APPLICATION OF *BEHAVIOURAL FACTOR ANALYTICS* TO LONG ONLY AUSTRALIAN EQUITIES PORTFOLIO

PRESENTATION BY JAY KUMAR, FORESIGHT ANALYTICS
IMAP FINTECH EVENT

Foresight Analytics
●●●● Unlocking your investment advantage

Email: info@foresight-analytics.com | Website: www.foresight-analytics.com

Who are we?

"Foresight believes in the disciplined application of behavioural and data science to improve decision making processes of investors, fund buyers and fund sellers"

CONSULTING

We bring together our firm-wide analytical capabilities to solve complex and predictive problems for our clients.
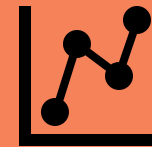
RESEARCH

Using forensics research and weight-of the-evidence-based approach, we analyse investment strategies, ETFs and indices across all major asset classes and geographies.
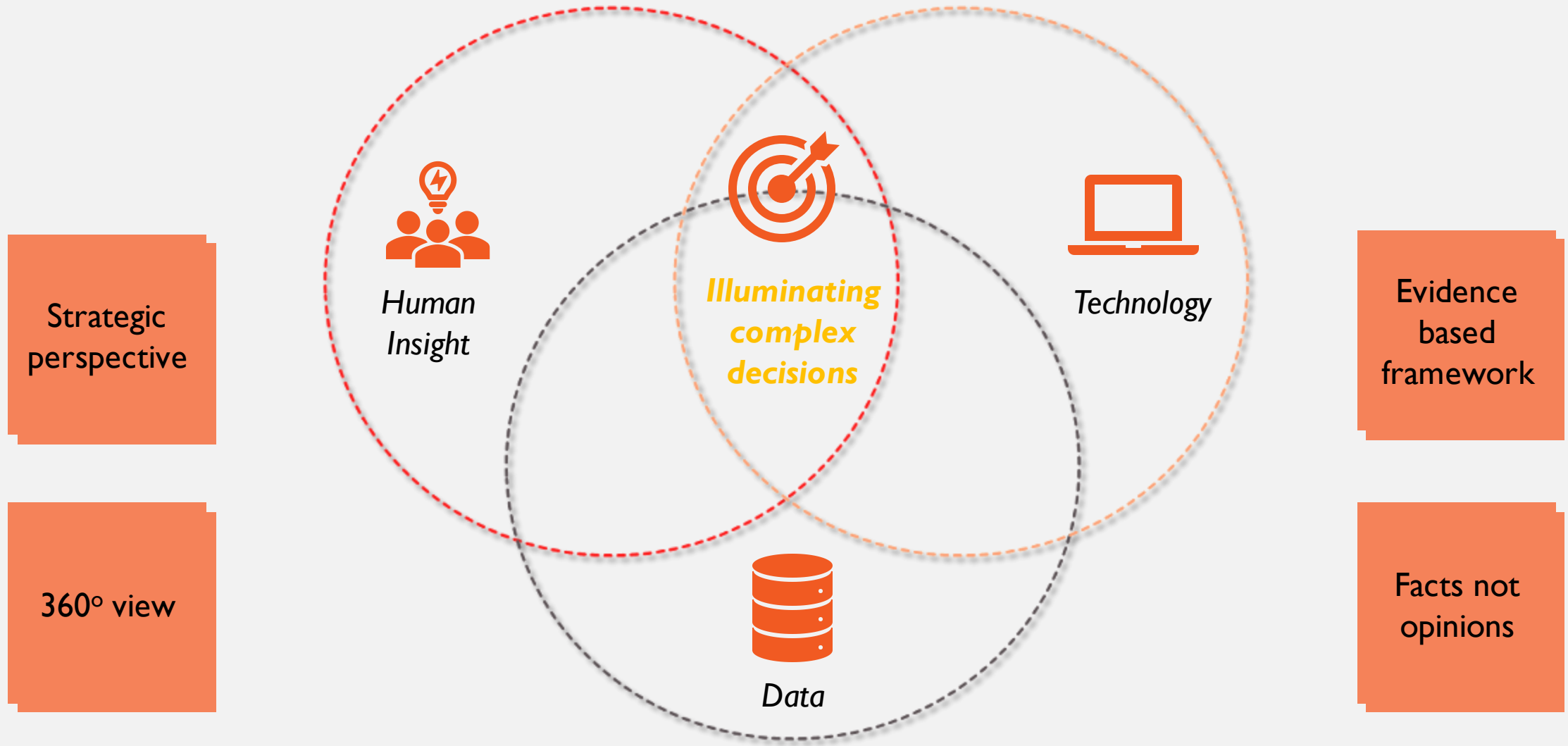
ANALYTICS

We use proprietary or third-party factor research, data-integration technology and investment expertise to built interactive and automated tools and insights dashboard.

Our competitive edge

Strategic perspective

360° view

Human Insight

Illuminating complex decisions

Technology

Data

Evidence based framework

Facts not opinions

What do we offer?

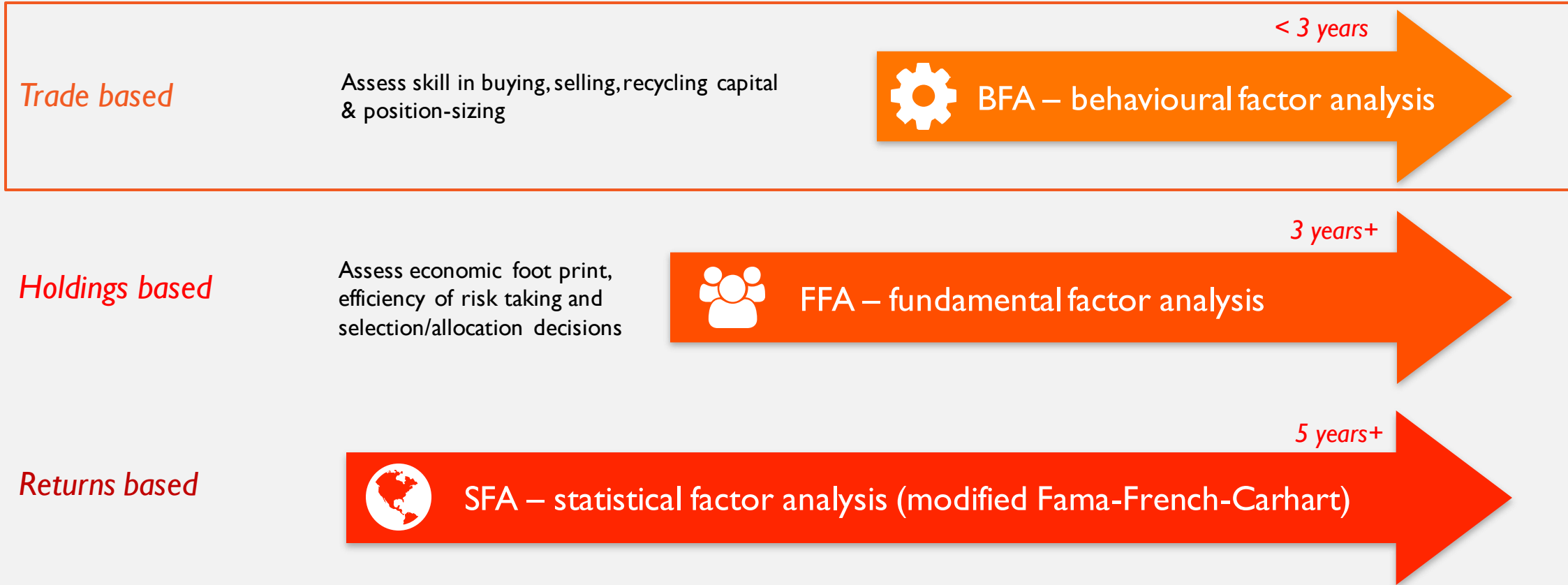|		
RISK & FACTOR AGGREGATION	**ESG & SUSTAINABILITY DIAGNOSTICS**	**PREDICTIVE MODELLING**
MANAGER SEARCH SOLUTIONS	**FUND STRATEGY CONSULTING**	**MARKET RESEARCH & INTELLIGENCE**
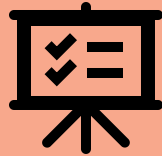
Our Client Portfolio

INTRODUCING FACTOR ANALYTICS FOR MARKETS, PORTFOLIOS AND SECURITIES

Foresight Analytics™

We analyse portfolios on different levels…

Trade based

Assess skill in buying, selling, recycling capital & position-sizing

< 3 years

BFA – behavioural factor analysis

Holdings based

Assess economic foot print, efficiency of risk taking and selection/allocation decisions

3 years+

FFA – fundamental factor analysis

Returns based

5 years+

SFA – statistical factor analysis (modified Fama-French-Carhart)

Isolating skill from luck using up-stream and down-stream methods that's powered by objective & disciplined process.

