Competition Links and Stock Returns

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Introduction

Background:

The information content of corporate financial statements has been explored for many years, The common objective of these studies is to assess what investors can learn about a certain company from the information embedded in its financial statements.:

- effect of unexpected net income on stock returns (Ball and Brown (1968) and Beaver, Clarke, and Wright (1979))
- a deeper look at the accounting numbers such as discretionary accruals (Sloan (1996))
- more sophisticated learning procedures such as text analysis

Research introductions:

- We focus on what we can learn about a company from the financial statements of its competitors.
- Using textual analysis & Google PageRank algorithm, we construct a preferred measure of competition rank(C-rank).
- We find that C-rank has a positive effect on stock returns and the effect originates mainly from mispricing and risk compensation.

Research problems

Part 1:Generating C-rank
- Feature of C-rank
- Measuring C-rank

Part 2:C-rank & stock returns
- How C-rank affects stock returns, where does the effect mainly comes from
- What the mechanism C-rank affecting stock returns is
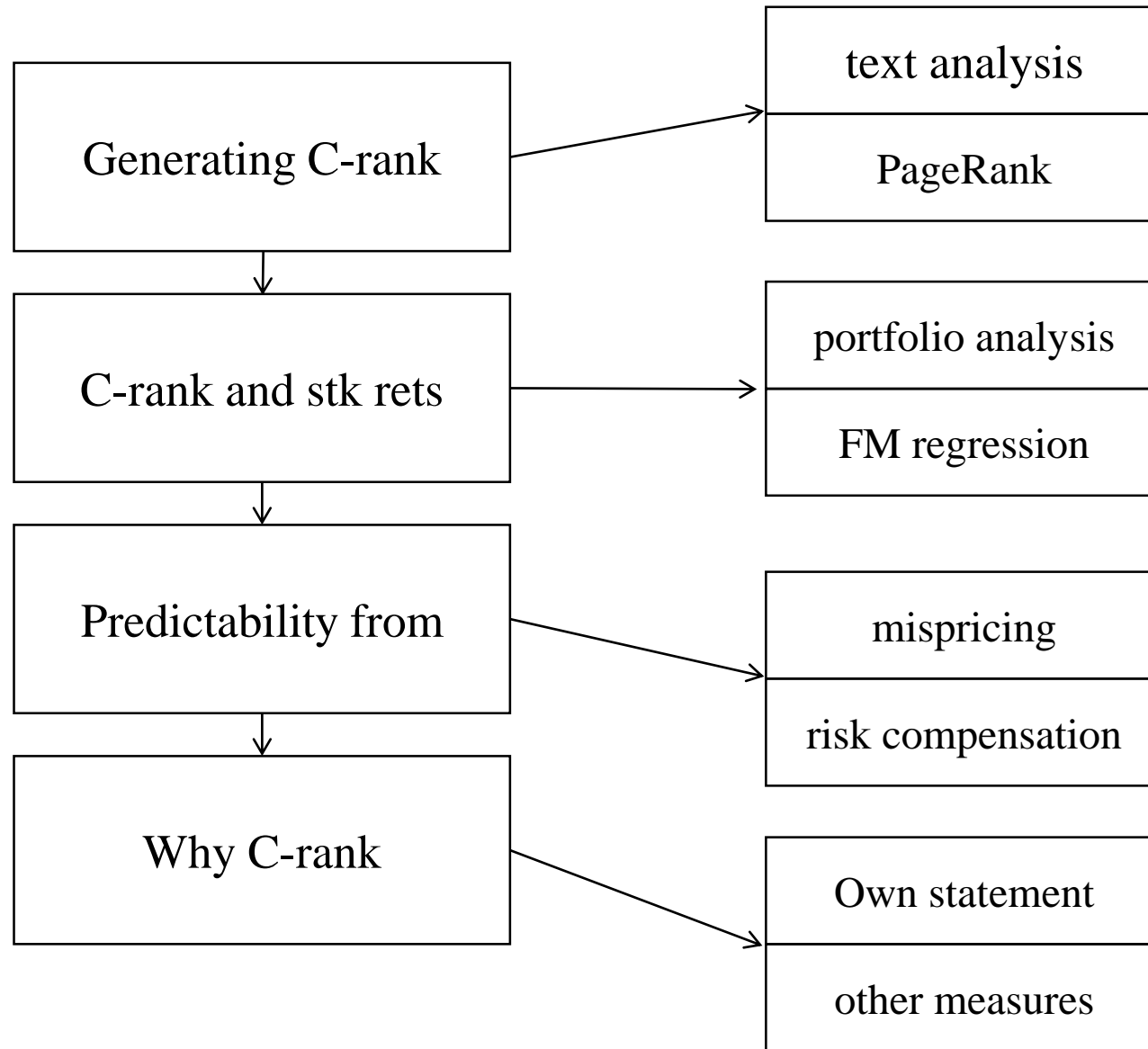- Further discuss about the feature of C-rank

