Wharton
University of Pennsylvania

Jacobs Levy Equity
Management Center
for Quantitative Financial Research

Discussion: “Moving Targets”

Bradford (Lynch) Levy

Booth School of Business, University of Chicago

Center for Applied AI, Becker Friedman Institute for Economics

Motivation

- How does the market interpret changes to firms' chosen performance measures?

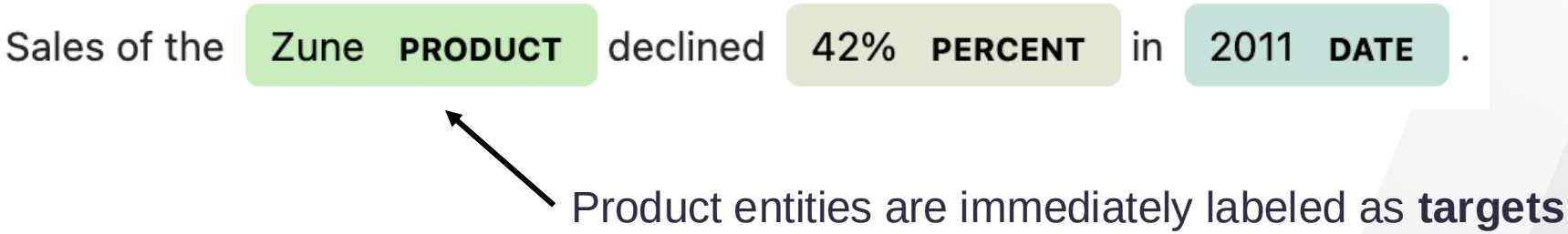
- Important question:
  - **No two firms are identical** – freedom to choose measures may provide investors with greater insight into the firm and improve price efficiency
  - **Costly information processing** – different measures for every firm could make valuation more difficult and impede price formation
  - **Mandatory disclosure** – regulators tend to focus on requiring disclosure. This work studies investors' ability to ***compel and interpret*** disclosure in a voluntary setting

Approach

- Analyze earnings call transcripts from 2006 through 2020
- Identify discussion of targets using named entity recognition and dependency parsing

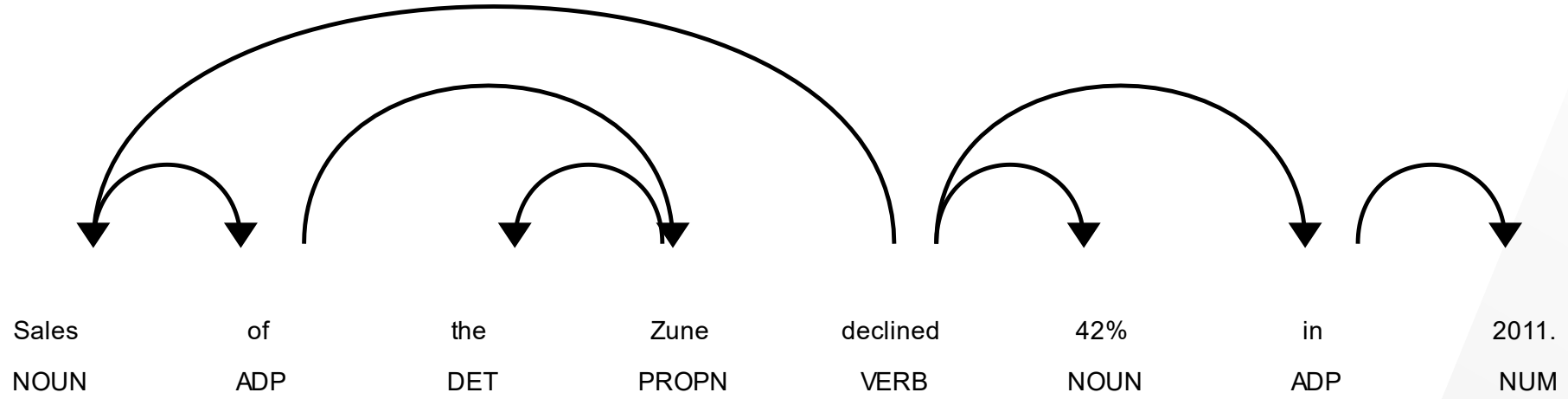
Approach

- Analyze earnings call transcripts from 2006 through 2020
- Identify discussion of targets using named entity recognition and dependency parsing



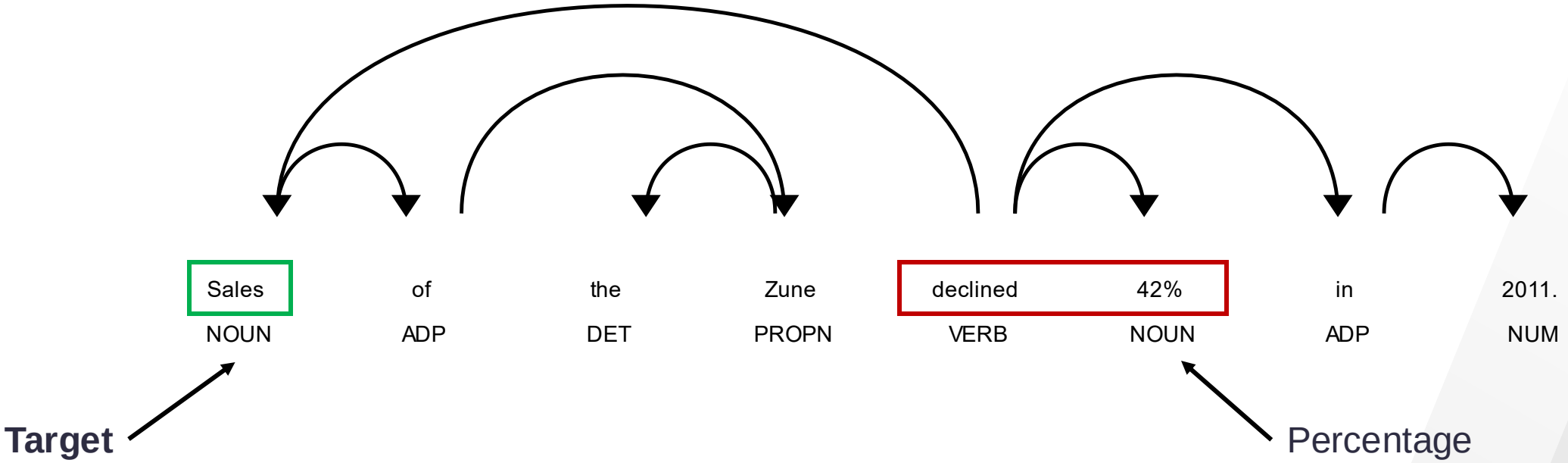
Approach

- Analyze earnings call transcripts from 2006 through 2020
- Identify discussion of targets using named entity recognition and dependency parsing
  - Special treatment for MONEY and PERCENT entities



