



# Extracting Performance from Return Dispersion in Equity Markets

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## Summary

Equity markets exhibit significant return dispersion in all phases and Trendrating's assertion is that this cross-sectional dispersion in returns makes a compelling case in support of active management as the opportunity to outperform underlying benchmarks is real.

Using Trendrating's **Trend Capture Model**, an investment strategy on a universe of **Developed Europe**<sup>1</sup> large capitalisation stocks delivered an annualised return<sup>2</sup>, net of transaction costs, of **4.37%** versus an annualised return of **1.38%** for the *Stoxx Europe 600 price index*. An investment strategy in a universe of **USA**<sup>3</sup> large capitalisation stocks delivered an annualised return, net of transaction costs, of **8.44%** versus an annualised return of **6.26%** for the *S&P 500 price index*. The Developed Europe strategy produced an annualised excess net return of **2.99%** and the USA strategy produced an annualised excess net return of **2.18%**.

Prior to developing the investment strategies, we validated the Trend Capture Model's efficacy as a ranking signal via a set of signal backtests on four investment universes, *Developed Europe*<sup>4</sup>, *Developed World*<sup>5</sup>, *USA*<sup>6</sup>, and *Emerging World*<sup>7</sup>. The equally weighted net return for the top & bottom quantiles for Developed Europe was **8.11%** & **1.56%** respectively, whilst the respective figures for Developed World were **11.91%** & **3.30%**, **11.37%** & **5.46%** for USA, & **10.03%** & **5.49%** for Emerging World.

**Trendrating** offers a robust framework for extracting performance from the inherent return dispersion that exists in equity markets by providing a clear mechanism for security selection for a **long-only** strategy or for a **long-short** strategy.

## 1 Introduction

Trendrating recently published a [paper](#) that illustrates the return dispersion inherent in equity markets across different market conditions. In most periods, the majority of the aggregate return contribution is concentrated in circa 20% of the constituents. The challenge for investment professionals is to be able to consistently identify this group of outperforming stocks on an ex-ante basis in order to profit from this inherent dispersion in cross-sectional returns.

The backtest results in the following sections prove that Trendrating's **Trend Capture Model** is very robust in identifying ex-ante, the group of securities that are most likely to be the outperformers in any universe. The top quantile of the universe ranked by our **Smart Momentum** outperforms the universe and the remainder universe on a consistent basis, and we believe that investors can improve returns by applying our trend capture model in their investment process to validate the inherent price trends of securities within their investment universe. We provide validation of our claim through two strategy backtests in which simulate over a 12-year period, an investment strategy with real world constraints.

The [CBOE](#) has constructed implied correlation indexes that use forward looking option pricing between an index and its constituents to derive the level of cross-sectional correlation that exists in the market. [EUREX](#) published a white paper that explores the implied correlations between the Euro Stoxx 50 index and its constituents.

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<sup>1</sup>2006-06-05 to 2018-07-02

<sup>2</sup>All return & risk metrics in this study are based on price return

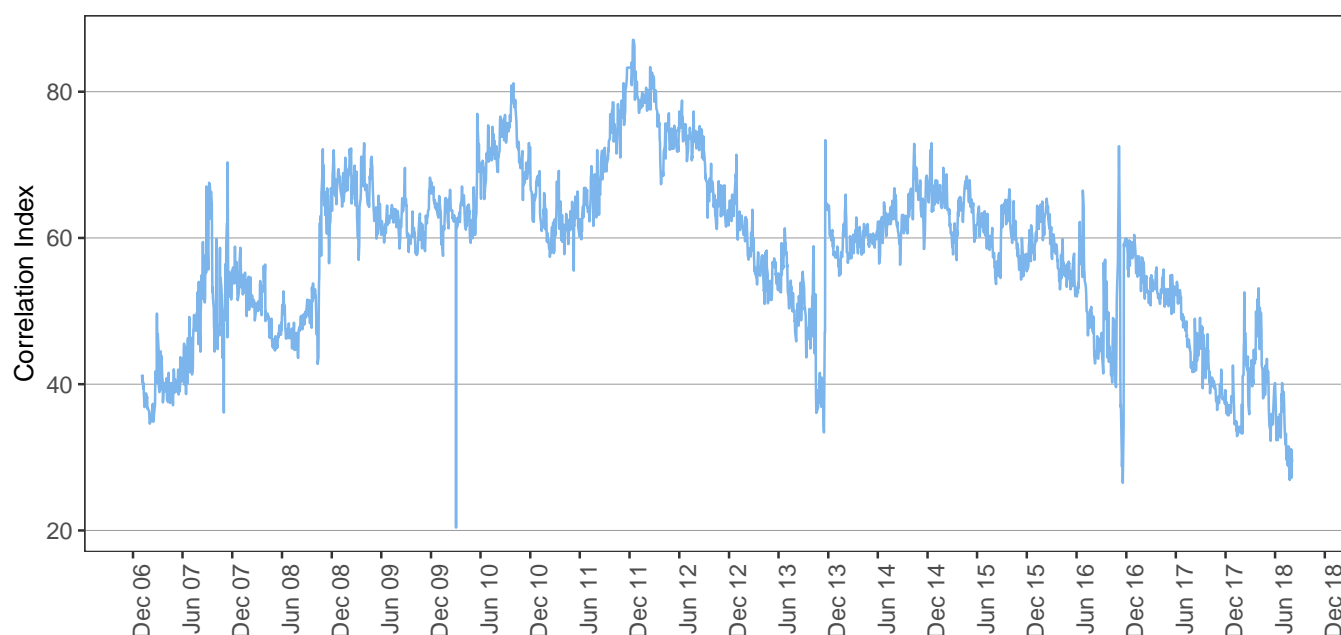
<sup>3</sup>2006-10-02 to 2018-07-02

<sup>4</sup>1997-02-28 to 2018-05-31

<sup>5</sup>1997-02-28 to 2018-05-31

<sup>6</sup>1997-02-28 to 2018-05-31

<sup>7</sup>2005-02-28 to 2018-05-31

**Figure 1: CBOE: S&P 500 Implied Cross-Sectional Correlation**

It is clear from **Figure 1** & **Figure 2** that correlation levels were at their highest in the years 2011-12, and these were extremely difficult periods for stock selection. During periods of heightened cross-sectional correlation, stocks start moving together and these periods are generally challenging for stock selection processes. However, the cross-sectional correlation does not stay at pronounced levels, rather it falls back to its long-term mean level, which validates our thesis that return dispersion exists in most periods, and armed with appropriate tools, market participants possess opportunities to outperform their benchmarks.

**Figure 2: EUREX - Euro Stoxx 50 Implied Cross-Sectional Correlation**

## 2 Backtest Framework

### 2.1 Signal Backtest

The universe of securities selected for the signal backtests uses a screening criteria to identify a set of stocks that historically will be very similar to an All Country World Index, which is the investment universe for a majority of investment managers. We then carve out four universes from this set of stocks namely, Developed World, Developed Europe, USA, and Emerging World. The analysis frequency for the signal backtests is monthly; at the beginning of each month, we rank the respective investment universe using the Smart Momentum<sup>8</sup> and Retracement<sup>9</sup> analytics generated by the Trendrating model, divide the universe into quantiles, and measure the performance of each quantile over the subsequent month. The specific parameters of the backtest are as follows:

- Universe: Developed World, Developed Europe, USA, & Emerging World
- Remove very tiny stocks that do not pass a liquidity screen, the effect of this is the removal on average of a negligible weight of 0.50% from the AC World universe
- Segment the universe into quantiles<sup>10</sup> using the Smart Momentum
- Flag stocks in each period as outliers based on two conditions:
  - Smart Momentum score for **C**'s below -1.90 and Smart Momentum score for **D**'s below -2.90
  - Stocks with  $\text{abs}(\text{Retracement})^{11} > 10\%$
- Set the weight in quantile and weight in remainder<sup>12</sup> universe to zero for all stocks flagged as outliers; the weight in universe remains as is because whilst outliers are not part of the strategy, they continue to be part of the universe
- Weighting scheme: Equal weight