What is behavioural factor analytics?

Allows you to measure and manage behavioral biases in decision making	BFA allows clients to understand the drivers of their portfolio and investment decision process in a different context from traditional analytics.
Tools for deep learning and deliberate improvements	BFA probes deeply into the heart of what active management is all about – how effective one is at maintaining current positions, creating new positions (buys) and exiting positions (sells), optimal position sizing and where improvement opportunities may exist.
Allows advisors and asset allocators to select funds/managers that have behavioural advantage.	Granular forensic analysis to get behind the track record by focusing on decisions, not outcomes.

What are some of the biases that investors are exposed to?

Neuroscientists claim that up to 95% of our behavior is governed by our subconscious (Lipton 2005).

Regret Aversion: the avoidance of an action today out of fear that you may come to regret its effect tomorrow. Investors tend to not add to new names sufficiently or in a timely manner.

Risk aversion: the preference for taking small profits, rather than risking unrealised gains in hope of doing even better. Investors tend to sell recent/ new winners well before their full alpha realization.

Loss aversion: the tendency to hold on to assets whose prices are down with the hope that they will rebound. Investors with this behavior tend to have a much lower turnover rate for substantial losers relative to other positions held.

Endowment Effect: the tendency to overvalue items in one's ownership, or endowment. Investors tend to hold on to some positions, especially winners, far beyond their productive lives.

Pain avoidance: the tendency to sell off assets whose prices have fallen in order to avoid potential further mental anguish if they fall further. Investors tend to sell stocks that have recently experienced a price drop, regardless of whether the stock's future is bright or questionable.

Disposition effect: tendency for investors hold losing positions for too long and cut their wining positions too soon. This behaviour is an expression of loss-aversion.
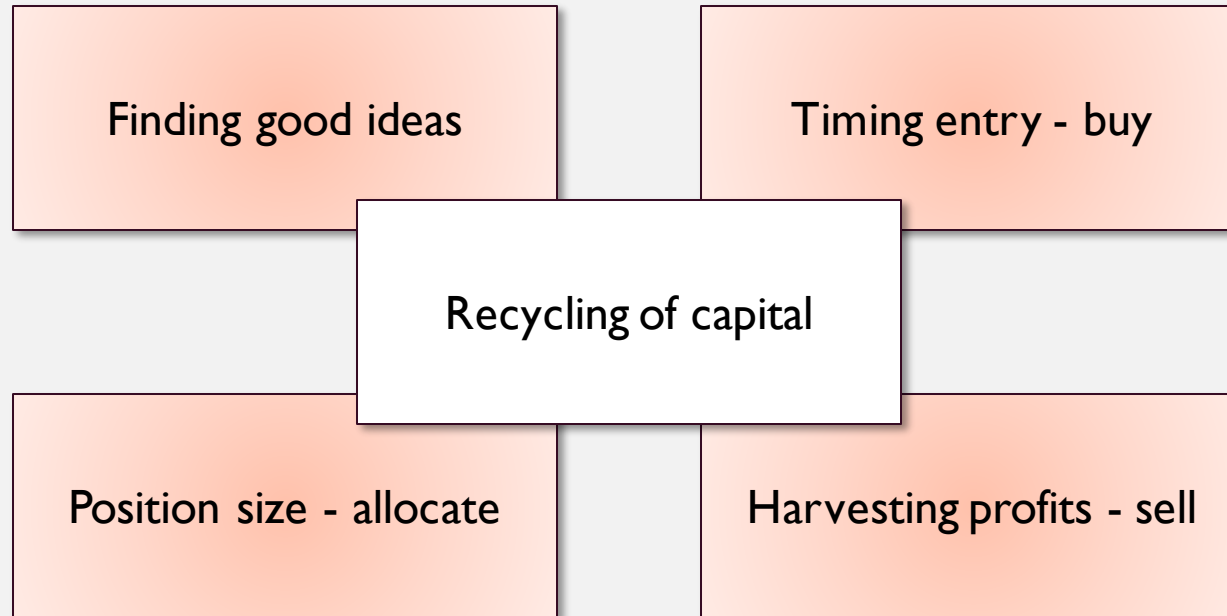
Extrapolation effect: estimation of a value based on extending a known sequence of values beyond the area that is certainly known.

Overconfidence: the tendency to over-estimate our own abilities is a common thread across multiple behavioral biases, and is one of the great pitfalls for professional investors.

Recency bias: tendency to overweight recent and easily available information even though it may not be predictive or relevant to decision making.

Key behaviours analysed under BFA

Finding good ideas	Timing entry - buy
Position size - allocate	Harvesting profits - sell

Recycling of capital
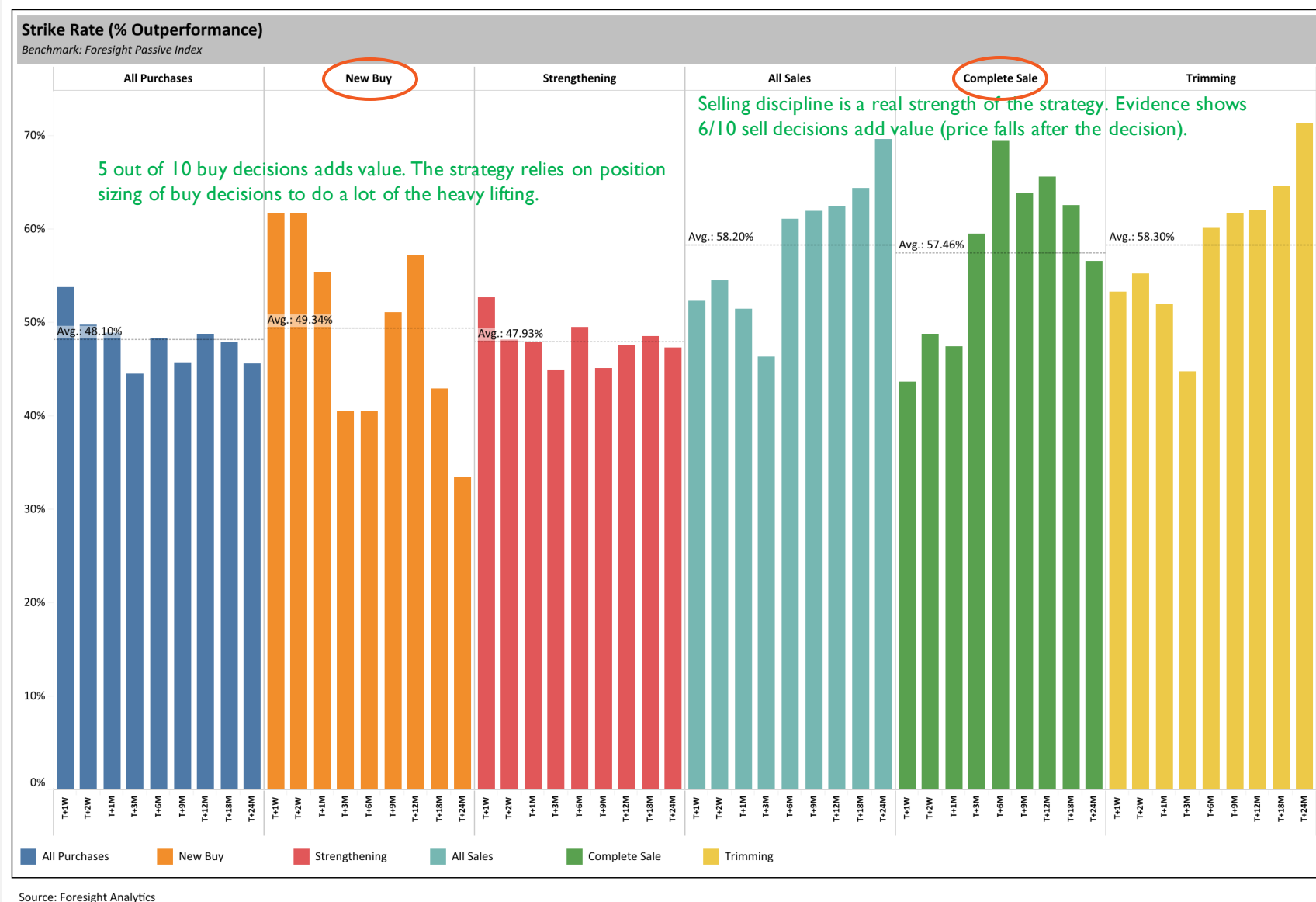
BACKGROUND TO STUDY

PARAMETERS	DETAIL
Strategy	XYZ Asset Manager Australian Shares
Time Period	Daily Trade Data Feb 2010 – March 2019
Benchmark	ASX 300 Foresight Proprietary Name Based Benchmark Foresight Proprietary Equally Weighted Passive Benchmark Foresight Peer group
Number of stocks modelled	71 Unique names Buy trades 521 Sell trades 411 Buy dollars 110 million Sell dollars 128 million
Vintage	By duration of ownership from first buy
Position sizing	Assessed against equally weighted name portfolio, with equal active share, daily rebalancing
Parameter frequency of data	Daily portfolio rebalancing Daily calculations Daily benchmarks
Data source	XYZ Asset Manager / Thomsen Reuters/ Foresight/Morningstar/Style Analytics

All returns and calculations are Gross of Fees and Taxes.