Research conclusions

Part 1:Generating C-rank

- Feature of C-rank:
- ➢ Not only own, but also others.
- ➢ The stronger, the higher weight.
- Measuring C-rank
- ➢ Textual analysis
- ➢ PageRank algorithm

Part 2:C-rank & stock returns

- C-rank has a positive relation between stock returns, with cross-sector C-rank behaving more significant, which is not captured by other firm chara.
- The return predictability is consistent with mispricing and risk compensation hypothesis
- Two important features of C-rank plays an essential part in C-rank predictability.

Framework

text analysis
PageRank

Generating C-rank

portfolio analysis
FM regression

C-rank and stk rets

mispricing
risk compensation

Predictability from

Why C-rank

Own statement
other measures

Generating C-rank

Part 1 --- Text analysis of competition sections in 10-Ks
Data:

119,785 10-Ks filed by 11,304 firms over the period 1995-2017, 58% include a designated section for competition, and 39% of these competition sections include names of the company's competitors.

Identifying competitors:

- Using an open-source NLP tool, StanfordNER to cut text into a list of parts.
- Matching organization name on Edgar-SEC database, CRSP master file and finally Wikipedia.
- Resulting in 1940 unique firms mentioned on 10-K filings of other companies each year.

Generating C-rank

Part 2 --- Applying the PageRank algorithm to calculate C-rank

Model:
Consider 3 firms(A,B,C) with competition relations as follows:
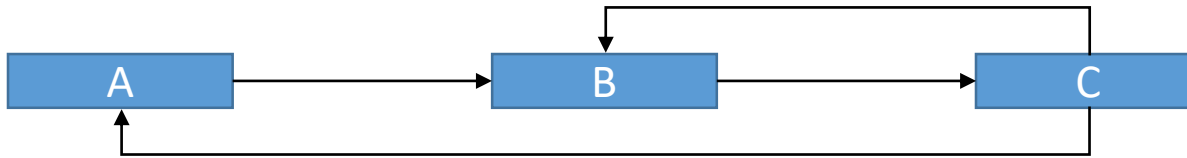
Algorithm:
Applying the PageRank algorithm solves a system of linear equations for each firm C-rank

$$CR(A) = \frac{1-d}{N} + d \times \frac{CR(C)}{2}$$

$$CR(B) = \frac{1-d}{N} + d \times \left[CR(A) + \frac{CR(C)}{2}\right]$$

$$CR(C) = \frac{1-d}{N} + d \times CR(B)$$

N: 公司数目
D: 阻尼系数，保证不存在CR = 0 的公司

Assuming d = 0.7 we have:

CR(A) = 0.2314

CR(B) = 0.3933

CR(C) = 0.3753

Firm B is mentioned by both A and C, thus having highest C-rank

Generating C-rank

Part 3 --- Summary Statistics
C-rank Only:
   We derive 3 types of C-rank: full, cross-and-within sector. All of which exhibit a positively skewed distribution with the within ones much higher.

	Mean	Stdev	min	p25	p50	p75	max
C-Rank full market	0.0172	0.0093	0.0123	0.0136	0.0149	0.0167	0.3422
C-Rank cross-sector	0.0193	0.0097	0.0143	0.0153	0.0174	0.0191	0.3673
C-Rank within-sector	0.2075	0.2317	0.0519	0.0942	0.1154	0.2324	10.0000

C-rank with other characteristics:
   Showing a high positive relation between size, while low for others, indicating C-rank may be more independent.