### 2.2 Strategy Backtest

The universe of securities for the two strategy backtests are the iShares ETFs IVV<sup>13</sup> and ESXA<sup>14</sup>. The analysis frequency for the strategy backtest is weekly; in the first period of the backtest, the portfolio goes from cash to full investment based on available liquidity at the stock level, and in each subsequent period, the prior period portfolio is monitored for specific criteria with rebalancing triggered only when all criteria is fulfilled. This ensures against unnecessary trading and allows the signal to run its course in extracting performance. The number of securities that the strategy holds varies accordingly to market conditions and our construct is a conservative strategy that targets an annualised excess return of circa **2%** that was successfully achieved. It is entirely possible to construct a more aggressive strategy if the return preference is higher. The specific parameters of the backtest are as follows:

- Universe: IVV & ESXA

<sup>8</sup>The primary ranking analytic from the Trendrating Trend Capture Model that provides a measure of the direction and magnitude of each security's price trend and is a powerful ranking metric

<sup>9</sup>Provides a measure of the quality of a security's trend and can be used as an early warning signal to implement performance risk management. It measures the distance in performance terms from the peak (**A** & **B**) or trough (**C** & **D**)

<sup>10</sup>Deciles for Developed World and Quintiles for Developed Europe, USA, & Emerging World

<sup>11</sup>Absolute value of Retracement

<sup>12</sup>Universe without stocks in Quantile 1

<sup>13</sup>S&P 500 Tracker

<sup>14</sup>Stoxx Europe Tracker



- Flag stocks in each period as outliers based on two conditions:
  - Smart Momentum score for **C**'s below -1.90 and Smart Momentum score for **D**'s below -2.90
  - Stocks with  $\text{abs}(\text{Retracement}) > 10\%$
- Objective: Maximise Smart Momentum subject to the following constraints
- Constraints:
  - Maximum number of stocks on rebalance: 60
  - Maximum number of stocks between rebalance: 70
  - Maximum position weight on rebalance: 7%
  - Maximum position weight between rebalance: 10%
  - Maximum % of ADV<sup>15</sup> allowed to trade: 10
  - Weight in outliers: 0%
- Portfolio Rebalancing Rules:
  - The position size for any given stock can only be decreased or increased by a maximum of 10% of ADV available for the given stock
  - A stock can enter the portfolio at a maximum position size of 7% but an existing position can grow to 10% before it is trimmed back to 7% if it is still a valid position
  - The maximum number of stocks held in the portfolio at rebalance is 60 but the number of positions can grow to 70 between rebalancings before it is trimmed back to 60
  - No rebalancing effected if any of the conditions are met:
    - \* If the current analysis date is within 14 calendar days of a large rebalancing<sup>16</sup>, then no rebalancing is implemented
    - \* If the total weight in securities is below 15% where either the rating is **C** or **D** or is flagged as an outlier
    - \* If the aggregated Smart Momentum of the initial portfolio is  $\geq 90\%$  \* Smart Momentum of the stock in the 90th percentile of Smart Momentum of the universe on analysis date
  - Transaction cost assumption of 0.15% for each leg of a transaction

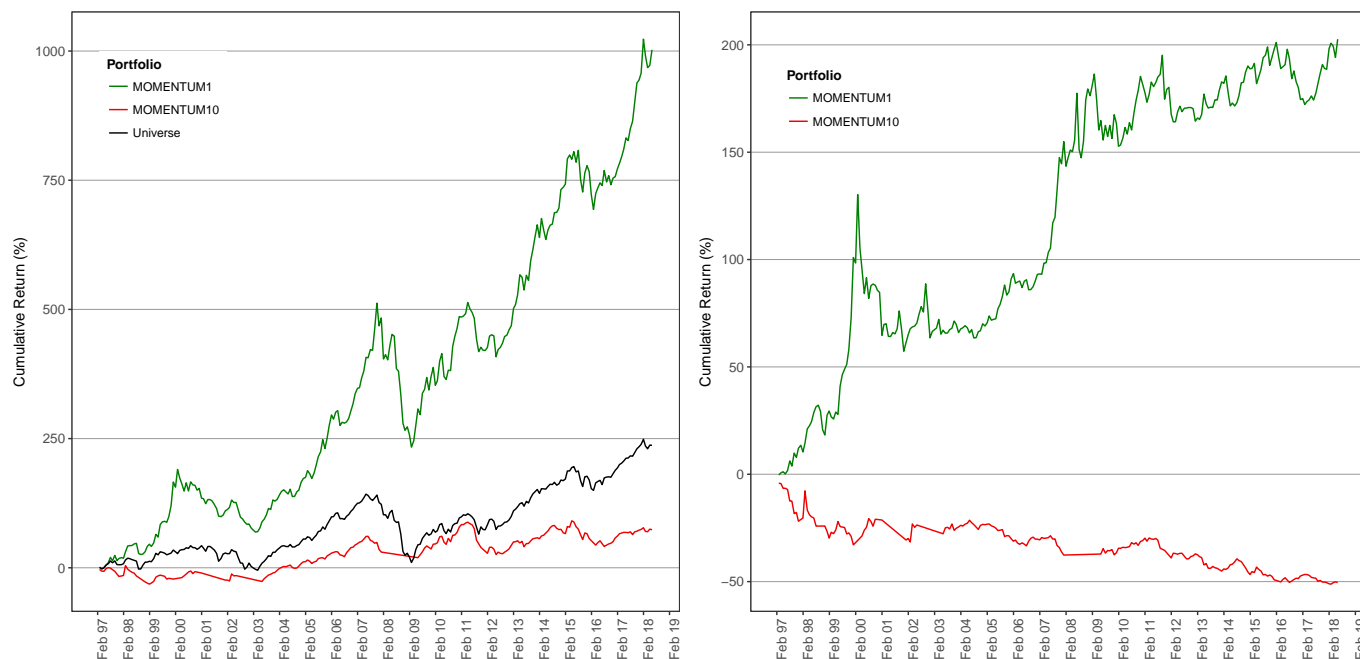
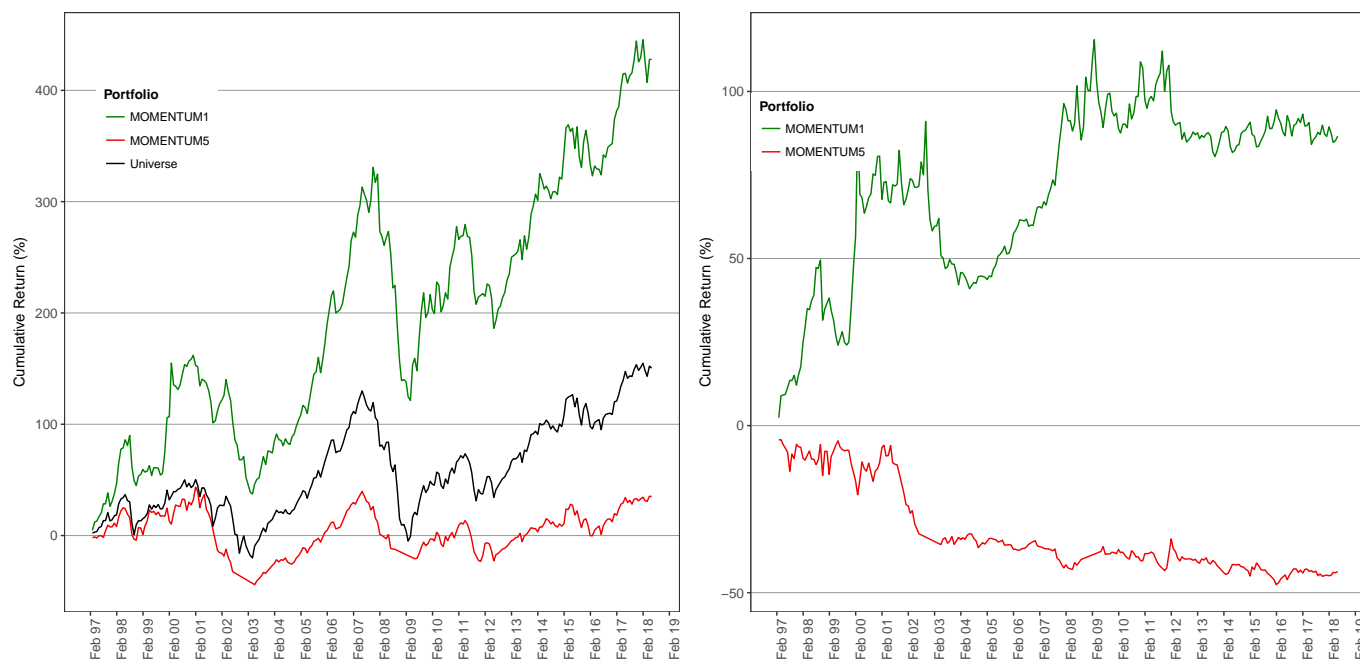
## 3 Backtest Results

### 3.1 Signal Backtest

**Figure 3a** plots the cumulative absolute return of the top quantile, bottom quantile, & for the universe for Developed World, whilst **Figure 3b** plots the cumulative relative return for the top and bottom quantiles of the Developed World universe. It is quite evident that the top quantile significantly outperforms the bottom quantile and the universe in absolute terms, and also delivers a strongly positive excess return relative to the bottom quantile. The Trendrating model's primary objective is to help identify these two extreme groups in an investment universe on an ex-ante basis, so that investment processes can focus their stock selection efforts within these two quantiles.