What is the quality of decision making?

- Manager's sell discipline is very strong: 6/10 sell decisions are correct (stock underperforms subsequently).

- Manager's buy decision is solid but can be improved. 5/10 buy decisions lead to positive performance (on average)

Strike Rate (% Outperformance)
Benchmark: Foresight Passive Index

5 out of 10 buy decisions adds value. The strategy relies on position sizing of buy decisions to do a lot of the heavy lifting.

Selling discipline is a real strength of the strategy. Evidence shows 6/10 sell decisions add value (price falls after the decision).

| All Purchases | New Buy | Strengthening | All Sales | Complete Sale | Trimming |

Avg.: 48.10%
Avg.: 49.34%
Avg.: 47.93%
Avg.: 58.20%
Avg.: 57.46%
Avg.: 58.30%

Legend: ■ All Purchases ■ New Buy ■ Strengthening ■ All Sales ■ Complete Sale ■ Trimming
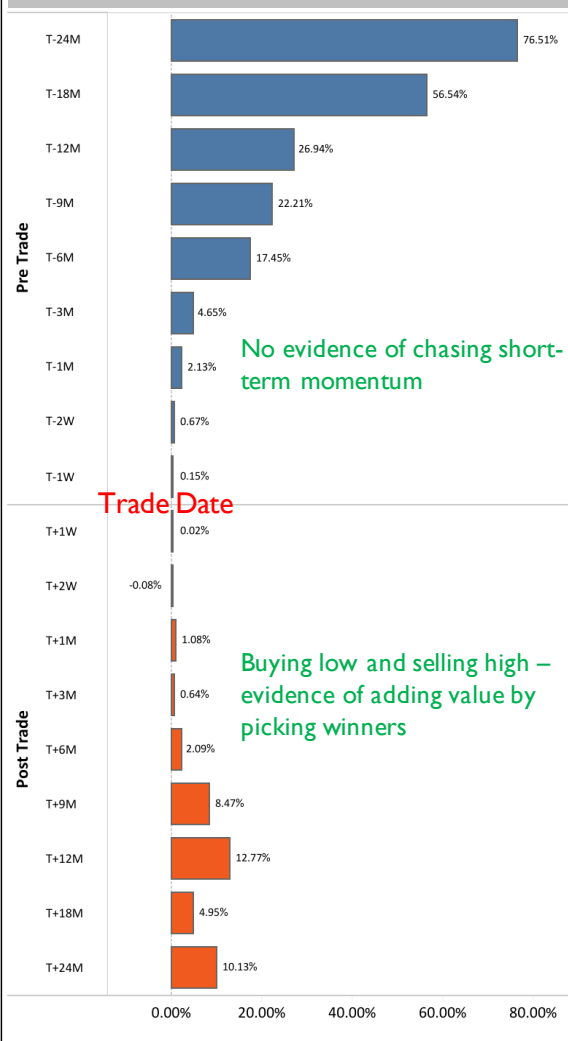
Source: Foresight Analytics

What is the quality of new buy decisions?

- Buy decisions are adding value – buying low and selling high is evident

- No evidence of chasing short term momentum (herding)

- Best rewards for buy decisions are realised after 12 months

New Buy Decisions: Pre & Post Trade Average Relative Return (Feb 2010 - Mar 2019)
*Benchmark: Foresight Passive Index*

Pre Trade

Period	Value
T-24M	76.51%
T-18M	56.54%
T-12M	26.94%
T-9M	22.21%
T-6M	17.45%
T-3M	4.65%
T-1M	2.13%
T-2W	0.67%
T-1W	0.15%

No evidence of chasing short-term momentum

Trade Date

Post Trade

Period	Value
T+1W	0.02%
T+2W	-0.08%
T+1M	1.08%
T+3M	0.64%
T+6M	2.09%
T+9M	8.47%
T+12M	12.77%
T+18M	4.95%
T+24M	10.13%

