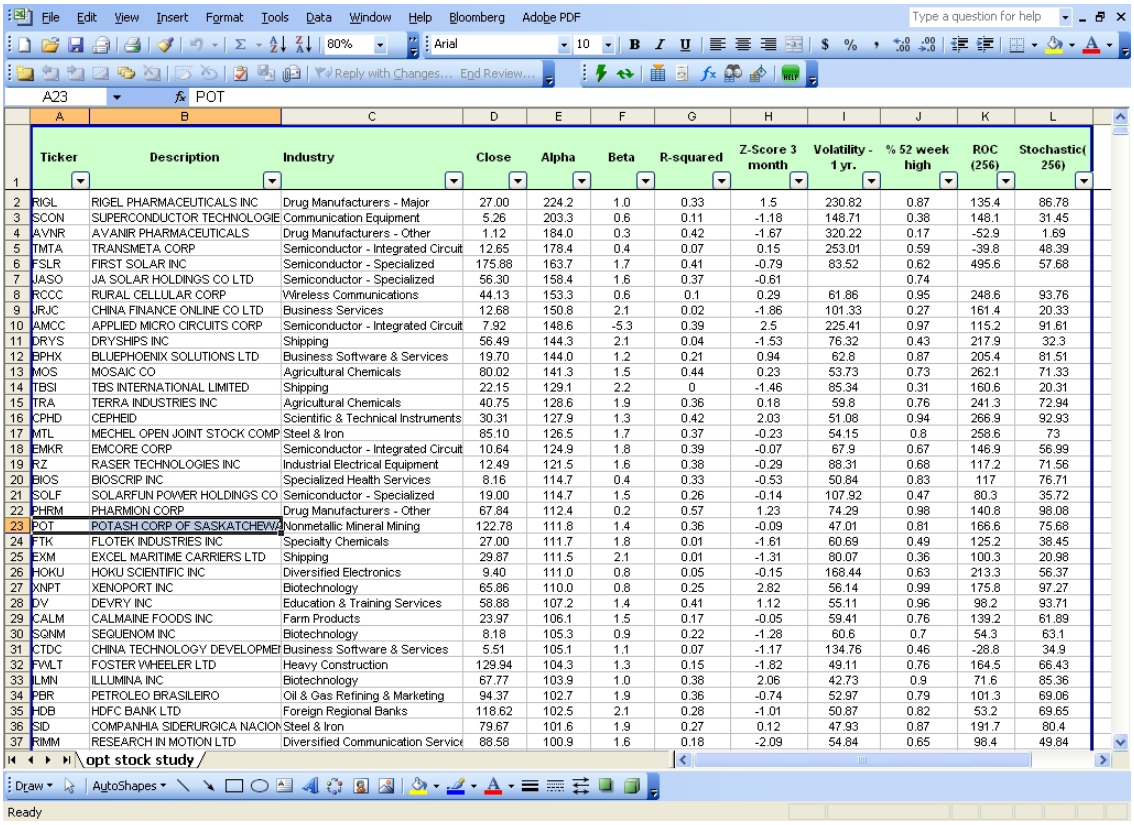
Number of rows: 1470

In figure 8, we show a screenshot example of an Excel spreadsheet used to sort an exported exploration of stocks with available listed options. The user can sort the list by clicking a column heading and choosing from the drop down menu. A short explanation of each column follows:

1. Sorting by industry group reveals the strongest/weakest stocks by industry; a very useful consideration for building diversified portfolios.
2. Alpha is a risk-adjusted measure of how strong the stock has been over the last year relative to the market.
3. Beta tells you how sensitive the stock has been to changes in the market.
4. R-squared (R^2) is the coefficient of determination, an indication of the historical explanatory power of the Market Model's Beta and Alpha estimates. R is the correlation between the stock and the benchmark, the most basic measure of how two assets move together over time. Stocks with low correlation and high ROC might provide diversification benefits to an alpha seeking portfolio.
5. The Z-score is a short-term overbought/oversold indicator (similar to %b), the lower the Z-score the more oversold.
6. Volatility, (the annualized standard deviation of daily returns) gives indication of the stock's risk over the last year (irrespective of the market); the higher the volatility the more risk and generally the higher the option premium.
7. ROC (256) is a simple measure of a stocks percentage change over the last year.

