Erasmus School of Economics

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Global factor premiums

Accepted for publication in Journal of Financial Economics

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20 April 2021

Erasmus University Rotterdam

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The Investment Engineers

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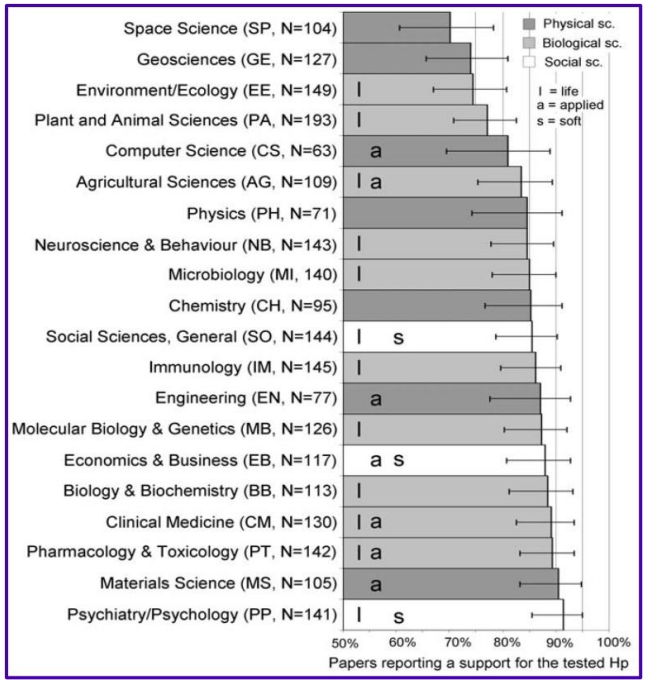
Torture the data until they confess

P-HACKING (or *data mining*) omnipresent in academics



Critical Finance Review, XXXX, XX: x–xx

Is Economics Research Replicable? Sixty Published Papers From Thirteen Journals Say "Often Not"

Andrew C. Chang[1]
Phillip Li[2]*

[1]*Board of Governors of the Federal Reserve System, USA;*
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[2]*Office of Financial Research, U.S. Department of the Treasury, USA;*
phillip.li@ofr.treasury.gov.

ABSTRACT

We attempted to replicate 67 macroeconomic papers published in 13 well-regarded economics journals using author-provided replication files that included both data and code by following a preanalysis plan. Aside from six papers that used confidential data, we obtained data and code replication files for 29 of 35 papers (83%) that were required to provide such files as a condition of publication, compared to 11 of 26 papers (42%) that were not required to provide data and code replication files. Defining replication success as our ability to use the author-provided data and code files to produce the key qualitative conclusions of the original paper, we successfully replicated 22 of 67 papers (33%) without contacting the authors. Excluding the six papers that used confidential data and the two papers that used software we did not possess, we replicated 29 of 59 papers (49%) with assistance from the authors. Because we were able to replicate less than half of the papers in our sample even with help from the authors, we assert that economics research is often not replicable. We conclude with recommendations on improving replication of economics research.

Replicating Anomalies

Kewei Hou
The Ohio State University and China Academy of Financial Research

Chen Xue
University of Cincinnati

Lu Zhang
The Ohio State University and National Bureau of Economic Research

Most anomalies fail to hold up to currently acceptable standards for empirical finance. With microcaps mitigated via NYSE breakpoints and value-weighted returns, 65% of the 452 anomalies in our extensive data library, including 96% of the trading frictions category, cannot clear the *single* test hurdle of the absolute *t*-value of 1.96. Imposing the higher multiple test hurdle of 2.78 at the 5% significance level raises the failure rate to 82%. Even for replicated anomalies, their economic magnitudes are much smaller than originally reported. In all, capital markets are more efficient than previously recognized. (*JEL* C58, G12, G14, G17, M41)


STOP
HACKING

How to deal with p-hacking?

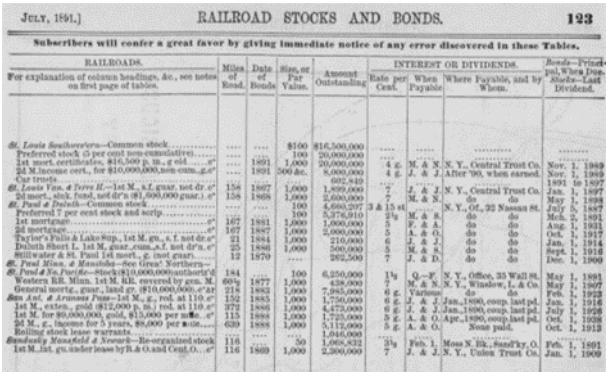
1. **Replication** of the original research

2. *Statistical corrections* to account for p-hacking

$$P(\theta \mid data) = \frac{P(data \mid \theta) \cdot P(\theta)}{P(data)}$$

Likelihood · Prior

3. Use more – previously unused – historical data



JULY, 1891.] RAILROAD STOCKS AND BONDS. 123

Subscribers will confer a great favor by giving immediate notice of any error discovered in these Tables.

