Dollar-Cost Averaging Using the CAPE Ratio: An Identifiable Trend Influencing Outperformance

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Define Financial

Financial Planning Association of Minnesota
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Abstract

- Previous research: DCA underperformed LSI most of the time
  - Did not examine the circumstances of this outperformance
- Concurrent with existing research, found LSI outperformed DCA
  - 15-year periods
  - roughly two-thirds of the time
  - on a nominal return basis, when ignoring taxes and transaction costs
- DCA outperformance a function of CAPE
  - higher CAPE ratios linked to DCA outperformance

Why This Paper

Why DCA & CAPE

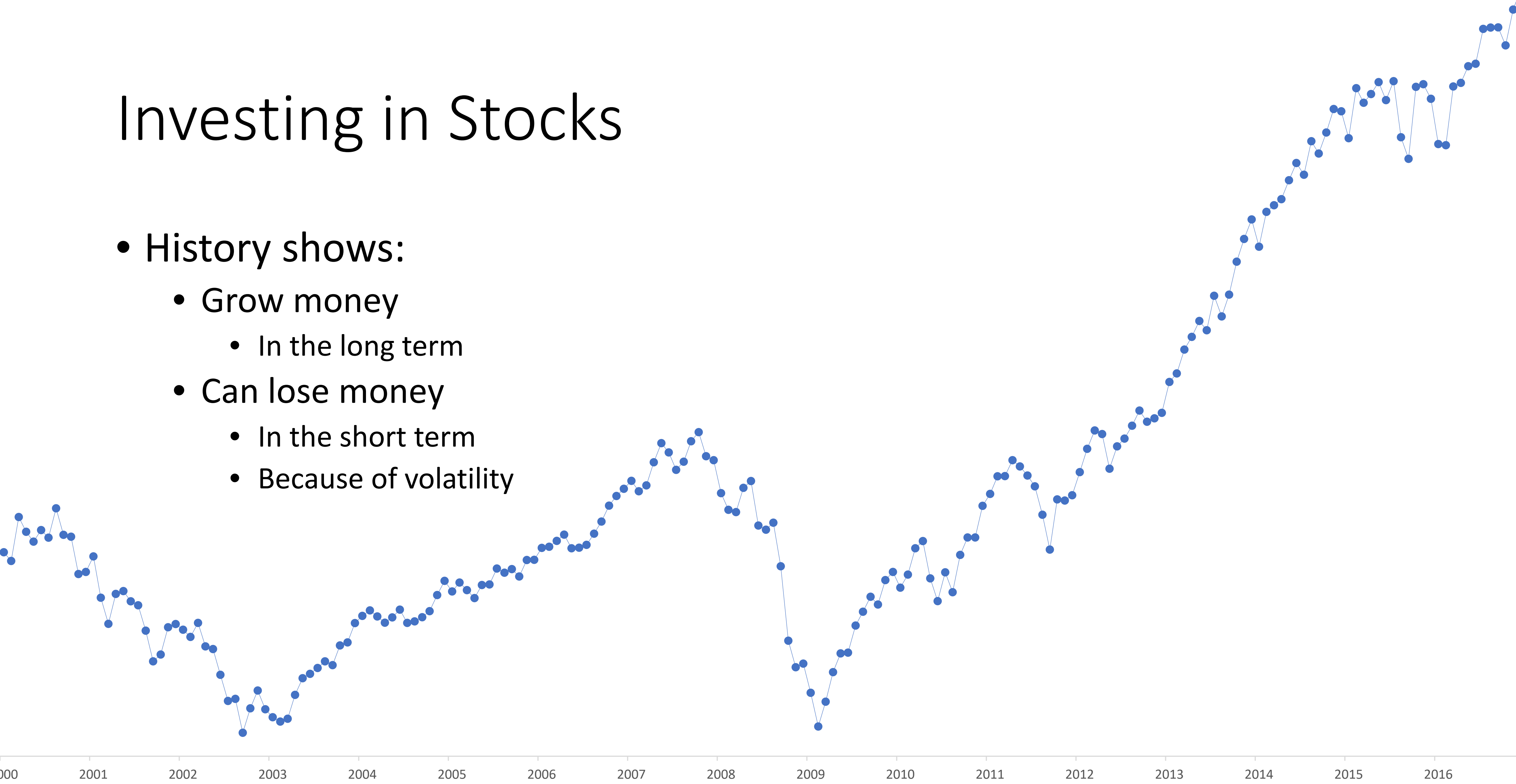
- Who uses DCA?
- Over what period?
- When/why?

Why DCA & CAPE

- How to Best Advice Clients with
  - Business Liquidation
  - Real Estate Liquidation
  - Pension Lump-Sum Distribution
  - Inheritance

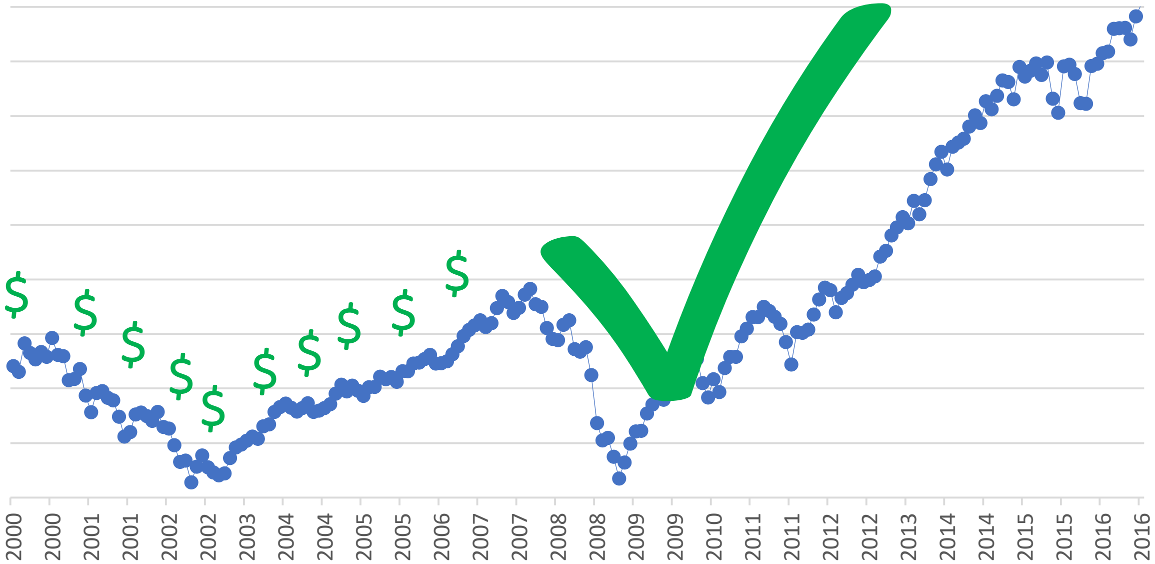
Investing in Stocks

- History shows:
  - Grow money
    - In the long term
  - Can lose money
    - In the short term
    - Because of volatility