Panel A. Full sample	C-Rank full market	C-Rank cross-sec	C-Rank within-sec
Log(size)	0.568	0.410	0.239
Log(market-to-book)	0.019	0.008	-0.003
Past return	0.008	0.003	0.012
Profitability	0.080	0.051	0.072
Investment	-0.018	-0.001	0.083
Beta	0.018	0.001	-0.109
Idiosyncratic volatility	-0.107	-0.069	-0.137

Panel B. Competitive firms	C-Rank full market	C-Rank cross-sec	C-Rank within-sec
Log(size)	0.583	0.398	0.361
Log(market-to-book)	0.025	0.006	0.000
Past return	0.003	0.002	0.017
Profitability	0.121	0.063	0.127
Investment	-0.039	-0.001	0.053
Beta	-0.074	-0.081	-0.147
Idiosyncratic volatility	-0.170	-0.112	-0.182

C-rank and stock returns

Part 1 --- Portfolio sorts

   We run monthly cross-sectional regressions of C-Rank as of 3 months earlier on current firm size, and use the regression residuals as our sorting variable.(mom in 4-factor and 6-factor)

Panel A. Full market C-Rank	1-low C	2	3	4	5-high C	high-low
Mean excess return	0.77	0.87	0.80	0.97	1.70	0.93
	(2.60)	(2.40)	(2.25)	(2.55)	(4.03)	(3.76)
CAPM alpha	0.03	0.04	0.02	0.23	0.80	0.77
	(0.28)	(0.20)	(0.09)	(0.86)	(3.13)	(3.17)
3-factor alpha	-0.06	-0.10	-0.10	0.17	0.76	0.83
	(-0.98)	(-1.33)	(-0.84)	(0.77)	(3.68)	(3.73)
4-factor alpha	-0.03	0.00	0.06	0.46	1.07	1.11
	(-0.53)	(0.02)	(0.56)	(2.47)	(6.25)	(5.65)
5-factor alpha	-0.13	-0.04	0.00	0.41	1.03	1.16
	(-1.96)	(-0.48)	(0.03)	(1.85)	(4.97)	(5.32)
6-factor alpha	-0.10	0.03	0.12	0.61	1.24	1.35
	(-1.62)	(0.47)	(1.04)	(3.18)	(7.23)	(7.00)
Panel B. Cross-sector C-Rank						
6-factor alpha	0.00	0.00	0.15	0.44	1.30	1.30
	(-0.03)	(-0.01)	(1.50)	(2.56)	(5.58)	(5.22)
Panel C. Within-sector C-Rank						
6-factor alpha	0.59	0.17	0.25	0.70	0.18	-0.41
	(3.71)	(1.75)	(2.34)	(4.15)	(1.36)	(-1.98)

The firm's real competition status is generated mostly by competing with companies outside the sector

C-rank and stock returns

Part 2 --- Portfolio sorts controlling for stock characteristics

    We perform double-sort analysis to explore how other characteristics affect the C-rank effect. We first sort stocks based on stock characteristics and then in each sub-group on C-rank, resulting in 5*5 groups.

	6-factor alpha of the high-low C-Rank portfolios		
	Full market	Cross-sector	Within-sector
Base results	1.35	1.30	-0.41
	(7.00)	(5.22)	(-1.98)
Sorting characteristic			
Size	1.07	0.77	-0.29
	(8.42)	(6.83)	(-1.50)
Market-to-book	1.18	1.07	-0.45
	(6.90)	(4.92)	(-2.23)
Past return	1.16	1.27	-0.11
	(7.23)	(5.96)	(-0.64)
Profitability	1.31	1.30	-0.17
	(7.74)	(6.04)	(-0.94)
Investment	1.31	1.34	-0.19
	(7.10)	(5.56)	(-1.04)
Beta	1.13	1.19	0.00
	(6.58)	(4.96)	(0.01)
Idiosyncratic volatility	1.19	1.27	0.04
	(8.04)	(6.58)	(0.22)

    The results confirm that the high stock returns to firms with high C-Rank, especially cross-sector, are not captured by common firm risk characteristics.

