BFF STOCKS: BACH, FIBONACCI, FRACTALS, AND US EQUITIES

Analysis of Model Trading Strategy Utilizing MAP Quantitative Equity Research Data

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SUMMARY

This paper explores an in-depth analysis of enhancing a model trading strategy utilizing MAP quantitative equity research data. Three studies were conducted and the dataset representing the weekly pool of securities for portfolio construction spanned over 3.5 years.

This paper poses the following primary question:

- *Can we use quantitative analysis to enhance the desirable risk-adjusted return of the Compass 20/10 model trading strategy?*

STUDY ONE: MODEL PORTFOLIO - WEEKLY COMPASS 20/10

The first study addressed the following question:

- *Is there enough statistical significance using MAP quantitative equity research data to create the Compass 20/10 model trading strategy to achieve desirable risk-adjusted return?*

HYPOTHESIS: A model portfolio constructed with the aim of buying stocks with the highest Compass Scores, and shorting stocks with the lowest Compass Scores each week will generate desirable risk-adjusted return over time with statistical significance.

RESULTS: The model strategy tested assumes portfolio construction based on the weekly COMPASS 20/10 reports. On a model portfolio of $1 million, it assumes dollar neutral execution of 20 initiated longs and 10 initiated shorts executing market-on-close orders on the date each basket was generated, with associated closing prices. Assumptions for trade impact slippage, commissions, and borrow rates for shorts were assumed which are detailed later in this report. The report also details our quantitative analysis based on the COMPASS 300 database, from which we analyzed 55,278 data points beginning 1/2/2013. The categories of interest are the Compass Score, Technical Score, and Fundamental Score.

Our findings show that the annualized Sharpe Ratio of our target stocks is **1.79** for the time period between 01/02/2013 and 06/14/2016. According to the regression results which are based on the optimal holding period of 5 trading days, we found that the Compass Score is **positively significant** for 5-day holding periods, indicating that stocks with higher Compass Scores suggest a higher return after 5 trading days. We further dissected the Compass Score into a Technical Score and a Fundamental Score in order to exclude the fundamental changes that influenced our stocks returns. The results still showed the Fundamental Score to be **positively significant** for 5-day holding periods.

STUDY TWO: COMPASS 20/10 TRADING STRATEGY BASED ON COMPASS SCORES – DEFINING OPTIMAL THRESHOLDS

The second study posed the questions:

- *Can we define optimal thresholds for upper and lower extremes of the Compass Score with statistical significance?*
- *Can we define optimal holding periods for the model strategy with statistical significance?*

HYPOTHESIS: Both an upper boundary and lower boundary of Compass Score exists at which point the Compass Score might exhibit an inverse signal.

RESULTS: Using the same portion of the COMPASS 300 dataset, we performed a refined 2.5% interval return distribution analysis on Compass and Technical Scores. The thresholds gravitated towards 0.175 and 0.9 for Compass Scores, and 0.225 for the downside portion of Technical Scores. There appears to be no statistically significant upside threshold for Technical Score. The returns displayed in the charts of this study correspond to the 5-day optimal holding period's returns. The annualized average returns for stocks where Compass Scores are larger than 0.9 is -41.83%, while the annualized average returns for stocks whose Compass Scores are smaller than 0.175 is +84.67%. This observation indicates that extreme positive and negative score tail results may actually exhibit an inverted signal.

STUDY THREE: COMPASS 20/10 TRADING STRATEGY BASED ON COMPASS SCORES WITH OPTIMAL THRESHOLDS

The third study posed the questions:

- *Do applying boundaries of upper thresholds for stocks with high Compass Scores and a lower boundary for stocks with low Compass Scores (eliminating extreme stocks and replacing with the next available Compass 300 stocks) enhance risk-adjusted return with statistical significance?*
- *If so, can we combine this with an optimal holding period to achieve further enhanced risk-adjusted return?*

HYPOTHESIS: Eliminating stocks with scores above and below a defined threshold residing on the Compass 20/10 report, coupled with a defined optimal hold time will enhance the risk-adjusted return of the Compass 20/10 model trading strategy.

RESULTS: Employing a 100% rollover strategy for new baskets constructed from the same Compass 300 dataset of more than 55,000 stocks, we excluded stocks with Compass Scores above 90 or below 17.5 as defined by the upper and lower thresholds from the results of Study Two. The investment horizon for this test strategy also lasts 3.5 years, from January 2nd, 2013 to June 14th, 2016. We found that the 3.5 year net return of our rotating basket investment strategy yields 91.18%, compared to 77.59% for the unfiltered Compass 20/10 with no thresholds employed. Compared with the original Compass 20/10 100% rollover strategy, we found the average weekly return on baskets increased from 0.36% to 0.40% (+4bps), and the standard deviation increased from 1.43% to 1.45% (+2bps); the annualized Sharpe Ratio increased from 1.79 to 1.96 (+0.17), and we compounded our principle and return every week. The 5-day holding period average Sharpe Ratio is 2.02 for our strategy employing thresholds, compared to the original average 5-day holding period Sharpe Ratio 1.71 without thresholds.

Whether or not you listen to classical music, J.S. Bach's impact on music in general is undisputable. He is generally hailed as the greatest composer of all time, composing well over 1,000 known works. He was prolific in family as well, fathering 20 children. Surprising to many, when he died in 1750, most of his music died with him and it wasn't until 1829 when a 19 year old Felix Mendelsohn revived Bach's works and ignited a new found passion for his music. Some may know that Bach aimed to make each composition perfect as an offering to God. With this fact, his music is replete with mathematical symmetry and hidden numerical meaning. In the mystical numerology known as Gematria, B equals 2, A equals 1, C equals 3 and H equals 8: the sum is 14. Both 14 and its mirror 41 (achieved by adding the numerical J and S to the prior result) were Bach's favorites. These two numbers, as well as many others, are hidden in the notes and musical structure of Bach's compositions. For example, there are 14 Canons in the Goldberg Variations and 14 Contrapuncti in the Art of Fugue. Symmetry is found heavily in the Goldberg Variations as his contrapuntal (two independent melodic lines) phrases would deviate and explore dizzying heights until they invariably would resolve, releasing the musical tension he created.