Buying low and selling high – evidence of adding value by picking winners

New Buy Decisions: Pre & Post Trade Relative Return (Feb 2010 - Mar 2019)
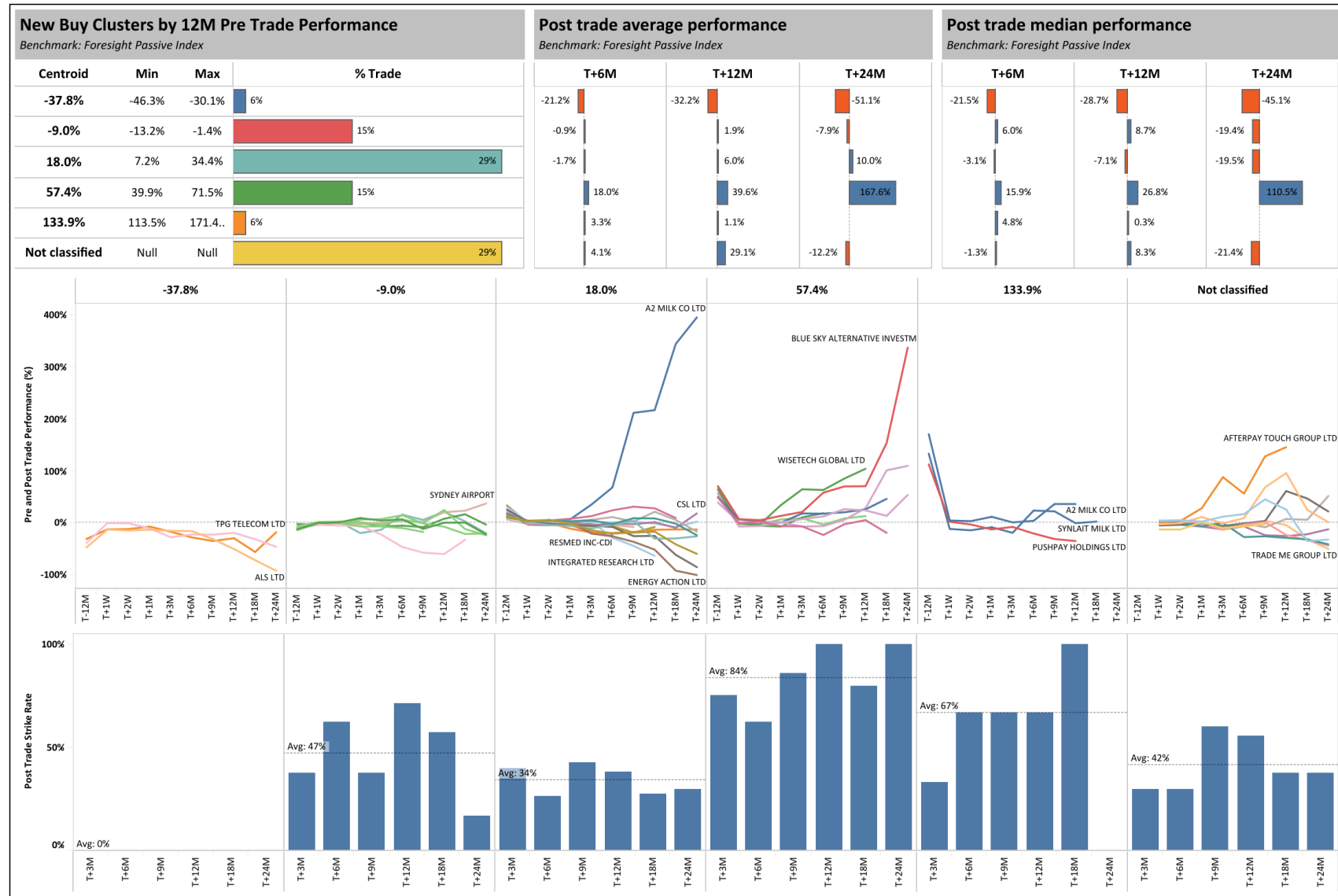*Benchmark: Foresight Passive Index*
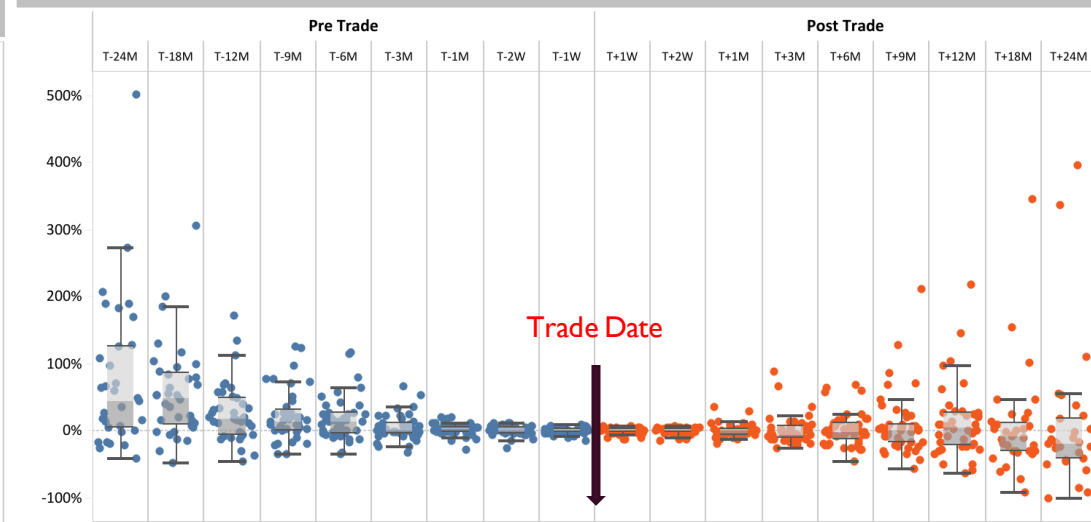
	Pre Trade									Post Trade								
	T-24M	T-18M	T-12M	T-9M	T-6M	T-3M	T-1M	T-2W	T-1W	T+1W	T+2W	T+1M	T+3M	T+6M	T+9M	T+12M	T+18M	T+24M
Avg.	76.5%	56.5%	26.9%	22.2%	17.5%	4.6%	2.1%	0.7%	0.2%	0.0%	-0.1%	1.1%	0.6%	2.1%	8.5%	12.8%	4.9%	10.1%
STD	110.5%	69.9%	44.9%	38.4%	32.7%	19.2%	8.7%	7.0%	4.9%	4.7%	5.0%	9.6%	20.5%	24.2%	46.5%	53.5%	74.6%	106.6%
Q1	125.0%	84.4%	49.4%	29.1%	25.6%	11.2%	5.2%	5.2%	2.6%	2.9%	3.3%	3.7%	6.2%	12.6%	9.8%	26.3%	12.3%	15.0%
Median	43.6%	49.6%	18.0%	12.7%	12.8%	0.3%	2.3%	0.2%	0.3%	0.6%	0.7%	0.6%	-5.0%	-2.3%	0.3%	4.2%	-9.0%	-18.1%
Q3	6.0%	10.9%	-5.6%	1.0%	-3.2%	-4.4%	-1.4%	-2.5%	-2.3%	-2.0%	-2.5%	-5.1%	-10.8%	-12.0%	-17.8%	-21.4%	-30.8%	-38.1%
Max	500.6%	305.3%	171.4%	125.4%	117.4%	65.8%	21.2%	12.5%	9.2%	8.0%	6.7%	35.5%	88.8%	69.1%	212.4%	217.6%	345.0%	396.0%
Min	-42.1%	-48.6%	-46.3%	-34.6%	-35.4%	-33.1%	-27.1%	-24.7%	-15.7%	-11.9%	-13.8%	-18.8%	-26.9%	-45.5%	-56.4%	-62.5%	-91.0%	-99.5%
Count	33	36	37	40	42	42	45	46	47	47	47	47	47	47	45	42	35	30

Source: Foresight Analytics

What is the quality of new buy decisions?

- 20% of new buy trades are contrarian based

- 45% of new trades are momentum-neutral

- 6% of new trades are momentum based

- Contrarian and momentum trades did not add value while momentum-neutral trades were more effective
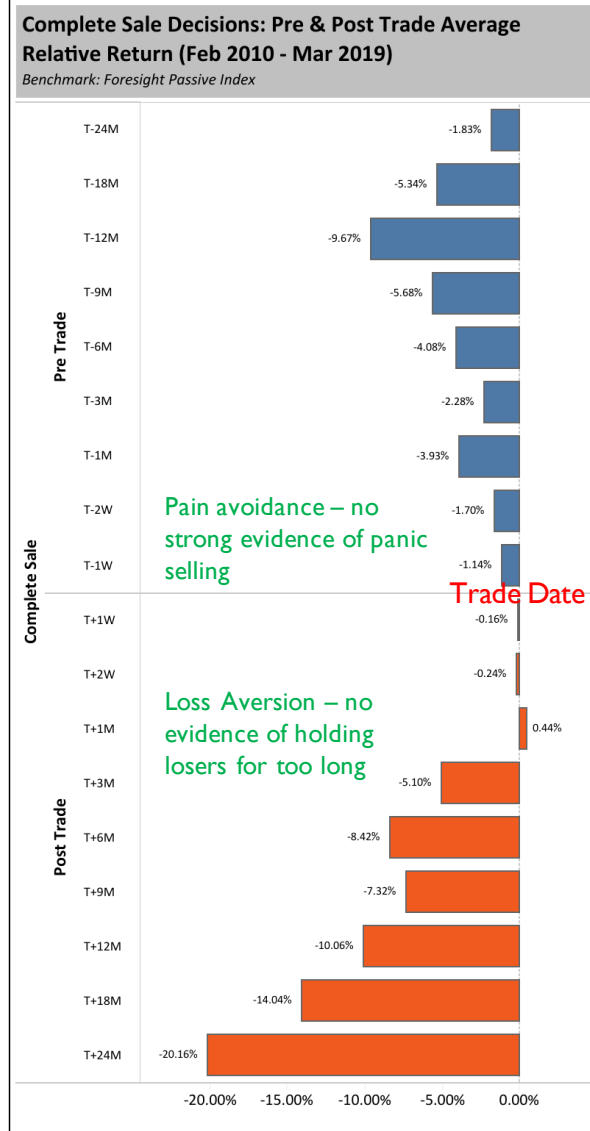
New Buy Clusters by 12M Pre Trade Performance
Benchmark: Foresight Passive Index

Centroid	Min	Max	% Trade
-37.8%	-46.3%	-30.1%	6%
-9.0%	-13.2%	-1.4%	15%
18.0%	7.2%	34.4%	29%
57.4%	39.9%	71.5%	15%
133.9%	113.5%	171.4..	6%
Not classified	Null	Null	29%