C-rank and stock returns

Part 3 --- FM regression

   We run cross-sectional Fama and MacBeth regressions each month of excess stock returns on full sample and a subsample of competitive firms, which includes only firms that are mentioned at least once in a year.

	C-Rank full market		C-Rank cross-sector		C-Rank within-sector	
	All firms	Competitive firms	All firms	Competitive firms	All firms	Competitive firms
Intercept	2.87	3.46	2.72	2.63	2.72	3.30
	(4.88)	(4.67)	(4.62)	(2.58)	(4.80)	(4.82)
C-Rank	5.45	5.55	2.55	5.72	-0.09	2.13
	(3.05)	(2.13)	(1.89)	(1.80)	(-0.02)	(0.52)
Log(size)	-0.11	-0.15	-0.10	-0.11	-0.10	-0.14
	(-3.21)	(-3.51)	(-2.94)	(-1.79)	(-3.05)	(-3.73)
Log(market-to-book)	-0.03	0.03	-0.04	0.00	-0.03	0.06
	(-0.75)	(0.54)	(-0.81)	(-0.01)	(-0.80)	(0.98)
Past return	0.56	0.48	0.53	0.31	0.54	0.50
	(2.47)	(1.41)	(2.40)	(0.82)	(2.43)	(1.50)
Profitability	0.78	0.37	0.77	0.53	0.77	0.44
	(3.72)	(1.42)	(3.61)	(1.48)	(3.72)	(1.75)
Investment	-1.74	-1.25	-1.76	-1.42	-1.76	-1.31
	(-4.85)	(-2.54)	(-4.84)	(-1.79)	(-4.92)	(-2.75)
Beta	0.00	0.01	-0.01	0.08	-0.01	0.02
	(-0.02)	(0.08)	(-0.04)	(0.39)	(-0.05)	(0.11)
Idiosyncratic volatility	-31.15	-22.59	-30.63	-16.15	-30.67	-20.39
	(-6.30)	(-3.88)	(-6.15)	(-1.63)	(-6.11)	(-3.59)

   The results show that the full market C-Rank has a positive and significant effect on stock return for all samples. And the difference between cross- and within- sector C-ranks corroborate previous results.

C-rank predictability

Part 1 --- Mispricing

    We conduct 2 tests that utilize data on analyst coverage to detect mispricing. In the first test, we generate a firm-year measure of the concentration of the firm's analyst across industries.

Panel A. Analyst industry concentration						
	All firms	Firms with analyst coverage	Mean analyst industry concentration			
			Low	Mid	High	High-Low
Full market	1.35 (7.00)	0.64 (4.25)	0.50 (2.99)	0.67 (3.56)	0.77 (3.05)	0.27 (0.84)
Cross sector	1.30 (5.22)	0.63 (3.78)	0.30 (1.69)	0.75 (3.23)	1.10 (3.48)	0.80 (2.48)
Within sector	-0.41 (-1.98)	-0.49 (-2.19)	-0.31 (-1.27)	-0.62 (-2.37)	-0.49 (-1.45)	-0.18 (-0.43)

  The results show that higher analyst concentration indeed reduce the effect of C-rank. (with 1.35%-7.00 and 1.30%-5.22 for full market and cross sector respectively)

C-rank predictability

Part 1 --- Mispricing

   We conduct 2 tests that utilize data on analyst coverage to detect mispricing. In the second test, we divide all competitive firms into two groups based on whether the given firm share analysts with their mentioning firms.

Panel B. Joint analyst coverage

	Competitive firms	Competitive with analyst coverage	Competitive firms share analysts with their mentioning firms		
			No	Yes	Diff.
Full market	0.55 (3.36)	0.50 (2.66)	0.61 (2.23)	-0.02 (-0.05)	0.62 (1.48)
Cross sector	0.35 (1.86)	0.18 (0.85)	0.48 (1.43)	-0.14 (-0.43)	0.61 (1.64)
Within sector	0.02 (0.10)	-0.26 (-1.09)	-0.24 (-0.78)	-0.13 (-0.46)	-0.11 (-0.38)

   The results show that analyst coverage indeed reduce the effect of C-rank.