The fact is, numbers, data, and quantitative relationships can be found in nearly everything in nature. One need only look toward the Golden Ratio found in hurricanes, tree branches, or even the structure of galaxies. The Fibonacci sequence is found countless places in nature, from the arrangement of petals on a flower to the scales of a pineapple. Similarly, fractals can be found in Romanesco Broccoli, the chambered shell of a Nautilus, pinecones, ice crystals, tree branches, and the list goes on and on.

If numerical patterns exist everywhere in nature and even in musical creations of man, the question can logically be redirected toward the financial markets:

Can we use quantitative analysis of fundamental and technical stock data to reveal statistically significant patterns in order to generate a strategy with desirable risk-adjusted return?

This was a founding question that served as a basis to begin MAP in the first place. To expound further on this question, we performed a series of studies based on MAP equity research historical data and the Compass 20/10 report. In this paper, we explore the analysis of MAP equity data to reveal patterns in the US equity market arranged into a model portfolio strategy. This model strategy describes a set of possible outcomes that exhibit desirable risk-adjusted return. We refer to this strategy as the COMPASS 20/10 strategy.

INTRODUCING THE COMPASS SCORING METHODOLOGY

Compass Score is a numeric ranking that we assign to a company (equity) based on our proprietary technical and fundamental filters. We begin our analytic process by defining a universe of US stocks that we deem to be tradable by institutions. We filter for stocks that meet our minimum criteria including amongst others: liquidity, market capitalization, average volume, and whether options are available. This universe is defined daily and yields an average of roughly 1400 US equities. The stocks that pass the filters collectively function as an index of institutionally tradable stocks that we refer to as the **MAP 1400.**

At this point, 110 individual historical data points are retrieved for each stock. A truncated list of example data points are shown in the table below.

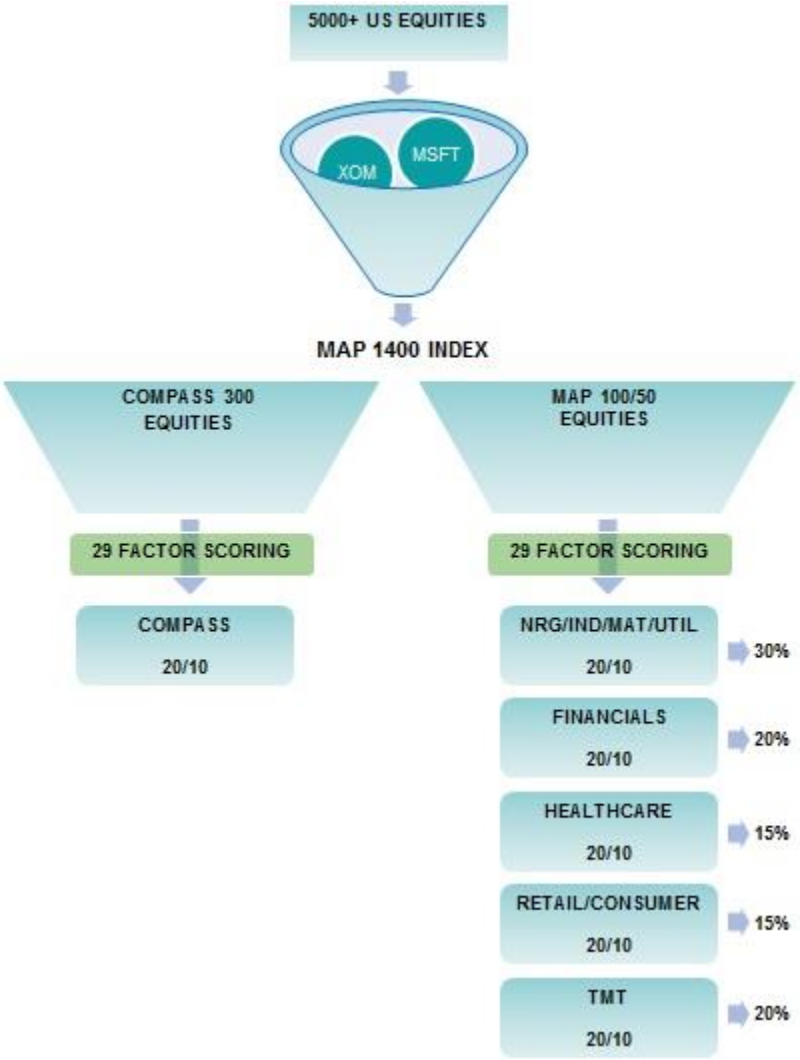
STOCK DATA EXAMPLES:

TECHNICAL	FUNDAMENTAL
Price highs and lows within a specified time period	Revenue and Earnings Growth - Single and Multi Year
52 week highs and lows	Analyst Revisions
Average Daily Volume within a specified time period	P/E ratio
Historical Volatility for a specified time period	Debt Levels
Several Moving Averages	Cash Flow
Relative Performance to Sector	Enterprise Value

We then employ a factor scoring methodology on the MAP 1400 utilizing 29 factors, each with various combinations of subsets of the 110 data points. Each factor component is part of an aggregate score. Aggregate scores approaching 100 are more bullish; approaching 0 are more bearish. The scores are further divided into technical and fundamental components. The technical score is our factor scoring methodology dealing with market mechanics: trading volumes, buying/selling pressure, price ranges, and volatility to name a few. The fundamental score is our factor scoring methodology dealing with the fundamental health of a company: revenues, earnings, debt, and revisions to name a few. The composite Compass Score is roughly 58% market mechanics (technical) and 42% fundamentals.