Dollar Cost Averaging

- The potential for short-term losses may have inspired the idea behind dollar cost averaging
- Don’t invest your money all at once
- Invest small chunks of your money over time



Dollar Cost Averaging

- Proven to be less risky than LSI (as measured by standard deviation)
  - Williams, R. E., & Bacon, P. W. (1993). Lump Sum Beats Dollar-Cost Averaging. *Journal of Financial Planning*, 64-67.
  - Dubil, R. (2005). Lifetime Dollar-Cost Averaging: Forget Cost Savings, Think Risk Reduction. *The Journal of Financial Planning*.

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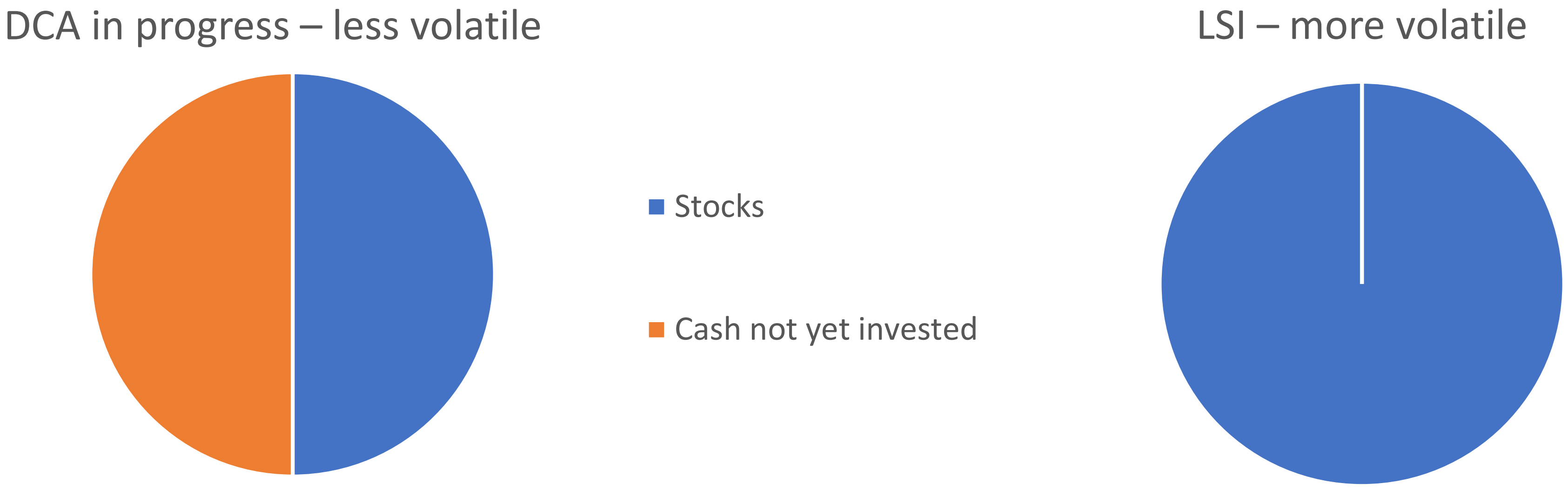
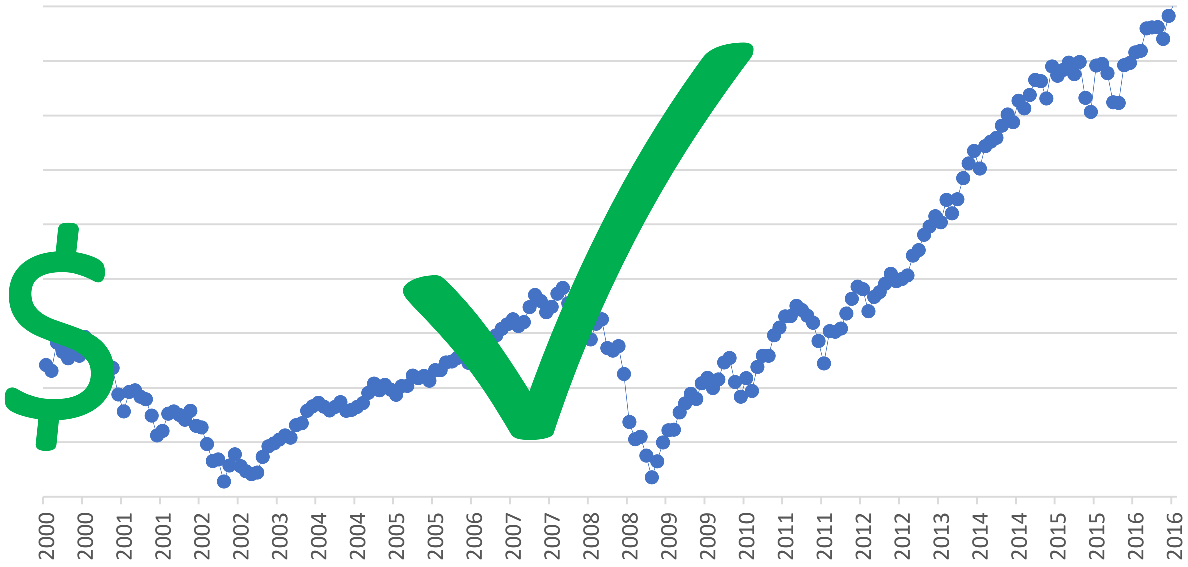