<sup>15</sup> 60-day average daily volume

<sup>16</sup>  $\geq 20\%$

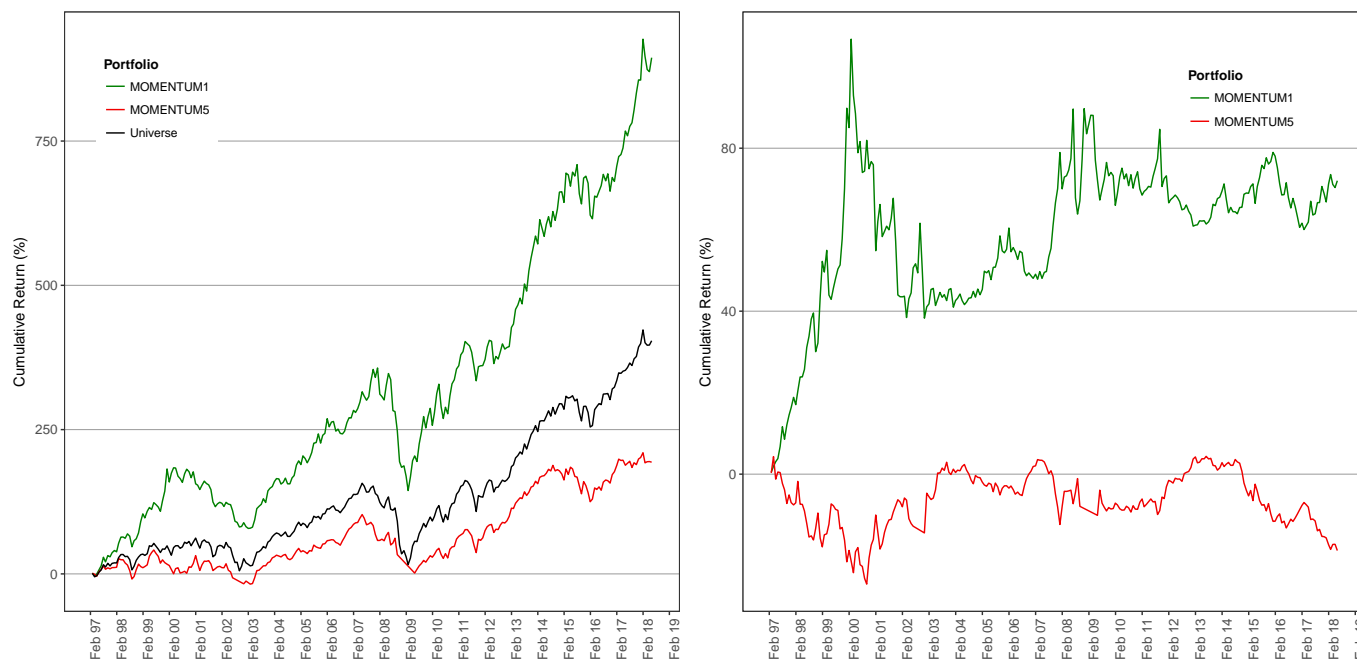
**Figure 3: Developed World: Cumulative Return****(a) Absolute Return****(b) Relative Return****Figure 4: Developed Europe: Cumulative Return****(a) Absolute Return****(b) Relative Return**

**Figures 4a & 4b** plot the cumulative absolute return and the cumulative relative return for the component portfolios in the Developed Europe universe. The story is similar to that of the Developed World universe with top quantile demonstrating an absolute return superior to that of the bottom quantile and to that of the universe, as well as strongly positive relative return whilst the bottom quantile significantly underperforms the universe.

Figure 5: USA: Cumulative Return

(a) Absolute Return

(b) Relative Return



**Figures 5a & 5b** plot the cumulative absolute return and the cumulative relative return for the component portfolios in the USA universe. The return pattern is similar to that for Developed World and for Developed Europe, providing efficacy that the Trend Capture model has robust discriminatory power across different investment universes and can provide vital information pertinent to security selection to an investment process. As with any model, there will be periods that are challenging, and in our case these are periods where trends are unclear due to extraneous factors, but the model reacts quickly as soon as clarity returns and begins to deliver its long-term outperformance.

The following sub-sections present results from the signal backtest for Developed World, Developed Europe, & USA universes, with results for the Emerging World universe available in the Appendix. The signal backtest that we have implemented offers complete transparency and we can make available on request, detailed quantile holdings for each backtest period.

### 3.1.1 Absolute Return Summary

**Tables 1, 2, & 3** present the absolute return statistics for each investment universe<sup>17</sup>. The summary statistic contain performance and risk metrics for the Universe<sup>18</sup>, Remainder Universe<sup>19</sup>, T-B Spread<sup>20</sup>, & for each Quantile<sup>21</sup>.

<sup>17</sup>Developed World, Developed Europe, and & USA; results for Emerging Markets are in the Appendix

<sup>18</sup>equally weighted return including outliers

<sup>19</sup>equally weighted return excluding outliers

<sup>20</sup>Spread between top quantile return & bottom quantile return excluding outliers

<sup>21</sup>equally weighted return excluding outliers



**Table 1: Absolute Return Summary: Developed World**

Portfolio	Annualised Return (%)	Annualised Volatility (%)	Information Ratio	Average Return (%)	Hit Rate (%)	Max Draw-down (%)	Avg Draw-down (%)	Annual Turnover (%)
Universe	5.79	14.57	0.40	0.56	62	-55	-8	
Remainder Universe	4.99	12.53	0.40	0.47	63	-49	-8	
T-B Spread	7.56	18.47	0.41	0.75	56	-50	-12	
Decile1	11.91	16.15	0.74	1.05	63	-46	-8	121
Decile2	8.48	12.94	0.66	0.75	61	-42	-6	229
Decile3	6.28	12.68	0.50	0.58	65	-49	-8	309
Decile4	5.57	12.67	0.44	0.52	61	-50	-8	348
Decile5	5.94	12.81	0.46	0.55	64	-47	-7	387
Decile6	4.24	12.98	0.33	0.42	61	-46	-9	396
Decile7	4.23	14.00	0.30	0.43	58	-46	-9	399
Decile8	4.54	14.70	0.31	0.46	61	-45	-7	394
Decile9	5.38	15.71	0.34	0.54	60	-54	-10	352
Decile10	3.30	16.24	0.20	0.38	59	-34	-15	284

The top quantile in each universe produces an absolute return that is superior to that of every other quantile, the entire universe, as well as to the remained universe. The T-B Spread is strongly positive highlighting the efficacy of the Trend Capture model for long-short investment strategies. The superior period average return of the top quantile highlights the consistency with which it outperforms the remainder universe making a strong case for a hedged strategy where one is long the top quantile and short the remainder universe.

The top quantile also produces the best risk-adjusted return as evidenced by the Information Ratio (IR)<sup>22</sup>, shallower drawdowns, & lower turnover providing efficacy of the Smart Momentum as a robust ranking metric on which to develop an investment strategy.