C-rank predictability

Part 2 --- Risk compensation

    Since being "targeted" by strong companies as a competitor impose uncertainty as to the firm's future performance, we conduct 2 ways to explore the "risk compensation" hypothesis, first we study changes in C-rank.

Excess return on hedge portfolio of high-minus-low change in C-Rank
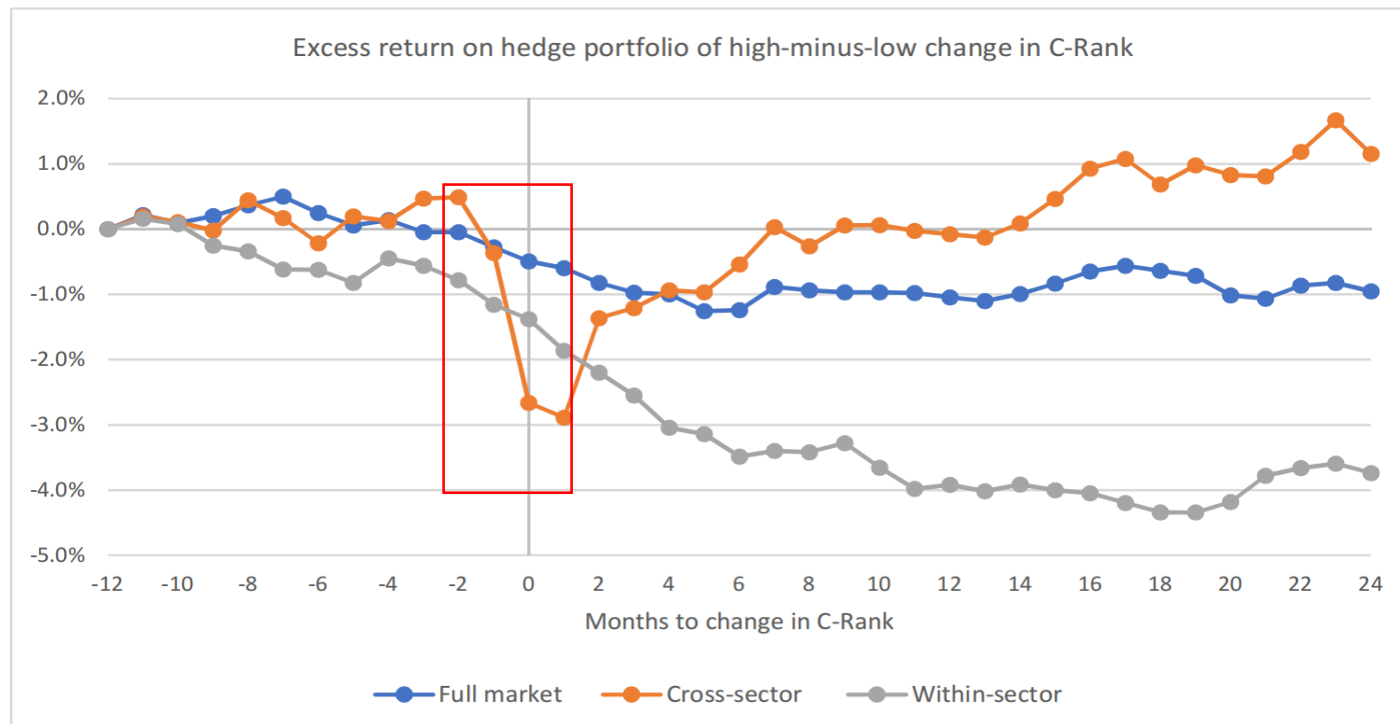
  We divide all companies into 5 quintiles according to the change in C-rank from the prior month, and look at the difference between the average cum-return of top and bottom quintiles. The figure shows a negative shock, especially for cross-sector C-rank.

C-rank predictability

Part 2 --- Risk compensation

    Second, we study the systematic pricing of C-rank, we run a rolling regression over past 36 months of a firm's excess return on C-rank spread each month, using the C-rank beta, we perform single portfolio analysis.