RAILROADS. For explanation of column headings, &c., see notes on first page of tables.	Miles of Road.	Date of Bonds.	Size, or Par Value.	Amount Outstanding.	INTEREST OR DIVIDENDS. Rate per Cent.	When Payable	Where Payable, and by Whom.	Bonds—Principal, When Due. Stocks—Last Dividend.
St. Louis Southwestern—Common stock	....	....	$100	$16,500,000	....	....	.....	.....
Preferred stock (5 per cent non-cumulative)	....	....	100	20,000,000	....	....	.....	.....
1st mort. certificates, $16,500 p. m., g. old	....	1891	1,000	20,000,000	4 g.	M. & N.	N. Y., Central Trust Co.	Nov. 1, 1949
2d M. income cert., for $10,000,000, non-cum., g.	....	1891	500 &c.	8,000,000	4 g.	J. & J.	After '90, when earned.	Nov. 1, 1949
Car trusts	....	....	....	602,849	....	....	.....	1891 to 1897
St. Louis Van. & Terre H.—1st M., s.f. guar. not dr. e.	158	1867	1,000	1,899,000	7	J. & J.	N. Y., Central Trust Co.	Jan. 1, 1897
2d mort., stck. fund, not dr'n ($1,500,000 guar.) e.	158	1868	1,000	2,500,000	7	M. & N.	do do	May 1, 1898
St. Paul & Duluth—Common stock	....	....	100	4,660,207	3 & 15 st	....	N. Y., Of., 32 Nassau St.	July 5, 1887
Preferred 7 per cent stock and scrip	....	....	100	5,276,910	2½	M. & S.	do do	Mch. 2, 1891
1st mortgage	167	1891	1,000	1,000,000	5	F. & A.	do do	Aug. 1, 1931
2d mortgage	167	1887	1,000	2,000,000	5	A. & O.	do do	Oct. 1, 1917
Taylor's Falls & Lake Sup., 1st M. gu., s. f. not dr. e.	21	1884	1,000	216,000	6	J. & J.	do do	Jan. 1, 1914
Duluth Short L. 1st M. guar. cons., s.f. not dr'n. e.	25	1886	1,000	500,000	5	M. & S.	do do	Sept. 1, 1916
stillwater & St. Paul 1st mort., g. (not guar).	12	1870	....	202,500	7	J. & D.	do do	Dec. 1, 1900
St. Paul Minn. & Manitoba—See Gres' Northern—								
St. Paul & So. Pacific—Stock ($10,000,000 authoriz'd	134	....	100	6,250,000	1¼	Q.—F.	N. Y., Office, 35 Wall St.	May 1, 1891
Western RR. Minn. 1st M. RR. covered by prs. M.	60½	1877	1,000	438,000	M. & N.	N. Y., Winslow, L. & Co.	May 1, 1907
General mortg., guar., land gr. ($10,000,000), e. ar	218	1883	1,000	7,985,000	6 g.	Various	do	Feb. 1, 1923
San Ant. & Aransas Pass—1st M., g., red. at 110. e*	152	1885	1,000	1,750,000	6 g.	J. & J.	Jan., 1890, coup. last pd.	Jan. 1, 1916
1st M., exten., gold ($12,000 p. m.) red. at 110. e*	272	1886	1,000	4,472,000	6 g.	J. & J.	Jan., 1890, coup. last pd.	July 1, 1926
1st M. for $6,000,000, gold, $15,000 per mile. e*	115	1888	1,000	1,725,000	5 g.	A. & O.	Apr., 1890, coup. last pd.	Oct. 1, 1938
2d M., g., income for 5 years, $8,000 per mile.....	639	1888	1,000	5,112,000	5 g.	A. & O.	None paid.	Oct. 1, 1913
Rolling stock lease warrants	....	....	....	1,046,000	....	....	.....	.....
Sandusky Mansfield & Newark—Re-organized stock	116	....	50	1,008,832	3½	Feb. 1	Moss N. Bk., Sand'ky, O.	Feb. 1, 1891
1st M. 1st. gu. under lease by B. & O. and Cent. O.	116	1869	1,000	2,300,000	7	J. & J.	N. Y., Union Trust Co.	Jan. 1, 1909

Do global factor premiums exist?

- Global factor premium: Assets with certain characteristics have higher Sharpe ratios

- Empirically testing factor strategies *across* global markets
  - Equity, bond, commodity and currency markets
  - Data is at the **country** level, *not at the* ***individual*** *stock/bond level*

