Quantitative stock selection and the AlphaDEX® approach

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Table of Contents:

Summary:

Traditional market capitalization weighted indexes are designed to measure the average performance of a group of stocks that are considered to be representative of either the broad market or a specific segment of the market. In order to be as representative as possible of the applicable group of underlying stocks, the performance goal of traditional market capitalization weighted indexes is to achieve a unitary "beta" versus the broad market or their specific market segment, as applicable. The emphasis on "beta" makes these indexes ideal for use in gauging the performance of portfolio managers who are trying to outperform the relevant index or generate "alpha". Academic literature supports the possibility of generating outperformance through the use of purely quantitative measures. The AlphaDEX® stock selection methodology attempts to capitalize on the evidence provided by academic research to alleviate the inherent limitations of subjective methods employed by human portfolio managers through the use of a purely objective, quantitative stock selection approach.

This paper will attempt to show the merits of the AlphaDEX® methodology and is organized into two sections. Section I will summarize unaffiliated, past academic research that demonstrates the predictive power of quantitative methods in stock selection. Section II will present the AlphaDEX® methodology.

Section I

Summary of Quantitative Academic Research

In order for a quantitative approach to stock selection to be successful the model employed must capitalize on systematic deviations in the stock price from its fair value based on expected future returns. The search for exploitable inefficiencies in equity prices has generally centered on value and momentum strategies.

Value:

A generation ago, the Sharpe-Lintner-Black model, commonly referred to as the Capital Asset Pricing Model ("CAPM") (Sharpe 1964)[15], was the generally accepted model of expected future returns. The model held that there were two components of risk: stock-specific risk or idiosyncratic risk and risk related to a stock's relationship to the market as a whole or systematic risk. Since stock-specific risk could be diversified away, investors would only be compensated for the systematic risk of their equity holdings, captured by the linear regression coefficient of each individual stock's monthly returns on the monthly returns of a proxy for the broad market. Each stock's estimated regression coefficient is referred to as the CAPM beta of the stock.

A major challenge to this single factor view described above was presented by Fama and French in the early 1990s. Eugene Fama and Kenneth French popularized the use of book value-to-price as a return predictor when they introduced their well-known three factor model of expected returns in 1992. They found that when size (market value of equity – ME) and the ratio of book value-to-price (BE/ME see Table I) are taken into account, the predictive power of beta coefficients become statistically insignificant. Two tables of data from their 1992 publication demonstrate the relative importance of book value-to-price and size in comparison to beta in explaining the future monthly returns of individual stocks. Table I summarizes the monthly returns of equally-weighted portfolios formed on size and book value-to-price from July 1963 to December 1990, while Table II shows the average monthly returns for equally-weighted portfolios of stocks sorted into deciles based on beta over the same period. As can be seen in Table I, over all size decile portfolios the highest book value-to-price decile portfolio outperformed the lowest book value-to-price decile portfolio by 99 basis points per month (≈12% per year). A clear upward trend can be observed from left to right across Table I; higher book value-to-price portfolios generated higher returns at each decile when all size deciles of stocks are considered. While the effect is diminished somewhat for the very largest decile of stocks, the return difference is still 25 basis points per month for these stocks and the spread is consistently larger for all nine of the other size deciles, ranging from 52 basis points to 136 basis points per month. The relationship between beta and stock returns is less significant (see Table II), with the lowest beta decile stocks outperforming the highest beta stocks by 20 basis points per month. Significantly, not only is the spread between the highest beta decile portfolio and lowest beta decile portfolio much lower than the spread between highest and lowest book value-to-price decile portfolios, the direction of the spread is the opposite of what the CAPM predicts. According to the CAPM, holders of higher beta stocks are supposed to be compensated for greater exposure to the risk in the overall market. As Fama and French have shown, empirically, this is not the case.

Table I:

Average Monthly Returns on Portfolios Formed on Size and Book-to-Market Equity; Stocks Sorted by ME(Down) and then BE/ME (Across): July 1963 – December 1990

In June of each year *t*, the NYSE, AMEX, and NASDAQ stocks that meet the CRSP-COMPUSTAT data requirements are allocated to 10 size portfolios using the NYSE size (ME) breakpoints. The NYSE, AMEX and NASDAQ stocks in each size decile are then sorted into 10 BE/ME portfolios using the book-to-market ratios for year *t* – 1. BE/ME is the book value of common equity plus balance sheet deferred taxes for fiscal year *t* – 1, over market equity for December of year *t* – 1. The equal-weighted monthly portfolio returns are then calculated for July of year *t* to June of year *t* + 1. Average monthly return is the time-series average of the monthly equal-weighted portfolio returns. The All column shows average returns for equal-weighted portfolios of the stocks in each BE/ME group.

		Book-to-Market Portfolios									
Size	All	1 (Low)	2	3	4	5	6	7	8	9	10 (High)
All	1.23%	0.64%	0.98%	1.06%	1.17%	1.24%	1.26%	1.39%	1.40%	1.50%	1.63%
1(Small)	1.47	0.70	1.14	1.20	1.43	1.56	1.51	1.70	1.71	1.82	1.92
2	1.22	0.43	1.05	0.96	1.19	1.33	1.19	1.58	1.28	1.43	1.79
3	1.22	0.56	0.88	1.23	0.95	1.36	1.30	1.30	1.40	1.54	1.60
4	1.19	0.39	0.72	1.06	1.36	1.13	1.21	1.34	1.59	1.51	1.47
5	1.24	0.88	0.65	1.08	1.47	1.13	1.43	1.44	1.26	1.52	1.49
6	1.15	0.70	0.98	1.14	1.23	0.94	1.27	1.19	1.19	1.24	1.50
7	1.07	0.95	1.00	0.99	0.83	0.99	1.13	0.99	1.16	1.10	1.47
8	1.08	0.66	1.13	0.91	0.95	0.99	1.01	1.15	1.05	1.29	1.55
9	0.95	0.44	0.89	0.92	1.00	1.05	0.93	0.82	1.11	1.04	1.22
10 (Large)	0.89	0.93	0.88	0.84	0.71	0.79	0.83	0.81	0.96	0.97	1.18