An additional technical flag is applied searching for potentially unusual institutional activity. We identify this activity by studying violations of relationships between price, volume and volatility. When a stock violates the upper thresholds on our filter it receives a PBO designation indicating potential unusual institutional accumulation. When a stock violates the lower thresholds on our filter it receives a PBD designation indicating potential unusual institutional distribution. PBO connotes Potential Breakout (Bullish Signal) while PBD connotes Potential Breakdown (Bearish Signal). Each day finds roughly 100 stocks resulting in PBO or PBDs in aggregate. For the purpose of the model portfolios published each week which are used in this study, we aggregated 5 days' worth of returns and removed duplicate stocks (roughly 40%). This gave us an average weekly universe of 300 stocks exhibiting unusual institutional activity. We refer to this weekly pool as the **COMPASS 300.**

The MAP Equity Filtering and Scoring Process



From this pool of 300 average weekly stocks, we select the 20 highest scores, and 10 lowest scores to assemble a weekly basket. The study examines a weekly strategy of initiating longs for the top 20 stocks, and shorts for the bottom 10 stocks. The long bias is based on several factors including historic long bias of the equity market and the observation that suggested shorts exhibit a higher beta component than suggested longs, thus partially neutralizing the long bias. These baskets are referred to as Compass 20/10 baskets.

Example of Compass 20/10 basket generated 6/21/16

COMPASS

COMPASS Top 20 and bottom 10 Stocks for the week prior.

Prepared by Macro Analytics for Professionals on 6/21/16 based on closing prices for the previous day.

TICKER	NAME	SECTOR	INDUSTRY GROUP	INDUSTRY SUBGROUP	PRIOR CLOSE	COMPASS SC	TECHNICAL	FUNDAMENTAL
MNST	Monster Beverage Corporation	Consumer Staples	Food Beverage & Tobacco	Soft Drinks	156.17	84.5	85%	83%
EGHT	8x8, Inc.	Telecommunication Service	Telecommunication Services	Alternative Carriers	13.76	82.8	94%	67%
AM	Antero Midstream Partners LP	Energy	Energy	Oil & Gas Storage & Transport	25.91	82.8	79%	88%
SJM	J. M. Smucker Company	Consumer Staples	Food Beverage & Tobacco	Packaged Foods & Meats	145.16	81.0	91%	67%
ALB	Albemarle Corporation	Materials	Materials	Specialty Chemicals	83.01	81.0	94%	63%
RGLD	Royal Gold, Inc.	Materials	Materials	Gold	67.51	81.0	94%	63%
PLAY	Dave & Buster's Entertainment, Inc.	Consumer Discretionary	Consumer Services	Restaurants	47.58	81.0	85%	75%
CYBR	CyberArk Software Ltd.	Information Technology	Software & Services	Systems Software	48.32	79.3	71%	92%
GRUB	GrubHub, Inc.	Information Technology	Software & Services	Internet Software & Services	30.59	79.3	74%	88%
SYK	Stryker Corporation	Health Care	Health Care Equipment & Services	Health Care Equipment	116.09	79.3	79%	79%
FNV	Franco-Nevada Corporation	Materials	Materials	Gold	70.6	79.3	91%	63%
WEC	WEC Energy Group Inc	Utilities	Utilities	Multi-Utilities	62.94	79.3	94%	58%
COR	CoreSite Realty Corporation	Financials	Real Estate	Specialized REITs	84.61	77.6	88%	63%
FNSR	Finisar Corporation	Information Technology	Technology Hardware & Equipment	Communications Equipment	18.83	77.6	82%	71%
DOC	Physicians Realty Trust	Financials	Real Estate	Health Care REITs	20.33	77.6	88%	63%
Z	Zillow Group, Inc. Class C	Information Technology	Software & Services	Internet Software & Services	34.76	75.9	82%	67%
GLPI	Gaming and Leisure Properties, Inc.	Financials	Real Estate	Specialized REITs	34.58	75.9	82%	67%
LOCK	LifeLock, Inc.	Consumer Discretionary	Consumer Services	Specialized Consumer Service	15.59	75.9	82%	67%
TRMB	Trimble Navigation Limited	Information Technology	Technology Hardware & Equipment	Electronic Manufacturing Ser	26.7	75.9	85%	63%
RICE	Rice Energy Inc.	Energy	Energy	Oil & Gas Exploration & Produ	22.48	75.9	91%	54%
DB	Deutsche Bank AG	Financials	Diversified Financials	Diversified Capital Markets	16.3	31.0	29%	33%
SNY	Sanofi Sponsored ADR	Health Care	Pharmaceuticals Biotechnology & Life Sciences	Pharmaceuticals	39.1	31.0	15%	54%
SPWR	SunPower Corporation	Information Technology	Semiconductors & Semiconductor Equipment	Semiconductors	15.07	29.3	15%	50%
JD	JD.com, Inc. Sponsored ADR Class A	Consumer Discretionary	Retailing	Internet Retail	21.06	29.3	18%	46%
RARE	Ultragenyx Pharmaceutical, Inc.	Health Care	Pharmaceuticals Biotechnology & Life Sciences	Biotechnology	54.5	29.3	26%	33%
ERJ	Embraer S.A. Sponsored ADR	Industrials	Capital Goods	Aerospace & Defense	21.06	29.3	21%	42%
VNET	21Vianet Group, Inc. Sponsored ADR Class	Information Technology	Software & Services	Internet Software & Services	11.39	24.1	15%	38%
HMHC	Houghton Mifflin Harcourt Company	Consumer Discretionary	Consumer Services	Education Services	16	24.1	18%	33%
INSM	Insmed Incorporated	Health Care	Pharmaceuticals Biotechnology & Life Sciences	Biotechnology	9.645	20.7	18%	25%
CS	Credit Suisse Group AG Sponsored ADR	Financials	Diversified Financials	Diversified Capital Markets	12.84	20.7	15%	29%