- Recent influential academic studies on the existence of 6 factor premiums

Trend

› JFE 2012

Momentum

› JF 2013

Value

› JF 2013

Carry

› JFE 2018

Seasonal

› JF 2016

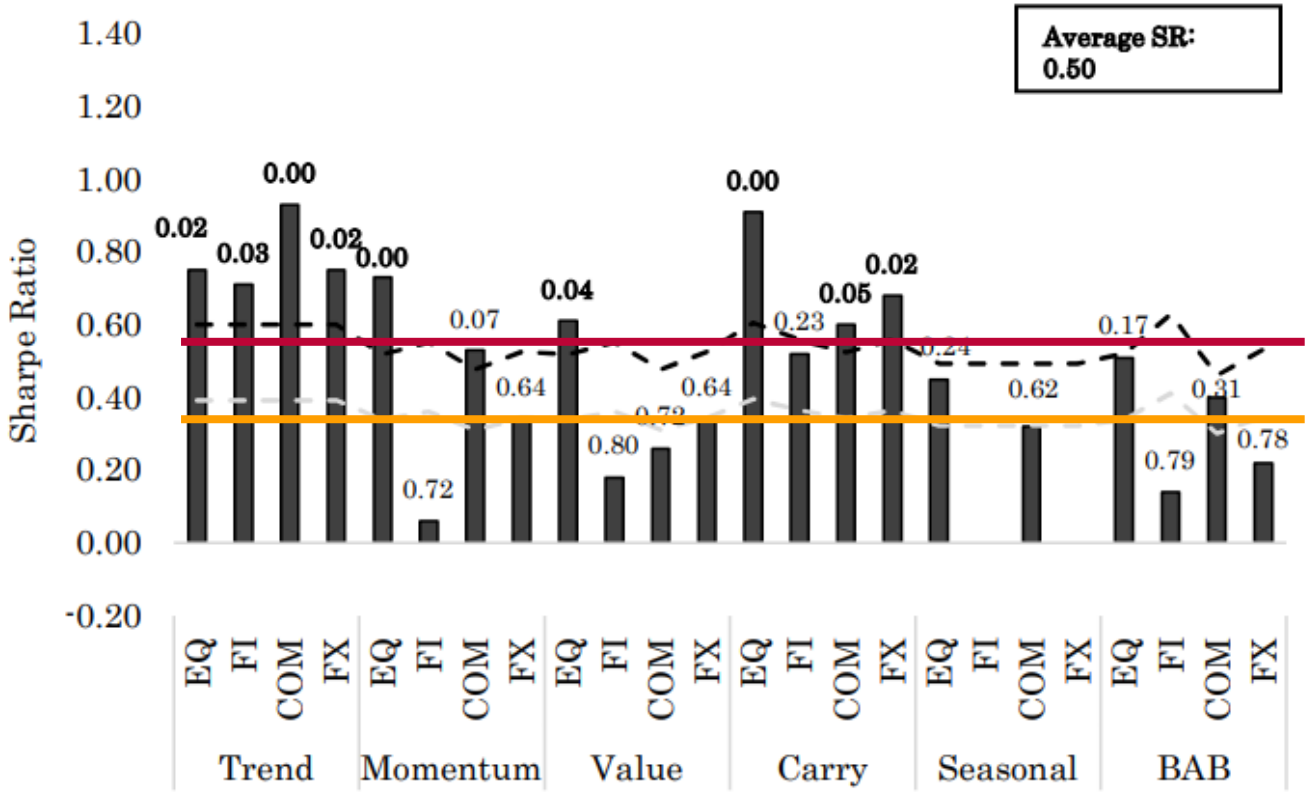
BAB

› JFE 2014

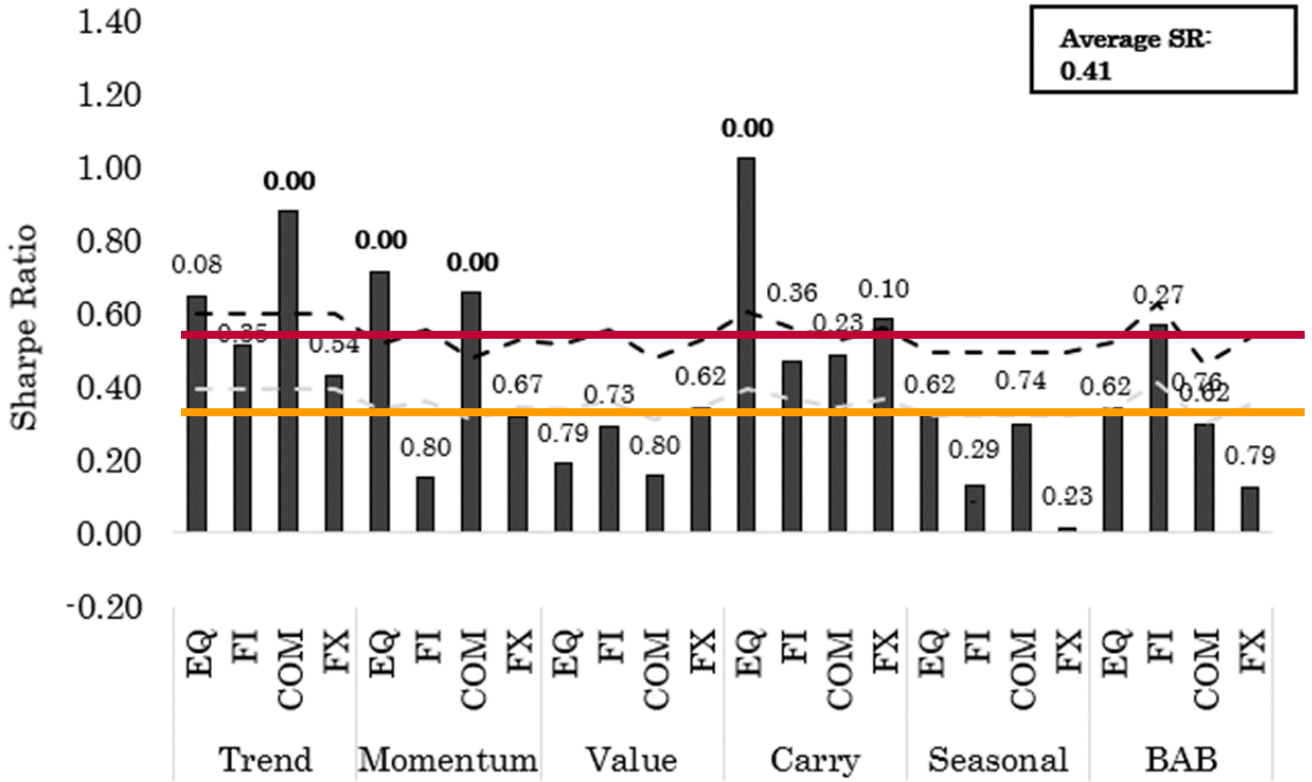
Definitions of the global factor premiums in our paper