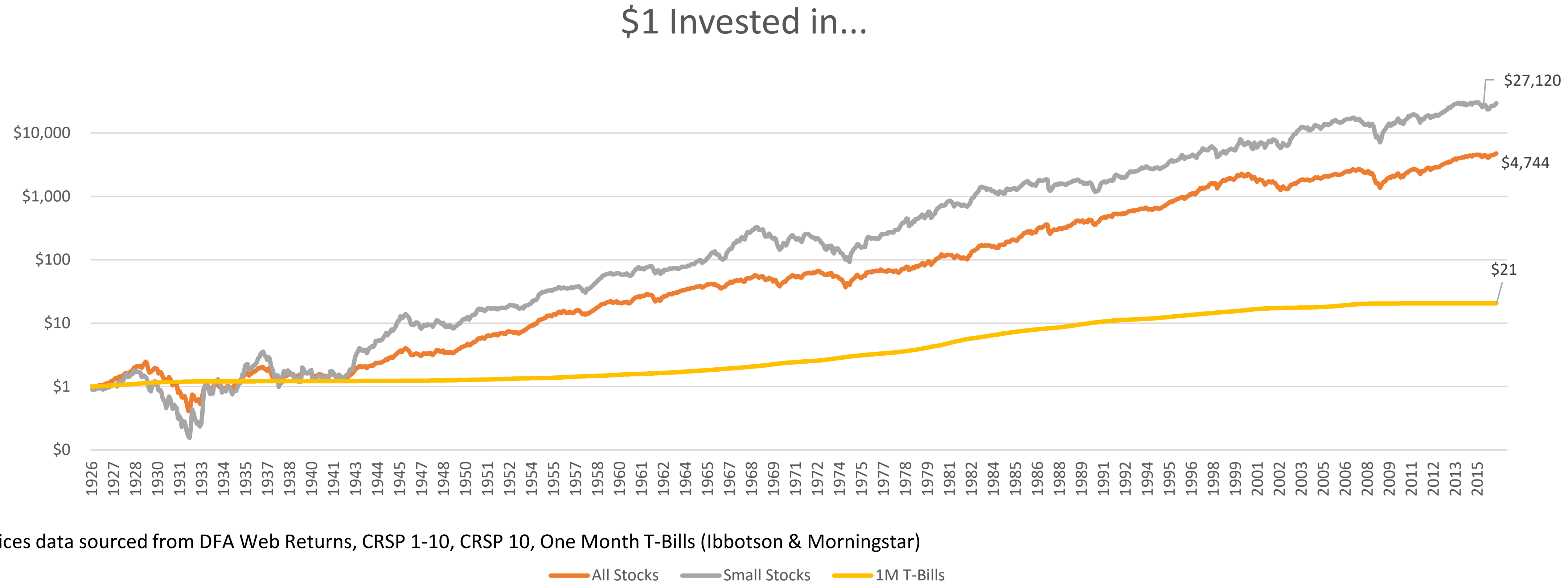
Dollar Cost Averaging

- If less risky, what about a higher investment return?
- Not really
- Less nominal investment return (on average)