Source: From Fama and French (1992).[6]

Table II:

Average Monthly Returns on Portfolios Formed Beta (β): July 1963 – December 1990

Portfolios are formed yearly. All NYSE, AMEX and NASDAQ stocks that meet the CRSP-COMPUSTAT data requirements are allocated into 10 β portfolios using pre-ranking βs of individual stocks, estimated with 2 to 5 years of monthly returns (as available) ending in June of year *t* (*t* = 1963-1990). The equal-weighted monthly returns on the resulting portfolios are then calculated for July of year *t* to June of year *t* + 1. The average return is the time-series average of the monthly equal-weighted portfolio returns.

		Beta (β) - Portfolios									
Size	All- β	Low-β	β -2	β -3	β -4	β -5	β -6	β -7	β -8	β -9	High -β
All-sizes	1.25%	1.34%	1.29%	1.36%	1.31%	1.33%	1.28%	1.24%	1.21%	1.25%	1.14%

Source: From Fama and French (1992).[6]

At about the same time as Fama and French's three-factor model study of expected returns on the U.S. market, Chan, Hamao and Lakonishok (1991)[3] tested the predictive power of three different valuation measures in the Japanese stock market: book value-to-price, cash flow-to-price, and earnings-to-price. Examining fundamental data for both first and second section stocks listed on the Tokyo Stock Exchange from July 1971 to December 1988, they found that after accounting for beta and size that both book value-to-price and cash flow-to-price were statistically significant predictors of future returns.* They found a 1.1% monthly return difference on average between portfolios formed using the highest quartile of book value-to-price stocks versus portfolios formed using the lowest quartile of book value-to-price stocks. When stocks were sorted by cash flow-to-price, the highest quartile of cash flow-to-price stocks outperformed the lowest quartile of cash flow to price stocks by 79 basis points per month. It is important to note that the valuations in the surging Japanese market were very different from the U.S. market during the time of the study; as a result, the evidence from Japan helps to set aside critiques that the value outperformance is merely the result of data snooping.

Further international confirmation of the profitability of value strategies was presented by Fama and French (1998)[8]. They examined the return spreads between portfolios comprised of the highest 30 percent book value-to-price stocks and portfolios formed with the lowest 30 percent book value-to-price stocks using data for 13 countries over a twenty year period from 1975 - 1995. In 12 out of 13 markets the high book value-to-price portfolios outperformed the low book value-to-price portfolios (see Table III). Similarly, high-low portfolio combinations using cash flow-to-price (see Table III), earnings-to price and dividends to price resulted in positive return spreads in 12, 12 and 10 out of 13 countries respectively.

*Earnings-to-price was not unambiguously significant in Chan, Hamao and Lakonishok's study. While significant in univariate tests, the regression coefficient of earnings yield was either not significant or reversed its sign when other variables (B/P, CF/P) were included under various different estimation methods. CHL suggest the low quality of Japanese earnings due to rules on depreciation methods and the reliance of earnings on manipulable accruals are two potential explanations.

Table III:

Annual Dollar Returns in Excess of U.S. T-Bill Rate for Market, Value and Growth Portfolios: 1975 – 1995

Value and growth portfolios were formed at the end of each year 1974 to 1994, based on sorted values of B/M, E/P, C/P, and D/P. P and M are based on price per share at the time of portfolio formation. E, C and D are the most recent available trailing year of earnings, cash flow (earnings plus depreciation), and dividends per share. B is the most recent available book common equity per share. Value portfolios (indicated with a leading H, for high) include firms whose ratio (B/M, E/P, C/P, or D/P) is among the highest 30 percent for a given country. Growth portfolios (indicated with a leading L, for low) include firms in the bottom 30 percent. H – L is the difference between the high and low returns. Market is the global market portfolio return. The global market portfolios are comprised of all 13 countries listed. Firms are weighted by their market capitalization in the country portfolios; countries are weighted by Morgan Stanley's country weights in the global portfolios. The first row for each country is the average annual return. The second is the standard deviation of the annual returns (in parentheses) or the *t* – statistic testing whether H – L is different from zero [in brackets]. (results for E/P, D/P omitted for brevity)

