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The Hidden Cost in Costless Put-Spread Collars: Rebalance Timing Luck

Roni Israelov | March 23, 2023

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Strategy	Withdrawal Protection	Median Value 2042	Net Return	Plan Security Score	Typical Max Drawdown
INDUSTRY STANDARD 60% Global Equities 40% Bonds	none	\$6.3M	6.4%	97/100	-16.6%
Optimized GROWTH STRATEGY 75% Global Equities with Hedged Enhanced Treasuries	40% Initial Protection	\$7.91M	8.55%	99+/100	-15%
Alternative GROWTH STRATEGY 75% Global Equities with Hedged Enhanced Treasuries	0% Protection	\$11M	11.35%	97/100	-22%

Not an NDVR Managed Portfolio For Comparison Only

View Advanced Analysis

AS SEEN IN:

THE WALL STREET JOURNAL.

Bloomberg

FINANCIAL TIMES

The Washington Post

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Forthcoming in

The Journal of
Alternative
Investments

The Hidden Cost in Costless Put-Spread Collars: Rebalance Timing Luck[‡]

January 24, 2023

Steven Braun Corey Hoffstein Roni Israelov David Nze Ndong

Prior research and empirical investment results demonstrate that strategy performance can be highly sensitive to rebalance schedules, an effect called rebalance timing luck ("RTL"). In this paper we extend the empirical analysis to option-based strategies. As a case study, we replicate a popular strategy – the self-financing, three-month put-spread collar – with three implementations that vary only in their rebalance schedule. We find that the annualized tracking error between any two implementations is in excess of 400 basis points. We also decompose the empirically-derived rebalance timing luck for this strategy into its linear and non-linear components. Finally, we provide intuition for the driving causes of rebalance timing luck in option-based strategies.

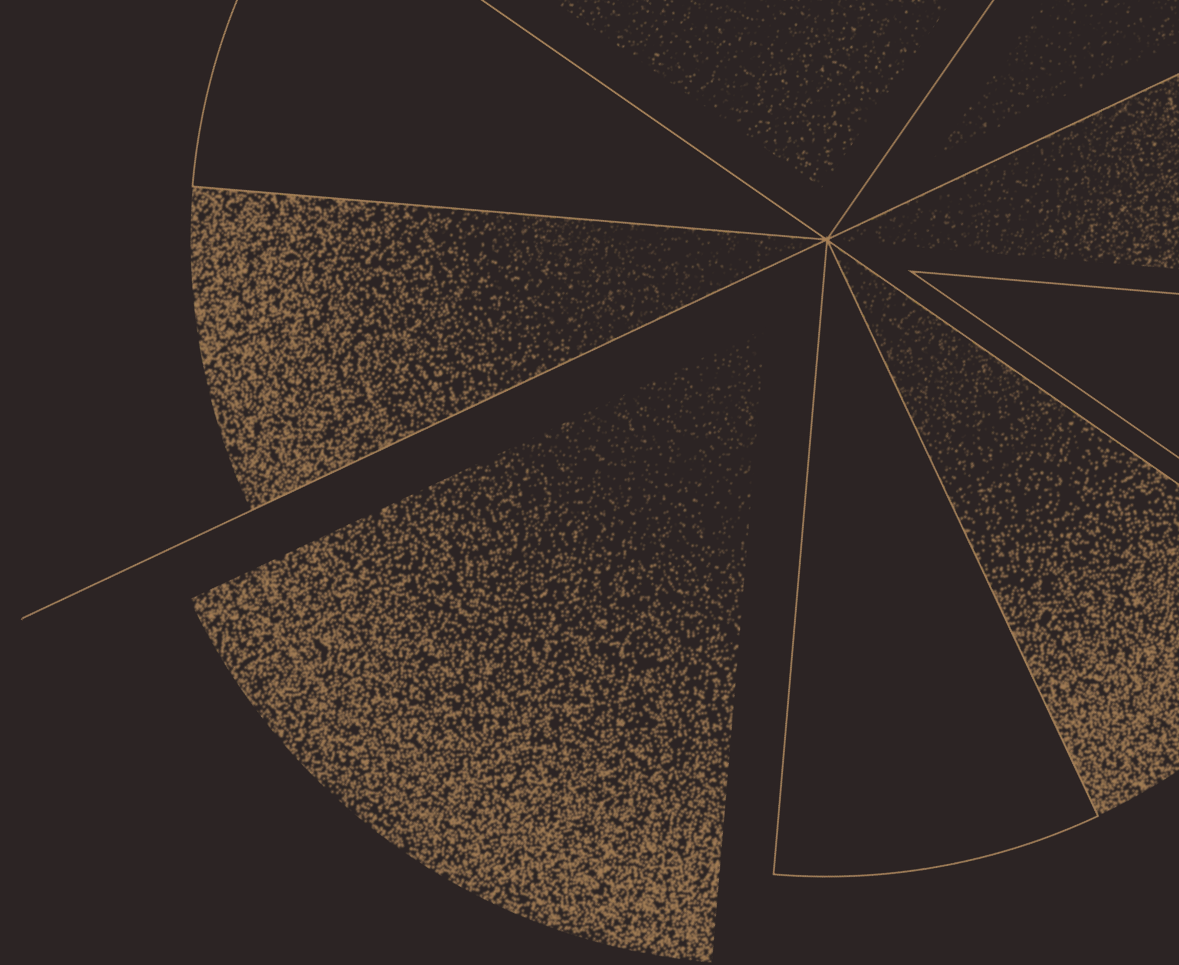
KEYWORDS: Calendar-Based Rebalancing, Options, Portfolio Construction, Put-Spread Collars, Rebalance Timing Luck, Systematic Investing

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Part 1: Introduction



What's Rebalance Timing Luck?

“The performance difference between identically managed portfolios with identical formation and holding period lengths but different dates for rebalancing”

- from “Rebalance Timing Luck: *The Difference Between Hired and Fired*”



What's a Put-Spread Collar?

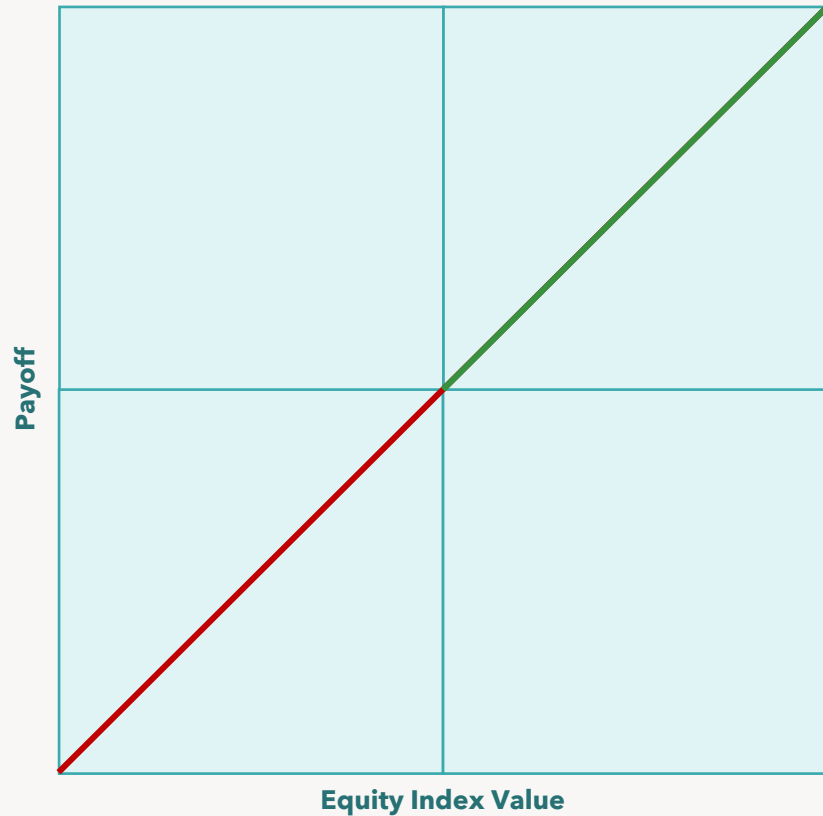
A combination of option positions overlaid on equity:

- Designed to reduce downside risk with 'buffered protection'
- Forgoes upside potential with capped performance
- Initial structure is self-financing



Let's Build a Put-Spread Collar

First: We obtain exposure to equities

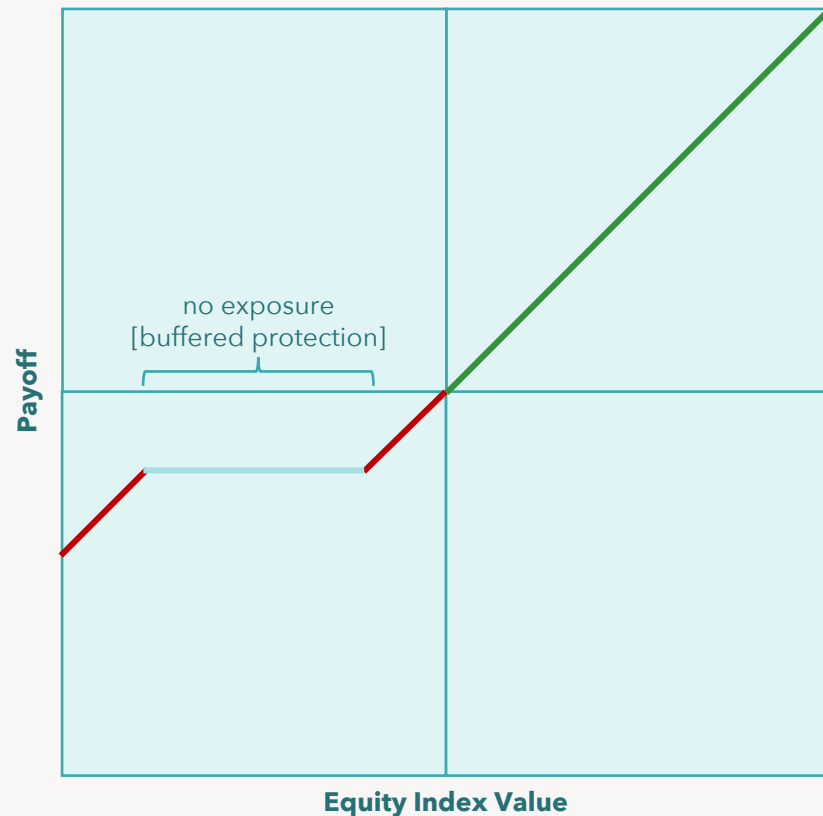


Put-Spread Collar Has Three [Four] Positions:

1. Owns the equity [S&P 500] index

Let's Build a Put-Spread Collar

Next: We buy partial protection with a put spread

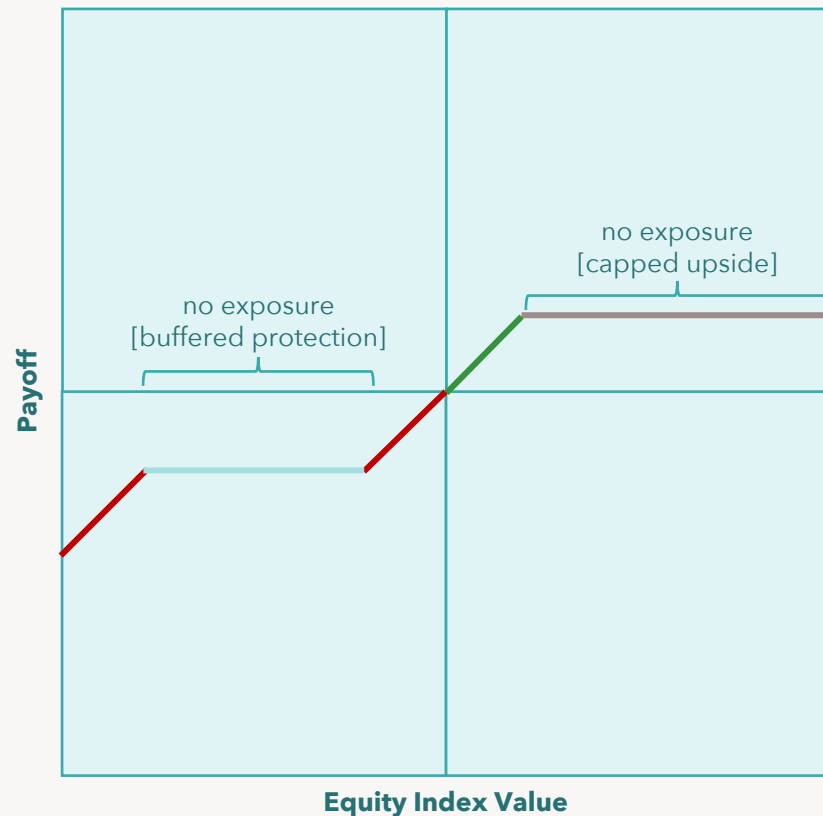


Put-Spread Collar Has Three [Four] Positions:

1. Owns the equity [S&P 500] index
2. Buys a fixed strike put spread
 - Buys a modest OTM put option
 - Sells a further OTM put option

Let's Build a Put-Spread Collar

Finally: We finance that protection by selling a call option



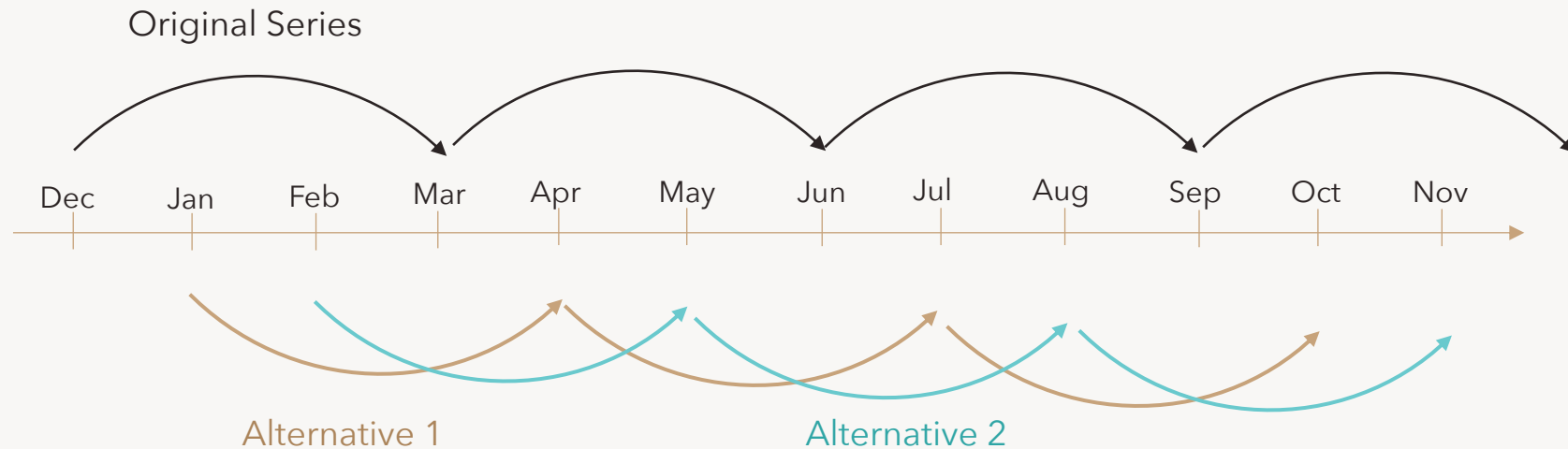
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1. Owns the equity [S&P 500] index
2. Buys a fixed strike put spread
 - Buys a modest OTM put option
 - Sells a further OTM put option
3. Sells a variable strike OTM call option
 - Self-financing position

Quarterly-Rebalanced Put-Spread Collars

They're subject to rebalance timing luck

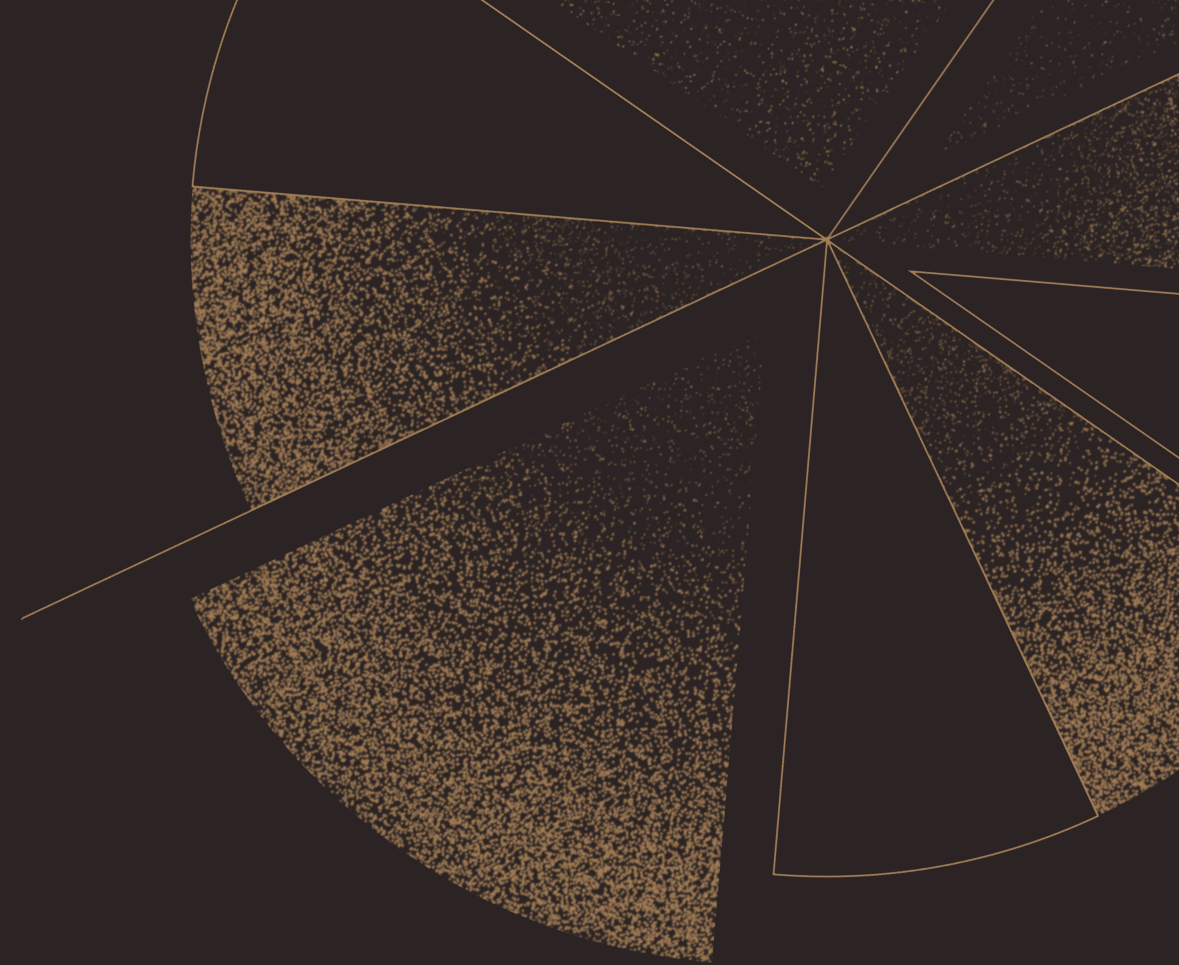
Quarterly put-spread collars are identically managed, with identical formation and holding period lengths