• Trend	12-1-month past return (versus 0)
• Momentum	12-1-month past return (versus the group average)
• Value	Equities: Dividend (12 month) / Price
	Government bonds: Real yield
	Currencies: Absolute and Relative 5yr PPP
	Commodities: 5-year price reversal
• Carry	Equities: Future implied dividend yield*
	Government bonds: 10-year -/- 3-month yield
	Currencies: Nominal 3-month interest rate differential
	Commodities: Slope of the futures curve
• Seasonal	20-year historical monthly return
• BAB	36-month asset-class market beta ('Betting Against Beta')

Original empirical evidence 1981-2011



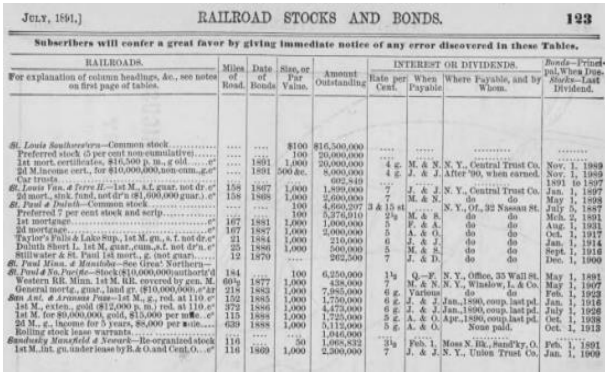
REPLICATED empirical evidence 1981-2011




WE
NEED
MORE
DATA

Building a deep historical database of factors…
Equity, bond, commodity and currency market data since **1800**

GLOBAL FINANCIAL DATA™



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Preferred stock (5 per cent non-cumulative)	....	....	100	20,000,000	....	.....	.....	.....
1st mort. certificates, $16,500 p. m., g old	....	1891	1,000	20,000,000	4 g.	M. & N.	N. Y., Central Trust Co.	Nov. 1, 1989
2d M. income cert., for $10,000,000, non-cum., g. e'	....	1891	500 &c.	8,000,000	4 g.	J. & J.	After '90, when earned.	Nov. 1, 1989
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1st mortgage	167	1881	1,000	1,000,000	5	F. & A.	do do	Aug. 1, 1931
2d mortgage e'	167	1887	1,000	2,000,000	5	A. & O.	do do	Oct. 1, 1917
Taylor's Falls & Lake Sup., 1st M. gu., s. f. not dr. e'	21	1884	1,000	210,000	6	J. & J.	do do	Jan. 1, 1914
Duluth Short L. 1st M. guar. cum. & n. not dr'n. e'	25	1886	1,000	500,000	5	M. & S.	do do	Sept. 1, 1916
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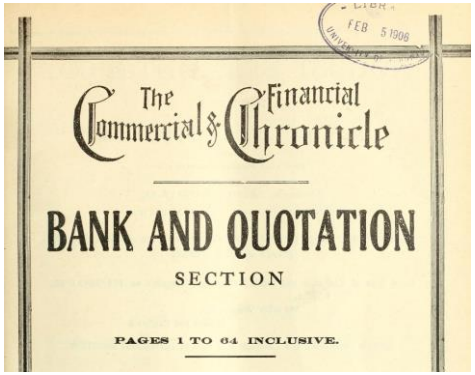


Public stock investing since 1604 in the Netherlands

Amsterdam Stock Exchange

- Picture from the 17th century (left)
- Euronext as of 21st century (right)

London, New York and others soon followed

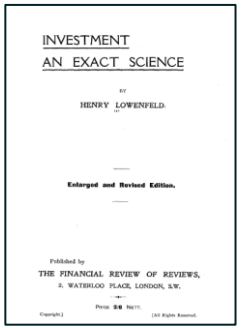
HISTORICAL markets are in many respects *sophisticated*

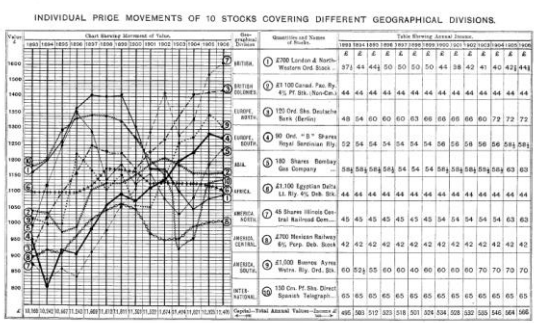
Investors invested internationally at reasonable costs

- Yes, transaction costs were higher
- Yes, information travelled slower

Still, investors were reasonably well informed and could trade internationally

- Historical transaction costs seem limited (e.g. Koudijs, 2014)
- Investor sophistication was also higher than often assumed (e.g. Lowenfeld, 1902)


INVESTMENT
AN EXACT SCIENCE
BY
HENRY LOWENFELD.
Enlarged and Revised Edition.
Published by
THE FINANCIAL REVIEW OF REVIEWS,
2, WATERLOO PLACE, LONDON, S.W.