	Market	H B/M	L B/M	H – L B/M	H C/P	L C/P	H –L C/P
U.S.	9.57	14.55	7.75	6.79	13.74	7.08	6.66
	(14.64)	(16.92)	(15.79)	[2.17]	(16.73)	(15.99)	[2.08]
Japan	11.88	16.91	7.06	9.85	14.95	5.66	9.29
	(28.67)	(27.74)	(30.49)	[3.49]	(31.95)	(29.22)	[3.03]
U.K.	15.33	17.87	13.25	4.62	18.41	14.51	3.89
	(28.62)	(30.03)	(27.94)	[1.08]	(35.11)	(26.55)	[0.85]
France	11.26	17.10	9.46	7.64	16.17	9.30	6.86
	(32.35)	(36.60)	(30.88)	[2.08]	(36.92)	(31.26)	[2.29]
Germany	9.88	12.77	10.01	2.75	13.28	5.14	8.13
	(31.36)	(30.35)	(32.75)	[0.92]	(29.05)	(26.94)	[2.62]
Italy	8.11	5.45	11.44	-5.99	11.05	0.37	10.69
	(43.77)	(35.53)	(50.65)	[-0.91]	(43.52)	(38.42)	[1.73]
Netherlands	13.30	15.77	13.47	2.30	11.66	11.84	-0.19
	(18.81)	(33.07)	(21.01)	[0.44]	(33.02)	(23.26)	[-0.03]
Belgium	12.62	14.90	10.51	4.39	16.46	12.03	4.44
	(25.88)	(28.62)	(27.63)	[1.99]	(28.84)	(25.57)	[1.27]
Switzerland	11.07	13.84	10.34	3.49	12.32	9.78	2.53
	(27.21)	(30.00)	(28.57)	[0.80]	(36.58)	(27.82)	[0.41]
Sweden	12.44	20.61	12.59	8.02	17.08	12.50	4.58
	(24.91)	(38.61)	(26.26)	[1.16]	(30.56)	(23.58)	[0.90]
Australia	8.92	17.62	5.30	12.32	18.32	4.03	14.29
	(26.31)	(31.03)	(27.32)	[2.41]	(29.08)	(27.46)	[2.85]
Hong Kong	22.52	26.51	19.35	7.16	29.33	20.24	9.09
	(41.96)	(48.68)	(40.21)	[1.35]	(46.24)	(42.72)	[1.37]
Singapore	13.31	21.63	11.96	9.67	13.42	8.03	5.39
	(27.29)	(36.89)	(27.71)	[2.36]	(26.24)	(28.92)	[1.49]

Source: From Fama and French (1998).[8]

The universe for each country listed in the above table is compiled from the constituents of the MSCI EAFE Index®.

As the previous studies demonstrate, the fact that value (e.g. high book value-to-price, high cash flow-to-price) stocks have historically outperformed glamour (e.g. low book value-to-price, low cash flow-to-price) is well documented. While there is general agreement on the evidence that value has outperformed growth, scholars have not always agreed about why this has historically occurred. Fama and French (1992)[6] argued that value stocks are fundamentally riskier and, in a rational market, investors are compensated for bearing this extra risk. Others, such as DeBondt and Thaler (1985)[5] argued that behavioral errors by investors, such as a tendency to extrapolate past earnings growth into the future cause stocks to be over or undervalued. Lakonishok, Shleifer and Vishny (1994)[12] evaluate the risk-based explanation. As they point out, if the risk-based explanation is plausible, value stocks must underperform during "bad states" of the world, when the marginal utility of wealth is high and risk-averse investors demand a greater premium. Using data from 1968 to 1989, Lakonishok, Shleifer and Vishny compared the return performance of high book value-to-price stocks (value) with low book value-to-price stocks during the worst stock market months and the worst GNP growth quarters (see Table IV).

Table IV:

Performance of Value Portfolios in Best and Worst Times: 1968 – 1989

Panel 1: All months in the sample are divided into the 25 worst stock market months based on the equally weighted index (W_{25}), the remaining 88 months other than the 25 worst (N_{88}), the 122 positive months other than the 25 best (P_{122}) and the 25 best months (B_{25}) in the sample. At the end of each April between 1968 and 1989, 10-decile portfolios are formed based on the ratio of end-of-previous year's book value to end-of-April market value of equity (B/M). For each portfolio (changing every April), Panel 1 presents its average return over the W_{25}, N_{88}, P_{122}, and B_{25} months.

Panel 2 has the same structure as Panel 1, but the states are defined in terms of the best and worst quarters for GNP growth. All quarters in the sample are divided into 4 sets: 10 quarters of the lowest real GNP growth during the sample period (W_{10}), 34 next lowest real GNP growth quarters (N_{34}), 34 next worst growth quarters (NB_{34}), and 10 highest real GNP growth quarters(B_{10}).

Panel 1: Portfolio Returns across Best and Worst Stock Market Months											
	Low B/M (Glamour)								High B/M (Value)			
B/M	1	2	3	4	5	6	7	8	9	10	Value-Glamour (9, 10 – 1, 2)	*t*-statistic
W_{25}	-0.112	-0.110	-0.104	-0.100	-0.097	-0.091	-0.093	-0.092	-0.098	-0.102	0.011	1.802
N_{88}	-0.029	-0.028	-0.026	-0.025	-0.023	-0.020	-0.021	-0.02	-0.018	-0.022	0.008	2.988
P_{122}	0.038	0.040	0.039	0.037	0.036	0.037	0.038	0.037	0.038	0.039	-0.001	-0.168
B_{25}	0.114	0.114	0.119	0.113	0.112	0.113	0.117	0.126	0.133	0.148	0.026	1.729

Panel 2: Portfolio Returns across Best and Worst GNP Growth Quarters											
	Low B/M (Glamour)								High B/M (Value)			
B/M	1	2	3	4	5	6	7	8	9	10	Value-Glamour (9, 10 – 1, 2)	*t*-statistic
W_{10}	-0.004	0.001	0.012	0.018	0.009	0.016	0.017	0.028	0.021	0.015	0.020	0.983
N_{34}	0.011	0.008	0.011	0.009	0.008	0.010	0.010	0.016	0.017	0.012	0.005	0.494
NB_{34}	0.022	0.028	0.027	0.025	0.030	0.035	0.036	0.035	0.041	0.039	0.012	1.555
B_{10}	0.092	0.102	0.118	0.117	0.117	0.135	0.132	0.141	0.145	0.151	0.051	2.685

Source: Lakonishok, Shleifer and Vishny (1994)[12]

The evidence provided in Table IV demonstrates that value stocks have actually outperformed glamour stocks during the worst 25 stock market months in the sample, with the top quintile book value-to-price stocks outperforming the lowest quintile book value-to-price stocks by an average of 1.10% per month. During the worst 10 quarters for GNP growth, high book value-to-price stocks outperformed low book value-to-price stocks by a full 2 percent.