STUDY ONE: MODEL TRADING STRATEGY BASED ON COMPASS SCORES

STRATEGY GUIDELINES

The model strategy tested, assumes execution of 20 initiated longs and 10 initiated shorts executing market-on-close orders on the date each basket was generated. It assumes closing prices were achieved on the date the baskets were released with an assumption for trade impact slippage of 0.75%. Commissions were accounted for on a 0.0025 per share trade transaction cost. Borrow rates for shorts were assumed to be 1.25%.

We used the following additional assumptions:

- Portfolio size of$1,000,000
- Longs were selected as the top 20 scoring stocks from the Compass 300
- Shorts were selected as the bottom 10 scoring stocks from the Compass 300
- Each stock included in our basket is equally dollar weighted ($33,333 exposure on each stock) at week 1 then compounded forward
- Using the average stock price of $30, each position was hypothetically 1,111 shares
- 20% of our basket's stocks repeated from prior week's basket (based on historic observation)
- Transaction fees calculated as .0025*30*1111*52*.8=$3,466.32
- Annual transaction fee in percentage is 0.346%

STATISTICAL DESCRIPTION OF OUR DATA

In this report we present the results of our quantitative analysis based on the COMPASS 300 database, from which we analyzed 55,278 data points beginning 1/2/2013. The categories of interest in our data include the Compass Score, Technical Score, and Fundamental Score.

METHODOLOGY

Sharpe Ratio Calculations for each holding period were based on the following formula:

$$\text{Sharpe Ratio} = \frac{E[R_{cumulative}]}{\sqrt{Var(R_{cumulative})}}$$

We performed a simple linear regression to test the significance of each variable.

RESULTS

Our initial findings show that the annualized Sharpe Ratio of our target stocks is **1.79** for the time period between 01/02/2013 and 06/14/2016. The Sharpe Ratio of 1.71 appears on the 5th trading day after we initiate our baskets. According to the regression results which are based on the optimal holding period of 5 trading days, we find that the Compass Score is **positively significant** for 5-day holding periods, which indicates that stocks with higher Compass Scores suggest a higher return after 5 trading days. From a more detailed point of view, we decomposed the Compass Score into a Technical Score and a Fundamental Score so that we could exclude the fundamental changes that influenced our stocks' returns. The results still show the Fundamental Score to be **positively significant** for 5-day holding periods.

STUDY TWO: COMPASS 20/10 TRADING STRATEGY BASED ON COMPASS SCORES- DEFINING OPTIMAL THRESHOLDS

REVISITING THE COMPASS SCORE

As discussed earlier, the Compass Score is a numeric ranking that we assign to a company (equity) based on our proprietary technical and fundamental filters. PBO means Potential Breakout (Bullish Signal), PBD means Potential Breakdown (Bearish Signal). The Compass Score is based on 29 technical and fundamental factors. PBO is based on additional parameters of potential buying and PBD is based on unusual potential selling. We perform our research based on the following assumptions:

1. All of the regressions use the cumulative return on day 5 without annualizing.
2. We use the equal dollar weighted method when calculating the return of the stock basket.
3. When we run the regression of returns and Compass Scores, we treat the stocks homogeneously.

STATISTICAL DESCRIPTION OF OUR DATA

In this report we present our quantitative results based on the COMPASS 300 database, from which we analyzed 55,278 data points. The categories of our data include MAP Compass Score, Technical Score, Fundamental Score, and cumulated returns of our target individual stocks over different periods and the S&P 500 returns accordingly.

	Min	1st Quarter	Median	3rd Quarter	Max
Compass Score	18.52	46.30	60.34	70.37	89.66
Technical Score	0.0290	0.3790	0.6320	0.8210	1.0000
Fundamental Score	0.0000	0.4900	0.5800	0.6700	1.0000
Stock Return on day 5	-0.5382	-0.0200	0.0000	0.0300	0.7700
S&P 500 Return	-0.1100	0.0000	0.0000	0.0100	0.0500
# of PBO	23,024				
# of PBD	32,254				
Time Period	01/02/2013-06/14/2016				
Total # of Data Points	55,278				

EXHIBIT 1: STATISTICAL DESCRIPTION

DEFINING UPPER AND LOWER SCORE THRESHOLDS

Using the same COMPASS 300 data points, we performed a refined 2.5% interval return distribution analysis on Compass and Technical Scores. The thresholds gravitated towards 0.175 and 0.9 for Compass Scores, and 0.225 for the downside portion of Technical Scores. There appears to be no statistically significant upside threshold for Technical Score. The returns displayed in the charts correspond to the 5-day optimal holding period's returns. The annualized average returns for stocks where Compass Scores are greater than 0.9 is -41.83%, while the annualized average returns for stocks whose Compass Scores are less than 0.175 is +84.67%. This observation indicates that extreme positive and negative score tail results may actually exhibit an inverted signal.