Dollar Cost Averaging

- Risk and return are positively correlated

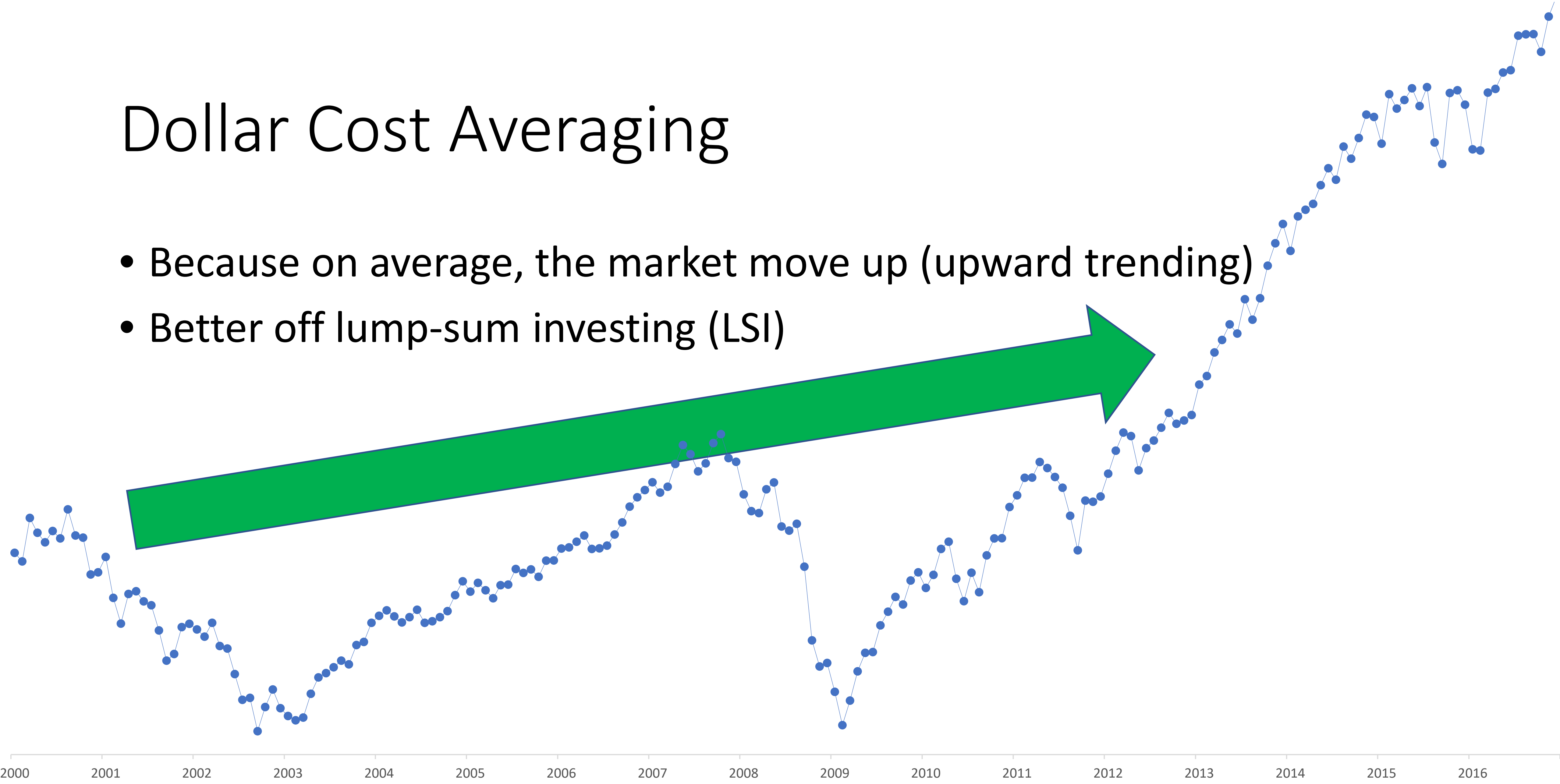


Dollar Cost Averaging

- DCA doesn’t usually beats LSI
  - Greenhut, J. G. (2006). Mathematical Illusion: Why Dollar-Cost Averaging Does Not Work. *The Journal of Financial Planning*.
- LSI beats 2/3 of the time
  - Shtekhman, A., Tasopoulos , C., & Wimmer, B. (2012, July). *Dollar-cost averaging just means taking more risk later.* Retrieved from Vanguard Group
    - 1926 to 2011; 6, 12, 18, 24, 30, or 36 months; U.S., U.K. & Australia
  - Williams, R. E., & Bacon, P. W. (1993). Lump Sum Beats Dollar-Cost Averaging. *Journal of Financial Planning*, 64-67
    - 1926 to 1991; 12-month holding periods; SP & 500

Dollar Cost Averaging

- Because on average, the market move up (upward trending)
- Better off lump-sum investing (LSI)



1/3 of the time?

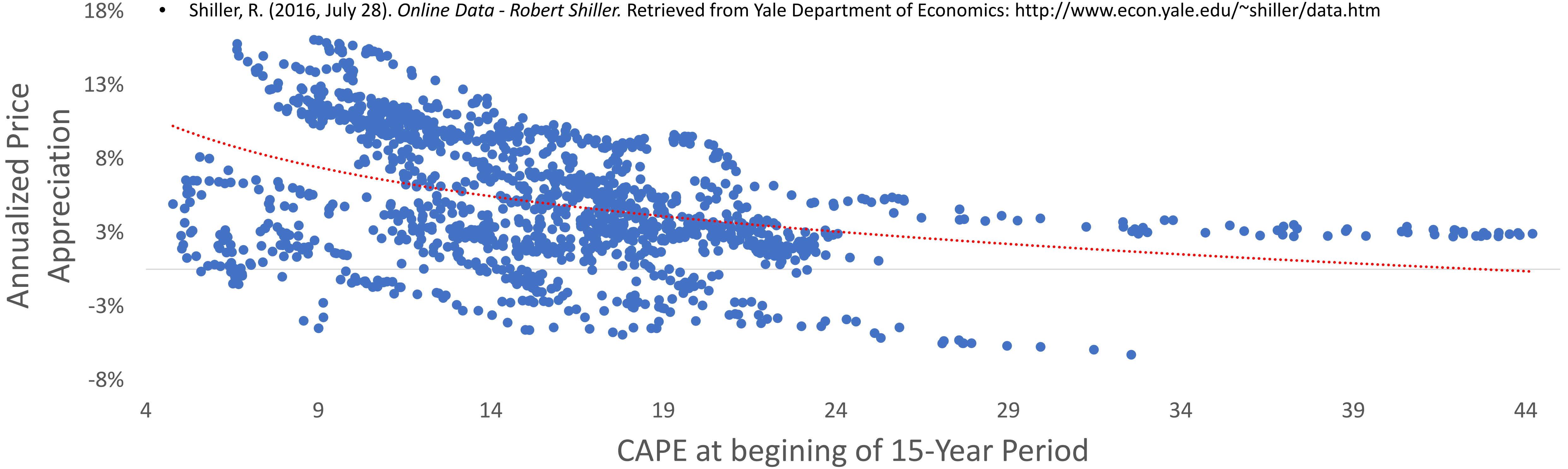
- If LSI outperforms, how does DCA outperform during that 1/3 of time?
  - Flat, downward trending, or volatile markets
    - Shtekhman, et al., 2012
    - Greenhut, 2006
  - Previous literature briefly mentioned high volatility made for DCA success
  - But stopped short of making a full analysis
- Would it be possible to determine what circumstances make for the success of DCA?
- Is it possible to predict when DCA would the better strategy?
- How would we determine this?

CAPE ratio

- Cyclically Adjusted Price to Earnings ratio
  - AKA Shiller P/E
  - Invented by economist & Nobel Laurette Robert Shiller
- A valuation metric
  - Measures if stocks are “cheap” or “expensive”
  - Looks at company earnings
  - Over 10 years
  - Adjusted for price
  - Relative to stock price
  - 10 years earnings, adjusted for inflation ÷ stock share price
- Varies between 5+ and 44+
  - ~16 being average

CAPE ratio

- Has predictive power for investment return
- Significant negative correlation (-0.41), 1871-2015
  - Shiller, R. (2016, July 28). *Online Data - Robert Shiller.* Retrieved from Yale Department of Economics: http://www.econ.yale.edu/~shiller/data.htm



Using Valuation Metrics as an Investment Strategy

- 5-year normalized P/E ratio to tilt equity allocations
  - Excess investment returns at highest lowest decile of valuations
    - Kitces, M., Solow, K., & Locatelli, S. (2011). Improving Risk-Adjusted Returns Using Market-Valuation-Based Tactical Asset Allocation Strategies. *Journal of Financial Planning*, 48.
- If a multi-year, inflation adjusted P/E ratio can be used to tilt equity allocation, why not for DCA?
  - It’s the same thing!