In addition to the univariate results on book-to-market and other valuation measures that have already been discussed, there is evidence that the use of multiple quantitative measures can improve returns even further. Chan and Lakonishok (2004)[4] tested the use of a composite valuation measure that combined book value-to-price, cash flow-to-price, earnings-to-price and sales-to-price. Using a regression model to weight the four value factors, both small and large capitalization portfolios formed using the composite valuation measure outperformed both broad and value only benchmarks (See Table V). Piotroski (2001)[13] attempts to refine a value-based stock selection model by adding fundamental factors to focus on financially strong firms within a universe of high book value-to-price stocks. He found that indicator variables for positive return on assets and cash flow were the most correlated with higher returns among alternative measures of financial health.

Table V:

Geometric Mean Returns to Value and Growth Strategies using a Composite Valuation Measure: 1969 – 2001

Large-cap stocks							
		Portfolio					
years	1 (glamour)	2	9	10 (value)	Russell 1000 Value Return	S&P 500 Return	(Deciles 9,10) - (Deciles 1,2)
1969-2001	4.5%	6.7%	15.6%	16.4%	NA	11.4%	10.4%
1979-2001	7.9	10.4	18.6	20.4	15.4%	15.1	10.4
1990-2001	3.8	6.0	16.1	18.0	12.9	12.9	12.2
Small-cap stocks							
		Portfolio					
years	1 (glamour)	2	9	10 (value)	Russell 2000 Value Return	Russell 2000 Return	(Deciles 9,10) - (Deciles 1,2)
1969-2001	-2.8%	4.8%	16.6%	18.3%	NA	NA	16.5%
1979-2001	-1.8	7.8	20.8	22.8	16.0%	13.8%	18.8
1990-2001	-6.2	3.6	18.4	17.7	13.4	11.0	19.4

Source: Chan and Lakonishok (2004).[4]

Momentum:

Price momentum is the tendency for stocks that have generated superior returns in certain past intervals (3 months, 6 months and 12 months) to continue to outperform low past return stocks over the next 3 to 12 months. It is an asset pricing anomaly that has confounded efficient markets adherents. Eugene Fama (1996, p 81)[6] has said that the "main embarrassment of the three-factor model" is "its failure to capture the continuation of short-term returns documented by Jegadeesh and Titman (1993)[9] and Asness (1994)[1]."

Jegadeesh and Titman are among the most commonly cited researchers of the anomaly. Table VI summarizes results from an update (2001)[10] of their initial study (1993)[9]. All stocks that trade on the three major exchanges, NYSE, AMEX, and NASDAQ, are sorted into equally weighted decile portfolios on the basis of past performance over the previous six months. From 1965 to 1998, the strongest past performance stocks (i.e. past winner decile) outperformed the worst performing stocks over the prior six months by an average of 1.23% per month over the next six months. The effect was statistically significant in both large and small capitalization stocks, and was robust over both the time period of their original study (1965 – 1989) and the additional subperiod covered by their updated research (1990 -1998).

Table VI:

Momentum Portfolio Returns

This table reports the monthly returns for momentum portfolios formed based on past six-month returns and held for six months. P1 is the equal-weighted portfolio of 10 percent of the stocks with the highest returns over the previous six months; P2 is the equal-weighted portfolio of 10 percent of the stocks with the next highest returns, and so on. The "All Stocks" sample includes all stocks traded on the NYSE, AMEX, or NASDAQ excluding stocks priced less than $5 at the beginning of the holding period and stocks in the smallest market cap decile (NYSE size decile cutoff). The "Small Cap" and "Large Cap" subsamples comprise stocks in the "All Stocks" sample that are smaller and larger than the median market cap NYSE stock respectively. "EWI" is the return on the equal-weighted index of stocks in each sample.

	All Stocks			Small Cap			Large Cap		
	1965 - 1998	1965 - 1989	1990 - 1998	1965 - 1998	1965 - 1989	1990 - 1998	1965 - 1998	1965 - 1989	1990 - 1998
P1 (Past Winners)	1.65	1.63	1.69	1.70	1.69	1.73	1.56	1.52	1.66
P2	1.39	1.41	1.32	1.45	1.50	1.33	1.25	1.24	1.27
P3	1.28	1.3	1.21	1.37	1.42	1.23	1.12	1.10	1.19
P4	1.19	1.21	1.13	1.26	1.34	1.05	1.10	1.07	1.20
P5	1.17	1.18	1.12	1.26	1.33	1.06	1.05	1.00	1.19
P6	1.13	1.15	1.09	1.19	1.26	1.01	1.09	1.05	1.20
P7	1.11	1.12	1.09	1.14	1.20	0.99	1.09	1.04	1.23
P8	1.05	1.05	1.03	1.09	1.17	0.89	1.04	1.00	1.17
P9	0.90	0.94	0.77	0.84	0.95	0.54	1.00	0.96	1.09
P10 (Past Losers)	0.42	0.46	0.30	0.28	0.35	0.08	0.7	0.68	0.78
P1-P10	1.23	1.17	1.39	1.42	1.34	1.65	0.86	0.85	0.88
t statistic	6.46	4.96	4.71	7.41	5.60	5.74	4.34	3.55	2.59
EWI	1.09	1.10	1.04	1.13	1.19	0.98	1.03	1.00	1.12

Source: Jegadeesh and Titman (2001).[10]

To test for a risk-based explanation of the effect, Jegadeesh and Titman calculated alphas using two of the most popular models of expected return; the Fama-French three factor model and the CAPM (Table VII). Both the CAPM alpha (1.24) and the Fama-French alpha (1.36) are slightly larger than the unadjusted average return spread and are statistically significant with *t*-statistics of 6.50 and 7.04, respectively. Statistically significant alphas point to the existence of other factors, such as potential behavioral biases, not accounted for by the risk based models of expected return.