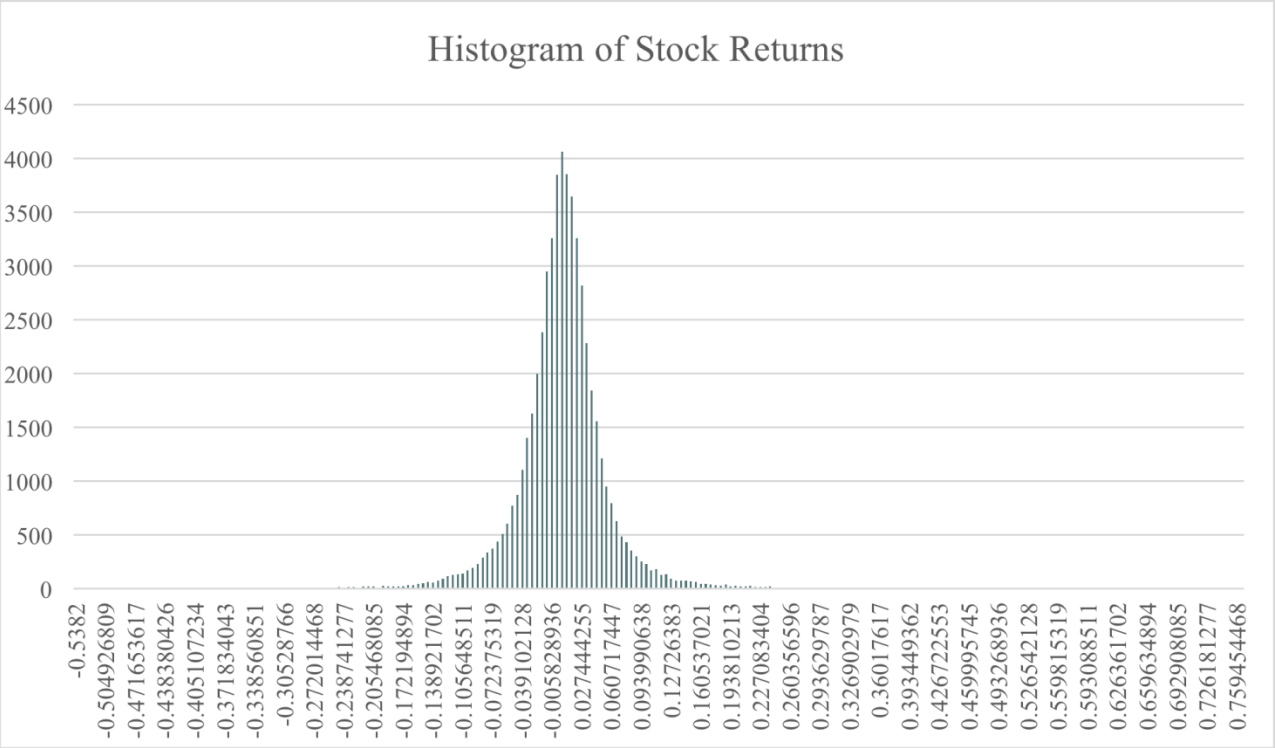


EXHIBIT 2: DISTRIBUTION OF STOCK RETURNS

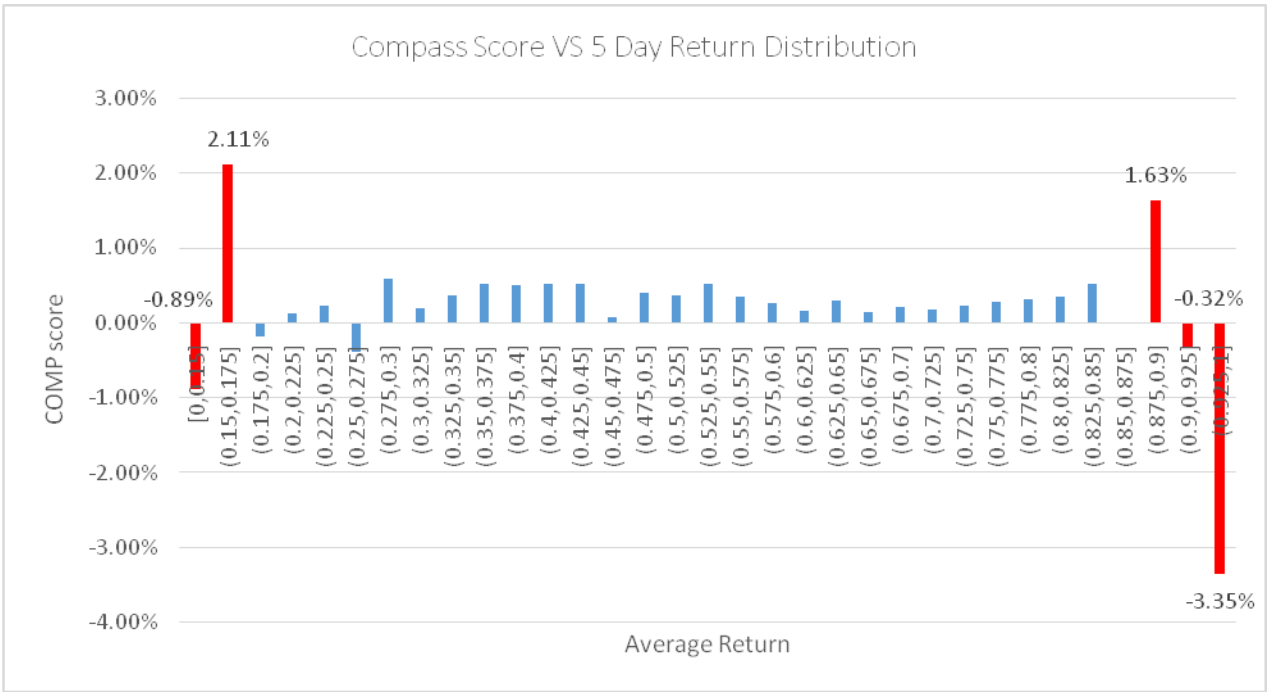


EXHIBIT 3: COMPASS SCORE VS RETURN ON DAY 5

OPTIMAL HOLDING PERIOD

This study considered holding periods from 1 day out to 20 days as 20 separate portfolios. We treated baskets for different weeks homogenously. For simplicity and comparison, we used the S&P 500 Index as our benchmark and utilized the Sharpe Ratio to represent the risk-adjusted return for each portfolio.