This is what initiates *rebalance timing luck*

Part 2

Data & Basic Methodology



Data & Basic Methodology

Data Vendor: iVolatility

Data Sample: 2008 to 2022

Equity Index: S&P 500 Index

Rebalance Dates: Typical Monthly Expirations (3rd Friday)

Put-Spread Collar Construction:

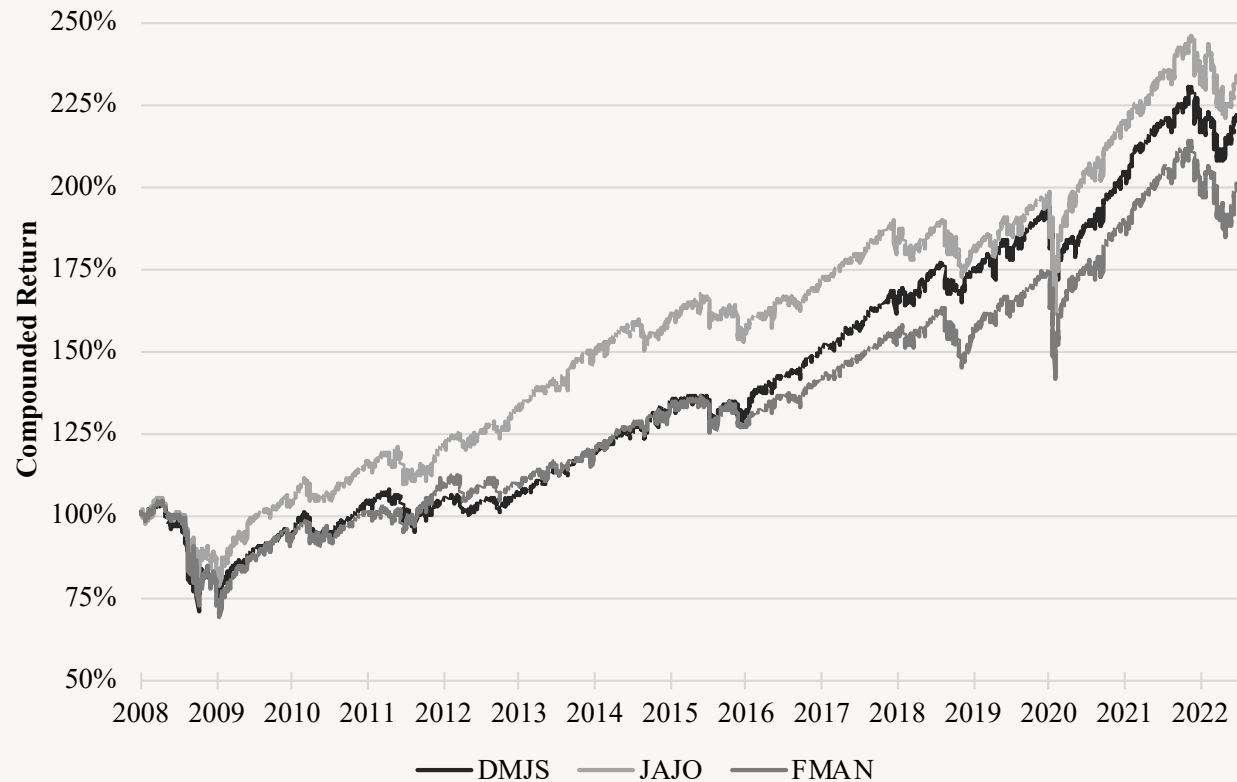
- Long S&P 500 Total Return Index
- Long 5% OTM Put Option
- Short 20% OTM Put Option
- Short Self-Financing OTM Call Option
- Three-month options traded on rebalance dates



Part 3
Establishing
Rebalance Timing Luck

Same Strategy with Different Outcomes

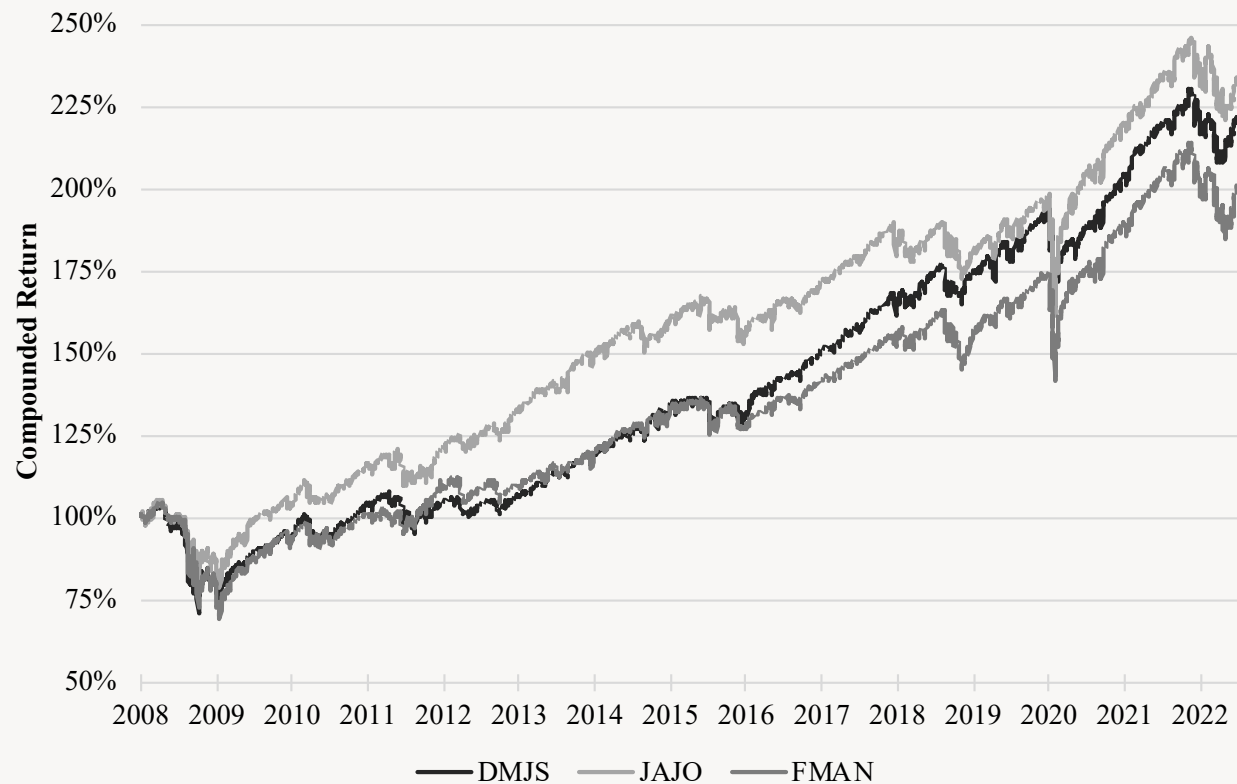
Material differences in performance: 1.0% in Excess Return



	S&P 500	DMJS	JAJO	FMAN
Excess Return	10.5%	5.7%	5.9%	4.9%
Volatility	20.8%	10.6%	10.9%	11.7%
Sharpe Ratio	0.51	0.54	0.54	0.42
Max Drawdown	52%	32%	25%	34%
Beta	1.00	0.47	0.49	0.53
Alpha	0.0%	0.8%	0.7%	-0.6%
Alpha T-Stat	0.00	0.70	0.70	-0.56

Same Strategy with Different Outcomes

Material differences in performance: 1.4% difference in realized alpha



	S&P 500	DMJS	JAJO	FMAN
Excess Return	10.5%	5.7%	5.9%	4.9%
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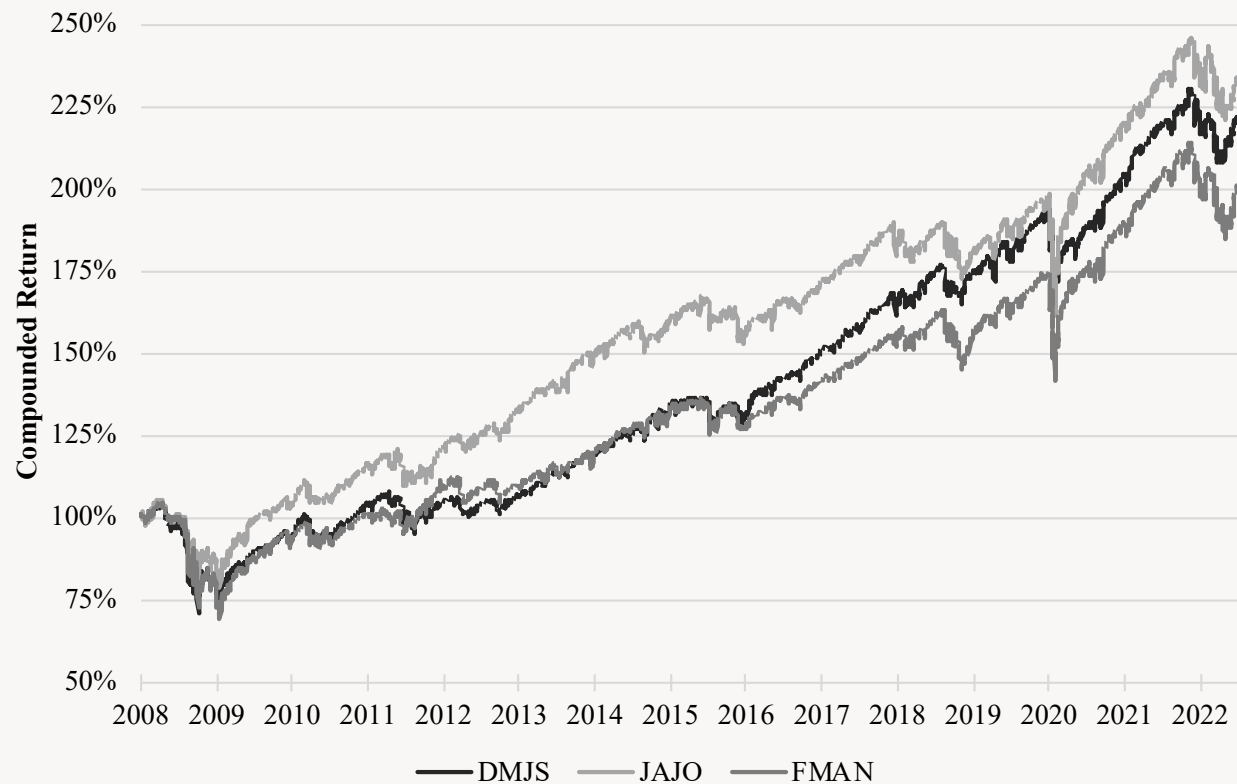
Material differences in performance: 1.1% difference in realized volatility