	1-low beta	2	3	4	5-high beta	high-low
Panel A. Full market C-Rank beta						
Mean excess return	0.88	0.87	0.92	0.98	1.20	0.32
	(2.41)	(2.79)	(2.90)	(2.64)	(2.27)	(1.13)
CAPM alpha	0.32	0.39	0.43	0.41	0.47	0.15
	(1.80)	(2.59)	(2.92)	(2.28)	(1.43)	(0.56)
3-factor alpha	0.13	0.23	0.28	0.26	0.33	0.19
	(1.30)	(2.63)	(3.12)	(2.12)	(1.30)	(0.87)
4-factor alpha	0.23	0.31	0.36	0.38	0.55	0.32
	(2.58)	(4.40)	(4.86)	(3.84)	(2.47)	(1.49)
5-factor alpha	0.14	0.14	0.20	0.29	0.60	0.46
	(1.32)	(1.58)	(2.20)	(2.33)	(2.38)	(2.07)
6-factor alpha	0.20	0.19	0.26	0.37	0.73	0.52
	(2.18)	(2.92)	(3.53)	(3.60)	(3.26)	(2.47)
Panel B. Cross-sector C-Rank beta						
6-factor alpha	0.20	0.23	0.25	0.38	0.69	0.49
	(2.12)	(3.30)	(3.60)	(3.56)	(3.03)	(2.15)
Panel C. Within-sector C-Rank beta						
6-factor alpha	0.60	0.37	0.30	0.19	0.30	-0.30
	(3.23)	(3.86)	(3.91)	(1.99)	(1.60)	(-1.14)

The result suggests that high C-rank beta firms outperform low C-rank beta firms.

C-rank predictability

Part 2 --- Risk compensation

    third, on the basis of test 2, we perform double-sorted portfolio analysis, based on C-rank beta controlling for C-rank.

C-Rank-beta return spread		
	Single sort	C-Rank neutral
Full market	0.52 (2.47)	0.28 (1.71)
Cross sector	0.49 (2.15)	0.23 (1.44)
Within sector	-0.30 (-1.14)	-0.25 (-1.14)

C-Rank return spread		
	Single sort	C-Rank-beta neutral
Full market	1.35 (7.00)	0.99 (6.33)
Cross sector	1.30 (5.22)	0.95 (4.54)
Within sector	-0.41 (-1.98)	0.12 (0.83)

The result suggests that C-rank explains 50% of the C-rank beta spread while C-rank beta explains a small part of C-rank spread.