8. Percentage of 52 week high indicates how close a stock is to its annual high; 100 means it closed on the high, 80 means it is 20% below its high.
9. The Stochastic indicates where the closing price is relative to the stocks high and low for the last year; 100 says the stock closed on its high, 0 indicates the stock closed on its low, 50 indicates the stock closed in the middle of its annual trading range.

Figure 8. Excel Screen Shot of Exported Amibroker Exploration



Ticker	Description	Industry	Close	Alpha	Beta	R-squared	Z-Score 3 month	Volatility - 1 yr.	% 52 week high	ROC (256)	Stochastic(256)
RIGL	RIGEL PHARMACEUTICALS INC	Drug Manufacturers - Major	27.00	224.2	1.0	0.33	1.5	230.82	0.87	135.4	86.78
SCON	SUPERCONDUCTOR TECHNOLOGIE	Communication Equipment	5.26	203.3	0.6	0.11	-1.18	148.71	0.38	148.1	31.45
AVNR	AVANIR PHARMACEUTICALS	Drug Manufacturers - Other	1.12	184.0	0.3	0.42	-1.67	320.22	0.17	-52.9	1.69
TMTA	TRANSMETA CORP	Semiconductor - Integrated Circuit	12.65	178.4	0.4	0.07	0.15	253.01	0.59	-39.8	48.39
FSLR	FIRST SOLAR INC	Semiconductor - Specialized	175.88	163.7	1.7	0.41	-0.79	83.52	0.62	495.6	57.68
JASO	JA SOLAR HOLDINGS CO LTD	Semiconductor - Specialized	56.30	158.4	1.6	0.37	-0.61		0.74		
RCCC	RURAL CELLULAR CORP	Wireless Communications	44.13	153.3	0.6	0.1	0.29	61.86	0.95	248.6	93.76
JRJC	CHINA FINANCE ONLINE CO LTD	Business Services	12.68	150.8	2.1	0.02	-1.86	101.33	0.27	161.4	20.33
AMCC	APPLIED MICRO CIRCUITS CORP	Semiconductor - Integrated Circuit	7.92	148.6	-5.3	0.39	2.5	225.41	0.97	115.2	91.61
DRYS	DRYSHIPS INC	Shipping	56.49	144.3	2.1	0.04	-1.53	76.32	0.43	217.9	32.3
BPHX	BLUEPHOENIX SOLUTIONS LTD	Business Software & Services	19.70	144.0	1.2	0.21	0.94	62.8	0.87	205.4	81.51
MOS	MOSAIC CO	Agricultural Chemicals	80.02	141.3	1.5	0.44	0.23	53.73	0.73	262.1	71.33
TBSI	TBS INTERNATIONAL LIMITED	Shipping	22.15	129.1	2.2	0	-1.46	85.34	0.31	160.6	20.31
TRA	TERRA INDUSTRIES INC	Agricultural Chemicals	40.75	128.6	1.9	0.36	0.18	59.8	0.76	241.3	72.94
CPHD	CEPHEID	Scientific & Technical Instruments	30.31	127.9	1.3	0.42	2.03	51.08	0.94	266.9	92.93
MTL	MECHEL OPEN JOINT STOCK COMP	Steel & Iron	85.10	126.5	1.7	0.37	-0.23	54.15	0.8	258.6	73
EMKR	EMCORE CORP	Semiconductor - Integrated Circuit	10.64	124.9	1.8	0.39	-0.07	67.9	0.67	146.9	56.99
RZ	RASER TECHNOLOGIES INC	Industrial Electrical Equipment	12.49	121.5	1.6	0.38	-0.29	88.31	0.68	117.2	71.56
BIOS	BIOSCRIP INC	Specialized Health Services	8.16	114.7	0.4	0.33	-0.53	50.84	0.83	117	76.71
SOLF	SOLARFUN POWER HOLDINGS CO	Semiconductor - Specialized	19.00	114.7	1.5	0.26	-0.14	107.92	0.47	80.3	35.72
PHRM	PHARMION CORP	Drug Manufacturers - Other	67.84	112.4	0.2	0.57	1.23	74.29	0.98	140.8	98.08
POT	POTASH CORP OF SASKATCHEWA	Nonmetallic Mineral Mining	122.78	111.8	1.4	0.36	-0.09	47.01	0.81	166.6	75.68
FTK	FLOTEK INDUSTRIES INC	Specialty Chemicals	27.00	111.7	1.8	0.01	-1.61	60.69	0.49	125.2	38.45