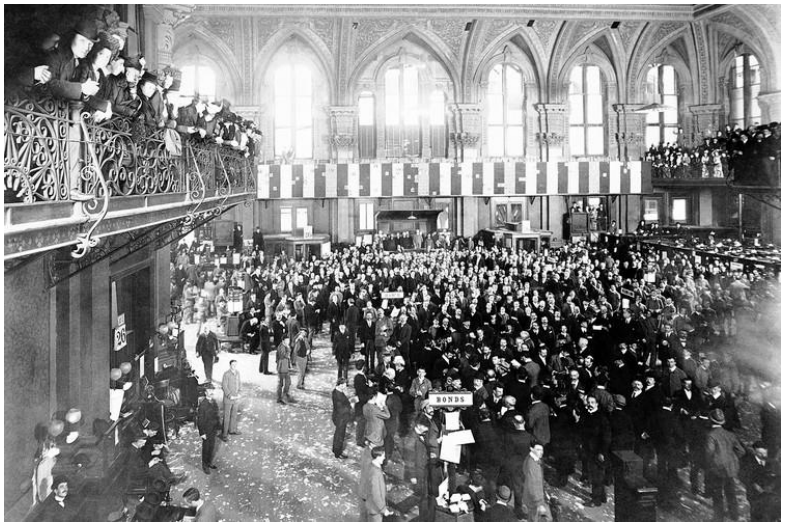
And arbitrage players were well active..

Wall Street, 1889: The Telegraph Ramps Up Trading Speed

It Takes Less Than 30 Seconds for the Price of the Latest Trade to Travel Between Boston and the NYSE

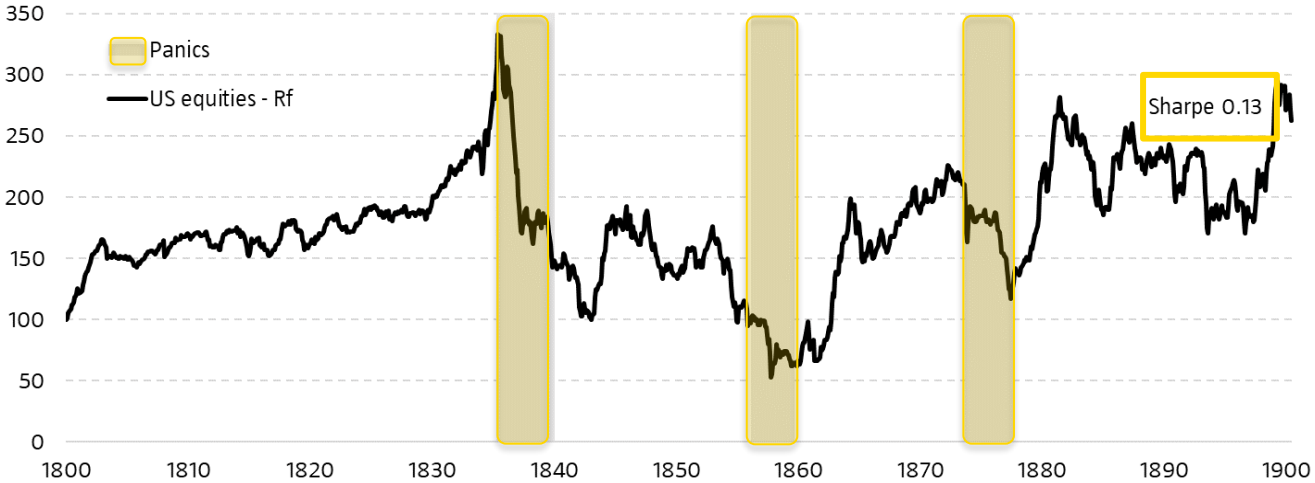
By Jason Zweig
July 7, 2014 4:45 p.m. ET

NEW YORK—The floor of the New York Stock Exchange is one of the most advanced technology centers on Earth.