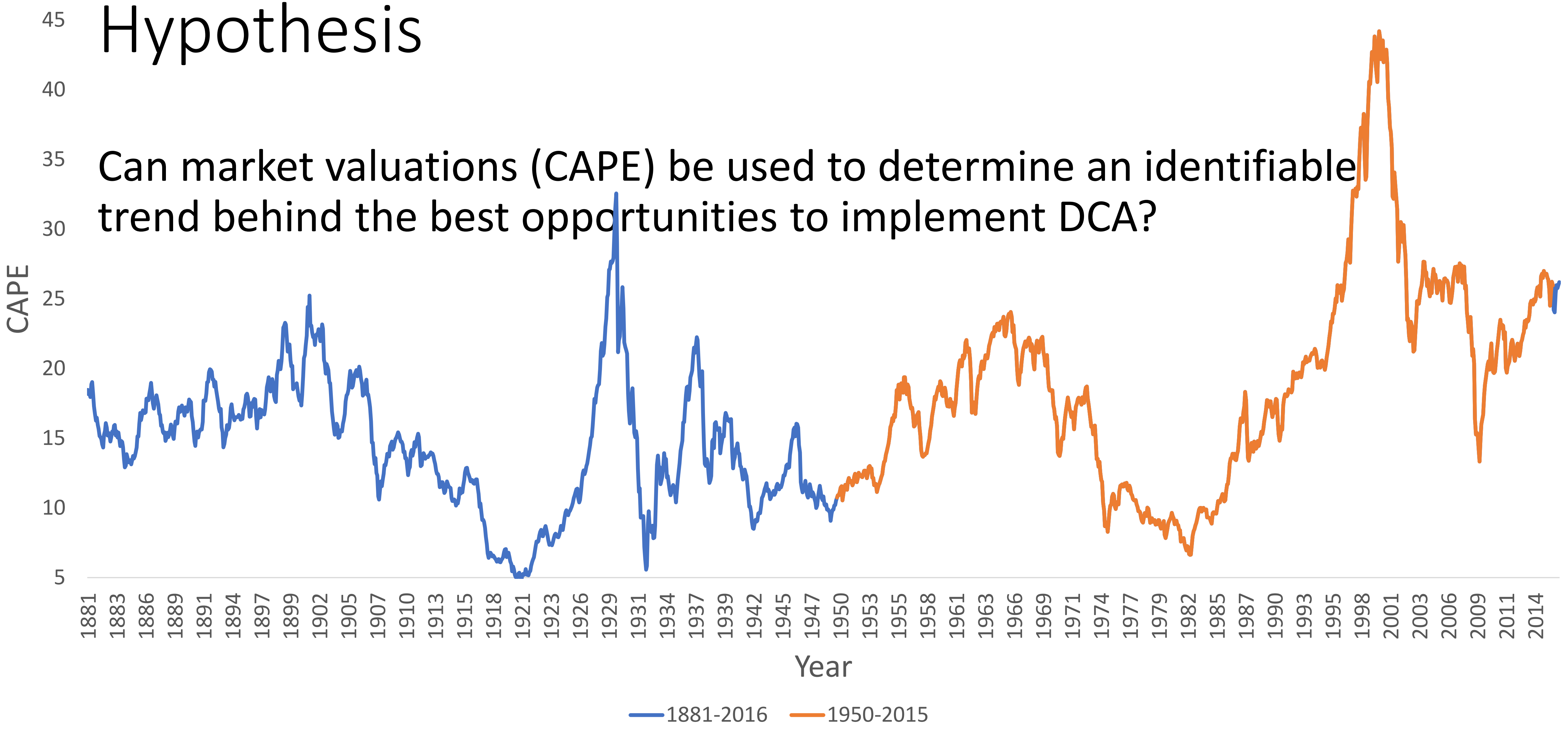
Tilting Equity Allocation Relative to CAPE

Challenges Using CAPE

- Imperfect valuation metric
- 10 years may be longer than a business cycle
- Technique for measuring inflation has changed with time
- Accounting standards and corporate taxation have changed over time
  - Wilcox, S. E. (2011, September). *A Cautionary Note About Robert Shiller's CAPE.* Retrieved from AAII: The American Association of Individual Investors

Hypothesis

Can market valuations (CAPE) be used to determine an identifiable trend behind the best opportunities to implement DCA?



Data & Methodology

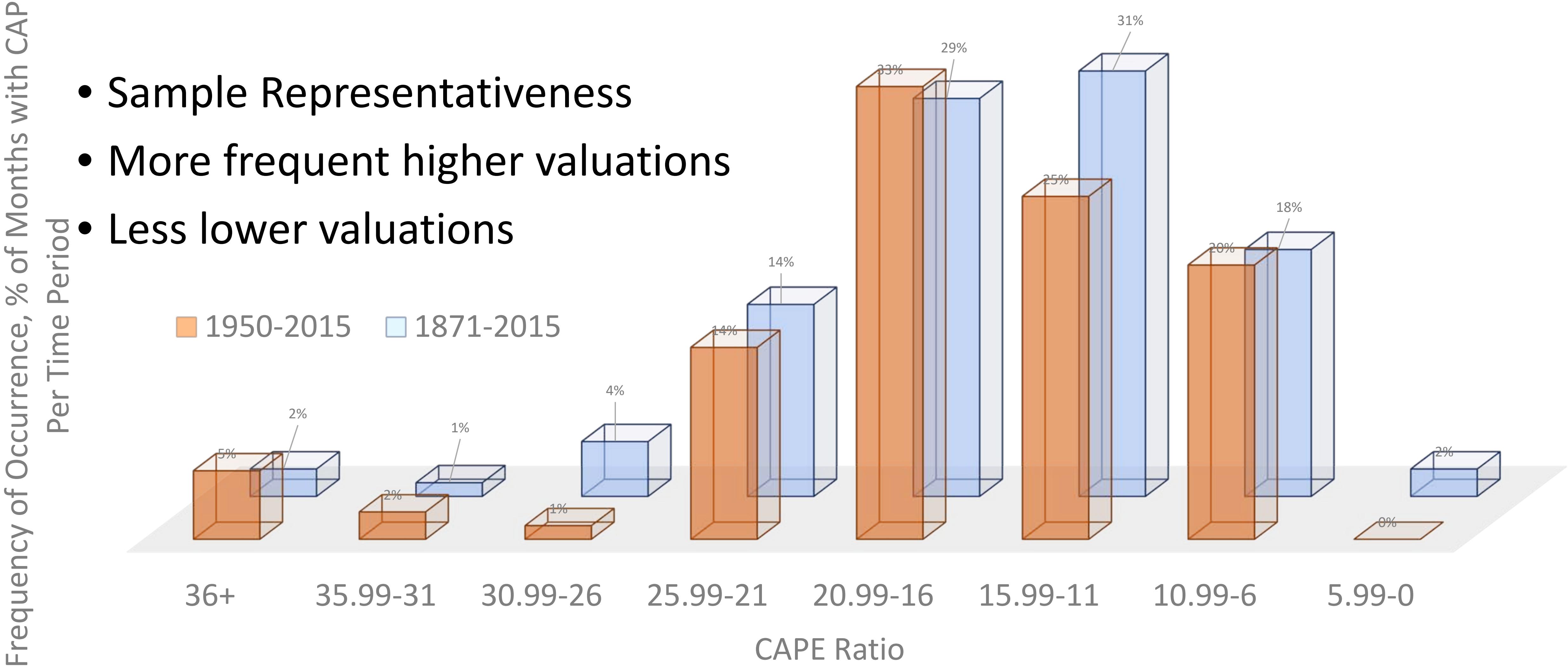
- S&P 500, Total Return
  - Yahoo Finance
- 90 Day T-Bills
  - Board of Governors of the Federal Reserve, 2016
- 1950-2015
- 15-year rolling time periods
  - Robust results, vis-à-vis 5 or 10 year
  - Monthly deposits
    - 180 deposits in total
      - 12 months X 15 years = 180 deposits
  - Uninvested cash grew at the risk-free rate