<sup>22</sup>Return/Volatility

**Table 2: Absolute Return Summary: Developed Europe**

Portfolio	Annualised Return (%)	Annualised Volatility (%)	Information Ratio	Average Return (%)	Hit Rate (%)	Max Draw-down (%)	Avg Draw-down (%)	Annual Turnover (%)
Universe	4.32	16.64	0.26	0.47	60	-59	-13	
Remainder Universe	3.37	14.74	0.23	0.37	61	-55	-14	
T-B Spread	4.92	17.75	0.28	0.53	57	-37	-17	
Quintile1	8.11	16.60	0.49	0.77	59	-49	-13	120
Quintile2	5.20	14.36	0.36	0.51	64	-52	-12	220
Quintile3	4.38	15.07	0.29	0.45	61	-52	-11	272
Quintile4	2.73	16.68	0.16	0.35	61	-53	-11	278
Quintile5	1.56	17.52	0.09	0.26	56	-61	-14	224

**Table 3: Absolute Return Summary: USA**

Portfolio	Annualised Return (%)	Annualised Volatility (%)	Information Ratio	Average Return (%)	Hit Rate (%)	Max Draw-down (%)	Avg Draw-down (%)	Annual Turnover (%)
Universe	7.89	16.60	0.48	0.75	61	-55	-7	
Remainder Universe	6.28	14.55	0.43	0.60	63	-49	-8	
T-B Spread	3.90	17.62	0.22	0.45	53	-47	-10	
Quintile1	11.37	15.87	0.72	1.01	59	-46	-6	106
Quintile2	6.39	13.79	0.46	0.60	65	-46	-8	207
Quintile3	6.73	14.75	0.46	0.64	63	-41	-8	272
Quintile4	7.93	15.45	0.51	0.74	60	-34	-7	282
Quintile5	5.46	18.51	0.30	0.59	59	-50	-12	235

### 3.1.2 Relative Return Summary

Tables 4a, 4b, & 5 present the relative return statistics for each quantile in the various investment universes<sup>23</sup>. The annualised relative return is the annualised period spread return between each quantile and the universe.

**Table 4: Relative Return Summary: Developed Europe & USA**

Portfolio	Ann Ret (%)	Ann Vol (%)	IR	Avg Ret (%)	Hit Rate (%)	Portfolio	Ann Ret (%)	Ann Vol (%)	IR	Avg Ret (%)	Hit Rate (%)
Quintile1	2.97	10.36	0.29	0.29	58	Quintile1	2.58	10.20	0.25	0.26	62
Quintile2	0.16	7.01	0.02	0.03	55	Quintile2	-2.08	7.43	-0.28	-0.15	50
Quintile3	-0.52	6.99	-0.07	-0.02	51	Quintile3	-1.67	6.55	-0.26	-0.12	46
Quintile4	-1.22	5.64	-0.22	-0.09	47	Quintile4	-0.41	5.55	-0.07	-0.02	51
Quintile5	-2.90	8.64	-0.34	-0.21	43	Quintile5	-1.02	8.58	-0.12	-0.06	47

**(a) Developed Europe**

**(b) USA**

The top quantile in each universe produces a strongly positive excess return underscoring its potential at identifying on an ex-ante basis, the set of securities mostly likely to deliver superior performance.

The top quantile delivers positive period average excess return with a high hit rate<sup>24</sup>, which provides a measure of consistency with which the securities selected in the top quantile deliver returns that outperform the universe.

The annualised volatility of the relative returns is essentially the tracking error of each quantile relative to the universe, and both the top and bottom quantiles display the same level of tracking error.

This means that both quantiles are sufficiently active in their composition and hence quite different from the overall universe. Selecting securities<sup>25</sup> from these quantiles will ensure an investment strategy that is active and one that has a high probability of delivering strong outperformance.

**Table 5: Relative Return Summary: Developed World**

Portfolio	Annualised Return (%)	Annualised Volatility (%)	Information Ratio	Average Return (%)	Hit Rate (%)
Decile1	5.33	11.00	0.48	0.48	64
Decile2	1.90	8.11	0.23	0.18	55
Decile3	-0.12	6.92	-0.02	0.01	55
Decile4	-0.71	5.85	-0.12	-0.04	52
Decile5	-0.35	6.04	-0.06	-0.01	52
Decile6	-2.22	5.85	-0.38	-0.17	43
Decile7	-1.67	4.74	-0.35	-0.13	45
Decile8	-1.32	5.79	-0.23	-0.10	48
Decile9	-0.11	6.61	-0.02	0.01	52
Decile10	-4.04	9.89	-0.41	-0.30	45

<sup>23</sup>Developed World, Developed Europe, and & USA; results for Emerging Markets are in the Appendix

<sup>24</sup>% of periods in which the quantile excess return is positive

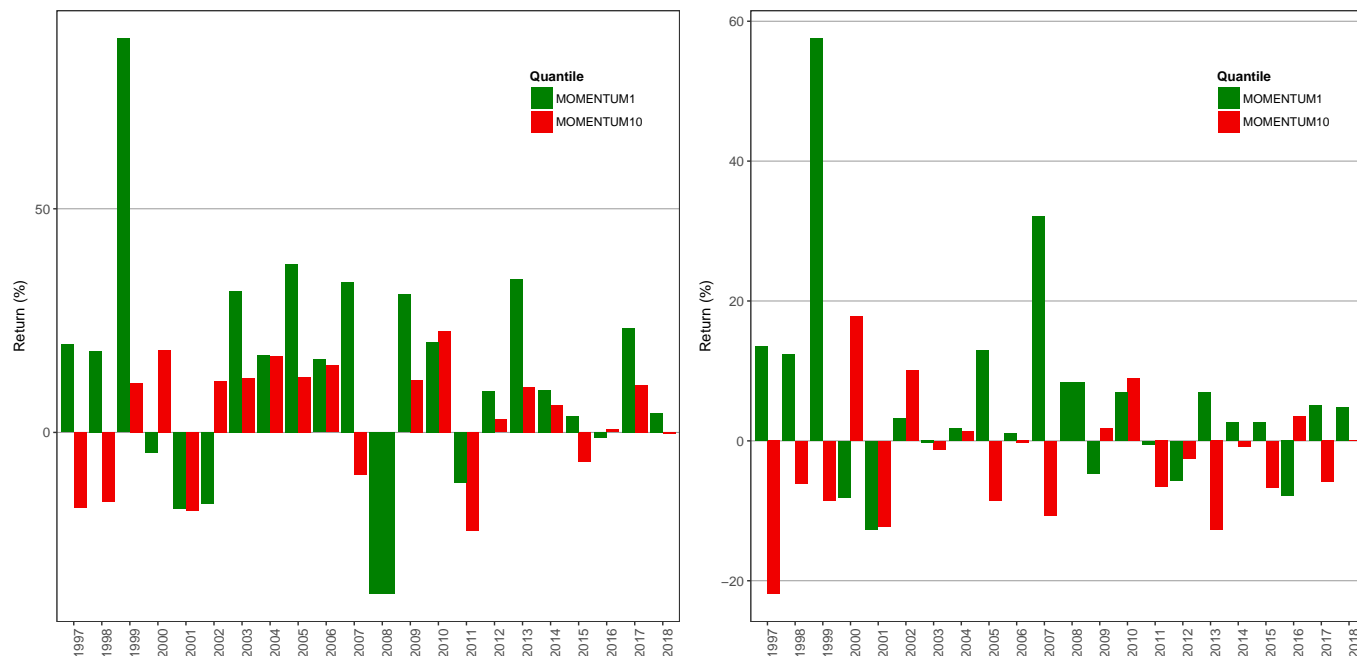
<sup>25</sup>long book from the top quantile & short book, if applicable, from the bottom quantile

### 3.1.3 Annual Return Summary

**Figure 6: Developed World: Annual Return**

**(a) Absolute Return**

**(b) Relative Return**



**Figures 6a & 6b** plot the annual absolute return and annual relative return respectively for the top and bottom quantiles of the Developed World universe. The top quantile consistently outperforms the bottom quantile in majority of the years, once again underscoring the robust efficacy with which the Trend Capture Model is able to identify on an ex-ante basis, the groups of securities mostly likely to outperform and underperform.

It is interesting to note that there is no performance bar for the bottom quantile in the year 2008, and this is because our outlier identification rules successfully labelled all securities in the bottom quantile as outliers, and hence no short position was taken in any of these securities. 2008 was a challenging year for the model but the ability to accurately identify outliers ex-ante helps limit the damage that they can cause because they often tend to behave erratically and more so in periods of market shocks.