Approach

- Analyze earnings call transcripts from 2006 through 2020
- Identify discussion of targets using named entity recognition and dependency parsing
  - Special treatment for MONEY and PERCENT entities



Approach

- Analyze earnings call transcripts from 2006 through 2020
- Identify discussion of targets using named entity recognition and dependency parsing
  - Special treatment for MONEY and PERCENT entities
- After identifying all targets over time, the authors measure moving targets as:

$$Moving\ Targets_t = \frac{\sum (Missing\ Targets_t \mid Targets_{t-4})}{\sum Targets_{t-4}}$$

Key Takeaways

- Firms talk about targets a lot.

	Count	Mean	SD	1%tile	99%tile
Number of Targets	143153	126.9272	57.28876	28	300
Moving Targets	143153	.5572682	.1149202	.2758621	.8409091

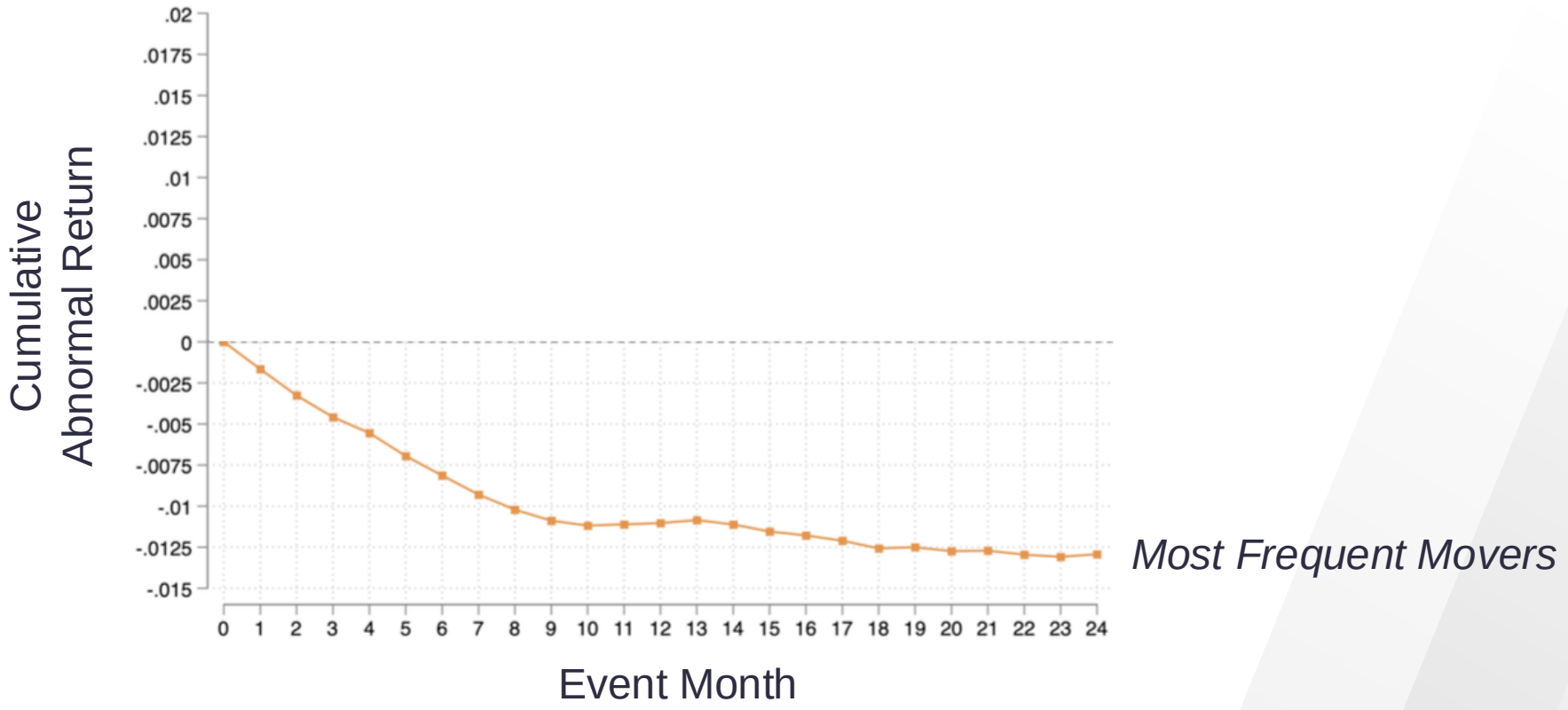
Key Takeaways

- Firms talk about targets a lot. They also "move" targets frequently.