As seen in the graph below, we find that the optimal holding period is still the 5th trading day with a maximum Sharpe Ratio of 2.02 (We initiate longs and shorts at the closing prices on the report dates. The 1st holding day is defined as the next trading day, e.g. Jan. 2nd, 2013 initiation held until Jan. 8th, 2013). The average basket Sharpe Ratio is 1.96 compared to the S&P 500's 0.69. The optimal holding period of S&P 500 is the 16th trading day with the max Sharpe Ratio equal to 0.95.

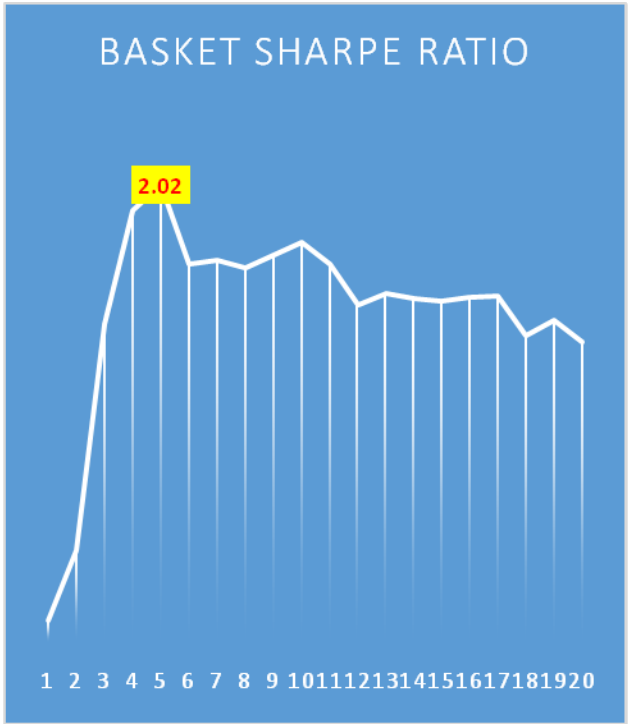


EXHIBIT 4: BASKET SHARPE RATIO

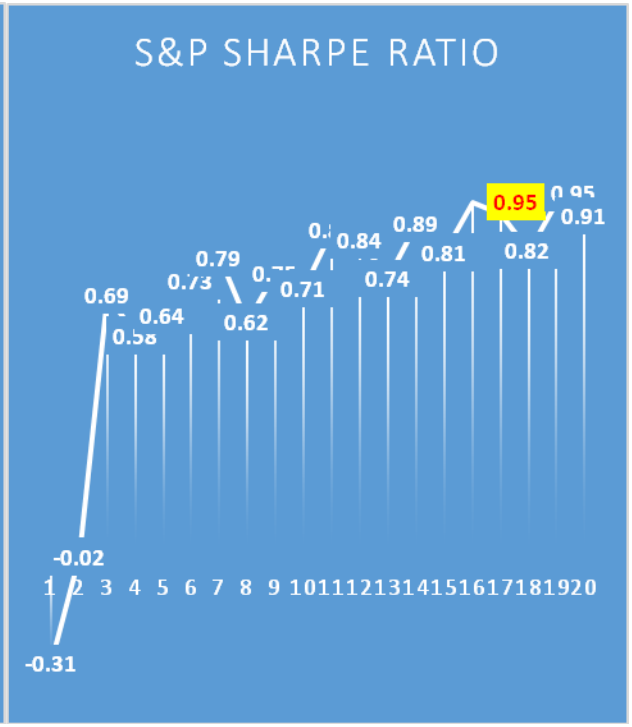


EXHIBIT 5: S&P SHARPE RATIO

REGRESSION RESULTS

Using the Compass 20/10 data subset from the Compass 300 for the same time period, we conducted regressions of the 5 day cumulative stock returns on the S&P 500 index cumulative returns, Compass, Technical and Fundamental scores. The results show that within the universe of data, the Compass, Technical and Fundamental Scores are all positively significant for 5-day holding periods. One interesting observation found that the parameter of the Compass Score is 0.0059897, which means if the Compass Score increases by 1 unit, the annualized return of our basket would significantly increase by +**35.19%.** Similarly if the Technical Score increases by 1 unit, the annualized return of our basket would increase less, but still by +**5.20%.**

These positive results give us statistical confidence that the Compass Score could be used to generate extra returns after considering the market trend (S&P 500). We could construct a weekly strategy trading the Compass 20/10 baskets and generate alpha on a desirable risk adjusted basis.

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Significance*
(Intercept)	-0.0035779	0.0007795	-4.59	4.44E-06	***
MAP$ADJ.COMPASS	0.0059897	0.001294	4.629	3.69E-06	***
S.P.500.cum.ret.on.day.5	1.231091	0.0101815	120.914	2.00E-16	***

EXHIBIT 6: 5D RETURN ~ COMPASS + S&P (ADJUSTED R^2 = 0.2093)

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Significance*
(Intercept)	-0.0048024	0.0010476	-4.584	4.57E-06	***
MAP$TECHNICAL	0.001007	1.29E-05	2.56E+00	0.01056	*
MAP$FUNDAMENTAL	0.0062502	0.001448	4.316	1.59E-05	***
S.P.500.cum.ret.on.day.5	1.2279407	0.0101612	120.846	2.00E-16	***

EXHIBIT 7: 5D RETURN ~ S&P + TECH + FUND (ADJUSTED R^2 = 0.2093)

*** 0.001 significance level

** 0.01 significance level

* 0.05 significance level

In the next section, we construct a 100% rollover strategy to apply our Compass 20/10 strategy into real world application.