**Figures 7a & 7b** plot the annual absolute return and annual relative return respectively for the top and bottom quantiles of the Developed Europe universe. Once again, the top quantile consistently outperforms the bottom quantile on both an absolute and relative return basis, whilst the top quantile delivering positive excess returns in most years and the bottom quantile delivering negative excess returns in most years.

In the case of the Developed Europe universe, we do have a performance bar for the bottom quantile in the year 2008 because there were securities in the bottom quantile that were not identified as outliers, and as mentioned before, this was a very challenging market period. It also underscores the point that it is always helpful to have a larger investment universe to improve the opportunity set available; this is implied in the higher magnitude of returns available in the Developed World universe relative to the narrower universes.

Figure 7: Developed Europe: Annual Return

(a) Absolute Return

(b) Relative Return

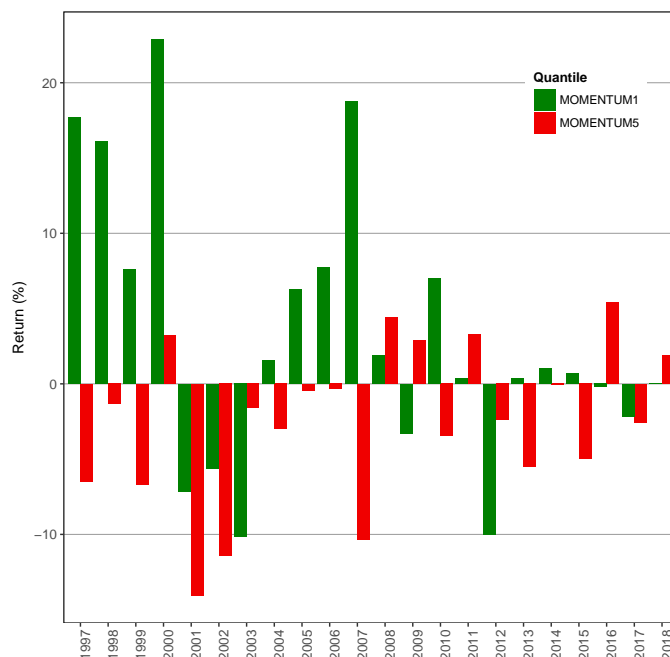
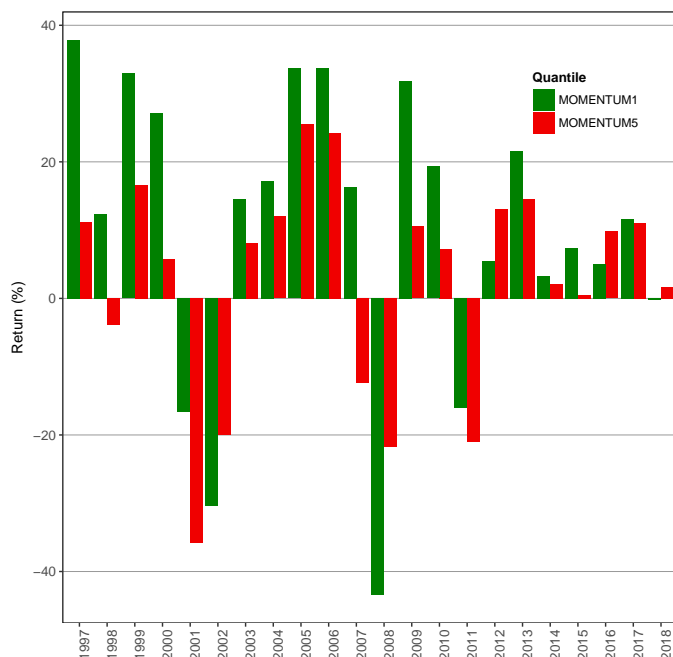
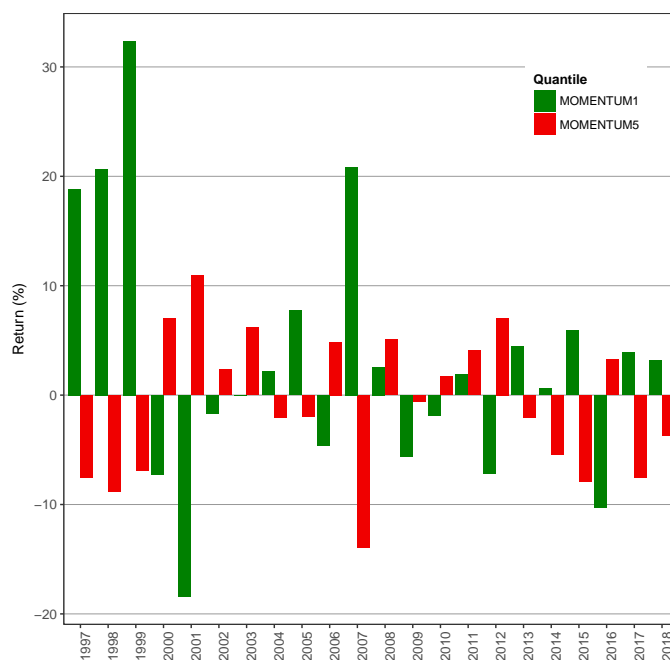
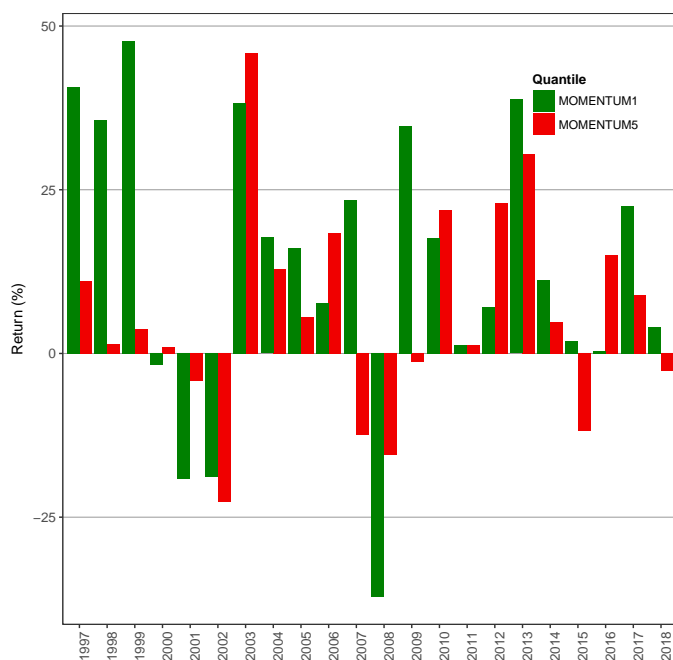