Source: https://spinup-000d1a-wp-offload-media.s3.amazonaws.com/faculty/wp-content/uploads/sites/67/2019/10/lowenfeld.pdf

US stock market in the 19th century…

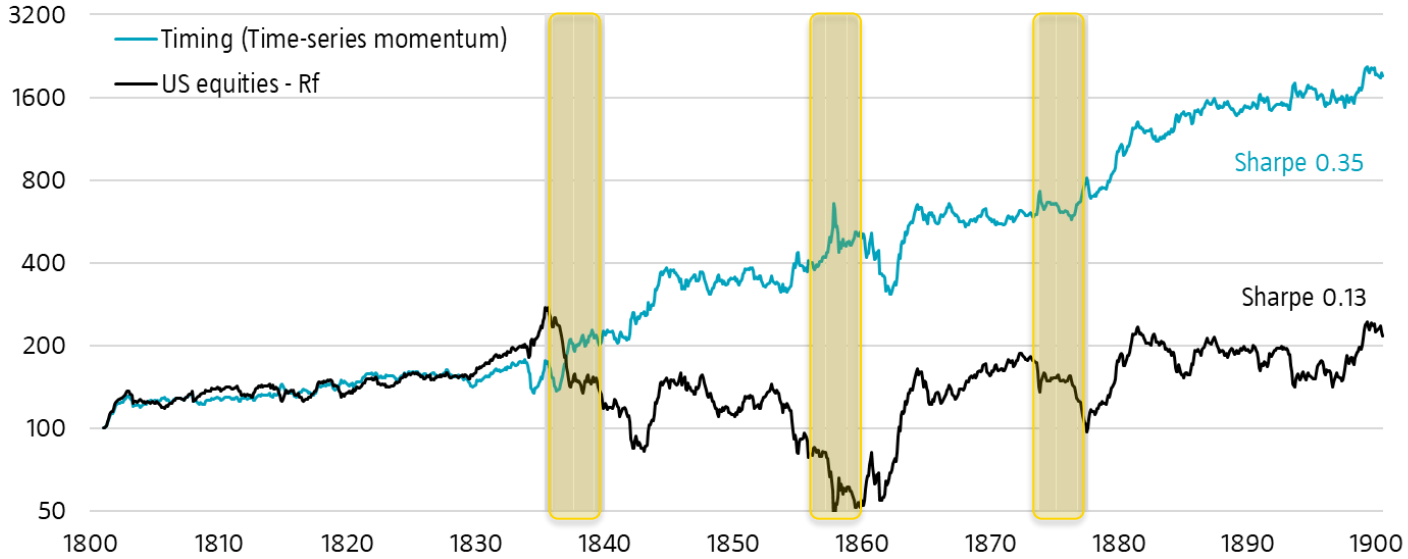


Whig cartoon (1837 US)

Bank run (1857 US)

Vienna market crash (1873 Austria)

Trend (or time-series momentum): US stock market 19th century

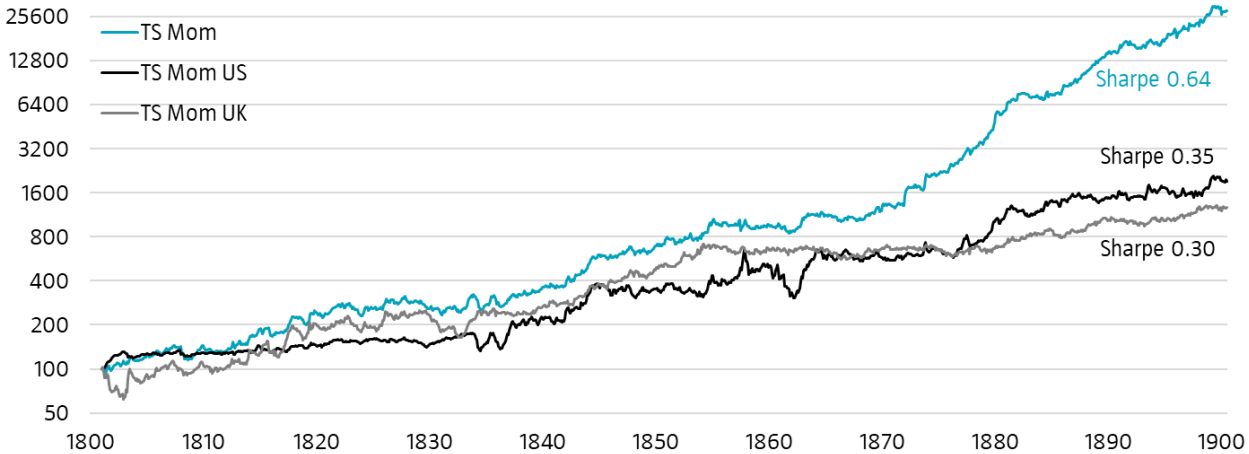


Time-Series (12-1M) momentum beats equities

- TS Momentum: Sharpe Ratio 0.35 (t-stat 3.5)
- Equity premium: Sharpe ratio 0.13 (t-stat 1.3)