Importance of C-rank features

Part 1 --- Not only own but also others

First, we divide all firms into 5 quintiles according to the average return of their mentioning firms in the past twelve months skipping the most recent month. We calculate the average buy-and-hold return during the next 24 months for the top and bottom group.
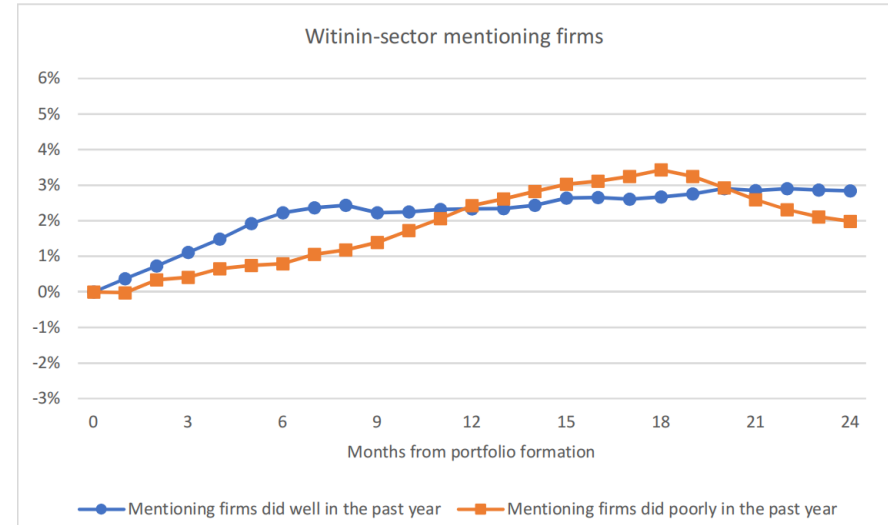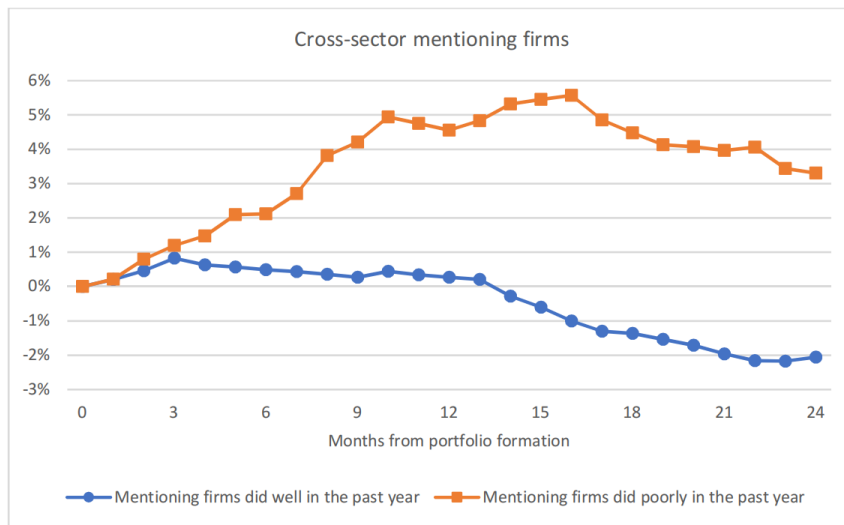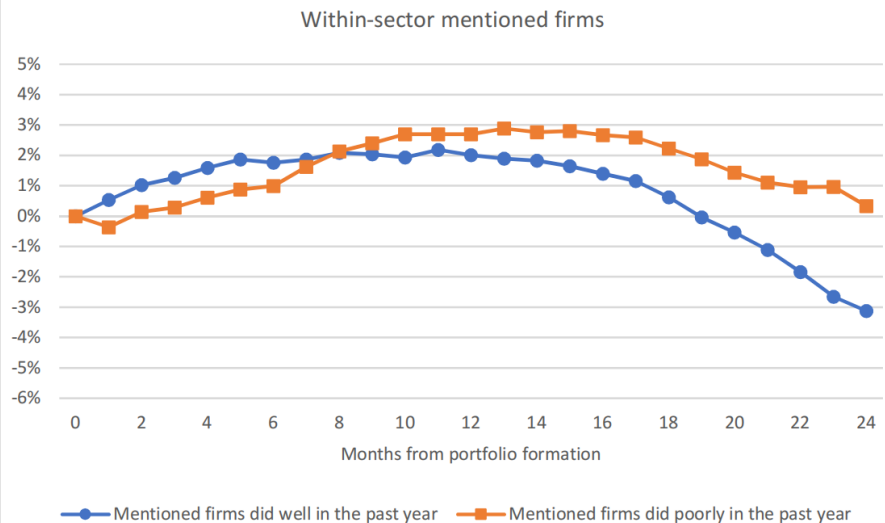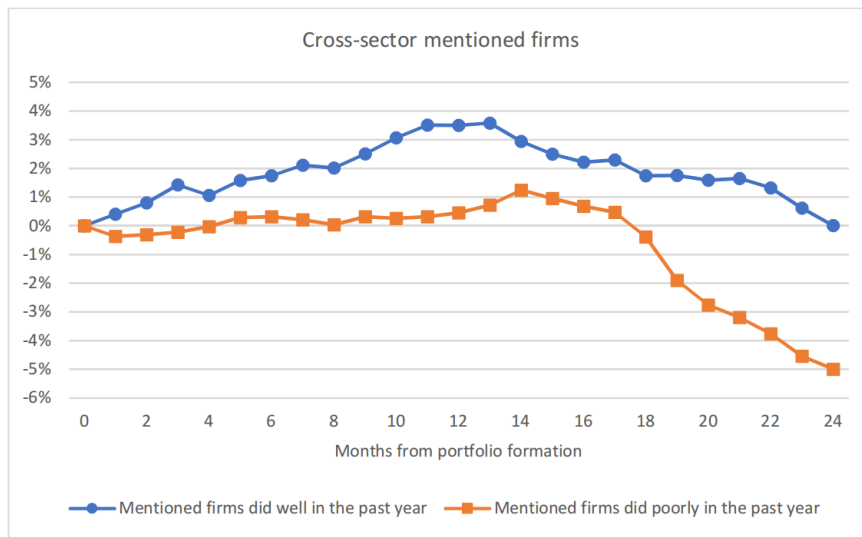