Since neither a CAPM nor a Fama-French risked-based explanation could now be deemed likely, Jegadeesh and Titman examined behavioral explanations such as underreaction to fundamental news. Past strong price performance of individual firms is presumably the result of strong past fundamental performance, such as quarterly earnings surprises. As Bernard and Thomas (1990)[2] have documented, year over year quarterly earnings changes display significant positive autocorrelation for two subsequent quarters. As a result of this pattern, it is evident that there is information about future earnings changes in past fundamental news releases. In the absence of underreaction, investors should anticipate this pattern. Upon detailed examination, Jegadeesh and Titman (1993) found that a disproportionately large and statistically significant percentage of the subsequent excess returns generated by price momentum portfolios are realized in a three-day period around subsequent earnings announcements. The implication is that investors are surprised by the results of the subsequent earnings announcements and have not fully incorporated the information contained in prior period earnings releases.

Table VII:

CAPM and Fama-French Alphas of Momentum Portfolios: January 1965 – December 1998

This table reports the intercepts from the market model regression (CAPM Alpha) and Fama-French three-factor model regression (FF Alpha). The *t*-statistics are reported in parentheses.

	CAPM Alpha	FF Alpha
P1	0.46	0.50
	(3.03)	(4.68)
P2	0.29	0.22
	(2.86)	(3.51)
P3	0.21	0.10
	(2.53)	(2.31)
P4	0.15	0.02
	(1.92)	(0.41)
P5	0.13	-0.02
	(1.70)	(-0.43)
P6	0.10	-0.06
	(1.22)	(-1.37)
P7	0.07	-0.09
	(0.75)	(-1.70)
P8	-0.02	-0.16
	(-0.19)	(-2.50)
P9	-0.21	-0.33
	(-1.69)	(-4.01)
P10	-0.79	-0.85
	(-4.59)	(-7.54)
P1 – P10	1.24	1.36
	(6.50)	(7.04)

Source: Jegadeesh and Titman (2001).[10]

Like the value-driven stock selection strategies discussed earlier, price momentum based strategies may be refined with the use of multiple factors. Jegadeesh and Livnat (2006)[11] confirm that earnings surprises that are driven primarily by sales changes rather than expense changes are more likely to produce future earnings surprises. As a result, strategies such as momentum that rely on underreaction to past earnings information could potentially be improved when combined with revenue change data. The use of multiple intervals to measure past price performance may also be useful. Alan Scowcroft and James Sefton (2005)[14] provide a recent survey of the literature supporting the value of utilizing various price momentum based stock selection strategies. Table VIII is from their survey and provides updated evidence of momentum driven future returns. As can be seen in the table, three different past price performance intervals - 3 months, 6 months and 12 months are useful indicators of future returns.

Table VIII:

Monthly Returns to Long-Short Momentum Strategies for Varying Portfolio Formation and Holding Periods: January 1992 – March 2003

	Holding Period (*K*, months)					
Formation Period (*J*, months)	1	3	6	12	24	36
1	-0.78%	0.11%	0.31%	0.38%	0.18%	0.04%
	(0.48)	(0.34)	(0.27)	(0.20)	(0.16)	(0.12)
3	0.04	0.42	0.71	0.65	0.32	0.10
	(0.57)	(0.50)	(0.43)	(0.33)	(0.27)	(0.21)
6	0.59	0.87	1.00	0.86	0.38	0.14
	(0.63)	(0.59)	(0.51)	(0.42)	(0.36)	(0.28)
12	0.92	1.05	0.93	0.79	0.25	-0.02
	(0.64)	(0.60)	(0.56)	(0.53)	(0.46)	(0.36)
24	0.67	0.75	0.66	0.36	-0.34	-0.53
	(0.67)	(0.65)	(0.63)	(0.61)	(0.50)	(0.43)
36	0.35	0.48	0.37	-0.23	-0.75	-1.02
	(0.67)	(0.66)	(0.64)	(0.59)	(0.53)	(0.49)

Source: From Scowcroft and Sefton (2005).[14]

All returns measured in U.S. dollars; there was no gap between formation and holding period.

Standard errors in parentheses.

Section II

The AlphaDEX® Methodology and Empirical Results

As discussed previously, the referenced academic literature supports the possibility of generating outperformance or "alpha" through the use of purely quantitative measures in the stock selection process. The question that naturally follows from the historical academic literature and evidence presented in Section I is how we go about designing a stock selection model that may benefit from this research. The theoretical building blocks for a quantitative stock selection model are generally related to two different behaviorally motivated investor errors, extrapolation of past results and underreaction to new information. The AlphaDEX® stock selection methodology utilizes two separate models to attempt to capitalize on these potential investor errors. As described on the following pages, a value model is applied to exploit the tendency of investors to extrapolate past results and a growth model is applied to take advantage of the tendency for investors to under-react to new information.