	S&P 500	DMJS	JAJO	FMAN
Excess Return	10.5%	5.7%	5.9%	4.9%
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Same Strategy with Different Outcomes

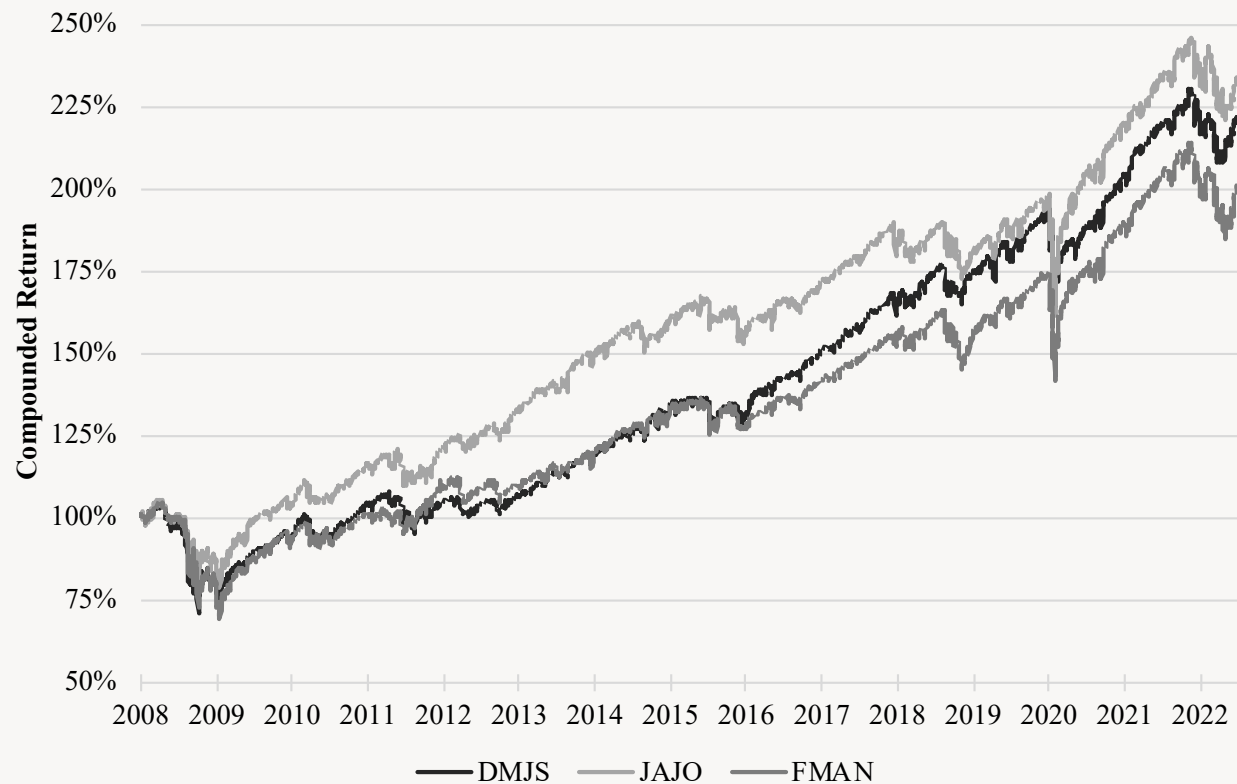
Material differences in performance: 0.12 difference in realized Sharpe ratio



	S&P 500	DMJS	JAJO	FMAN
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Same Strategy with Different Outcomes

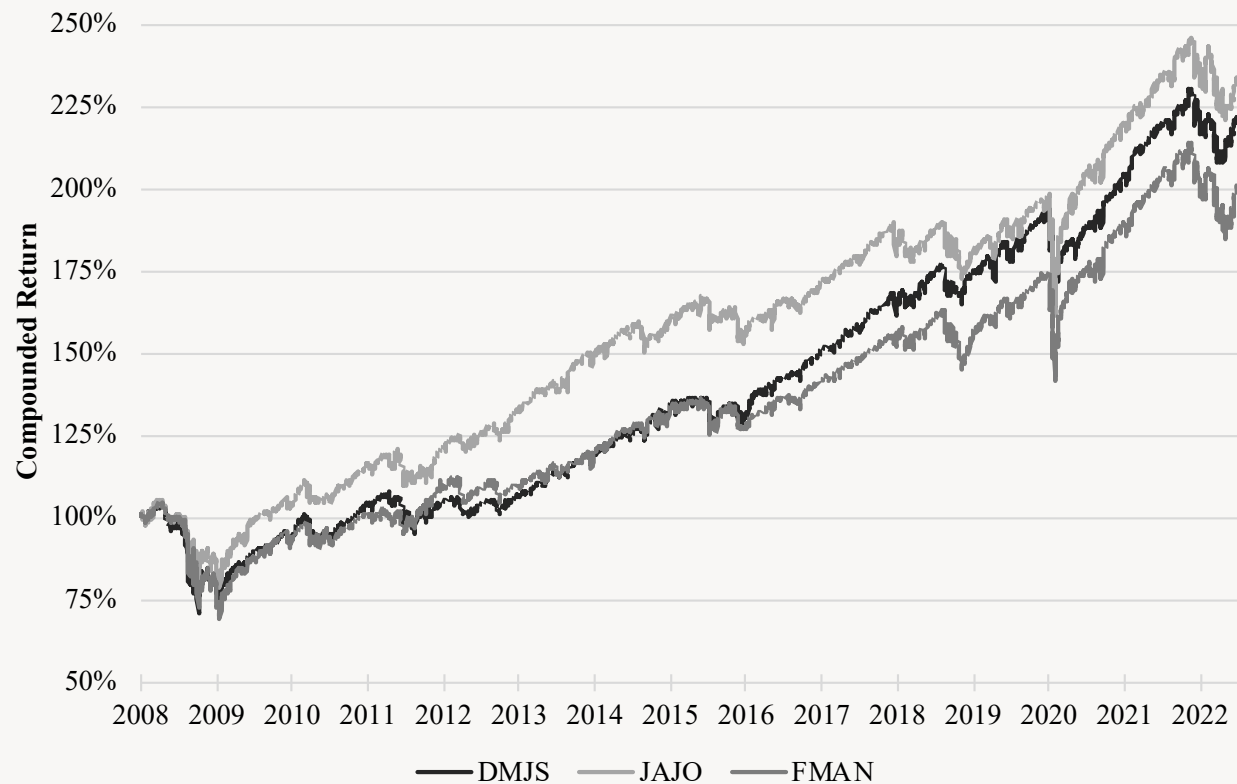
Material differences in performance: 9% difference in worst drawdown



	S&P 500	DMJS	JAJO	FMAN
Excess Return	10.5%	5.7%	5.9%	4.9%
Volatility	20.8%	10.6%	10.9%	11.7%
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Same Strategy with Different Outcomes