	Count	Mean	SD	1%tile	99%tile
Number of Targets	143153	126.9272	57.28876	28	300
Moving Targets	143153	.5572682	.1149202	.2758621	.8409091

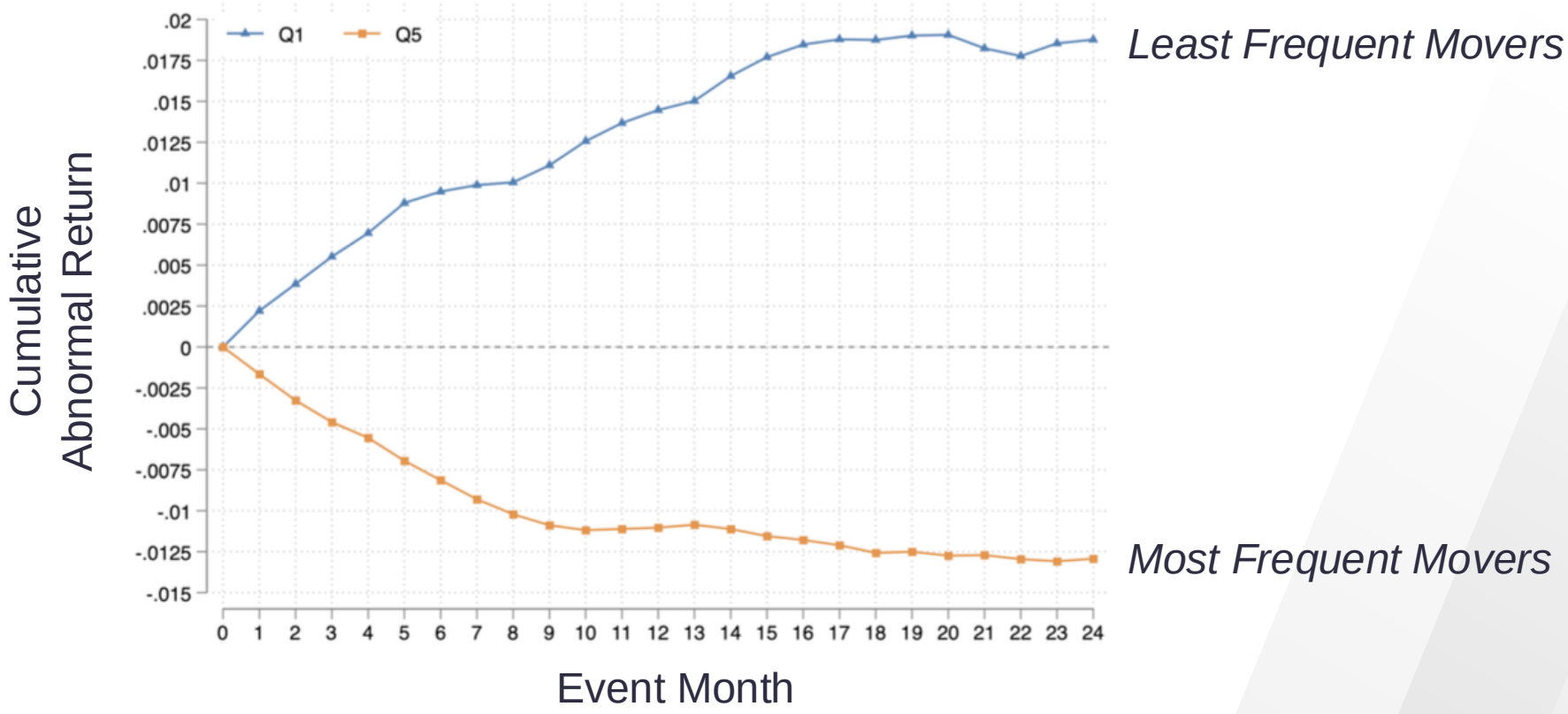
Key Takeaways

- Firms talk about targets a lot. They also “move” targets frequently.
- The *Most Frequent Movers* underperform the market.



Key Takeaways

- Firms talk about targets a lot. They also “move” targets frequently.
- The *Most Frequent Movers* underperform the market. *Least Frequent Movers* outperform.



Key Takeaways

- Firms talk about targets a lot. They also “move” targets frequently.
- The *Most Frequent Movers* underperform the market. *Least Frequent Movers* outperform.
- Find this pattern is more pronounced when firm’s targets are more complex or non-financial

Key Takeaways

- Firms talk about targets a lot. They also “move” targets frequently.
- The *Most Frequent Movers* underperform the market. *Least Frequent Movers* outperform.
- Find this pattern is more pronounced when firm’s targets are more complex or non-financial
- Evidence is consistent with “investors fail[ing] to realize or take into account the valuable information in these simple changes in targets.”

Key Takeaways

- Firms talk about targets a lot. They also "move" targets frequently.
- The *Most Frequent Movers* underperform the market. *Least Frequent Movers* outperform.
- Find this pattern is more pronounced when firm's targets are more complex or non-financial
- Evidence is consistent with "investors fail[ing] to realize or take into account the valuable information in these simple changes in targets."
  - Reminiscent of *Lazy Prices*: "investors are inattentive to the valuable information in these simple changes"

Ideas for Future Analyses

- Large literature on use of targets in compensation and contracting
  - How does use of a target for compensation affect the firm's discussion of it?

Ideas for Future Analyses

- Large literature on use of targets in compensation and contracting
  - How does use of a target for compensation affect the firm's discussion of it?

- Discontinuation of a target is not categorically a bad thing
  - A firm ceases discussing one target because it has been supplanted by a more profitable one.
  - Discussion of losses ends as a firm turns profitable.