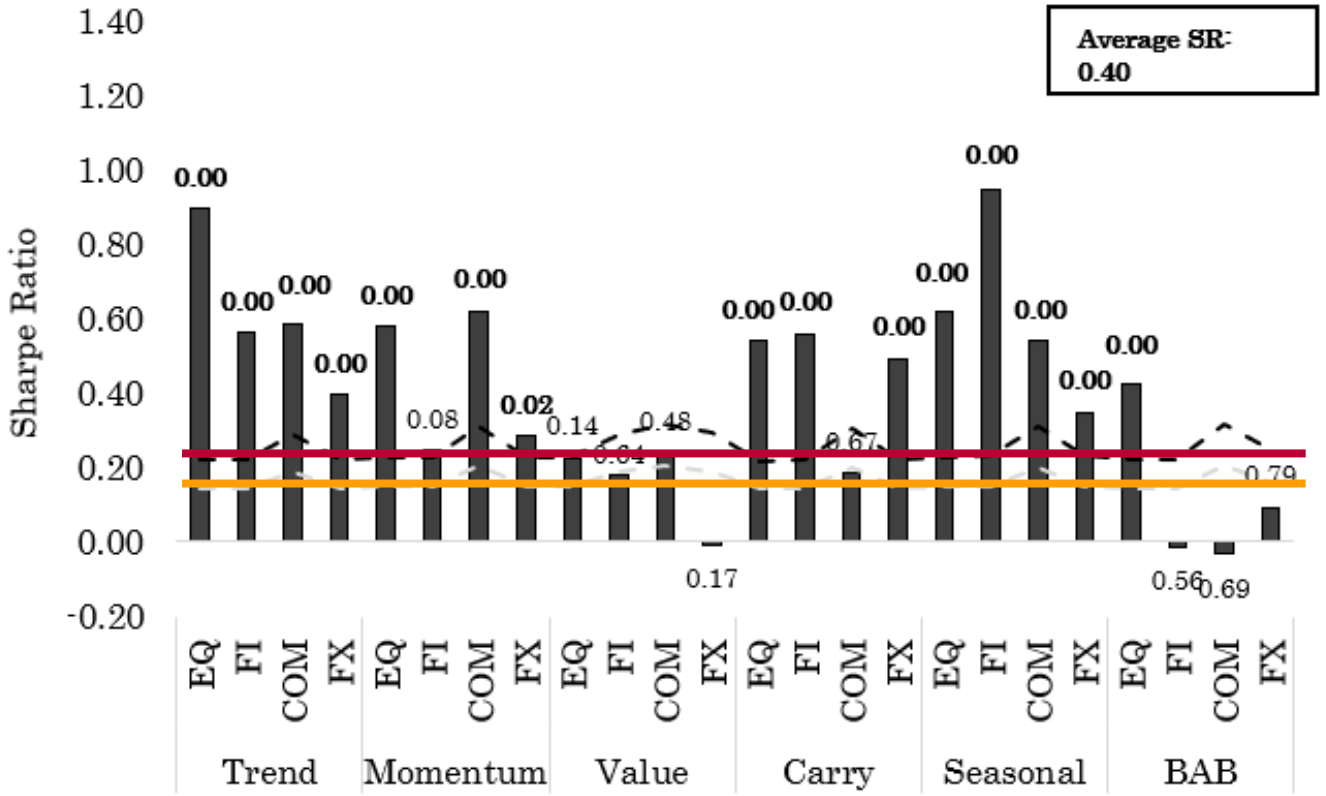
Time-Series momentum: ‘Global’ Equity markets