STUDY THREE: COMPASS 20/10 TRADING STRATEGY SCORE WITH OPTIMAL THRESHOLDS

NEW BASKET CONSTRUCTION METHODOLOGY

For this portion of the study, we employ a 100% rollover strategy for new baskets constructed from the same Compass 300 dataset of more than 55,000 stocks. We excluded stocks whose Compass Scores are above 90 or below 17.5 as defined by the upper and lower thresholds above. The investment horizon for this test strategy also lasts 3.5 years, from January 2nd, 2013 to June 14th, 2016. Displayed in the graph below, we find that the 3.5 year net return of our rotating basket investment strategy yields 91.18% compared to 77.59% for the unfiltered Compass 20/10 (no thresholds employed), significantly outperforming our benchmark S&P 500 return of 41.91% for the same time period. Compared with the original Compass 20/10 100% rollover strategy, we see the average weekly return on baskets increases from 0.36% to 0.40% (+4bps), and the standard deviation increases from 1.43% to 1.45% (+2bps). The annualized Sharpe Ratio increases from 1.79 to 1.96 (+0.17). We compounded our principle and return every week until June 14th, 2016 at 4:00pm.

As a side note, the new 5-day holding period average Sharpe ratio is 2.02 for our strategy employing thresholds, compared to the original average 5-day holding period Sharpe ratio 1.71 without thresholds.

100% Rollover	New Basket	S&P
Mean	**0.40%**	**0.21%**
Stdev	**1.45%**	**1.77%**
Sharpe	**0.28**	**0.12**
Annualized Sharpe	**1.96**	**0.84**
Total Net Return	**91.18%**	**41.91%**
Maximum Drawdown	**14.35%** Peak on 7/28/2015 Trough on 9/29/2015	**17.62%**
Transaction cost (20% repeat stocks)	**$.0025 per share**	
Borrow rate	**1.25%**	
execution slippage	**0.75%**	

EXHIBIT 8: RETURN DESCRIPTION

We used the following assumptions:

- Portfolio size of $1,000,000
- Each stock included in our basket is equally dollar weighted ($33,333 exposure on each stock) at week 1 then compounded forward
- Using the average stock price of $30, each position is hypothetically 1,111 shares
- 20% of our basket's stocks repeat from prior week's basket.
- Transaction fees calculated as .0025*30*1111*52*.8=$3,466.32
- Annual transaction fee in percentage is 0.346%

DATA & METHODOLOGY

1. Cumulative basket returns and S&P 500 returns calculated on Aug. 17th, 2016.
2. Construct new Compass 20/10 baskets
    - Based on the Compass 300 dataset, we constructed new Compass 20/10 baskets, excluding stocks where Compass Scores are above 90 or below 17.5. The investment horizon lasts 3.5 years, from Jan. 2nd, 2013 to Jun. 14th, 2016.
3. Eliminate events on company M&A activities:
    - Replace companies having M&A targets during the report period with new tickers of the next highest scores.
4. Basket returns for 100% rollover strategy calculated as:
    - Invest $1 on Jan. 2nd, 2013 at 4:00 pm in our newest basket; roll over each investment in the new basket every week, at the closing prices on the report dates. Compound our principle and return every week until June 14th, 2016 at 4:00 pm.
5. Passive investment in S&P 500:
    - Invest $1 on Jan. 2nd, 2013 at 4:00 pm in S&P 500, hold our position for 3.5 years and close our position on Jun. 14th, 2016 at 4:00 pm.