Ideas for Future Analyses

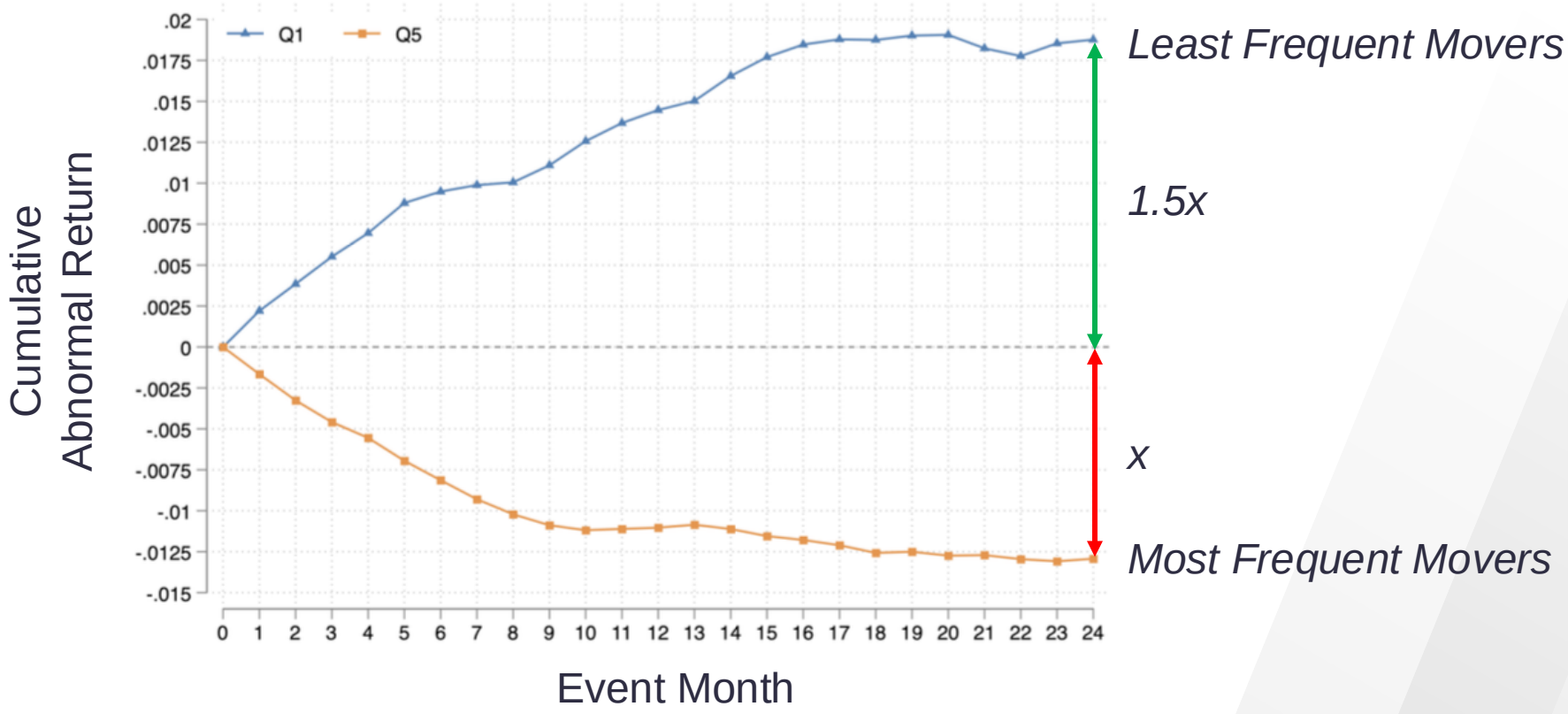
- Large literature on use of targets in compensation and contracting
  - How does use of a target for compensation affect the firm's discussion of it?

- Discontinuation of a target is not categorically a bad thing
  - A firm ceases discussing one target because it has been supplanted by a more profitable one.
  - Discussion of losses ends as a firm turns profitable.

- Is there more to the story behind what is driving the alpha?

Ideas for Future Analyses

- Alpha also comes from infrequent movers.



Ideas for Future Analyses

- Alpha also comes from infrequent movers.

Table II - Panel D: VW Returns

	Q1	Q10	Q10 - Q1
Excess	0.0131***	0.0067*	-0.0064***
Return	(3.1932)	(1.6808)	(-3.6985)
	Q1	Q10	Q10 - Q1
3-Factor	0.0042***	-0.0026**	-0.0068***
Alpha	(2.9654)	(-2.4540)	(-3.7704)
	Q1	Q10	Q10 - Q1
5-Factor	0.0048***	-0.0030***	-0.0078***
Alpha	(3.4588)	(-2.9335)	(-4.3795)

Table IX: VW Returns Most Persistent Targets

	Q1	Q10	Q10 - Q1
Excess Return	0.0140***	0.0064	-0.0076***
	(3.2500)	(1.5570)	(-3.4562)
3-Factor Alpha	0.0052***	-0.0030**	-0.0081***
	(3.0797)	(-2.0676)	(-3.6411)
5-Factor Alpha	0.0060***	-0.0039***	-0.0099***
	(3.5183)	(-2.8833)	(-4.3978)

Ideas for Future Analyses

- Alpha also comes from infrequent movers. Seems like the paper could be about both moving ***and stationary*** targets.

Table II - Panel D: VW Returns

	Q1	Q10	Q10 - Q1
Excess	0.0131***	0.0067*	-0.0064***
Return	(3.1932)	(1.6808)	(-3.6985)
	Q1	Q10	Q10 - Q1
3-Factor	0.0042***	-0.0026**	-0.0068***
Alpha	(2.9654)	(-2.4540)	(-3.7704)
	Q1	Q10	Q10 - Q1
5-Factor	0.0048***	-0.0030***	-0.0078***
Alpha	(3.4588)	(-2.9335)	(-4.3795)

Table IX: VW Returns Most Persistent Targets

	Q1	Q10	Q10 - Q1
Excess Return	0.0140***	0.0064	-0.0076***
	(3.2500)	(1.5570)	(-3.4562)
3-Factor Alpha	0.0052***	-0.0030**	-0.0081***
	(3.0797)	(-2.0676)	(-3.6411)
5-Factor Alpha	0.0060***	-0.0039***	-0.0099***
	(3.5183)	(-2.8833)	(-4.3978)

Ideas for Future Analyses

- Large literature on use of targets in compensation and contracting
  - How does use of a target for compensation affect the firm's discussion of it?
- Discontinuation of a target is not categorically a bad thing
  - A firm ceases discussing one target because it has been supplanted by a more profitable one.
  - Discussion of losses ends as a firm turns profitable.
- Is there more to the story behind what is driving the alpha?
  - What is driving the outperformance in the "least frequent movers" portfolio?
- Can the measure be developed further?

Ideas for Future Analyses

HEAD-DRIVEN STATISTICAL MODELS FOR NATURAL LANGUAGE PARSING

Michael Collins

A DISSERTATION

in

Computer and Information Science

Presented to the Faculties of the University of Pennsylvania

in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

1999

Ideas for Future Analyses

HEAD-DRIVEN STATISTICAL MODELS FOR NATURAL LANGUAGE PARSING

Michael Collins

A DISSERTATION

in

Computer and Information Science

Presented to the Faculties of the University of Pennsylvania

in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

1999

Ideas for Future Analyses

- NER is challenging.

Ideas for Future Analyses

- NER is challenging.