Post trade average performance
Benchmark: Foresight Passive Index

T+6M	T+12M	T+24M
-21.2%	-32.2%	-51.1%
-0.9%	1.9%	-7.9%
-1.7%	6.0%	10.0%
18.0%	39.6%	167.6%
3.3%	1.1%	-12.2%
4.1%	29.1%	

Post trade median performance
Benchmark: Foresight Passive Index

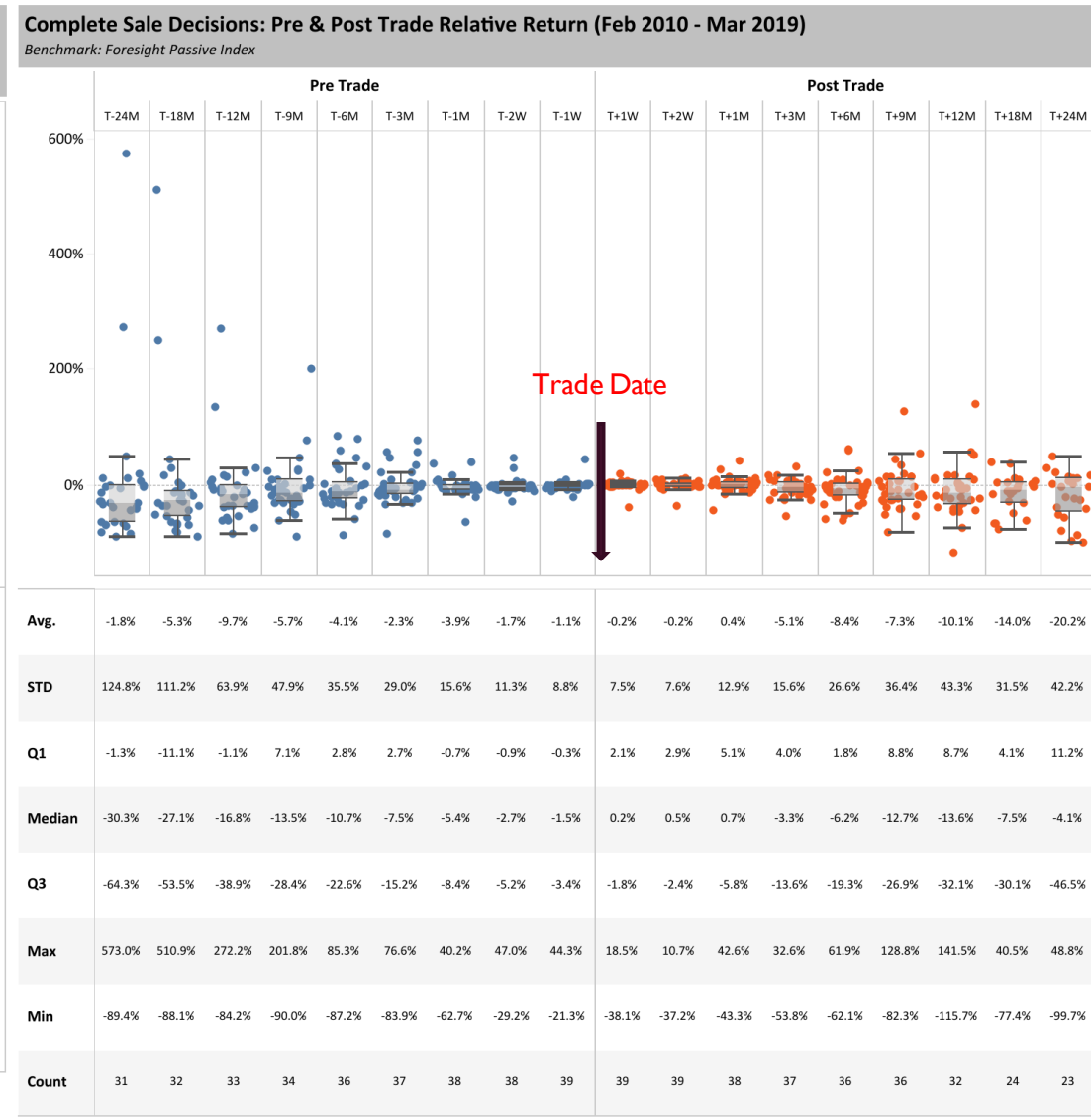| T+6M	T+12M	T+24M
-21.5%	-28.7%	-45.1%
6.0%	8.7%	-19.4%
-3.1%	-7.1%	-19.5%
15.9%	26.8%	110.5%
4.8%	0.3%	-21.4%
-1.3%	8.3%	

Source: Foresight Analytics

What is the quality of sell decisions?

- Strike rate for selling decisions is very good. Usually this is a weak point for most managers

- No evidence of Pain avoidance and Loss aversion

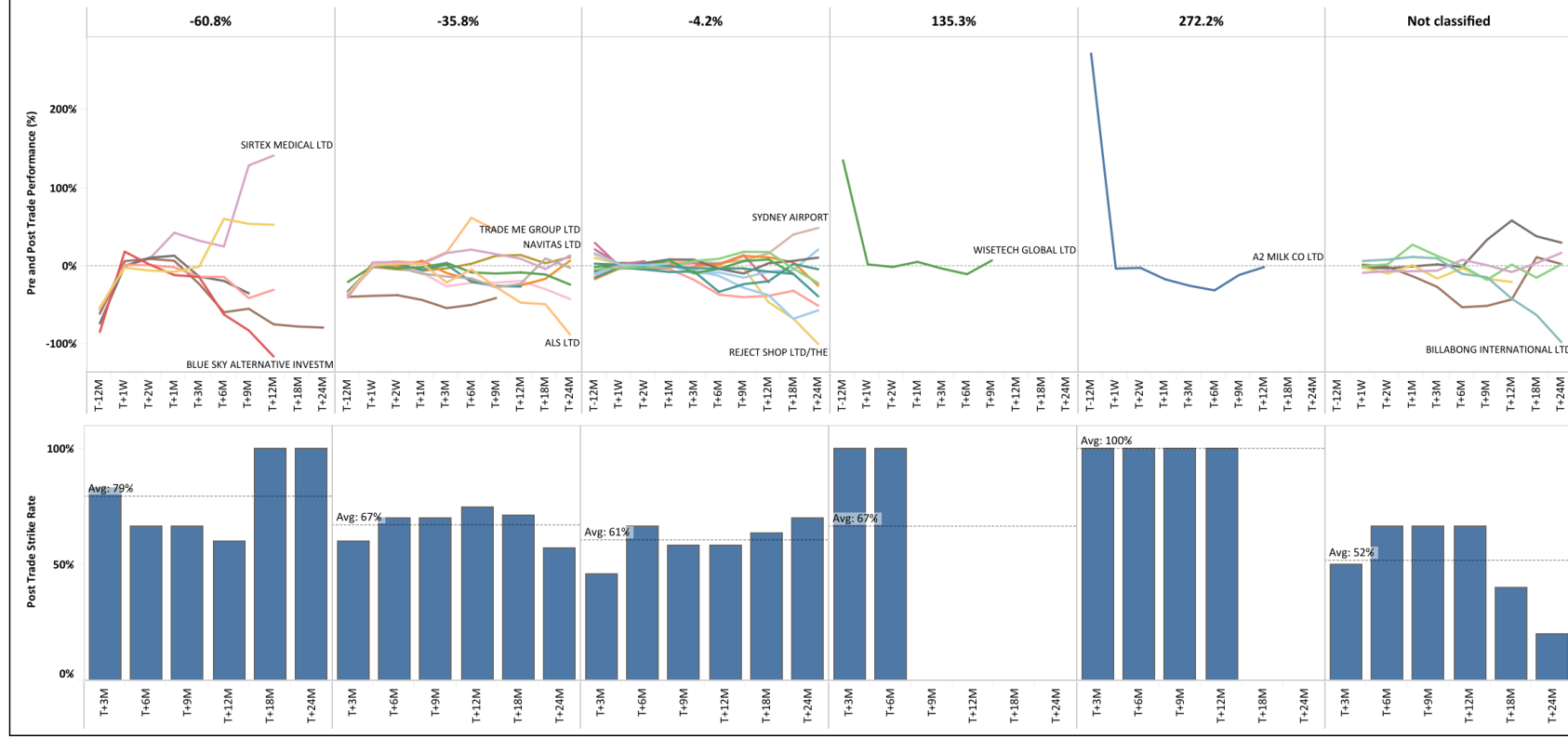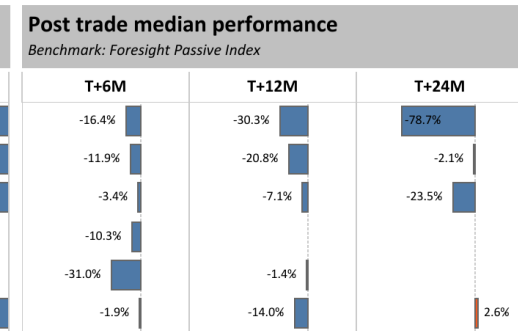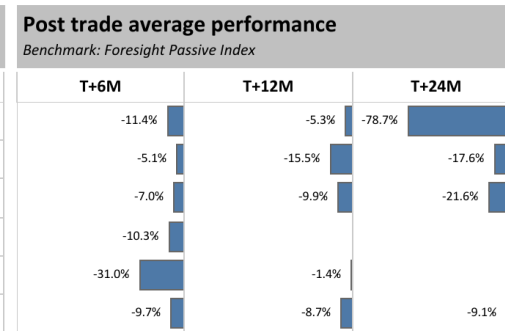### Complete Sale Decisions: Pre & Post Trade Average Relative Return (Feb 2010 - Mar 2019)
Benchmark: Foresight Passive Index