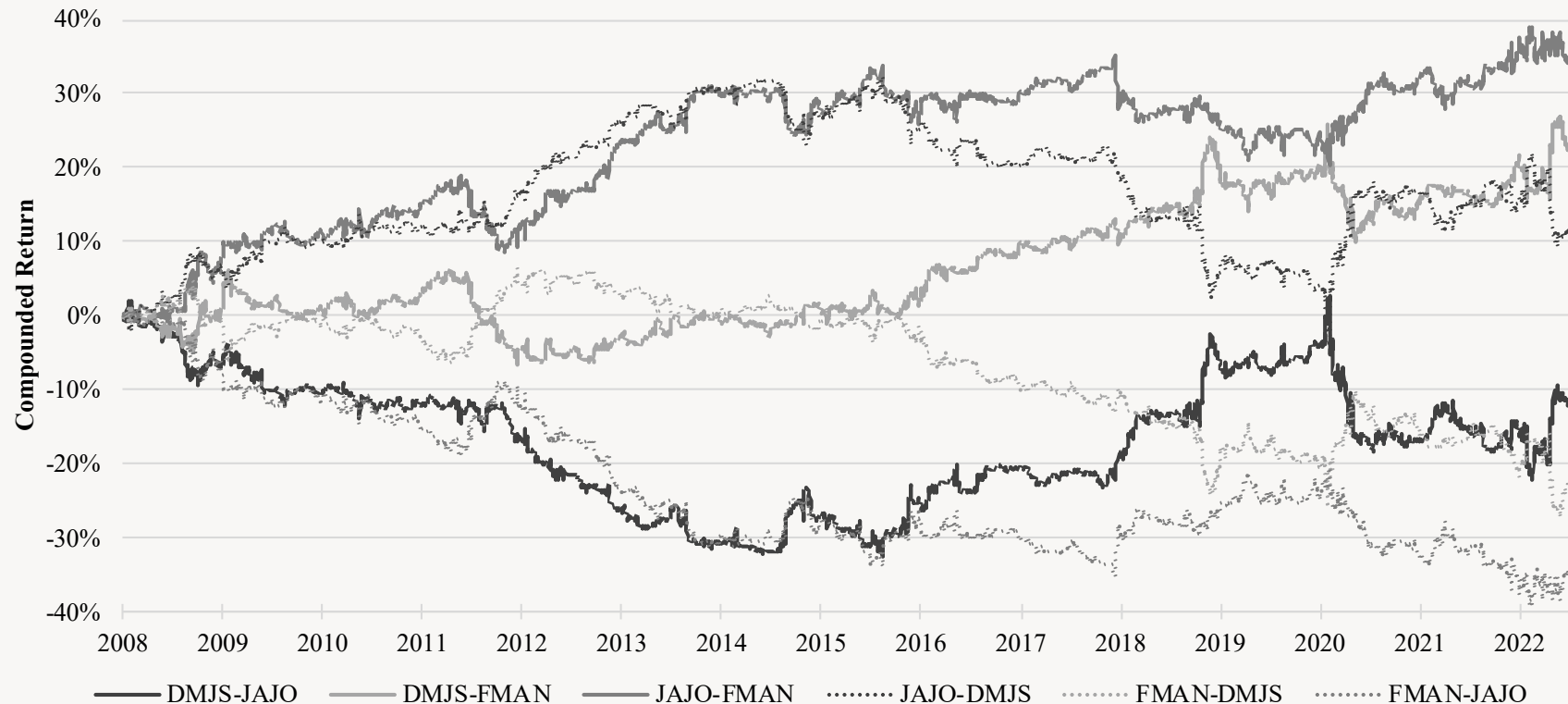
Material differences in performance: 0.06 difference in realized equity beta



	S&P 500	DMJS	JAJO	FMAN
Excess Return	10.5%	5.7%	5.9%	4.9%
Volatility	20.8%	10.6%	10.9%	11.7%
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Alpha	0.0%	0.8%	0.7%	-0.6%
Alpha T-Stat	0.00	0.70	0.70	-0.56

Same Strategy with Different Outcomes

These differences compound - nearly a 40% difference in total wealth over 15 years!



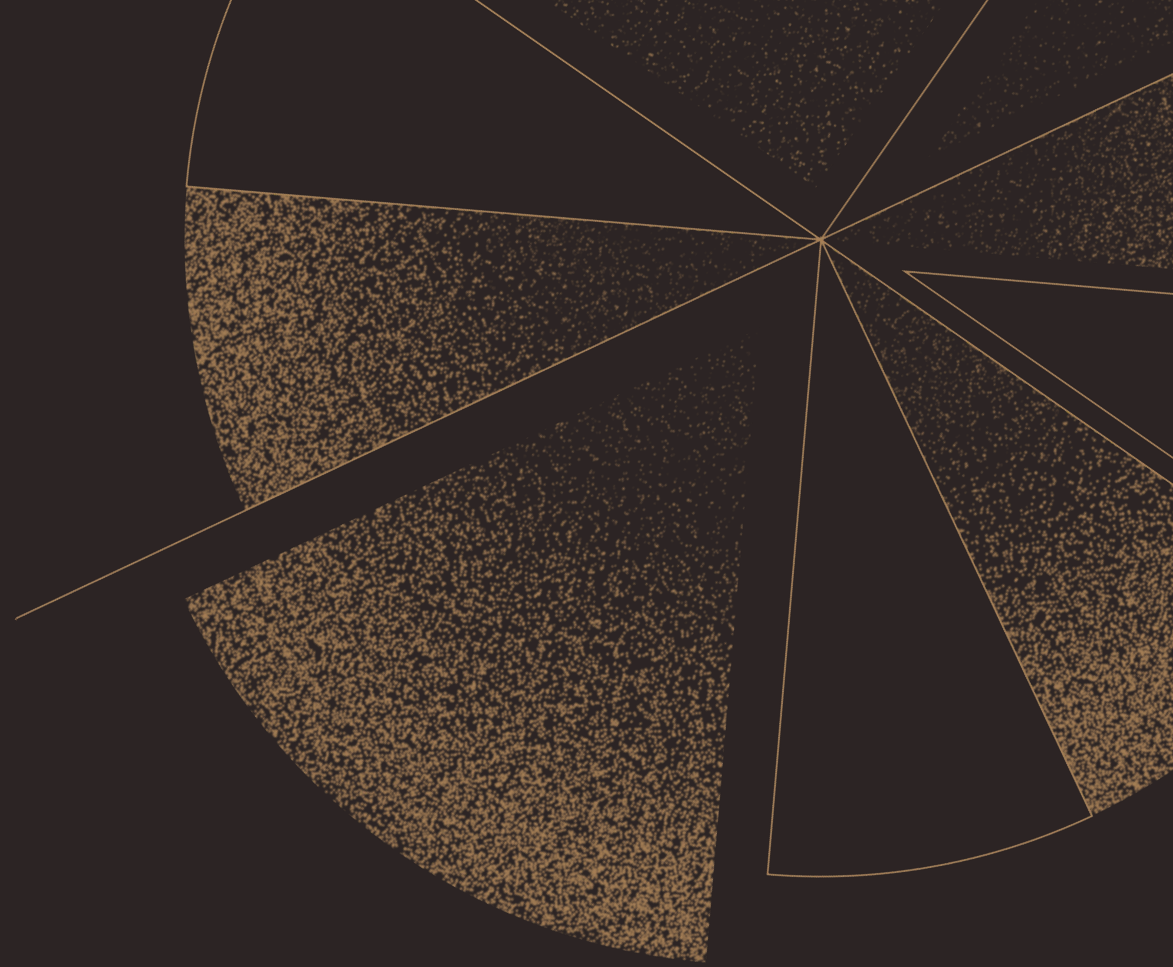
Same Strategy with Different Outcomes

Annual differences are large too - the spread is often greater than the average return!



Part 4

Delta



What is Delta?

Delta quantifies the sensitivity of an option's price to a change in the underlying asset price.

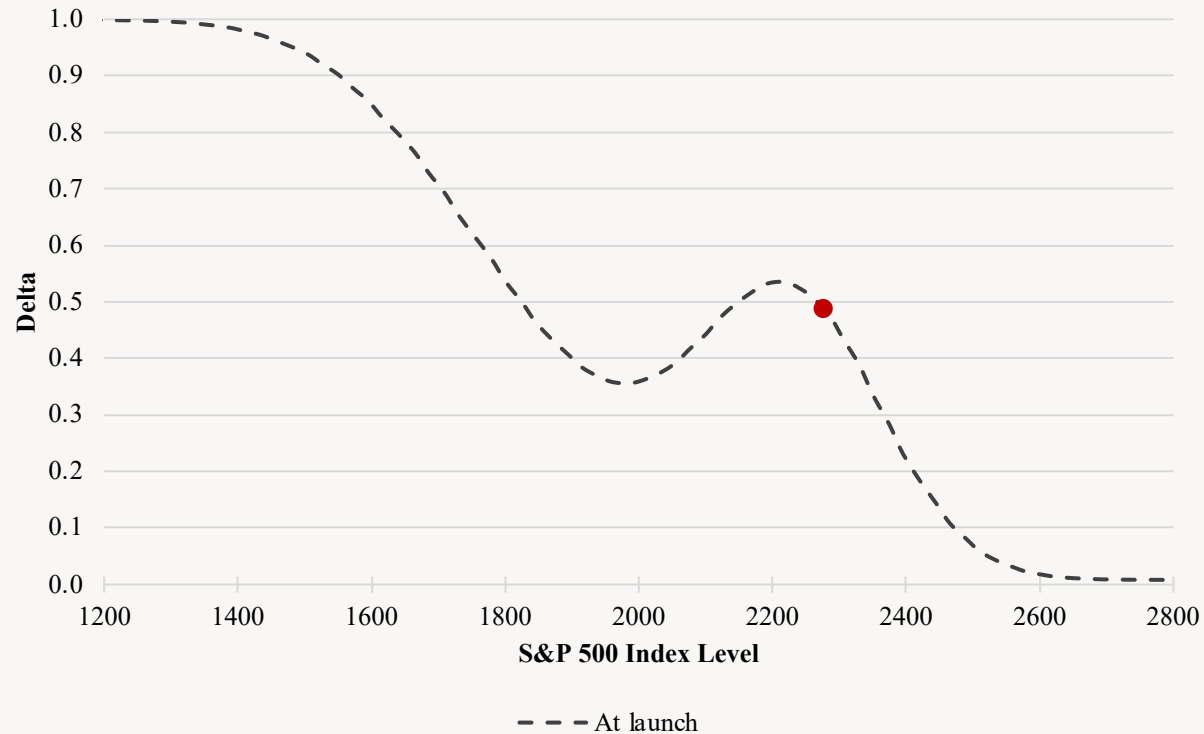
For a put-spread collar, it ranges from zero to one:

- Impacted by underlying asset price
- Impacted by time to expiry
- *And other things too...*