Figure 1: Sample Part of Speech to Identify Targets

Figure 1A

Excerpt from Apple Conference Call on October 19th, 2009

Peter Oppenheimer, Apple Inc. - VP - Finance, CFO: Thank you, Nancy. Thank you for joining us. We're extremely pleased to report Apple's most profitable quarter ever and sales of more Macs PRODUCT and iPhones than in any previous quarter. We are thrilled with these record-breaking results, particularly given the economic environment around us. Revenue for the quarter was $9.87 billion MONEY, representing 25% PERCENT growth over the prior September quarter's results. This was Apple's second highest quarterly revenue ever, next to the record results reported for last December quarter. Operating margin was Apple's highest ever at $2.19 billion MONEY, representing over 22% PERCENT of revenue and higher than our guidance, due to better than expected revenue and gross margin. Net income was $1.67 billion MONEY, which translated to earnings per share of $ 1.82 MONEY. In terms of non-GAAP measures, adjusted sales totaled $12.25 billion MONEY for the September quarter, which was almost $2.4 billion MONEY higher than our reported revenue. Adjusted gross margin was $5.21 billion MONEY, which was almost $1.6 billion MONEY higher than our reported gross margin. And adjusted net income was $2.85 billion MONEY, or almost $1.2 billion MONEY higher than our reported net income. We believe that these non-GAAP financial measures provided added transparency to our business and hope they are helpful to you in your analysis and understanding of our performance in the September quarter. Turning to the details of our results, I would like to begin with our Mac products and services. We generated outstanding Mac sales of $3.05 million MONEY, meeting our previous record set in the year-ago quarter by over $ 440,000 MONEY. The Mac PRODUCT is showing fantastic momentum, growing faster than the market in 19 of the past 20 quarters. We believe this is the result of our unmatched innovation and commitment to providing customers with the best hardware, the best software, and the best user experience in the world. Quarterly Mac PRODUCT sales grew 17% PERCENT year-over-year and this compares extremely favorably to IDC's latest published estimate of 2% PERCENT growth for the market overall in the September quarter. Customers continue to respond very positively to our Mac PRODUCT portable lineup, which we updated in June. Portable sales increased 35% PERCENT year-over-year and represented 74% PERCENT of our Mac PRODUCT mix. Our execution in the quarter was outstanding, and we were particularly pleased with the 42% PERCENT year-over-year growth in our Asia-Pacific segment. We once again had a very successful back-to-school season, and were very pleased with the 12% PERCENT year-over-year increase in Mac PRODUCT sales to US education institutions, which resulted in the highest quarterly Mac sales ever for our US education business. The shipments to US education institutions this quarter included 50,000 MacBooks PRODUCT to the state of Maine as part of its ongoing one-to-one initiative. Customer response to the August 28th release of Snow Leopard PRODUCT has been tremendous.

Ideas for Future Analyses

- NER is challenging.