Figure 8: USA: Annual Return

(a) Absolute Return

(b) Relative Return

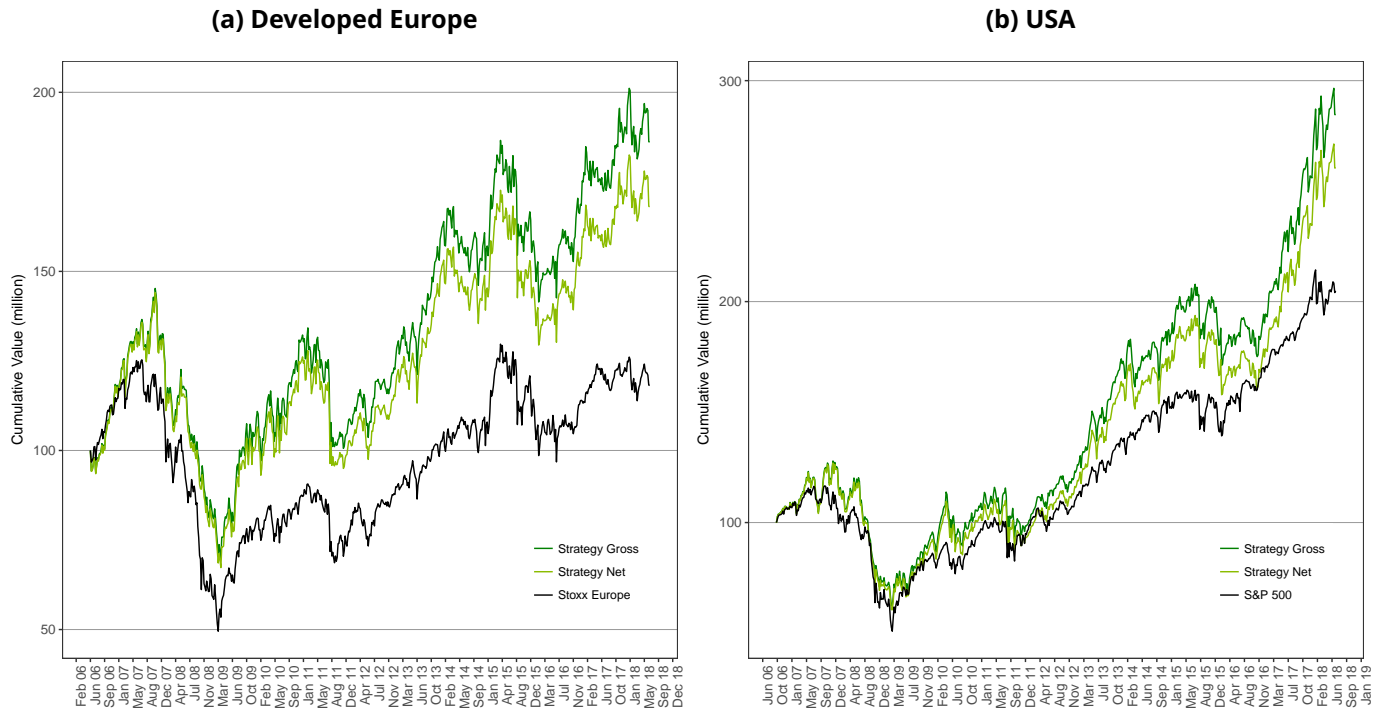


**Figures 8a & 8b** plot the annual absolute return and annual relative return respectively for the top and bottom quantiles of the USA universe. An interesting aspect of the Trend Capture model is that in challenging periods, the top quantile keeps pace with the universe return, but delivers significant outperformance in periods where fewer extraneous shocks are permeating through the equity markets. The shallower drawdowns on offer from securities in the top quantile ensures that when upward market trends resume, an investment strategy begins its upwards trajectory from a higher point and moves forward at a steeper slope.

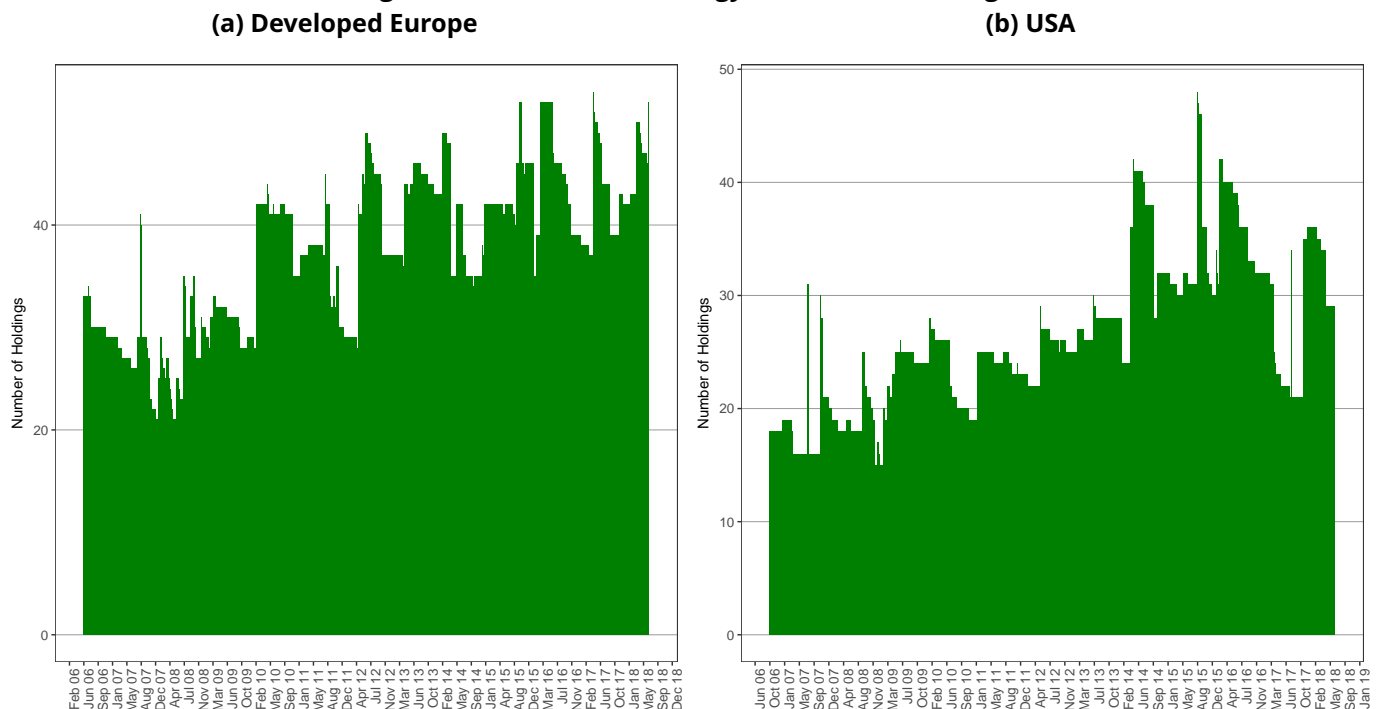
### 3.2 Strategy Backtest

**Figure 9a** plots the cumulative absolute value for the various components of the Developed Europe strategy. Both the gross value and net return value are comfortably above that of the Stoxx Europe index apart from the first couple of rebalancing periods. The minimal gap between the gross value and net value lines implies immaterial loss of return due to transaction costs, which means that portfolio turnover is not an issue. **Figure 9b** plots the cumulative absolute value for the various components of the USA strategy.

**Figure 9: Investment Strategy: Cumulative value**



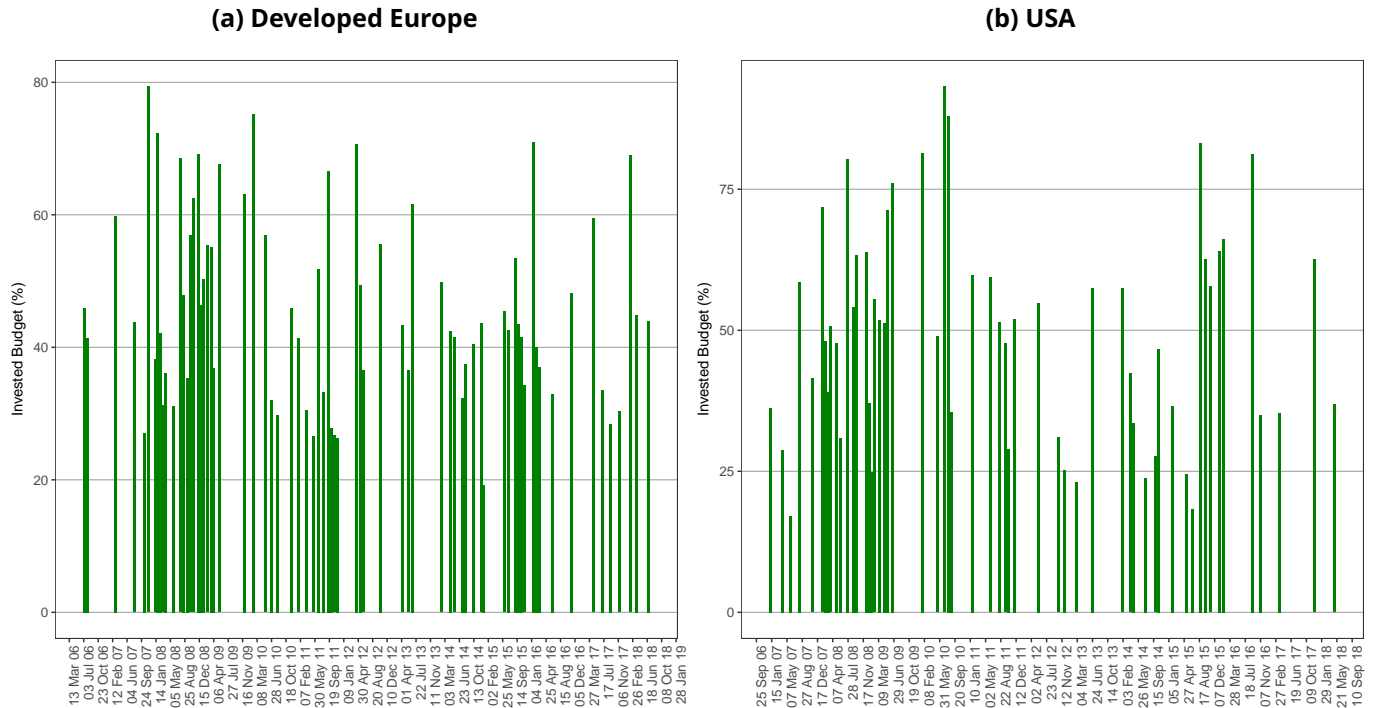
**Figure 10: Investment Strategy: Number of Holdings**