Pre Trade / Complete Sale

Period	Value
T-24M	-1.83%
T-18M	-5.34%
T-12M	-9.67%
T-9M	-5.68%
T-6M	-4.08%
T-3M	-2.28%
T-1M	-3.93%
T-2W	-1.70%
T-1W	-1.14%

Pain avoidance – no strong evidence of panic selling

Trade Date

Loss Aversion – no evidence of holding losers for too long

Post Trade

Period	Value
T+1W	-0.16%
T+2W	-0.24%
T+1M	0.44%
T+3M	-5.10%
T+6M	-8.42%
T+9M	-7.32%
T+12M	-10.06%
T+18M	-14.04%
T+24M	-20.16%

Complete Sale Decisions: Pre & Post Trade Relative Return (Feb 2010 - Mar 2019)
Benchmark: Foresight Passive Index

	Pre Trade									Post Trade								
	T-24M	T-18M	T-12M	T-9M	T-6M	T-3M	T-1M	T-2W	T-1W	T+1W	T+2W	T+1M	T+3M	T+6M	T+9M	T+12M	T+18M	T+24M
Avg.	-1.8%	-5.3%	-9.7%	-5.7%	-4.1%	-2.3%	-3.9%	-1.7%	-1.1%	-0.2%	-0.2%	0.4%	-5.1%	-8.4%	-7.3%	-10.1%	-14.0%	-20.2%
STD	124.8%	111.2%	63.9%	47.9%	35.5%	29.0%	15.6%	11.3%	8.8%	7.5%	7.6%	12.9%	15.6%	26.6%	36.4%	43.3%	31.5%	42.2%
Q1	-1.3%	-11.1%	-1.1%	7.1%	2.8%	2.7%	-0.7%	-0.9%	-0.3%	2.1%	2.9%	5.1%	4.0%	1.8%	8.8%	8.7%	4.1%	11.2%
Median	-30.3%	-27.1%	-16.8%	-13.5%	-10.7%	-7.5%	-5.4%	-2.7%	-1.5%	0.2%	0.5%	0.7%	-3.3%	-6.2%	-12.7%	-13.6%	-7.5%	-4.1%
Q3	-64.3%	-53.5%	-38.9%	-28.4%	-22.6%	-15.2%	-8.4%	-5.2%	-3.4%	-1.8%	-2.4%	-5.8%	-13.6%	-19.3%	-26.9%	-32.1%	-30.1%	-46.5%
Max	573.0%	510.9%	272.2%	201.8%	85.3%	76.6%	40.2%	47.0%	44.3%	18.5%	10.7%	42.6%	32.6%	61.9%	128.8%	141.5%	40.5%	48.8%
Min	-89.4%	-88.1%	-84.2%	-90.0%	-87.2%	-83.9%	-62.7%	-29.2%	-21.3%	-38.1%	-37.2%	-43.3%	-53.8%	-62.1%	-82.3%	-115.7%	-77.4%	-99.7%
Count	31	32	33	34	36	37	38	38	39	39	39	38	37	36	36	32	24	23

Source: Foresight Analytics

What is the quality of sell decisions?

- 80% of sell trades are recent losers but selling them is still the right decision on average.

- This demonstrate a lack of Loss-aversion (holding onto losers for too long).

- 6% of sell trades are recent winners. They tend to underperform after the trade.

- This demonstrates a lack of risk aversion bias (sell recent winners before full alpha realisation).

Complete Sale Clusters by 12M Pre Trade Performance
Benchmark: Foresight Passive Index

Centroid	Min	Max	% Trade
-60.8%	-84.2%	-52.8%	15%
-35.8%	-40.4%	-20.3%	26%
-4.2%	-16.8%	29.7%	38%
135.3%	135.3%	135.3..	3%
272.2%	272.2%	272.2..	3%
Not classified	Null	Null	15%

Post trade average performance
Benchmark: Foresight Passive Index

T+6M	T+12M	T+24M
-11.4%	-5.3%	-78.7%
-5.1%	-15.5%	-17.6%
-7.0%	-9.9%	-21.6%
-10.3%		
-31.0%	-1.4%	
-9.7%	-8.7%	-9.1%

Post trade median performance
Benchmark: Foresight Passive Index

T+6M	T+12M	T+24M
-16.4%	-30.3%	-78.7%
-11.9%	-20.8%	-2.1%
-3.4%	-7.1%	-23.5%
-10.3%		
-31.0%	-1.4%	
-1.9%	-14.0%	2.6%

Source: Foresight Analytics

Does the manager demonstrate portfolio sizing skill?

- Manager is able to add value through position sizing

- Average value add is 13% over 9 years

- There is no evidence of Regret aversion. Regret aversion is a tendency for investors not to reach the full position size in a timely manner

Portfolio Sizing Skill (Gross, Daily compounding, AUD, 05/02/10 to 29/03/19)

Name Portfolio
Actual Portfolio

188% (11.8%)
175% (11.3%)

Regret Aversion – no evidence of regret aversion over the entire period

13.1% (0.5%)

Some evidence of Regret aversion in the early stages of the strategy
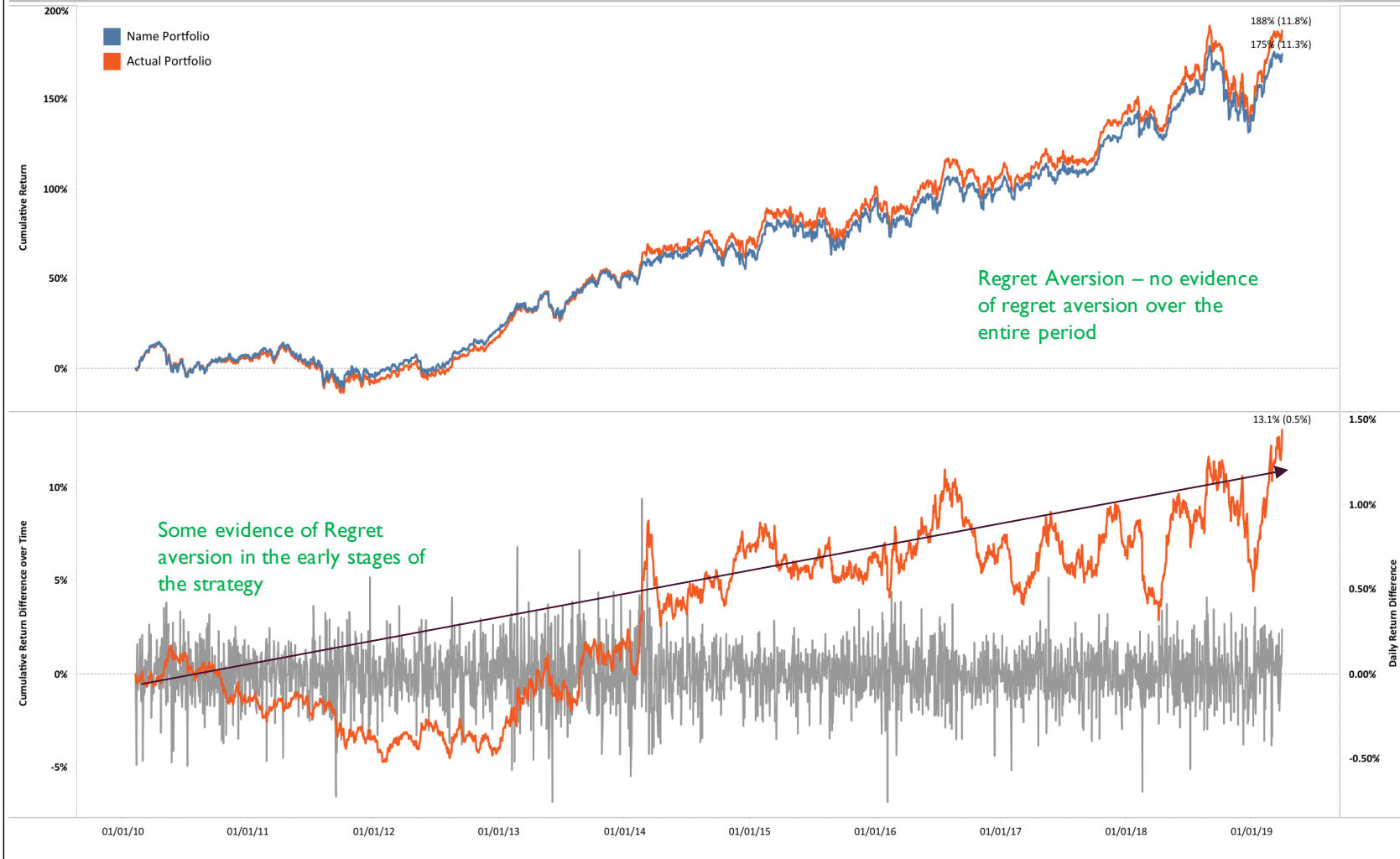
Measurement Period
05/02/10 to 29/03/19

Source: Foresight Analytics

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How effective is manager at recycling capital?