TS Mom 1800-1900			
Sharpe ratio	0.35	0.30	**0.64**

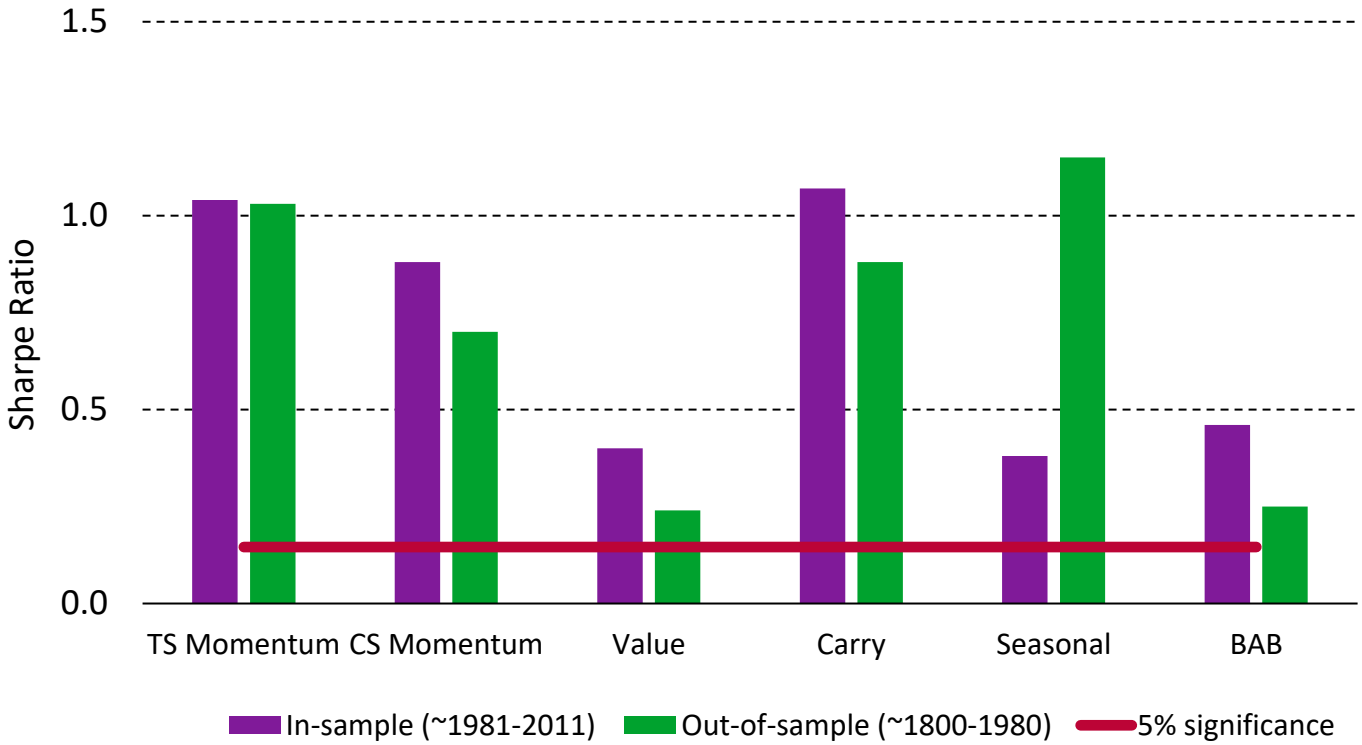


https://datarepository.eur.nl/authors/Laurens_Swinkels/6487932

Out-of-sample evidence 1800-1980

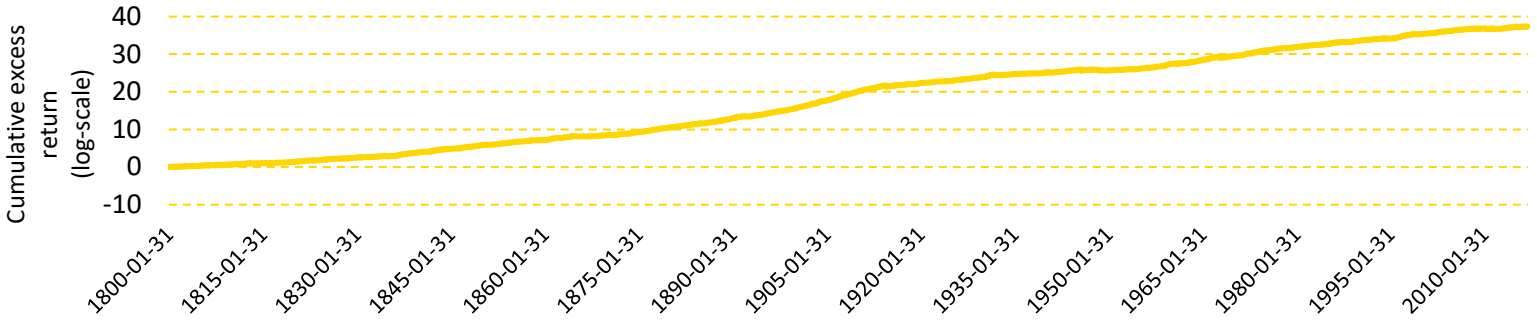


Global Factor Premiums: Significant, sizable and persistent

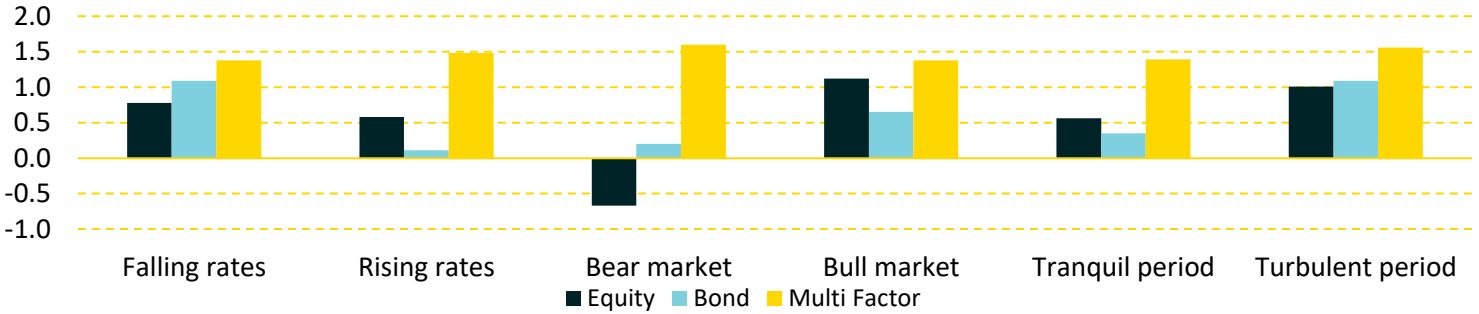


Global Factor Premiums are not explained by risk

Multi-Factor Multi-Asset: Consistent & stable outperformance since the 1800's



Multi-Factor Multi-Asset portfolios: Positive performance across economic / market scenario's



Summary

Are global factor premiums the result of p-hacking?

What we did to find the answer:

- ✓ Replication of the original research
- ? Statistical corrections to account for p-hacking
- ✓ Solution: use more – previously unused – historical data

Research on the existence of global factor premiums unlikely the result of p-hacking

- ✗ Global factor premiums cannot be explained by the **risk** models we employ

Bedankt
Thank you