Figure 1: Sample Part of Speech to Identify Targets

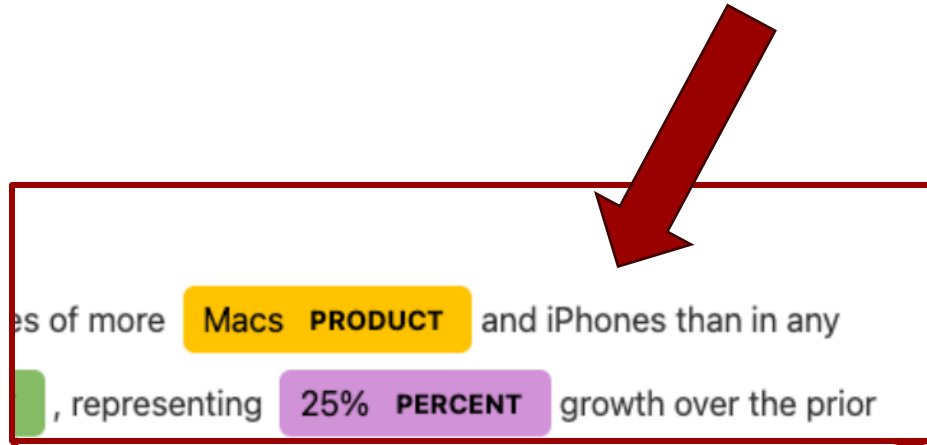


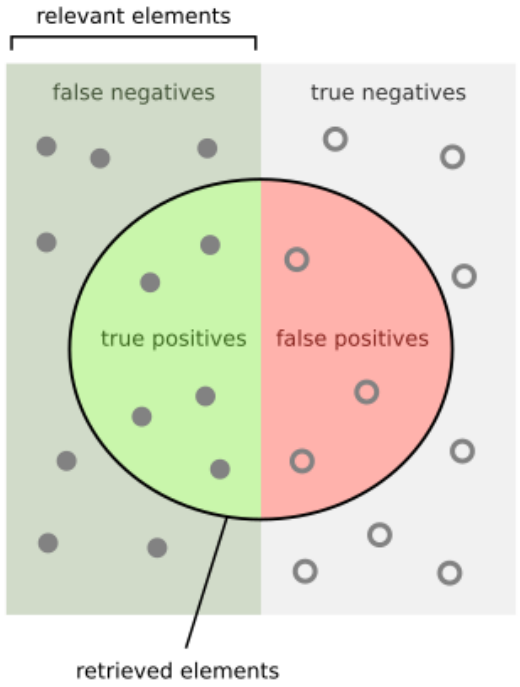
Figure 1A

Excerpt from Apple Conference Call on October 19th, 2009

Peter Oppenheimer, Apple Inc. - VP - Finance, CFO: Thank you, Nancy. Thank you for joining us. We're extremely pleased to report Apple's most profitable quarter ever and sales of more Macs PRODUCT and iPhones than in any previous quarter. We are thrilled with these record-breaking results, particularly given the economic environment around us. Revenue for the quarter was $9.87 billion MONEY, representing 25% PERCENT growth over the prior September quarter's results. This was Apple's second highest quarterly revenue ever, next to the record results reported for last December quarter. Operating margin was Apple's highest ever at $2.19 billion MONEY, representing over 22% PERCENT of revenue and higher than our guidance, due to better than expected revenue and gross margin. Net income was $1.67 billion MONEY, which translated to earnings per share of $ 1.82 MONEY. In terms of non-GAAP measures, adjusted sales totaled $12.25 billion MONEY for the September quarter, which was almost $2.4 billion MONEY higher than our reported revenue. Adjusted gross margin was $5.21 billion MONEY, which was almost $1.6 billion MONEY higher than our reported gross margin. And adjusted net income was $2.85 billion MONEY, or almost $1.2 billion MONEY higher than our reported net income. We believe that these non-GAAP financial measures provided added transparency to our business and hope they are helpful to you in your analysis and understanding of our performance in the September quarter. Turning to the details of our results, I would like to begin with our Mac products and services. We generated outstanding Mac sales of $3.05 million MONEY, meeting our previous record set in the year-ago quarter by over $ 440,000 MONEY. The Mac PRODUCT is showing fantastic momentum, growing faster than the market in 19 of the past 20 quarters. We believe this is the result of our unmatched innovation and commitment to providing customers with the best hardware, the best software, and the best user experience in the world. Quarterly Mac PRODUCT sales grew 17% PERCENT year-over-year and this compares extremely favorably to IDC's latest published estimate of 2% PERCENT growth for the market overall in the September quarter. Customers continue to respond very positively to our Mac PRODUCT portable lineup, which we updated in June. Portable sales increased 35% PERCENT year-over-year and represented 74% PERCENT of our Mac PRODUCT mix. Our execution in the quarter was outstanding, and we were particularly pleased with the 42% PERCENT year-over-year growth in our Asia-Pacific segment. We once again had a very successful back-to-school season, and were very pleased with the 12% PERCENT year-over-year increase in Mac PRODUCT sales to US education institutions, which resulted in the highest quarterly Mac sales ever for our US education business. The shipments to US education institutions this quarter included 50,000 MacBooks PRODUCT to the state of Maine as part of its ongoing one-to-one initiative. Customer response to the August 28th release of Snow Leopard PRODUCT has been tremendous.

Ideas for Future Analyses

- NER is challenging.



Model	Macro-P	Macro-R	Macro-F1

How many retrieved items are relevant?

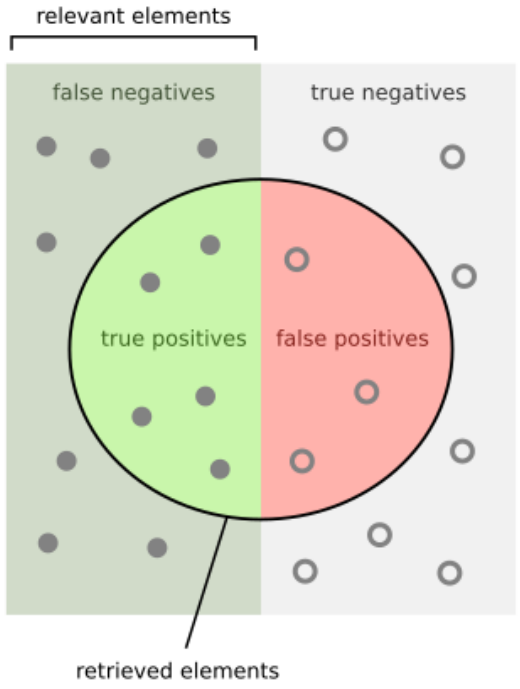
$$\text{Precision} = \frac{\text{true positives}}{\text{true positives} + \text{false positives}}$$

How many relevant items are retrieved?

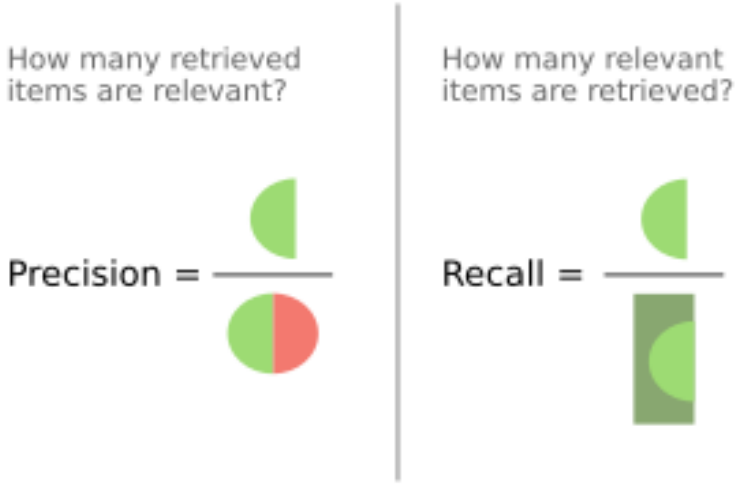
$$\text{Recall} = \frac{\text{true positives}}{\text{true positives} + \text{false negatives}}$$

Ideas for Future Analyses

- NER is challenging. Current SOTA is LUKE (Yamada et al, (2020)) has been shown to have a 21-40% improvement in performance over spaCy (en_core_web_lg)[1]



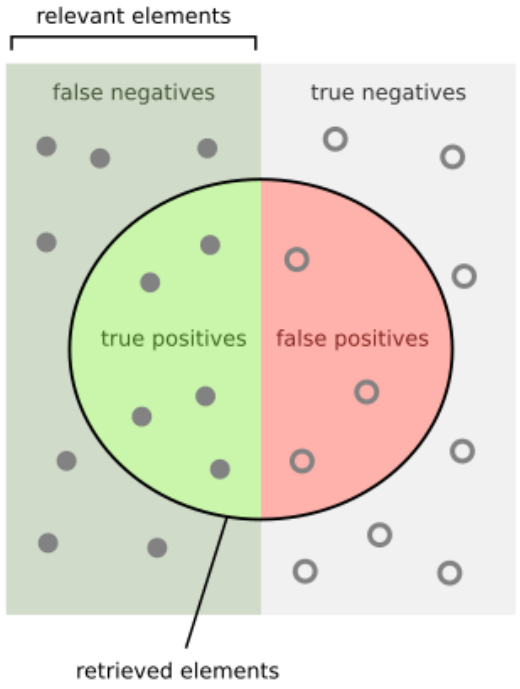
Model	Macro-P	Macro-R	Macro-F1
LUKE-conll-2003	0.732	0.854	0.788
spaCy	0.603	0.612	0.607



[1]LUKE and spaCy comparison from Kurdanova (2024)

Ideas for Future Analyses

- NER is challenging. Current SOTA is LUKE (Yamada et al, (2020)) has been shown to have a 21-40% improvement in performance over spaCy (en_core_web_lg)[1]



Model	Macro-P	Macro-R	Macro-F1
LUKE-conll-2003	0.732	0.854	0.788
spaCy	0.603	0.612	0.607

Δ +21-40%

How many retrieved items are relevant?