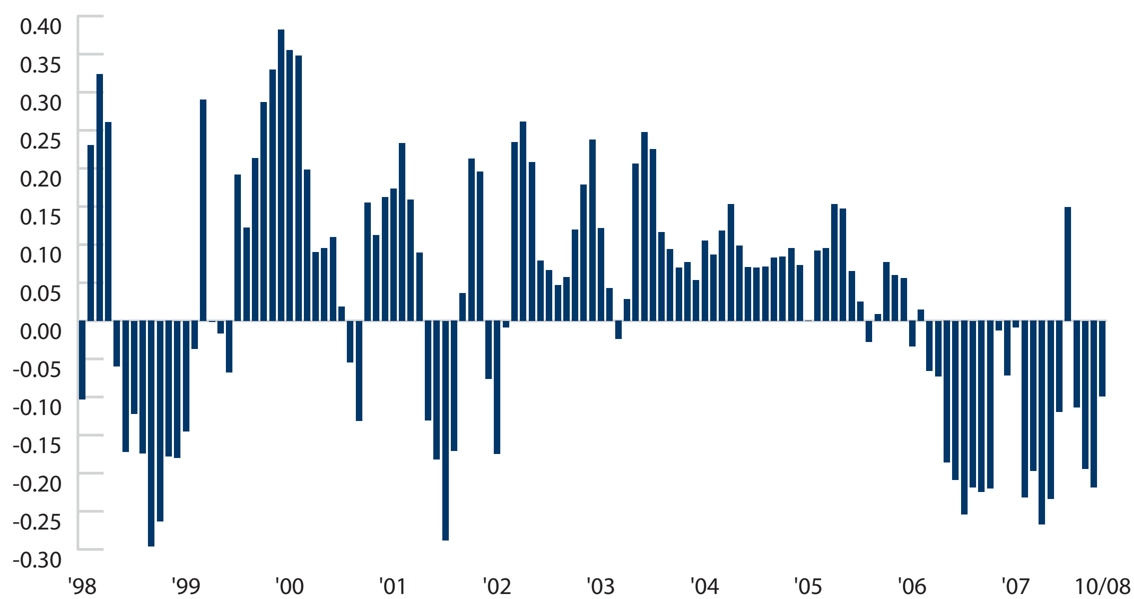
AlphaDEX® Value Model

The AlphaDEX® Value model is based on three factors - the book value-to-price ratio, the cash flow-to-price ratio and return on assets (ROA). Book value-to-price and cash flow-to-price are complementary valuation metrics. Book value-to-price is probably a purer measure of long-term value, as book value only changes incrementally each year when a portion of net income is accrued to retained earnings. Cash flow-to-price avoids the potential distortions of the accrual-based portion of net income.*

The stability of a quantitative selection model over time is an important consideration when choosing the proper mix of factors. While many single factors can be useful in stock selection, upon closer examination, it is apparent multi-factor models are generally more consistent over time.** Figure I charts the information coefficient of the book value-to-price ratio for S&P 500 stocks, assuming a three month holding period from each portfolio selection month.

Figure I:

Book value-to-price: 3 month Information Coefficient for S&P 500 stocks



Source: Compustat

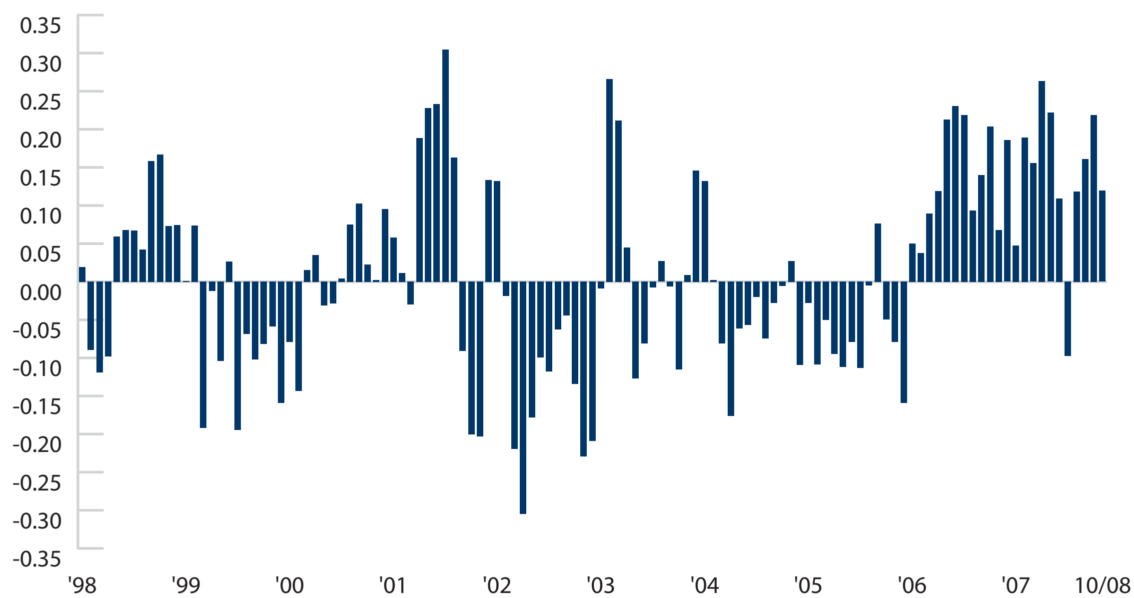
*The "accrual anomaly", documented by Sloan (1996)[16], is the tendency for investors to rely too heavily on the current level of accrual based earnings when making investing decisions. The accrual portion of earnings has been shown to be less persistent than the portion of earnings that result in cash flow to the firm.

**Past performance is no guarantee of future results.

Book value-to-price has some predictive value over time, and we believe prudent investment managers should utilize the ratio as an important valuation metric. Neither book value-to-price nor any other quantitative measure should be used in isolation, however. During the recent credit crisis, book values became less trustworthy, and the ratio's informational value suffered. During this challenging environment, ROA has often served as an important indicator of balance sheet quality. The information coefficient for ROA was largely positive during the time when book value-to-price was less predictive (see Figure II). Consequently, during the relevant time period ROA, served as a good complementary measure to the book value-to-price ratio.