Data & Methodology

- No consideration for taxes or fees
  - Account fees
  - Expense Ratios
  - Transaction / Trade Fees / Commissions
- IRA, at Vanguard, using Vanguard funds, etc.

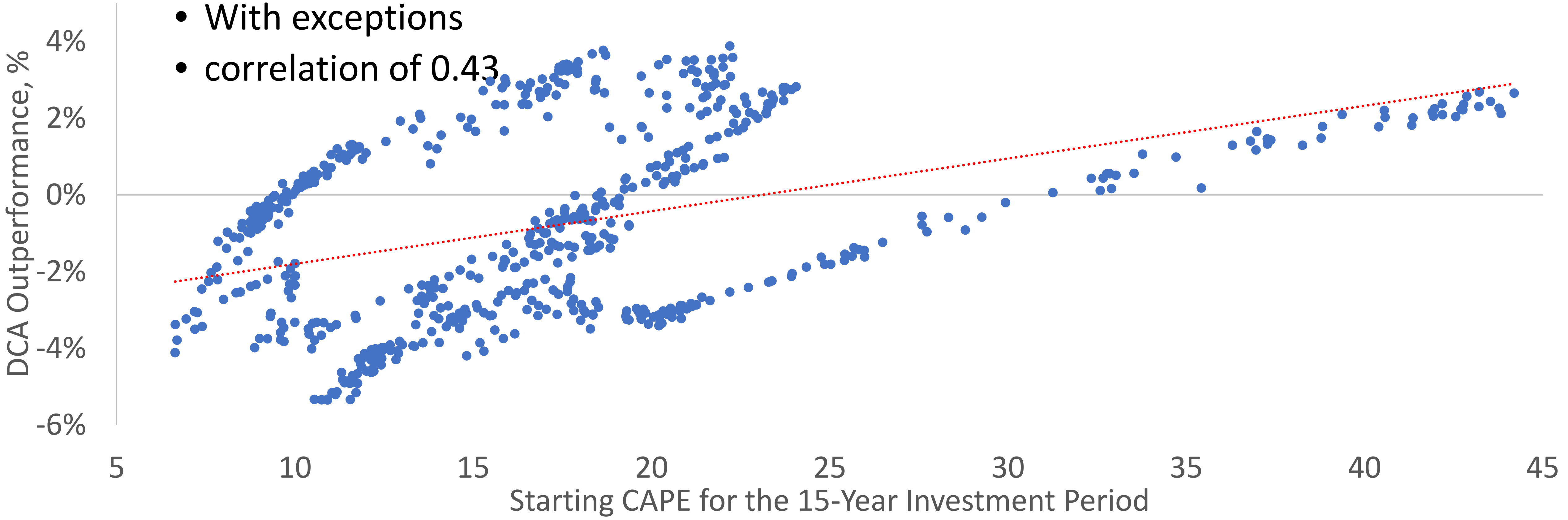
Data & Methodology

- Sample Representativeness
- More frequent higher valuations
- Less lower valuations



Results

- DCA outperformance as CAPE increased
  - With exceptions
  - correlation of 0.43