EXM	EXCEL MARITIME CARRIERS LTD	Shipping	29.87	111.5	2.1	0.01	-1.31	80.07	0.36	100.3	20.98
HOKU	HOKU SCIENTIFIC INC	Diversified Electronics	9.40	111.0	0.8	0.05	-0.15	168.44	0.63	213.3	56.37
XNPT	XENOPORT INC	Biotechnology	65.86	110.0	0.8	0.25	2.82	56.14	0.99	175.8	97.27
DV	DEVRY INC	Education & Training Services	58.88	107.2	1.4	0.41	1.12	55.11	0.96	98.2	93.71
CALM	CALMAINE FOODS INC	Farm Products	23.97	106.1	1.5	0.17	-0.05	59.41	0.76	139.2	61.89
SQNM	SEQUENOM INC	Biotechnology	8.18	105.3	0.9	0.22	-1.28	60.6	0.7	54.3	63.1
CTDC	CHINA TECHNOLOGY DEVELOPME	Business Software & Services	5.51	105.1	1.1	0.07	-1.17	134.76	0.46	-28.8	34.9
FWLT	FOSTER WHEELER LTD	Heavy Construction	129.94	104.3	1.3	0.15	-1.82	49.11	0.76	164.5	66.43
ILMN	ILLUMINA INC	Biotechnology	67.77	103.9	1.0	0.38	2.06	42.73	0.9	71.6	85.36
PBR	PETROLEO BRASILEIRO	Oil & Gas Refining & Marketing	94.37	102.7	1.9	0.36	-0.74	52.97	0.79	101.3	69.06
HDB	HDFC BANK LTD	Foreign Regional Banks	118.62	102.5	2.1	0.28	-1.01	50.87	0.82	53.2	69.65
SID	COMPANHIA SIDERURGICA NACION	Steel & Iron	79.67	101.6	1.9	0.27	0.12	47.93	0.87	191.7	80.4
RIMM	RESEARCH IN MOTION LTD	Diversified Communication Servic	88.58	100.9	1.6	0.18	-2.09	54.84	0.65	98.4	49.84

Conclusion

An important purpose of technical analysis is to provide real world tools for professionals managing market risk. Our results suggest that several MPT metrics (alpha, beta, correlation and volatility), estimated from historical prices and applied as indicators, can constitute a useful form of technical analysis. Charts are an integral part

of a sound investment process. Trade discretion and timing, flexibility, creativity and yes, a greater reliance on subjective human judgment, differentiates the technician from the pure quantitative analyst.

A little knowledge of company fundamentals goes a long way, especially when it comes to investing in momentum stocks. An investor too familiar with the fundamental story of a given stock can become overly confident and inclined to ignore waning price momentum and the necessity to sometimes "change horses". Price momentum usually leads the *known* fundamentals of a stock. When well-regarded fundamental research analysts increase earnings estimates in response to rising stock prices and vice versa, fundamental cause and effect becomes blurred and a near useless basis for analysis.

Caution: Mean reverting investment returns are a fundamental tenet of competitive market capitalism. Market participants will eventually bid up a great stock so high as to fully discount future profits. Actions and reactions of competitors, suppliers, and consumers each working in their own economic interest eventually reduce excess profitability at the company level. An investor naively buying a handful of high alpha "growth stocks" from a list to "hold for the long-term" is probably pursuing a losing strategy.

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