Figure II:

Return on Assets (ROA): 3 month Information Coefficient for S&P 500 stocks

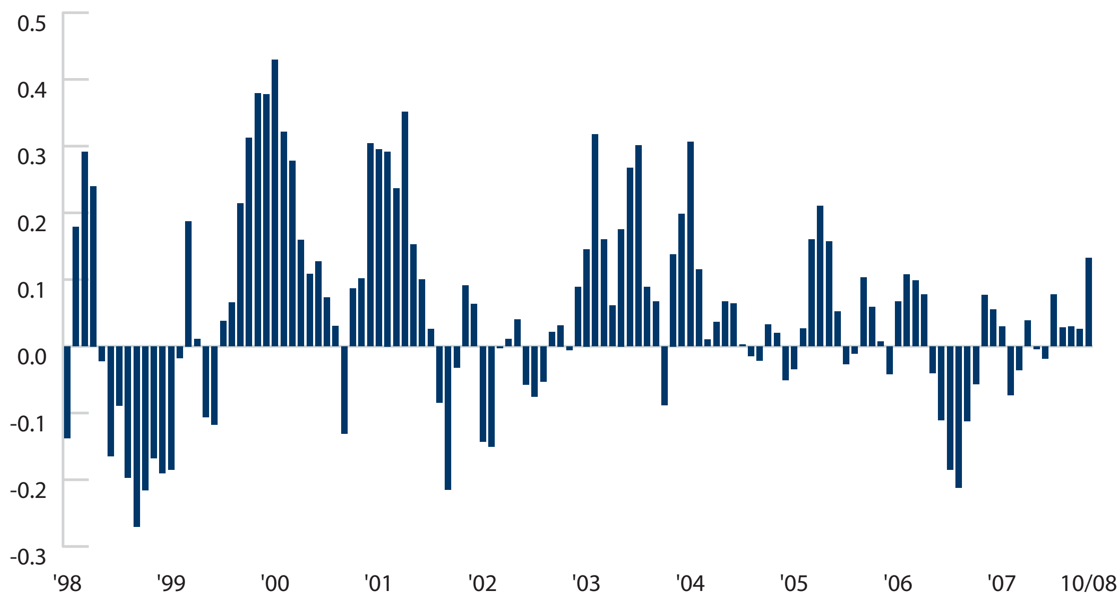


Source: Compustat

When book value-to-price and return on assets are combined with cash flow-to-price, the model tends to become more stable and periods of low predictive power appear to be attenuated compared to any one of the factors alone. Figure III shows the 3 month information coefficients over time for a model using all three AlphaDEX® value factors.

Figure III:

AlphaDEX® Value Model: 3 month Information Coefficient for S&P 500 stocks



Source: Compustat

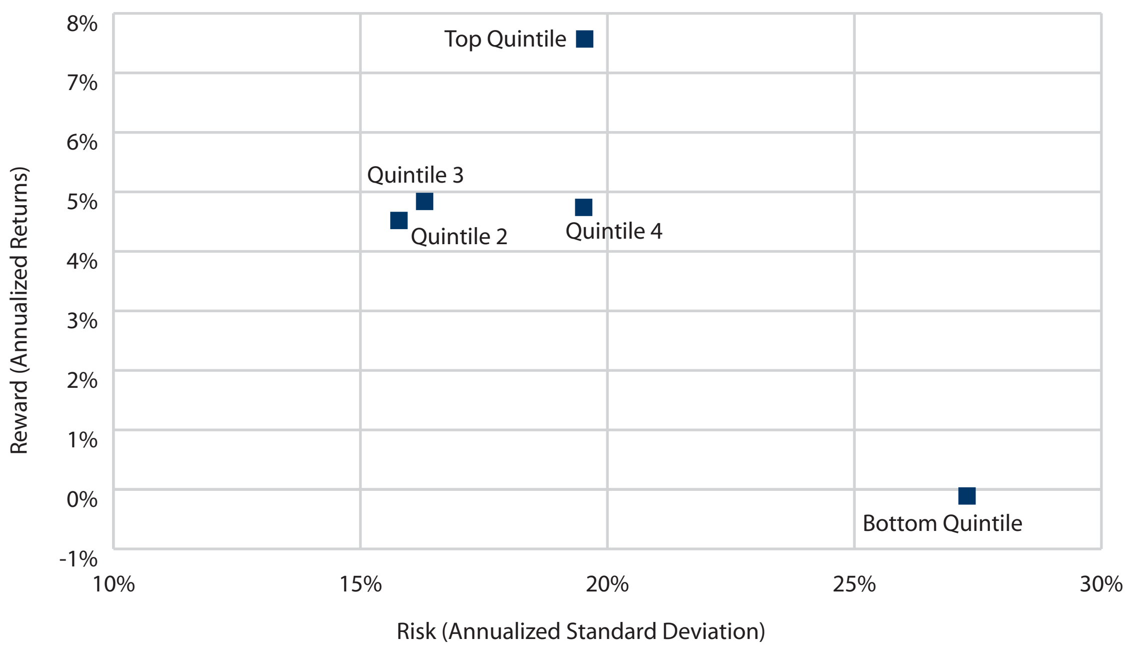
AlphaDEX® Growth Model

The AlphaDEX® Growth model is designed to capitalize on investor underreaction and employs three measures of price momentum: three, six and 12-month price appreciation. One year sales growth and the sales-to-price ratio are also used in the growth model for a total of five factors. Strong sales growth tends to provide some evidence that recent positive price movement is due to more repeatable improvements in underlying business activity, rather than unsustainable cost cutting. The sales-to-price ratio is a valuation metric often used to evaluate high growth firms. Like the value factors, the growth factors were chosen based on evidence presented in academic literature and the informational value of the factors.

While it is certainly important that a model show skill in generating outperformance, the ability to mitigate risk is obviously another desirable attribute of a well constructed stock selection model. In thinking about price momentum measures, high performing, fast growing stocks often come to mind, but using momentum factors tends to contribute added value as a potential volatility reducer as well. As can be seen in Figure IV, this is not accomplished so much from the identification of low volatility stocks, but the avoidance of the worst performing stocks which have tended to have extremely high volatility. Note that the worst momentum stocks not only exhibited the poorest performance during the relevant time period, but also were the most volatile.