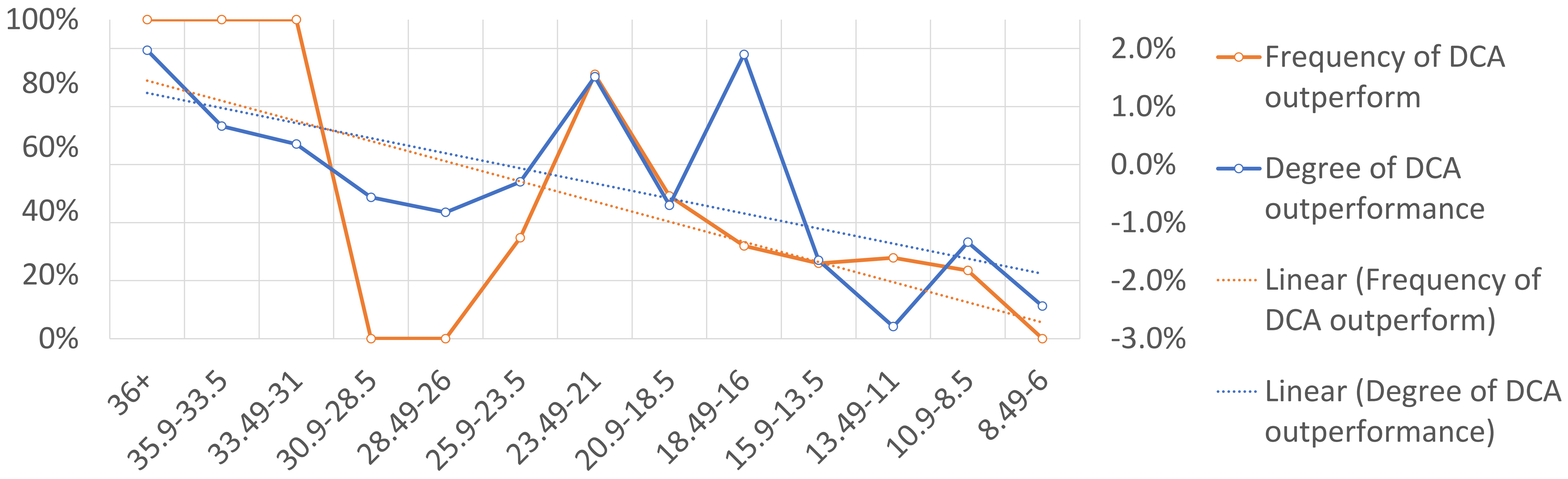


Results

- DCA outperformed 1/3 of the time
  - As per previous literature
- 1/3 of time, CAPE valuations are above ~18.6
- Using DCA at valuations above ~18.6 averaged an excess return of 0.45 BPS per year
  - Over 15 years
- Increasing valuations made for a greater degree of DCA outperformance – with the tech bubble exception

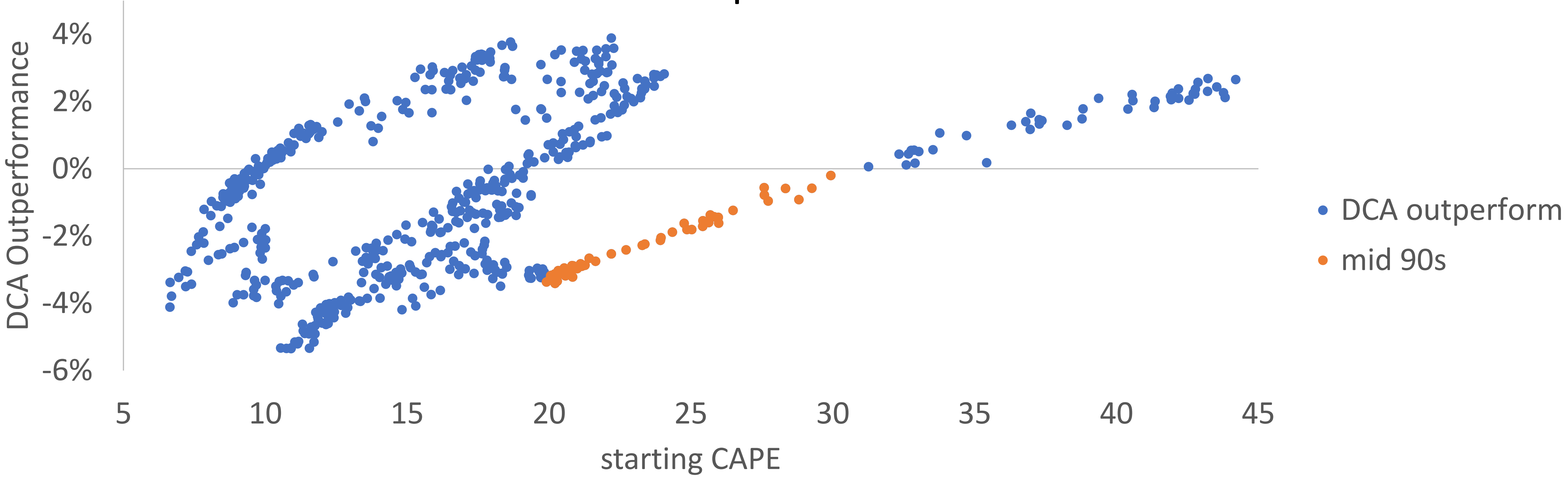
Results

- Using DCA at higher valuations averaged higher outperformance
  - But a non-linear relationship, from the tech bubble



Results

- Higher CAPE usually meant greater DCA outperformance
- With the tech bubble as an exception



Considerations for Applications

- Perspective #1: You Can Use CAPE to Indicate when to Use DCA
  - CAPE of 31 – as of Friday, October 13th, 2017
  - Will valuations peak at ~44, as per the tech bubble?
    - Or will valuations surpass ~44?
    - Is this the valuation peak?
- Perspective #2: You Cannot Use CAPE to Indicate when to Use DCA
  - Allocate to a Portfolio that is Always Risk Appropriate for your Client
  - "Taking Risk Later"
  - What Happens During a Drawdown at Year 16?

Future Research

- Closely Examine Additional Time Periods
  - 12 months, 24 months, 36 months, 60 months
- Incorporate Taxes & Fees
- Examine Time Periods Back to 1926, 1871
  - Great Depression
- Examine five- & one-year P/E valuation metrics

What I Couldn't Squeeze into the FPA Journal

- Best Month for LSI? *November*
  - foreign and domestic indices; 1970–1998; 12-month periods
  - Atra, R. J., & Mann, T. L. (2001). Dollar-Cost Averaging and Seasonality: Some International Evidence. *Journal of Financial Planning*, 98–105.

- November has the second highest CAPE ratio, on average, behind December (this study)
  - Returns on short timelines (one year) determined by momentum
  - Return on long timelines (15 years) determined by valuation