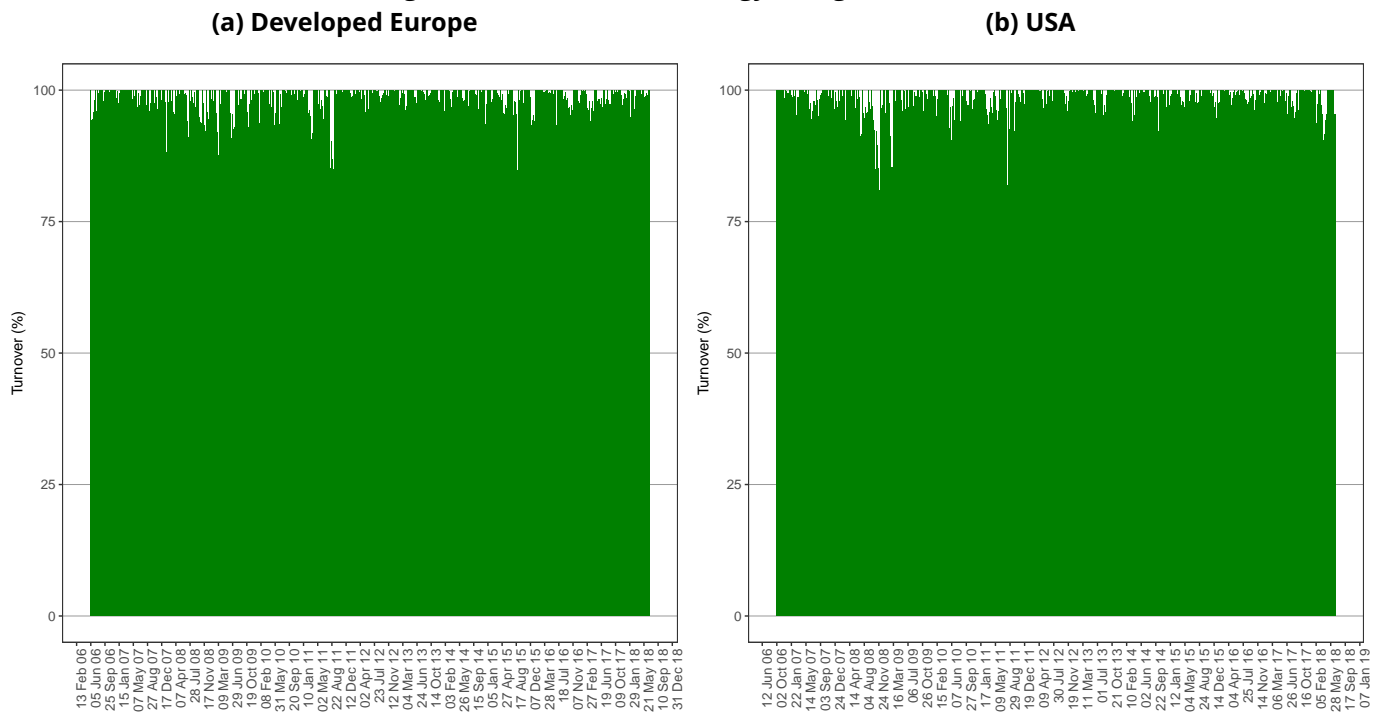


**Figures 10a & Figures 10b** show that the Developed Europe strategy on average held a higher number of securities than the USA strategy and this is not surprising as the US market has shown a higher degree of cross-sectional correlation, which means that portfolios have had to be more concentrated in order to be sufficiently active. **Figures 11a & Figures 11b** underscore the point that the portfolio construction rules invoke rebalancing only when the portfolio structure no longer conforms to the desired parameters. Both strategies invested a very large proportion of their respective budgets during the entire analysis.

**Figure 11: Investment Strategy: Period Turnover**



**Figure 12: Investment Strategy: Budget Invested**



### 3.2.1 Strategy Return Summary

**Table 6** presents the summary metrics for the performance of the Developed Europe strategy. The difference between the annualised gross return and the annualised net return represents the return lost due to transaction cost, which is **0.88%** per annum, implying an acceptable level of turnover. The annualised excess return delivered by the strategy is **2.99%**, a very strong performance given that the strategy delivers a superior return with a similar volatility to that of the benchmark. The strategy's maximum drawdown is considerably shallower and it tends to favour a portfolio composition of lower beta stocks that implicitly exploits the low volatility anomaly.

**Table 6: Strategy Return Summary: Developed Europe**

Portfolio	Annualised Gross Return (%)	Annualised Net Return (%)	Annualised Volatility (%)	Annualised Turnover (%)	Information Ratio	Max Draw-down (%)	Portfolio Beta
Strategy	5.25	4.37	19.16	271.93	0.23	-53.28	0.83
Stoxx Europe		1.38	19.38		0.07	-60.48	

**Table 7** presents the summary metrics for the USA strategy. The amount of annualised return lost due to transaction costs of **0.82%** is again low whilst the net excess return is strong at **2.18%** for a conservative strategy benchmarked against a highly efficient index. The USA strategy also delivers a superior return to that of the index whilst assuming a similar level of volatility, though its portfolio beta is higher than that of the Developed Europe strategy highlighting the stronger cross-sectional correlation that has been present in the US market.

**Table 7: Strategy Return Summary: USA**

Portfolio	Annualised Gross Return (%)	Annualised Net Return (%)	Annualised Volatility (%)	Annualised Turnover (%)	Information Ratio	Max Draw-down (%)	Portfolio Beta
Strategy	9.26	8.44	19.87	240.33	0.42	-52.33	0.89
S&P 500		6.26	18.65		0.34	-56.43	

### 3.2.2 Strategy Annual Return Summary

**Table 8** presents the annual performance metrics for the Developed Europe universe. The strategy consistently outperforms the Stoxx Europe index by producing positive excess returns in **8** of the **13** years, an accuracy rate of **62%**. The mean excess return when the strategy beats the benchmark is **7.52%** versus a mean excess return of **-4.79%** when it underperforms the benchmark, underscoring our point that the Trend Capture model produces relative returns of a higher magnitude when market conditions are conducive, and stays course with the benchmark when they are not. This asymmetric return pattern is the source of the outperformance delivered by the model.

The max annual drawdown delivered by the Developed Europe strategy is generally lower than that of the benchmark, and in the years where it exceeds that of the benchmark, it is not excessively lower. The strategy's annual volatility of returns is at similar levels of that of the Stoxx Europe index except in years where the index volatility is at pronounced levels, in which case the strategy delivers returns with considerably lower volatility. The lost of return due to transaction costs is quite low in most years, the outliers are years of market turmoil where trends are not clear, and the model induces more frequent rebalancing and hence a higher turnover. The strategy's IR is higher than that of the benchmark in majority of the years highlighting its ability to deliver superior risk-adjusted returns.