Put-Spread Delta for One Tranche Across Time

Deltas for April 2017 expiration put-spread collar on four different dates



S&P 500 on Jan 20, 2017: 2271.31

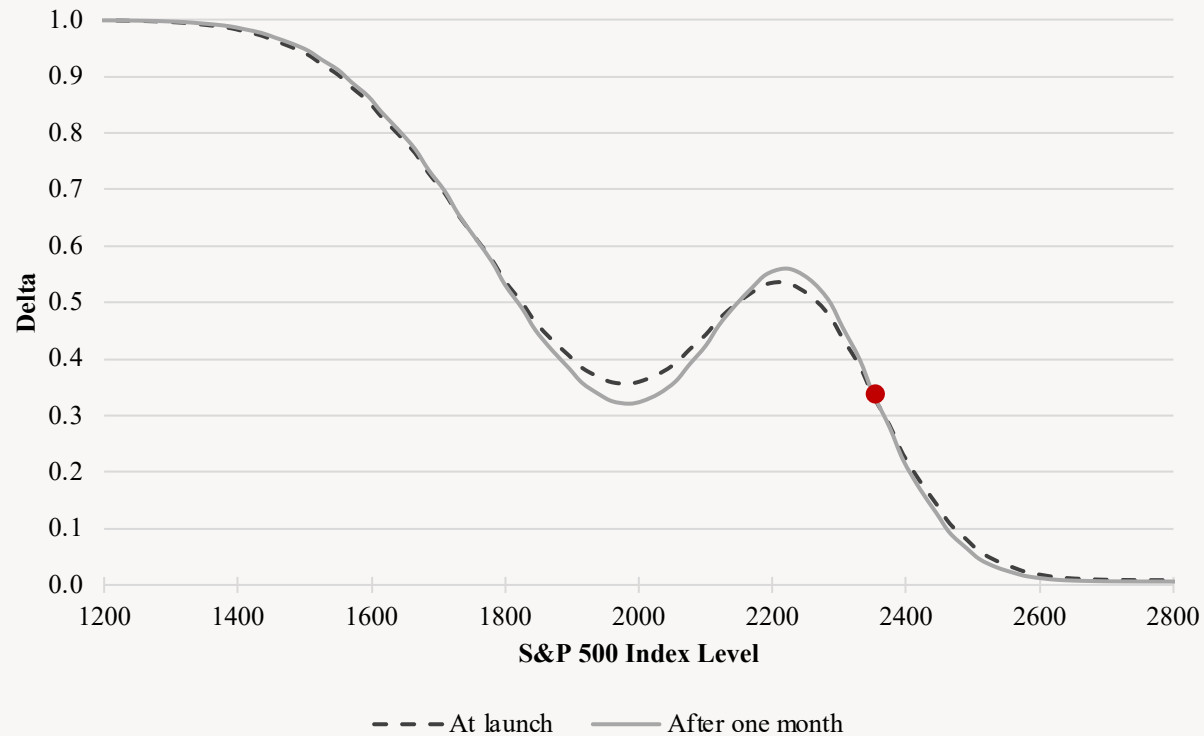
Delta on that date: 0.49

Delta characteristics:

1. Ranges from zero to one
2. Depends on index level

Put-Spread Delta for One Tranche Across Time

Deltas for April 2017 expiration put-spread collar on four different dates



S&P 500 on Feb 17, 2017: 2351.16

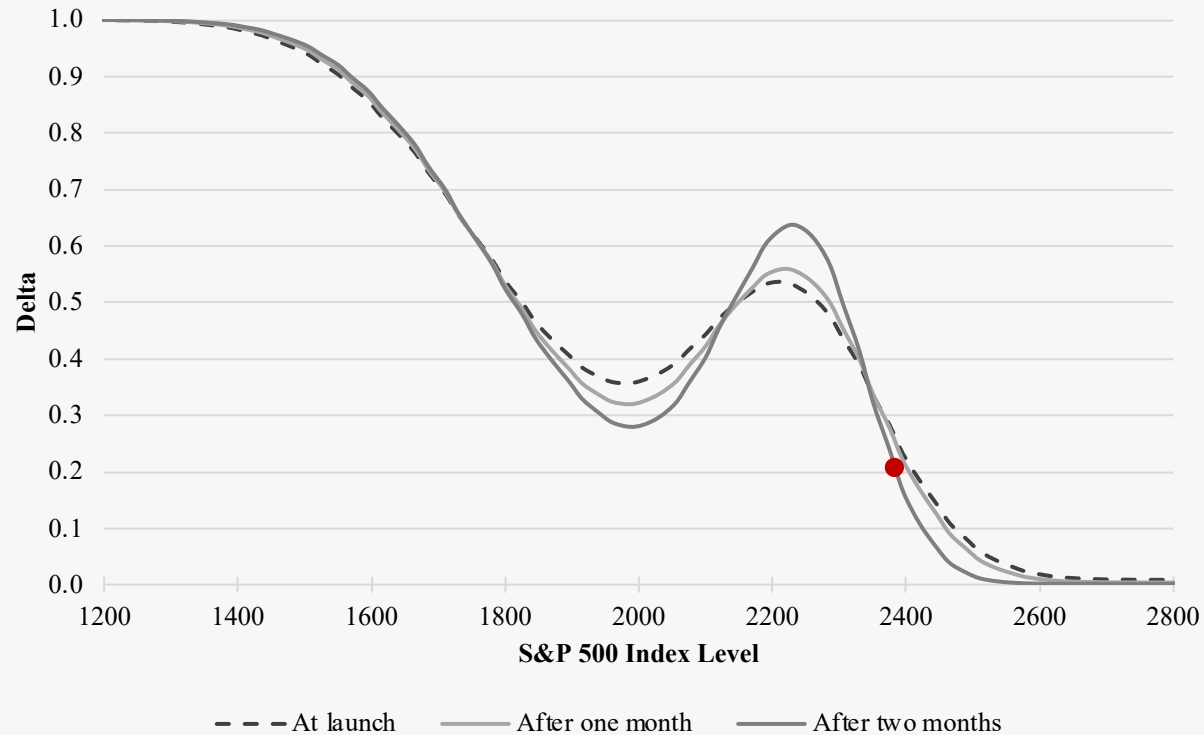
Delta on that date: 0.33

Delta characteristics:

1. Ranges from zero to one
2. Depends on index level
3. Depends on time to expiration

Put-Spread Delta for One Tranche Across Time

Deltas for April 2017 expiration put-spread collar on four different dates



S&P 500 on Mar 17, 2017: 2378.25

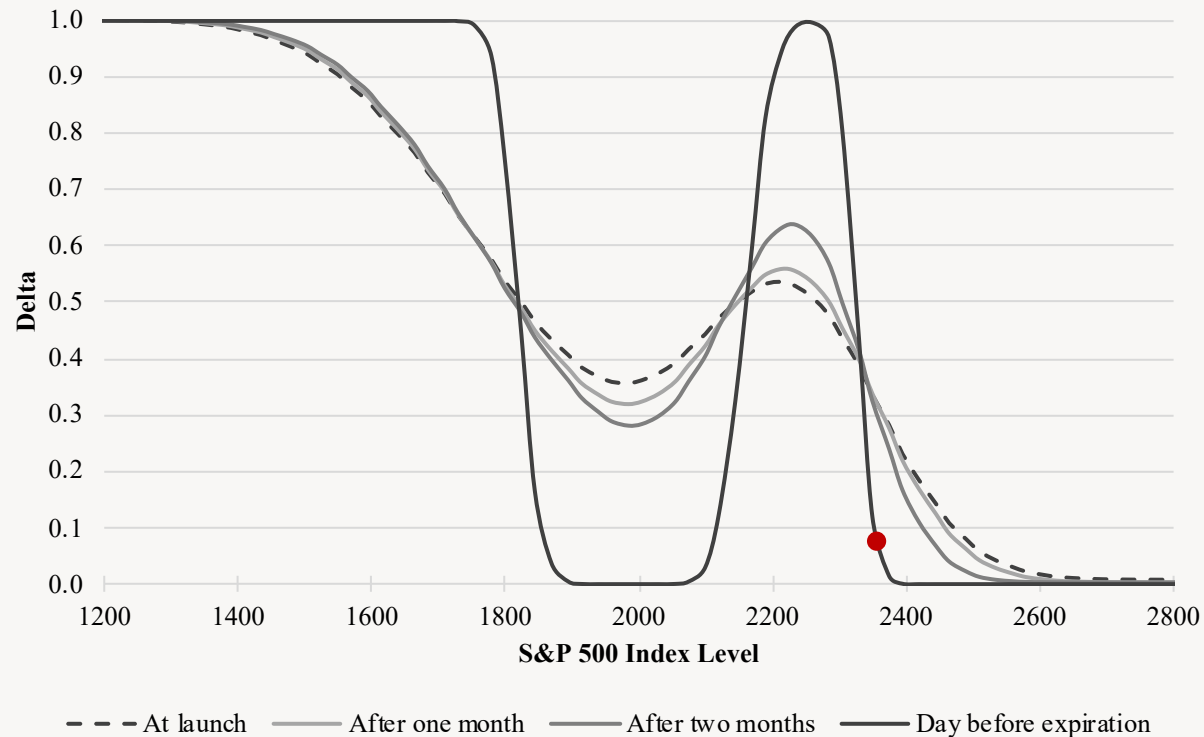
Delta on that date: 0.21

Delta characteristics:

1. Ranges from zero to one
2. Depends on index level
3. Depends on time to expiration

Put-Spread Delta for One Tranche Across Time

Deltas for April 2017 expiration put-spread collar on four different dates



S&P 500 on Apr 20, 2017: 2355.84

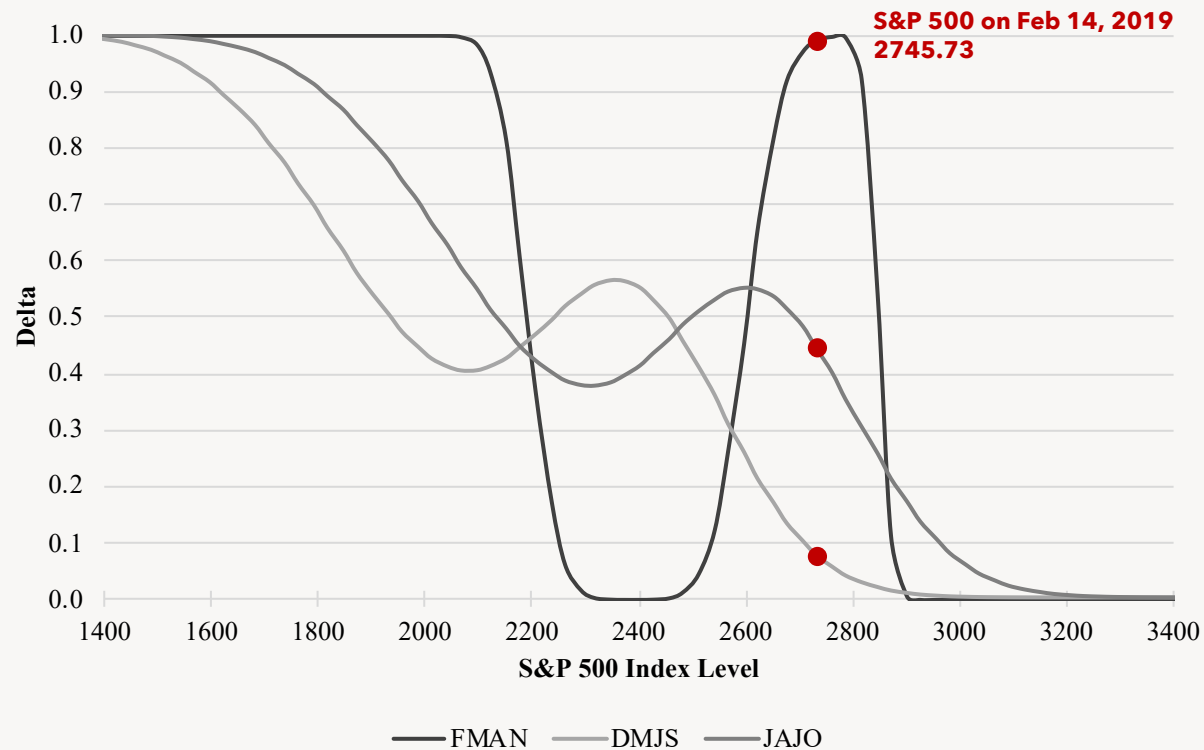
Delta on that date: 0.07

Delta characteristics:

1. Ranges from zero to one
2. Depends on index level
3. Depends on time to expiration

Three Tranches on the Same Date

Delta profiles on Feb 14, 2019 for the three rebalanced strategies



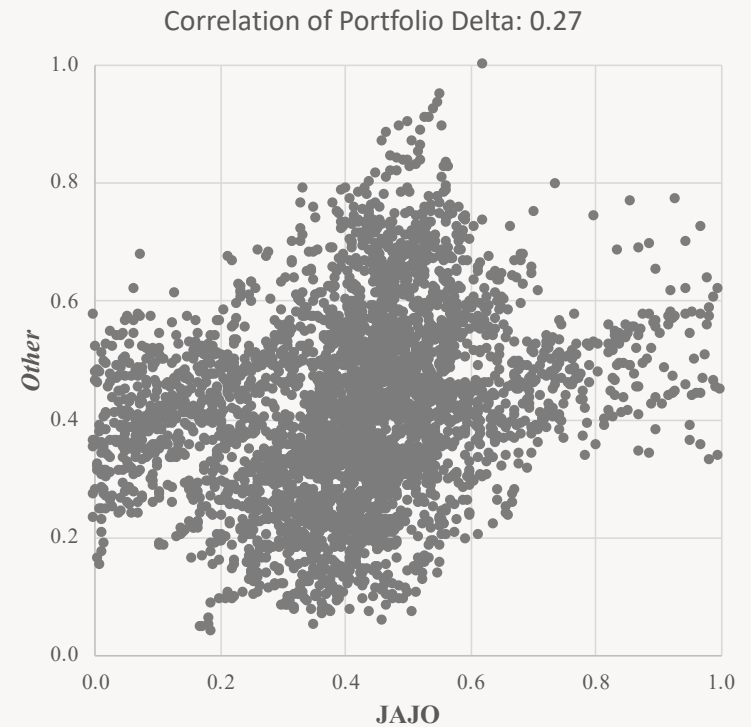
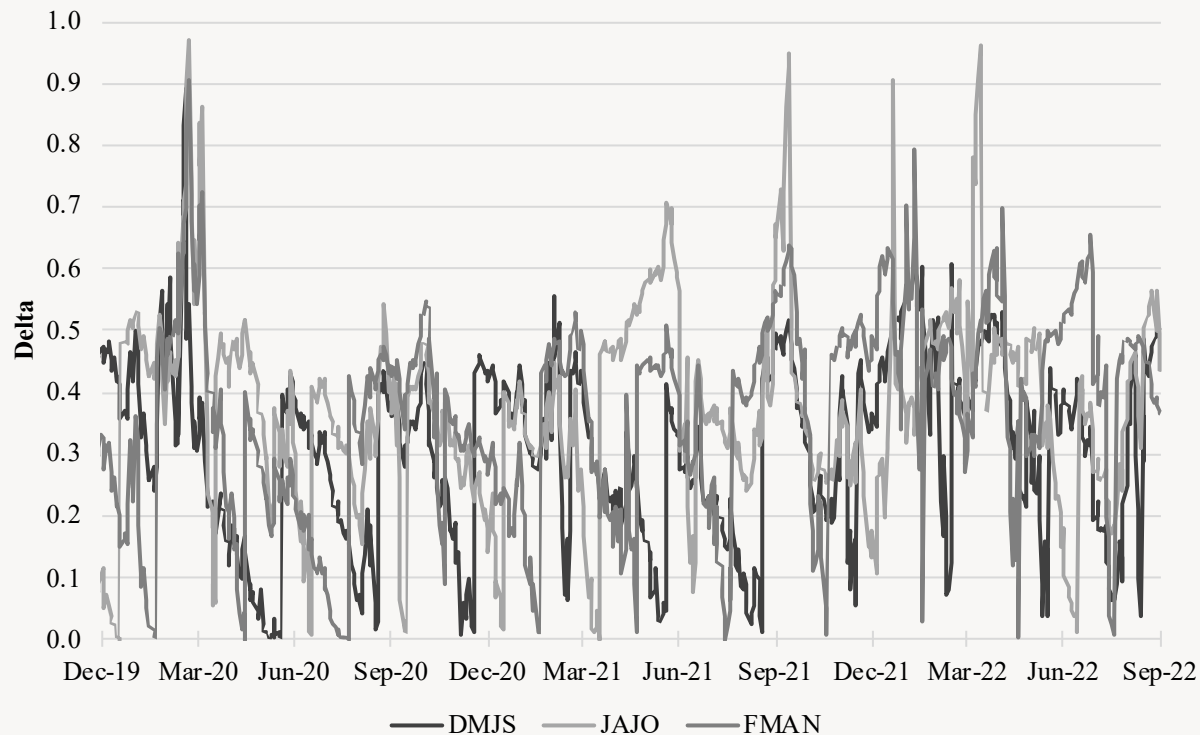
Materially different exposure to S&P 500!

- FMAN Tranche: Nearly 100% exposed
- JAJO Tranche: About 45% exposed
- DMJS Tranche: Less than 10% exposed