Precision =

How many relevant items are retrieved?

Recall =

[1]LUKE and spaCy comparison from Kurdanova (2024)

Ideas for Future Analyses

- NER is challenging. Current SOTA is LUKE (Yamada et al, (2020)) has been shown to have a 21-40% improvement in performance over spaCy (en_core_web_lg)[1]

Model	Macro-P	Macro-R	Macro-F1
LUKE-conll-2003	0.732	0.854	0.788
spaCy	0.603	0.612	0.607

- Wang and Levy (2024) assemble largest corpus of business text (150B+ tokens)
  - Find that content is systematically different from what is typically used to train LLMs
  - Fine-tuning LLMs on the data reduces toxicity and improves performance on finance tasks

[1]LUKE and spaCy comparison from Kurdanova (2024)

Ideas for Future Analyses

- NER is challenging. Current SOTA is LUKE (Yamada et al, (2020)) has been shown to have a 21-40% improvement in performance over spaCy (en_core_web_lg)[1]

Model	Macro-P	Macro-R	Macro-F1
LUKE-conll-2003	0.732	0.854	0.788
spaCy	0.603	0.612	0.607
spaCy-fine-tuned	0.823	0.824	0.823

- Wang and Levy (2024) assemble largest corpus of business text (150B+ tokens)
  - Find that content is systematically different from what is typically used to train LLMs
  - Fine-tuning LLMs on the data reduces toxicity and improves performance on finance tasks
- Makes me wonder how well spaCy is performing and what FT-ing could do for you

[1]LUKE and spaCy comparison from Kurdanova (2024)

Ideas for Future Analyses

- Large literature on use of targets in compensation and contracting
  - How does use of a target for compensation affect the firm's discussion of it?
- Discontinuation of a target is not categorically a bad thing
  - A firm ceases discussing one target because it has been supplanted by a more profitable one.
  - Discussion of losses ends as a firm turns profitable.
- Is there more to the story behind what is driving the alpha?
  - What is driving the outperformance in the "least frequent movers" portfolio?
- Can the measure be developed further? Domain-specific models?

Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month

Table IX: VW Returns Most Persistent Targets

	Q1	Q10	Q10 - Q1
Excess Return	0.0140***	0.0064	-0.0076***
	(3.2500)	(1.5570)	(-3.4562)
3-Factor Alpha	0.0052***	-0.0030**	-0.0081***
	(3.0797)	(-2.0676)	(-3.6411)
5-Factor Alpha	0.0060***	-0.0039***	-0.0099***
	(3.5183)	(-2.8833)	(-4.3978)

Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps

Table IX: VW Returns Most Persistent Targets

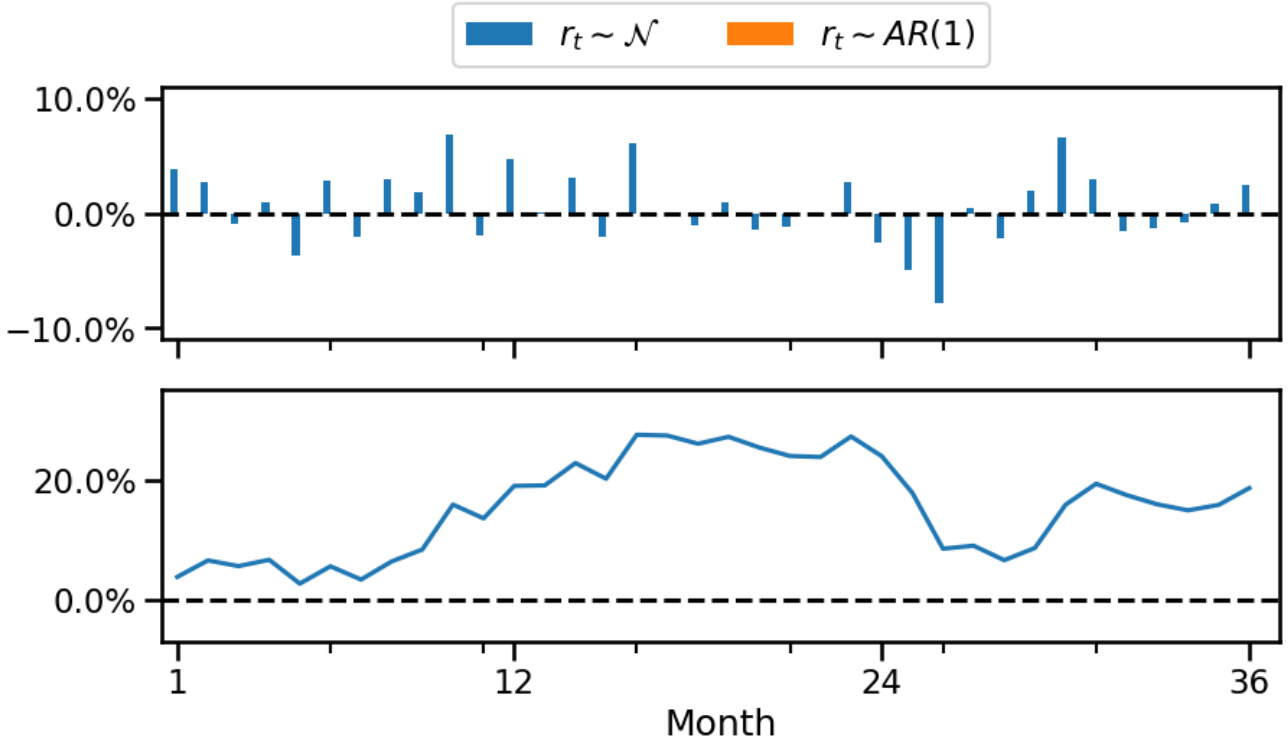
	Q1	Q10	Q10 - Q1
Excess Return	0.0140***	0.0064	-0.0076***
	(3.2500)	(1.5570)	(-3.4562)
3-Factor Alpha	0.0052***	-0.0030**	-0.0081***
	(3.0797)	(-2.0676)	(-3.6411)
5-Factor Alpha	0.0060***	-0.0039***	-0.0099***
	(3.5183)	(-2.8833)	(-4.3978)