- Majority of the vintages are adding value to the portfolio

- 24 to 36 months vintage represents the sweet spot for this manager

- Slight evidence of Endowment effect from vintages 60-72 months (5-6 years)

- Endowment effect is where investors tend to hold on positions far beyond their alpha potential

Cumulative Contribution to Portfolio Return by Vintages (Gross, AUD, Daily compounding, 05/02/10 to 29/03/19)

Source: Foresight Analytics

Legend: 0m - 6m | 6m - 12m | 12m - 24m | 24m - 36m | 36m - 48m | 48m - 60m | 60m - 72m | 72m - 84m | 84m - 96m | More than 96m

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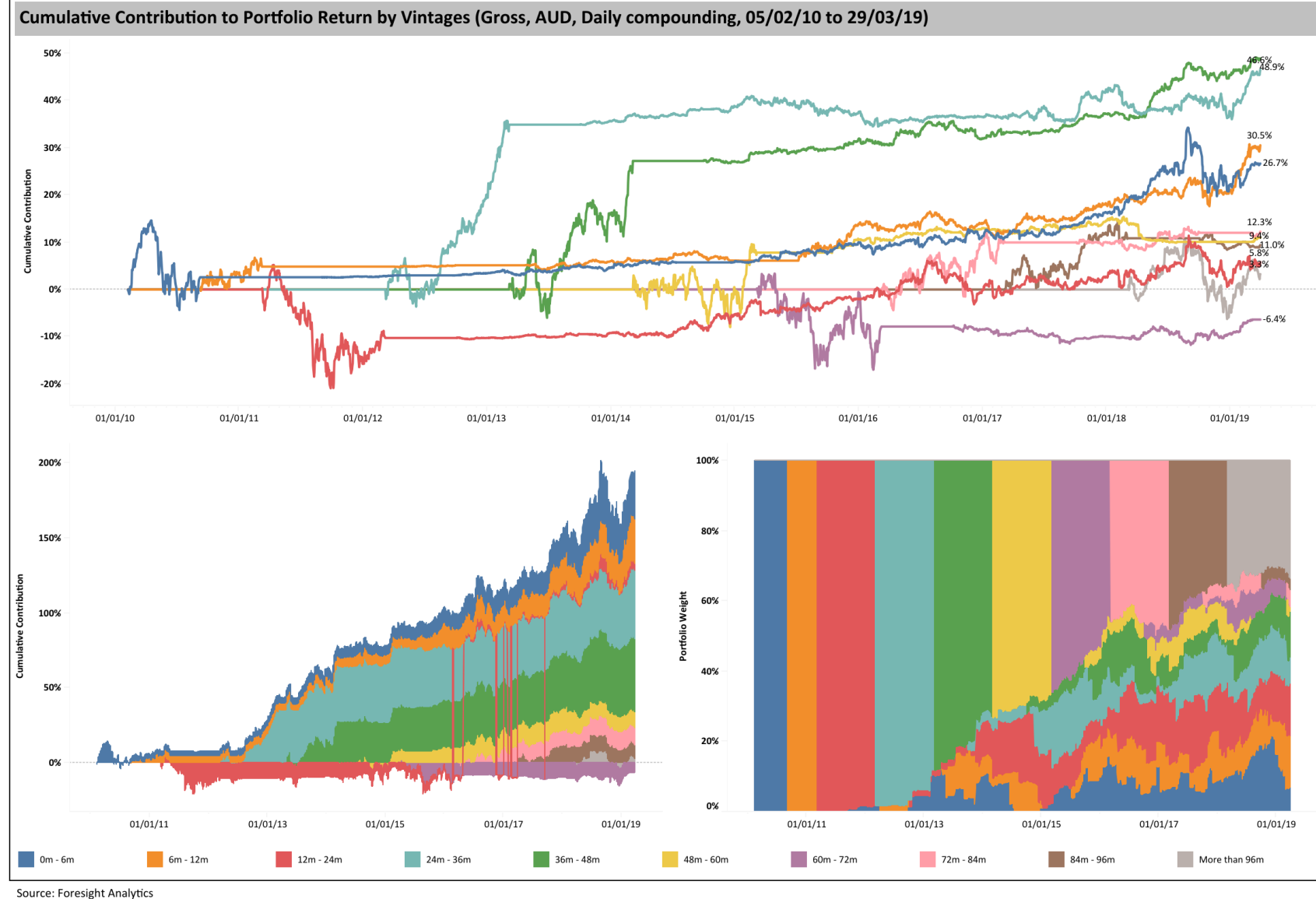
Concluding Remarks

1. Availability of technology and data allows more granular analysis of behavioral biases (heuristics) in decision making.

2. Behavioral factor analytics provides deeper and direct evidence on manager investing skill compared to traditional inference-based approaches.

3. In the case study presented, there was no evidence of *Regret aversion*, *Risk aversion*, *Loss aversion* and *Pain avoidance* over the entire dataset. However, there was some evidence of *Endowment effect* (recycling capital) and *Regret aversion* in the early stages of the strategy (position sizing).

APPENDIX

Foresight Analytics™

What is the investment style of this manager?

- The manager operates to Quality Growth style.

- This means it's selection process identifies companies that exhibit faster than market growth that is sustainable over the long term (quality).

XYZ Asset Manager Australian Shares: Historical Style Tilts - CASA Adjusted - from 01/2009 to 03/2019 - Highlighted: 03/2019

Benchmark: S&P/ASX 300 TR
(Style tilts between -0.5 and +0.5 are probably not significant. Style tilts less than -0.5 or more than +0.5 indicate a tilt exists but may not be significant. Style tilts less than -1 or more than +1 are significant. Style tilts less than -2 or more than +2 are very significant.)

Measurement Period	Highlighted Month	Adjustment	Group (Factor)	Factor
01/2009 to 03/2019	03/2019	CASA Adjusted	Multiple values	Multiple values

Source: Foresight Analytics
Data source: XYZ Asset Manager, Thomson Reuters, Morningstar, eVestment and Style Analytics

How has this manager performed since inception?

- The manager has strongly outperformed the market since inception.

- The managers stock selection skill is the most dominant driver of outperformance.

- The manager's bias to Growth and Quality style has provided some tailwind to their outperformance.

XYZ Asset Manager Australian Shares: Active Return Attribution (from 31.01.2009 to 31.03.2019, Gross Returns, AUD)
Benchmark: S&P/ASX 300 TR