The results show that if the mentioning firms do well, they might be able to adversely affect the mentioned firm, especially across the sector.

Importance of C-rank features

Part 1 --- Not only own but also others

    First, we divide all firms into 5 quintiles according to the average return of their mentioned firms in the past twelve months skipping the most recent month. We calculate the average buy-and-hold return during the next 24 months for the top and bottom group.


    The results show that the past performance of the mentioned firms positively predicts the firm's return, especially cross-sector groups. This result is in contrast to the negative effect of mentioning firms, suggesting the competition captured by C-rank cannot be uncovered by looking only at the firm's own statement.

Importance of C-rank features

Part 2 --- The stronger, the higher weight

    We replicate the portfolio sort analysis using:

(1)simple mention count

(2)the mean market capitalization of the mentioning firms

(3)the sum market cap of mentioning firms.
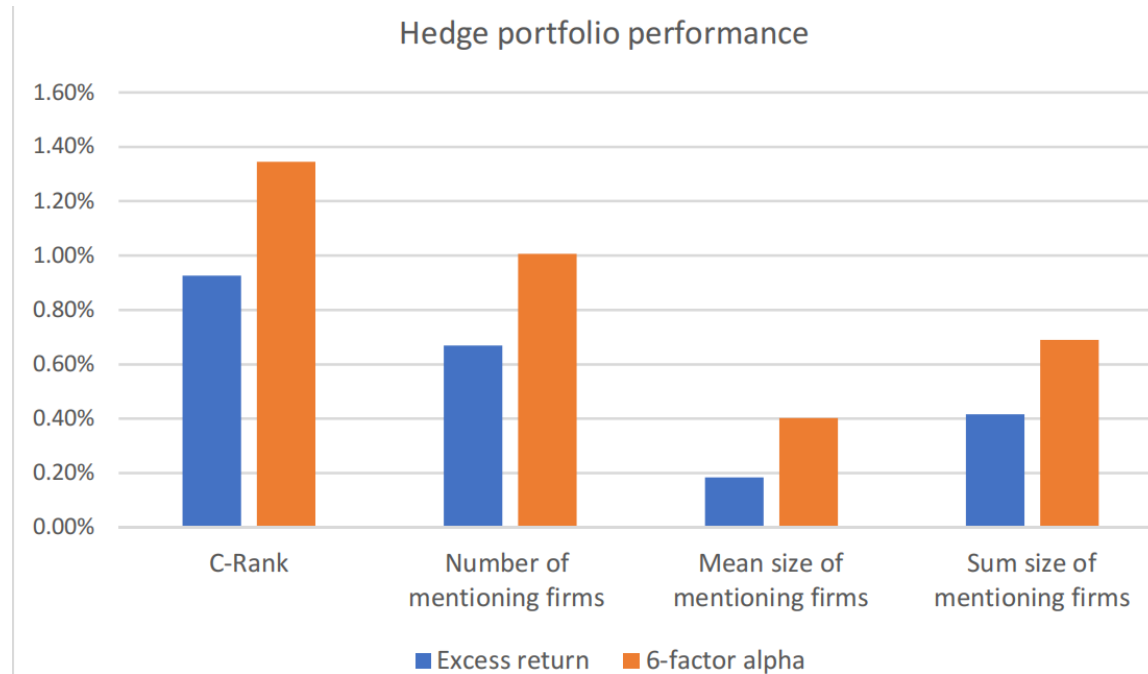
All three measures have a positive effect on future stock returns; yet these effects are still weaker than that of C-rank. Thus C-rank contains information that is not fully captured by these measures.