On dates such as this, these are very different strategies

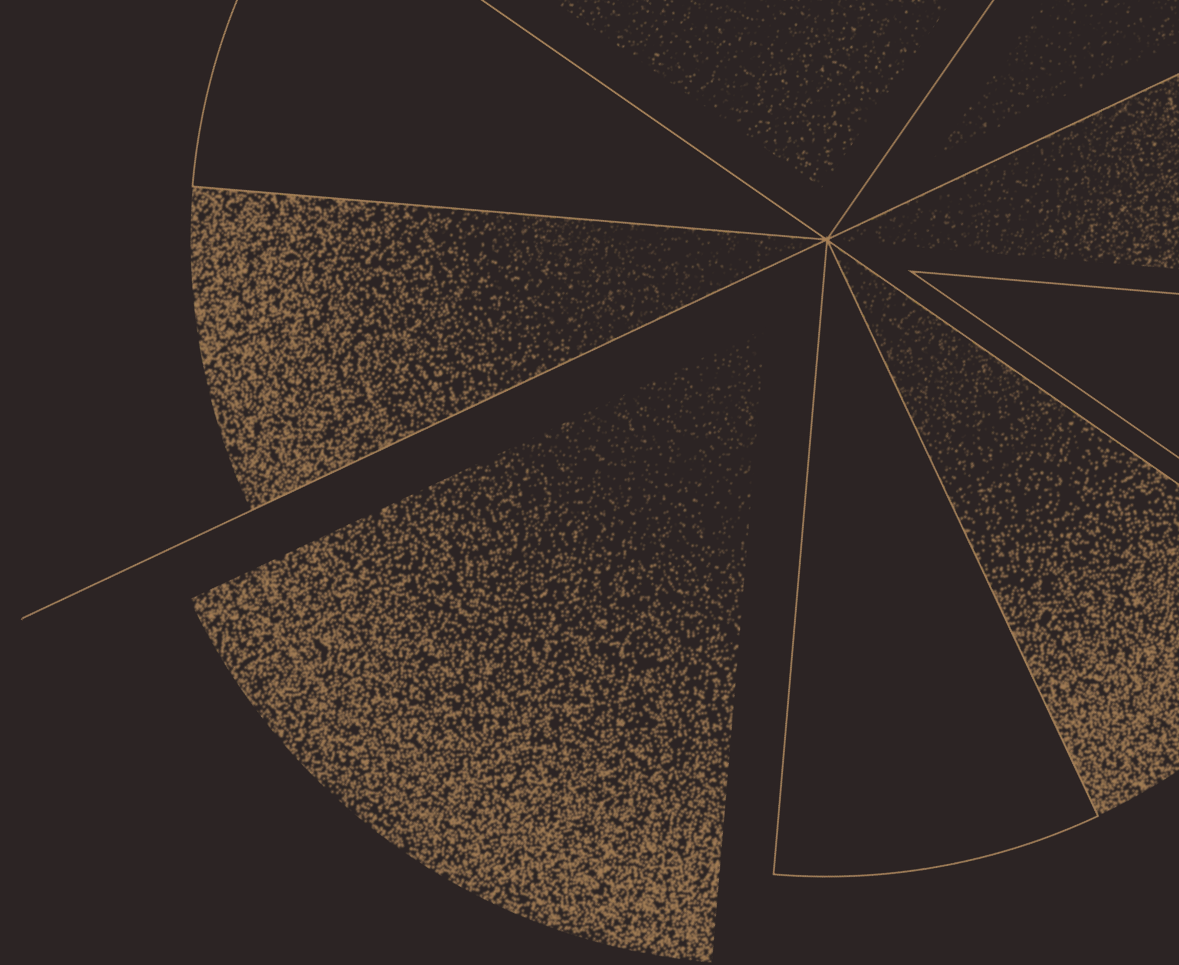
Time Varying Lowly Correlated Deltas

Differences in exposure to S&P 500 Index are a primary source of *rebalance timing luck*



Part 5

Performance Attribution



Performance Attribution Part I

One suggested attribution decomposes strategy return:

1. Passive Equity [due to average delta]
2. Timing [due to variable de-meaned delta]
3. Delta-Neutral (Convexity) [everything else]

- from “Covered Calls Uncovered”



Performance Attribution Part II

Each of these components can be further split into a common and an idiosyncratic component:

$$r_t = \underbrace{\left(\overbrace{\bar{r}_{pe,t}}^{\text{common}} + \overbrace{r_{pe,t}^*}^{\text{idiosyncratic}} \right)}_{\text{passive}} + \underbrace{(\bar{r}_{te,t} + r_{te,t}^*)}_{\text{timing}} + \underbrace{(\bar{r}_{dn,t} + r_{dn,t}^*)}_{\text{convexity}}$$

For Rebalance Timing Luck, we're interested in the idiosyncratic components



Performance Attribution

Decomposing the three tranches...

Average	Portfolio	Common			Idiosyncratic			Common	Idiosyncratic
		<i>Passive</i>	<i>Timing</i>	<i>Delta Neutral</i>	<i>Passive</i>	<i>Timing</i>	<i>Delta Neutral</i>		
Excess Return	5.5%	4.4%	0.6%	0.5%	0.0%	0.0%	0.0%	5.5%	0.0%
Volatility	11.1%	8.6%	2.8%	2.5%	0.1%	2.9%	1.8%	10.8%	3.1%
Sharpe Ratio	0.50	0.51	0.22	0.21	0.17	0.00	0.00	0.51	0.00
Max Drawdown	30.5%	24.5%	5.1%	6.1%	0.3%	9.3%	7.1%	29.2%	10.6%
Beta	0.50	0.42	0.05	0.03	0.00	0.00	0.00	0.50	0.00
Alpha	0.28%	0.00%	0.08%	0.20%	0.00%	0.00%	0.00%	0.28%	0.00%
Alpha T-Stat	0.28	0.00	0.11	0.32	0.00	0.00	-0.01	0.34	-0.01

Performance Attribution

Common components first

Average	Portfolio	Common			Idiosyncratic			Common	Idiosyncratic
		<i>Passive</i>	<i>Timing</i>	<i>Delta Neutral</i>	<i>Passive</i>	<i>Timing</i>	<i>Delta Neutral</i>		
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Sharpe Ratio	0.50	0.51	0.22	0.21	0.17	0.00	0.00	0.51	0.00
Max Drawdown	30.5%	24.5%	5.1%	6.1%	0.3%	9.3%	7.1%	29.2%	10.6%
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Alpha T-Stat	0.28	0.00	0.11	0.32	0.00	0.00	-0.01	0.34	-0.01

1. Each of the common components has equity beta

2. *Timing & Delta Neutral* have positive performance, but alphas are negligible and statistically insignificant

Performance Attribution

Idiosyncratic components next

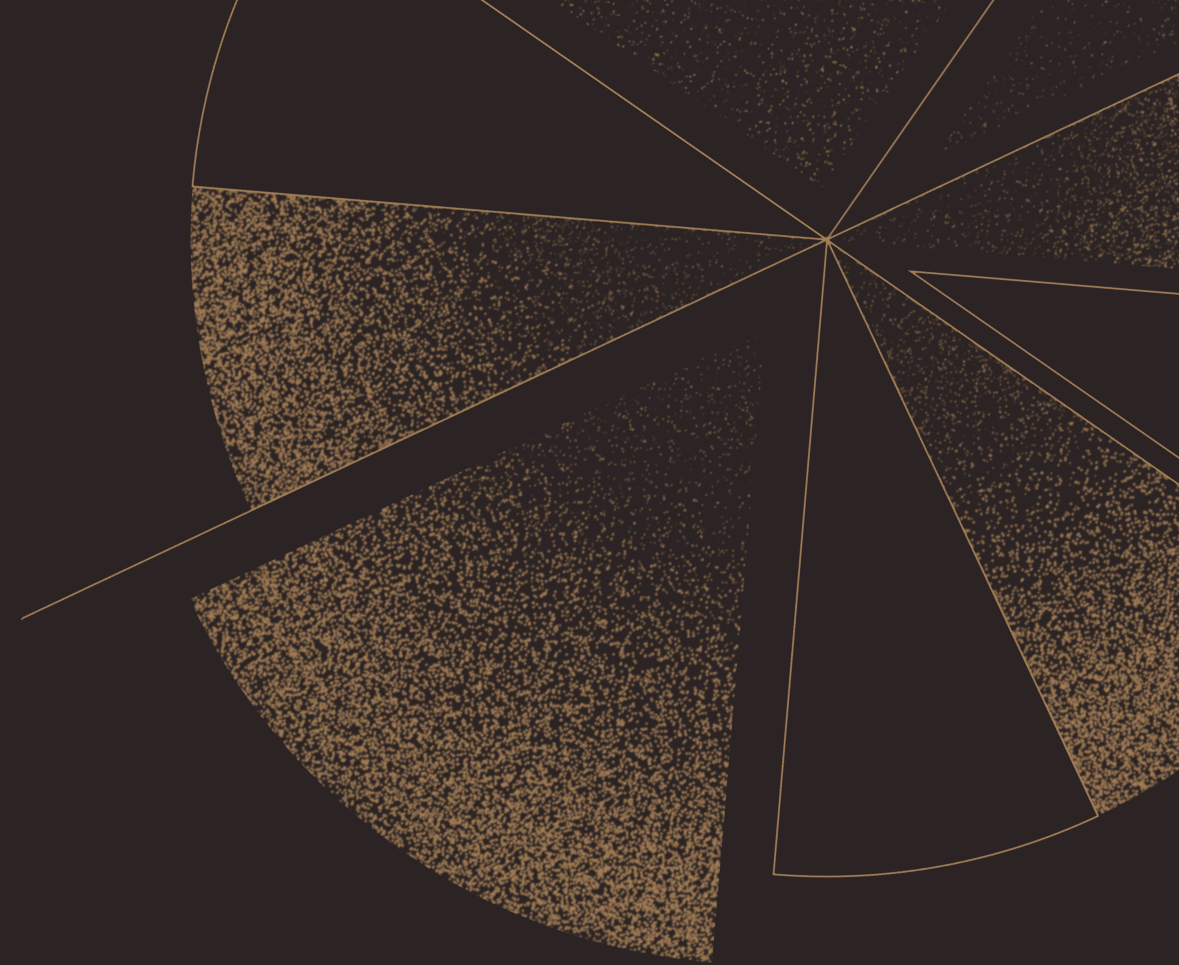
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Alpha T-Stat	0.28	0.00	0.11	0.32	0.00	0.00	-0.01	0.34	-0.01

1. **Rebalance Timing Luck [idiosyncratic] is a significant source of risk**
2. **Timing arising from delta is responsible for most of RTL**
3. **But Convexity [Delta Neutral] is also important**

Part 6

Final

Thoughts



Final Thoughts

Put-Spread Collars are materially impacted by Rebalance Timing Luck

Put-Spread Collars rebalanced on different dates have materially different performance

Rebalance Timing Luck has nearly 40% of the volatility of the strategy itself

Be careful not to reward or penalize managers or funds due to *luck*

If allocating ... can invest in a single tranche as a well-defined point-to-point solution

... or can diversify across tranches:

- Little impact on reducing volatility or improving peak-to-trough drawdowns ☹️
- But mitigates the risk of unluckily investing in the “loser” strategy, which underperformed median by 15% over full sample 😊

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AGE 41, TECH EXECUTIVE

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