**Table 8: Strategy Annual Return Summary: Developed Europe**

Year	Net Ret (%)	Bmk Ret (%)	Excess Ret (%)	Vol (%)	Bmk Vol (%)	Max Draw-down (%)	Bmk Max Drawdown (%)	Turnover (%)	T-Cost (%)	IR	Bmk IR	Beta
2006	16.07	13.64	2.42	11.31	9.40	-6.49	-3.73	137.36	0.41	1.42	1.45	1.09
2007	12.88	0.60	12.28	19.78	16.11	-11.71	-11.26	210.74	0.63	0.65	0.04	1.11
2008	-39.92	-46.94	7.03	19.84	31.70	-39.92	-46.98	648.46	1.91	-2.01	-1.48	0.46
2009	28.47	30.86	-2.40	26.60	27.43	-19.59	-24.30	328.43	0.99	1.07	1.13	0.85
2010	23.83	10.27	13.56	23.15	17.74	-12.67	-12.37	239.92	0.72	1.03	0.58	1.22
2011	-19.49	-13.37	-6.12	24.06	22.08	-25.72	-24.27	330.89	0.99	-0.81	-0.61	0.92
2012	14.13	15.64	-1.51	12.29	13.79	-11.77	-14.04	213.22	0.64	1.15	1.13	0.71
2013	30.18	16.97	13.22	15.16	12.42	-10.96	-11.01	141.49	0.42	1.99	1.37	1.12
2014	-2.96	5.24	-8.19	16.01	14.99	-13.62	-9.06	306.84	0.92	-0.18	0.35	0.94
2015	0.12	5.87	-5.75	21.20	23.24	-17.40	-17.42	260.78	0.78	0.01	0.25	0.86
2016	4.07	-1.24	5.31	17.27	19.63	-11.08	-15.29	229.56	0.69	0.24	-0.06	0.75
2017	13.87	8.42	5.45	13.54	7.14	-7.00	-5.98	151.73	0.46	1.02	1.18	1.26
2018	-2.58	-3.47	0.89	11.39	9.13	-10.12	-9.68	157.87	0.47	-0.23	-0.38	1.14

The USA strategy produces a benchmark beating performance similar to that of the Developed Europe strategy as evidenced by the annual results in **Table 9**. It consistently outperforms the S&P 500 index by producing positive excess returns in **7** of the **13** years, an accuracy rate of **54%**. The mean excess return when the strategy beats the benchmark is **9.37%** versus a mean excess return of **-5.31%** when it underperforms the benchmark. The USA strategy too delivers a consistently higher IR to its benchmark, thereby implying a superior risk-adjusted return profile.

Table 9: Strategy Annual Return Summary: USA

Year	Net Ret (%)	Bmk Ret (%)	Excess Ret (%)	Vol (%)	Bmk Vol (%)	Max Draw-down (%)	Bmk Max Drawdown (%)	Turnover (%)	T-Cost (%)	IR	Bmk IR	Beta
2006	6.52	5.97	0.55	4.18	3.29	-1.60	-1.33	50.00	0.15	1.56	1.81	1.13
2007	16.43	4.08	12.34	18.88	15.14	-15.13	-9.36	183.64	0.55	0.87	0.27	1.12
2008	-42.53	-40.79	-1.74	23.78	32.17	-44.33	-44.41	587.74	1.76	-1.79	-1.27	0.56
2009	27.40	29.72	-2.32	27.14	29.27	-17.28	-27.05	330.84	0.99	1.01	1.02	0.81
2010	11.01	11.51	-0.50	24.82	17.59	-22.08	-15.63	346.99	1.04	0.44	0.65	1.27
2011	-7.52	0.62	-8.14	28.78	26.19	-20.35	-19.25	299.11	0.90	-0.26	0.02	1.04
2012	21.59	12.71	8.88	11.07	11.15	-6.17	-9.93	111.00	0.33	1.95	1.14	0.83
2013	44.53	29.09	15.44	13.76	10.09	-9.18	-5.59	80.84	0.24	3.24	2.88	1.20
2014	6.81	13.55	-6.75	15.98	11.86	-11.89	-6.42	231.38	0.69	0.43	1.14	1.15
2015	4.48	-1.63	6.11	16.48	16.45	-12.35	-11.62	283.07	0.85	0.27	-0.10	0.93
2016	-2.34	10.08	-12.42	16.39	13.57	-13.66	-9.87	247.21	0.74	-0.14	0.74	0.92
2017	31.60	18.53	13.07	14.92	5.07	-6.08	-2.12	101.70	0.29	2.12	3.66	1.21
2018	10.83	1.62	9.22	13.53	11.39	-9.50	-9.52	38.06	0.11	0.80	0.14	1.11

## 4 Conclusion

Equity markets display significant dispersion in cross-sectional return and a large proportion of the return is consistently concentrated in the top quantile of securities in an investment universe. The bottom quantile of performers significantly underperform the top performing securities, and investors have the potential to exploit this return asymmetry to extract outperformance for their investment strategies. Trendratings **Trend Capture Model** provides a robust framework for identifying on an ex-ante basis with a high degree of accuracy, the set of potential outperformers and potential underperformers. Our model can provide vital information to an investment process both at the security selection stage and at the portfolio formation stage.

The signal backtest results along with the two strategy backtest results provide strong evidence to the efficacy of the Trend Capture Model to deliver market beating performance. Most signals experience a significant decay in performance when fairly concentrated & highly active portfolios are formed using the signal as the primary selection metric. Our **Smart Momentum** metric together with the **Retracement** metric provides a robust framework for constructing strategies that have the potential to deliver outperformance relative to ones benchmark. We strongly believe that investors can improve returns by applying our trend capture model in their investment process to validate the inherent price trends of securities within their investment universe.

# Appendix

## A Signal Backtest: Emerging World

Table 10: Emerging World: Return Summary

Portfolio	Ann Ret (%)	Ann Vol (%)	IR	Avg Ret (%)	Max Draw-down (%)	Ann Turn (%)
Universe	6.48	15.26	0.42	0.62	-49	
Remainder Universe	7.06	14.03	0.50	0.65	-43	
T-B Spread	3.50	15.16	0.23	0.38	-29	
Quintile1	10.03	15.44	0.65	0.90	-37	106
Quintile2	9.05	14.77	0.61	0.82	-45	191
Quintile3	9.41	15.33	0.61	0.85	-47	247
Quintile4	2.22	15.06	0.15	0.28	-45	271
Quintile5	5.49	15.05	0.36	0.54	-31	209

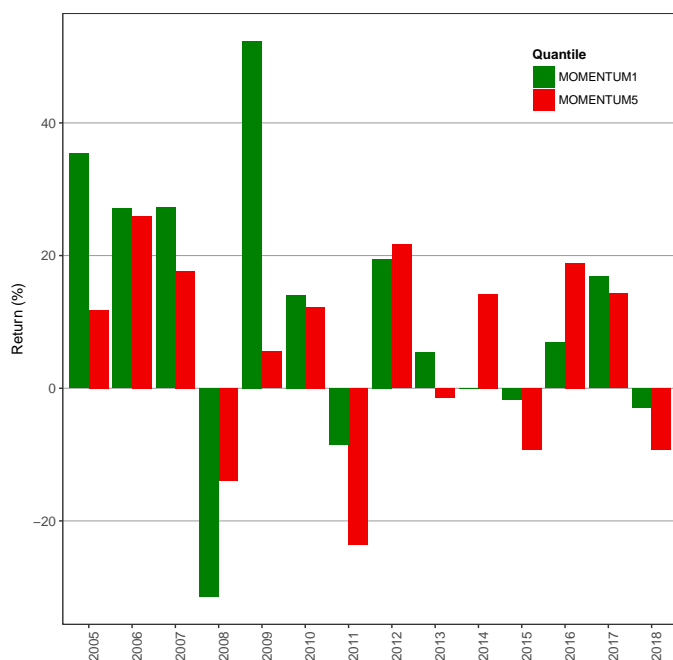
(a) Absolute Return

Portfolio	Ann Ret (%)	Ann Vol (%)	IR	Avg Ret (%)	Hit Rate (%)
Quintile1	2.84	8.30	0.34	0.26	57
Quintile2	2.00	5.82	0.34	0.18	55
Quintile3	2.42	5.81	0.42	0.21	54
Quintile4	-4.13	5.51	-0.75	-0.34	40
Quintile5	-1.84	7.50	-0.24	-0.13	45

(b) Relative Return

Figure 13: Emerging World: Annual Return

(a) Absolute Return



(b) Relative Return