Sector

Style

Cumulative Allocation   Cumulative Stock   Cumulative Currency   Cumulative Cash Allocation
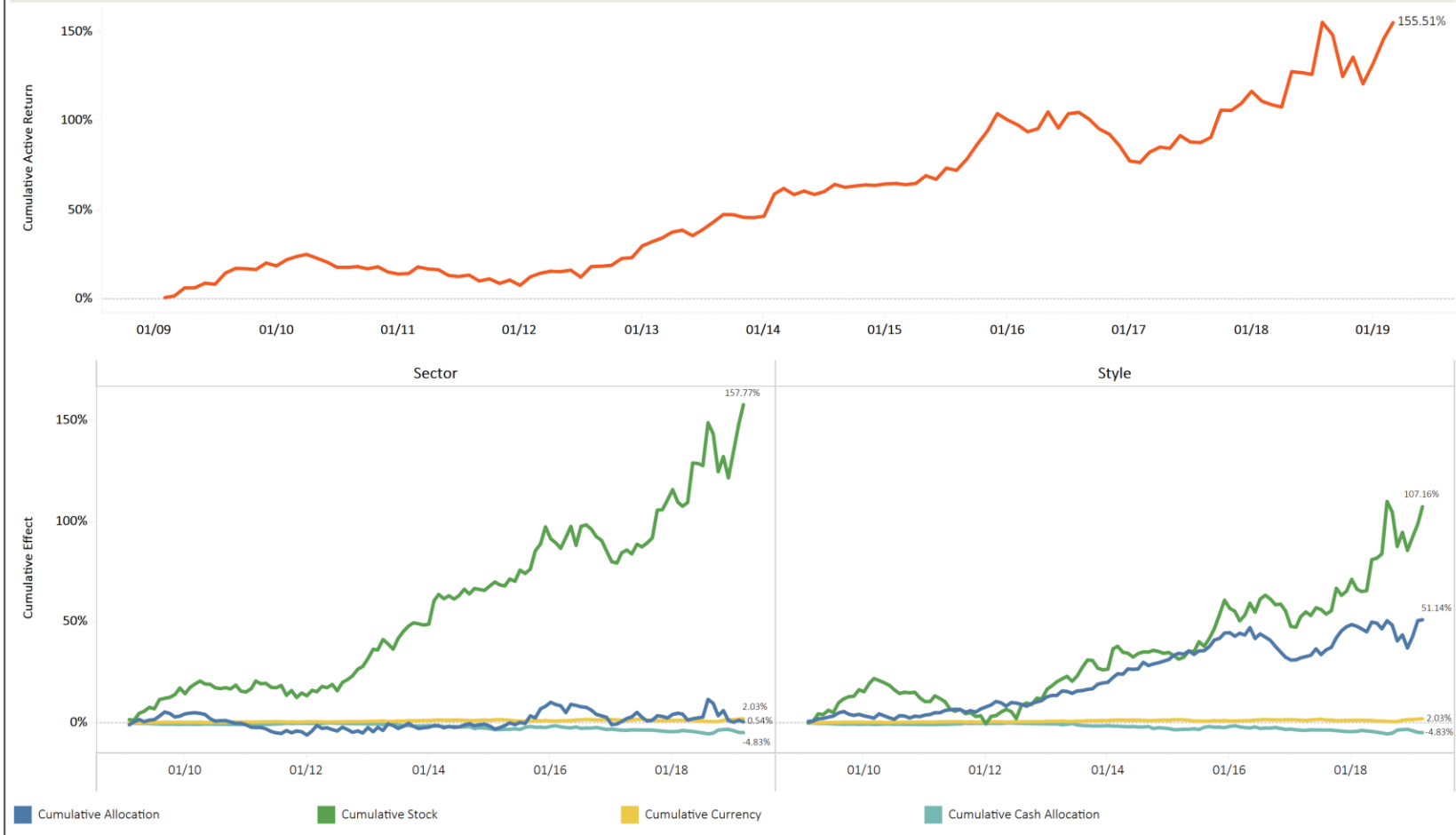
Effects
All

Source: Foresight Analytics
Data source: XYZ Asset Manager, Thomson Reuters, Morningstar, eVestment and Style Analytics

How has this manager performed relative to other Australian equity managers?

- This manager has delivered first quartile factor-adjusted alpha (idiosyncratic alpha) over the past 3, 5 and 7 year periods.

Annualised Idiosyncratic Alpha: XYZ Asset Manager Australian Shares vs Peers (Gross, AUD, 30.06.2019)
Peer Group: Australian Large Cap Equities
Funds' returns over cash are regressed against a linear component of risk factors: Market, Size (Small - Large), Value (Value - Growth), Momentum, Asset Growth, and Profitability. Idiosyncaric alpha is the fund's return component that can not be replicated by loading on those risk factors. It serves as a measure for manager stock picking skill.
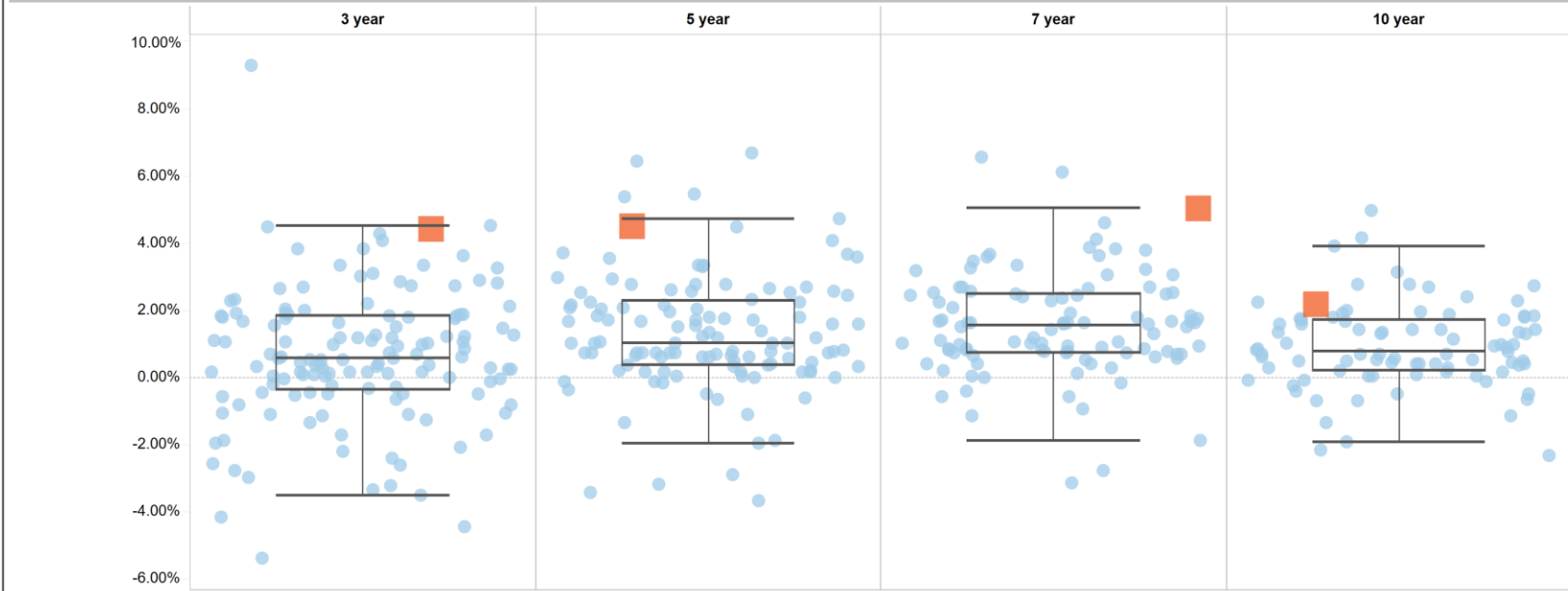
	3 year	5 year	7 year	10 year
XYZ Asset Manager Australian Shares	4.41%	4.52%	5.04%	2.18%
Avg.	0.64%	1.33%	1.58%	0.93%
Std. dev.	2.03%	1.79%	1.58%	1.27%
Percentile (75)	1.83%	2.29%	2.50%	1.71%
Median	0.55%	1.03%	1.54%	0.79%
Percentile (25)	-0.38%	0.36%	0.74%	0.23%
Sample Size	135	115	100	86

Source: Foresight Analytics
Data source: Morningstar and Refinitiv Datastream

Foresight Analytics™

Jay Kumar

Jay has over 20 years of investment and data-driven research experience with firms such as ANZ, ING & Morningstar Inc.

Recognised by his industry peers as an innovator and thought leader, Jay's predictive empirical work has been published in several journals covering diverse topics such as corporate strategy, financial distress, capital markets and disruptive trends within financial services.

After identifying a gap for forensic research in the financial services market, Jay founded **Foresight Analytics** in 2015, utilizing his research and significant institutional asset management experience. Since then, Foresight has solved numerous problems for its client portfolio, which was built on the basis of trust and service with integrity, and continues to build innovative….

Jay Kumar
Founding Director

Foresight Analytics - Unlocking your investment advantage

Foresight Analytics is a data-driven investment research, analytics and consulting firm. Using its innovative 360-degree framework and factor-based technology, Foresight provides analytical, predictive and market intelligence solutions to leading investment management companies, superannuation funds and wealth groups.

For asset owners, Foresight solutions include quality and risk-based manager appraisal, forensic validation of manager skill, portfolio risk aggregation and factor-based portfolio optimisation. Foresight's 360-degree analytical framework integrates financial and extra-financial considerations and across equity and bond asset classes.

Foresight Analytics™