Figure IV:

Six Month Price Momentum: Ten Year Average Annualized 3 month Risk/Reward for S&P 500 stocks: December 31, 1998 – December 31, 2008



Source: Compustat

For Illustrative purposes only. The information applies to the stocks comprising the S&P 500 Index by applying the AlphaDEX® stock selection methodology. However, all stocks contained in the five quintiles in this example have been equally weighted. This is not a representation of any index or AlphaDEX® fund.

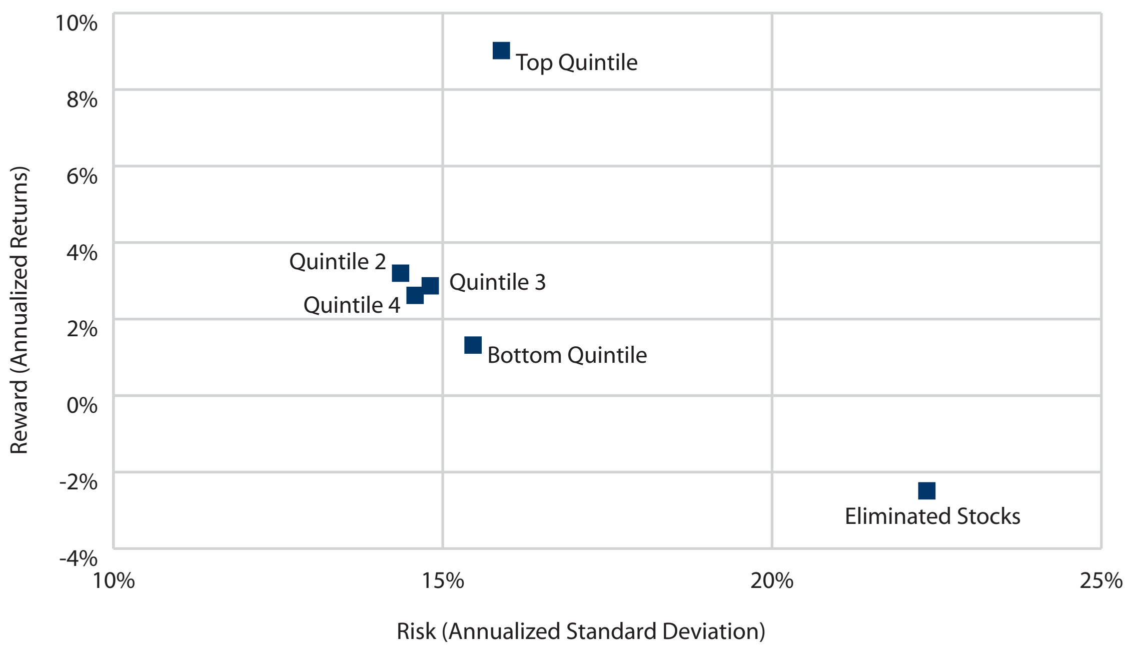
Implementation of the AlphaDEX® Methodology

On the following page, we show an example of the AlphaDEX® methodology applied to the S&P 500 Index. Based on the AlphaDEX® screening methodology, the bottom scoring 25% of the stocks in the S&P 500 Index are left out of the selection. The remaining 75% of S&P 500 Index stocks are selected. The resulting stocks are not weighted based on market capitalization, but on the basis of potential investment merit. The selected stocks are then divided into quintiles based on their AlphaDEX® methodology scores; the higher scoring quintiles are given greater weight than lower scoring quintiles.

As can be seen in Figure V, the 10 year risk reward profile of an equally weighted portfolio of the top scoring quintile has historically been the most appealing, earning over 11% more than an equally weighted portfolio of the eliminated stocks. In addition, the equally weighted portfolio of eliminated stocks had a higher standard deviation than any of the five selected quintiles.

Figure V:

10-year Risk/Reward Profile Example: S&P 500 Index Stocks that would be included in Top 5 Quintile Stocks versus Eliminated Stocks: December 31, 1998 – December 31, 2008



Source: Compustat

For Illustrative purposes only. The information applies to the stocks comprising the S&P 500 Index by applying the AlphaDEX® stock selection methodology. This is not a representation of any index or AlphaDEX® fund.

Section III

Conclusion

As presented in Section I, the past academic literature supports the use of quantitative metrics to identify stocks with potential investment merit. We have shown that the use of value and momentum measures are both supported by empirical studies. Section II describes the AlphaDEX® model for stock selection, which draws inspiration from the studies cited in Section I. The results of the implementation of the AlphaDEX® screening process of the S&P 500 Index in Section II also lends support to quantitative stock selection. The conclusion can therefore be drawn that market capitalization weighted "beta" indexes may likely be challenged by a next generation of theoretically inspired, empirically supported "alpha" indexes.

Glossary:

B/M = Book to Market

Beta is a measure of price variability relative to the market.

C/P = Cash Flow/Price

D/P = Dividends/Price

E/P = Earnings/Price

Geometric Mean is technically, the Nth root product of N numbers. The geometric mean is used to calculate average historical returns for a portfolio or stock. For example the average annual return over the last three years would be calculated as follows: $((1+YR1)*(1+YR2)*(1+YR3))^{1/3} - 1$ where YR1, YR2 and YR3 are the first, second and third year annual returns.

Information Coefficient is a measure of the quality of a forecasting factor or signal to the forecast of stock returns.

Standard Error is the standard deviation of an estimate. The statistic measures the precision of an estimate, with a higher error indicating less precision.

Standard Deviation is a measure of price variability (risk).

T-Statistic is the ratio of an estimate to its standard error. A t-statistic of 2 or above indicates statistical significance at a 95% level of confidence.

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