$$t = \frac{\alpha}{se(\alpha)} \longrightarrow se(\alpha) = \frac{-0.0099}{-4.3978} = 0.0023$$

$$se(\alpha) = \frac{SD(\alpha)}{\sqrt{n}} \longrightarrow SD(\alpha) \approx 0.0023 * \sqrt{156} = \mathbf{0.0281}$$

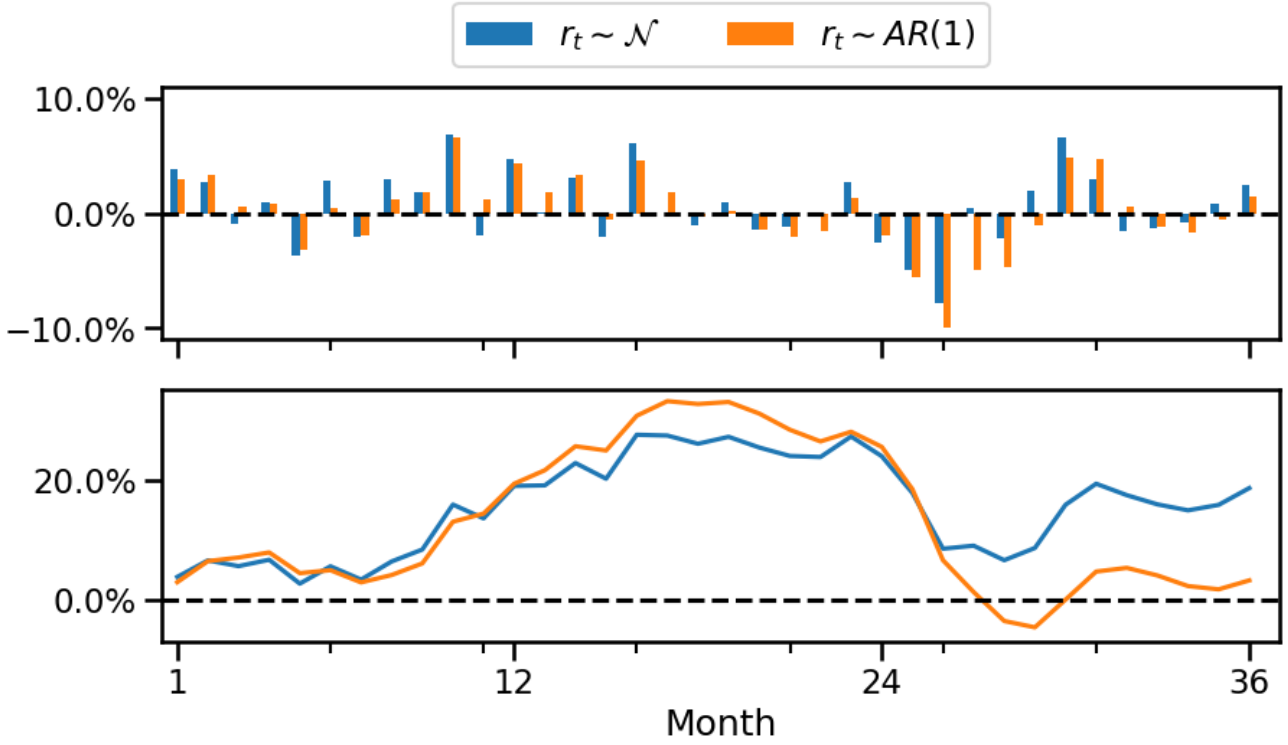
Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps



Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps
  - Autocorrelation of Returns?



Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps
  - Autocorrelation of Returns?
  - Scalability?

Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps
  - Autocorrelation of Returns?
  - Scalability?

$$N_{events/month} = \frac{N_{obs}}{N_{months}} = \frac{143{,}153}{156} = 918$$

Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps
  - Autocorrelation of Returns?
  - Scalability?

$$N_{events/month} = \frac{N_{obs}}{N_{months}} = \frac{143{,}153}{156} = 918 \longrightarrow N_{stocks/month} = \frac{N_{events/month}}{10\ deciles} * 2 * HoldingPeriod = 550$$

Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps
  - Autocorrelation of Returns?
  - Scalability?

$$N_{events/month} = \frac{N_{obs}}{N_{months}} = \frac{143{,}153}{156} = 918 \longrightarrow N_{stocks/month} = \frac{N_{events/month}}{10\ deciles} * 2 * HoldingPeriod = 550$$

$$Size_{portfolio} = N_{stocks/month} * Size_{firm} * ADV * Partitipaction_{max}$$

Practical Considerations

- What is it like to live with this strategy?
  - Statistically significant alpha of 99bps per month, SD(alpha) ~ 281bps
  - Autocorrelation of Returns?
  - Scalability?

$$N_{events/month} = \frac{N_{obs}}{N_{months}} = \frac{143{,}153}{156} = 918 \longrightarrow N_{stocks/month} = \frac{N_{events/month}}{10\ deciles} * 2 * HoldingPeriod = 550$$

$$Size_{portfolio} = N_{stocks/month} * Size_{firm} * ADV * Partitipaction_{max} = 550 * \$8B * 20\% * 10\% = \$88B$$

Very scalable!

Conclusion

- Clever use of classical NLP to create a parsimonious measure of target stability
- Show that “investors fail to realize or take into account the valuable information in these simple changes in targets.”
- Would like to see more on:
  - Connection to compensation literature and how targets are set
  - Exploration of the “least frequent movers”
  - Portfolio characteristics, e.g., returns in calendar time, trading and borrow costs, scalability

Thank you!