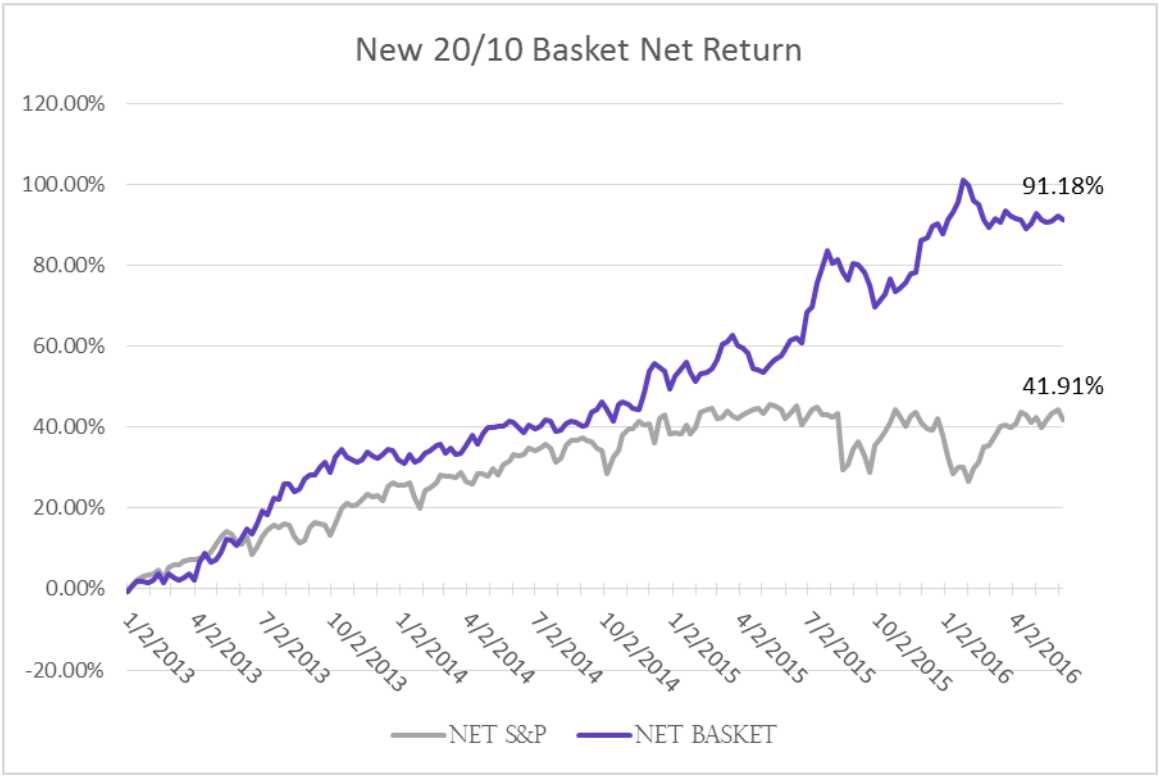


EXHIBIT 9: NEW 20/10 BASKET NET RETURN

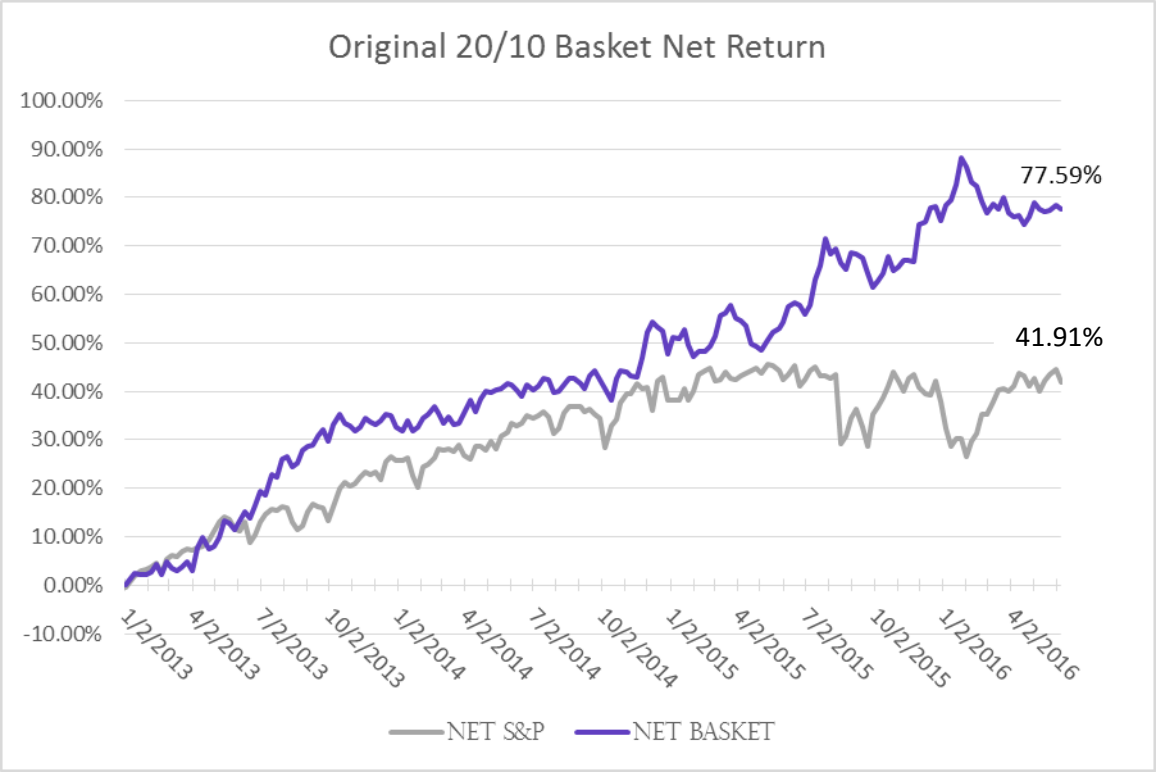


EXHIBIT 10: ORIGINAL 20/10 BASKET NET RETURN

CONCLUSION

In conclusion, we tested for the efficacy of using our Compass Score as a trade indicator using a dataset spanning 3.5 years. We found statistical significance in the effectiveness of the Compass Score. Constructing weekly baskets of 20 longs and 10 shorts, we found 5 days to be our optimal holding period. The shorter-term period for this strategy exhibits characteristics that reduce positon risk and generate considerable risk-adjusted return. We sought to enhance this strategy by defining upper and lower thresholds for the Compass Scores and optimal holding periods.

Future studies may focus on different methodologies for basket construction utilizing an oscillating strategy of numbers of longs and shorts dictated by the overall market performance. We may also examine reliability of scores on a sector or industry group level. More analysis may also be performed on the intrinsic value of the PBO/PBD designation indicating unusual institutional activity.

Numerical patterns and symmetry exist all over nature, art, music, and virtually everywhere you look. When we apply a quantitative method to analyzing technical and fundamental data of stocks, patterns can emerge over larger data sets. These patterns can potentially be exploited by creating strategies to identify opportunities for alpha. Bach coded numerical puzzles in his music that computers are now analyzing. We at MAP seek to find hidden relationships and patterns in the equity markets. With these studies of a model trading strategy, we can illustrate that they do exist and that there are statistically significant ways to identify them, quantify them, and potentially profit from them.