What I Couldn’t Squeeze into the FPA Journal

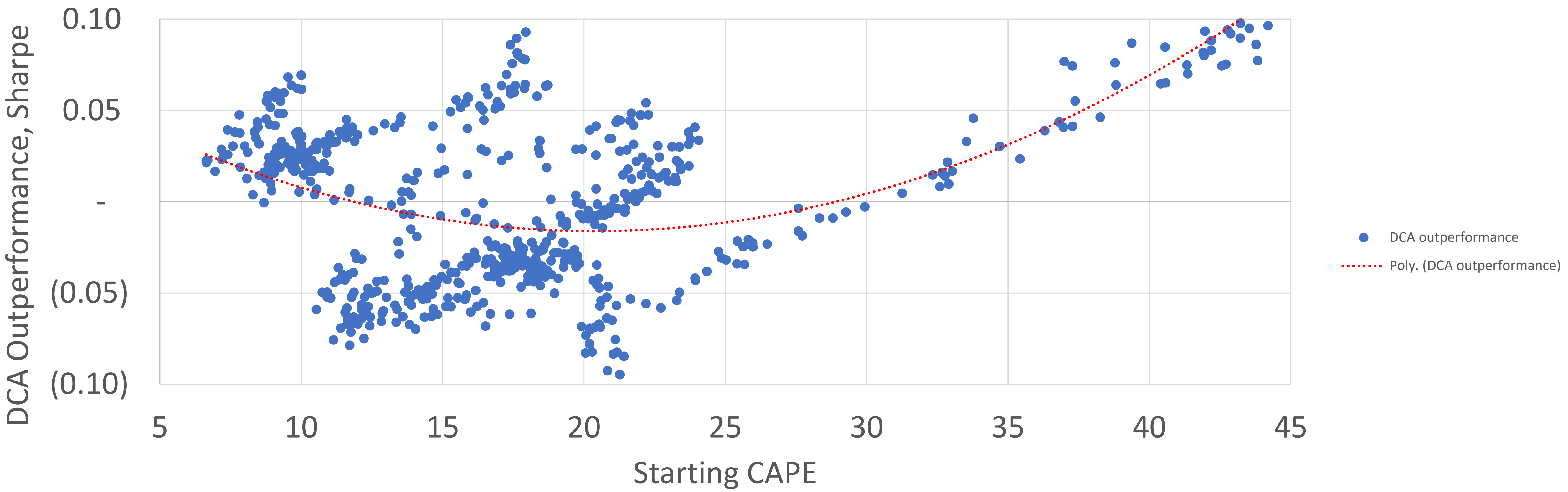
		Timeline	
		Short	Long
Valuations	High	LSI	DCA
	Low	DCA	LSI

What I Couldn't Squeeze into the FPA Journal

- Risk-Adjusted Return
  - LSI ~0.1+ Sharpe ratios, on average
    - Shtekhman, et al. (2012)
    - 1926 to 2011; 6, 12, 18, 24, 30, or 36 months; U.S., U.K. & Australia
  - LSI ~0.07+ Sharpe ratios
    - Leggio, K. B., & Lien, D. (2003, January). Comparing Alternative Investment Strategies Using Risk-Adjusted Performance Measures. The Journal of Financial Planning.
    - One-year periods; 1926-1999; S&P 500

What I Couldn't Squeeze into the FPA Journal

- LSI outperformed roughly 1/2 of the time



What I Couldn't Squeeze into the FPA Journal

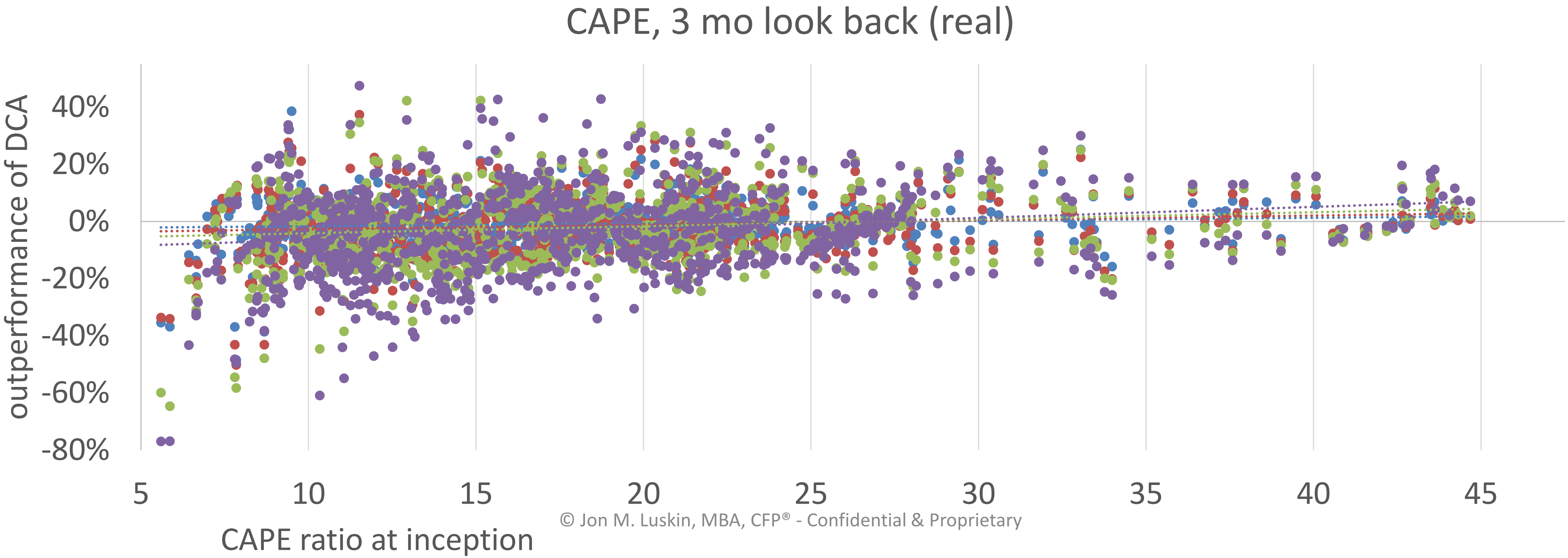
- LSI outperformed roughly 1/2 of the time
  - DCA outperforming when valuations are high and low
    - but not median
- DCA strategy outperforms (nominal & risk-adjusted) when valuations are high
  - Higher Return for Less Risk
  - Hence higher Sharpe Ratio

What I Couldn't Squeeze into the FPA Journal

- DCA outperforms on a risk-adjusted basis when valuations are low
  - Because of consistently high variations in investment return for LSI
    - from upward deviations
  - Hence higher Sharpe
  - But who really cares about upward volatility?
    - Sharpe perhaps not an appropriate metric in this circumstance

Postscript: Shorter timelines?

- Shorter timelines of DCA implementation show no consistent result
  - 6 months, 9 months, 12 months, 18 months



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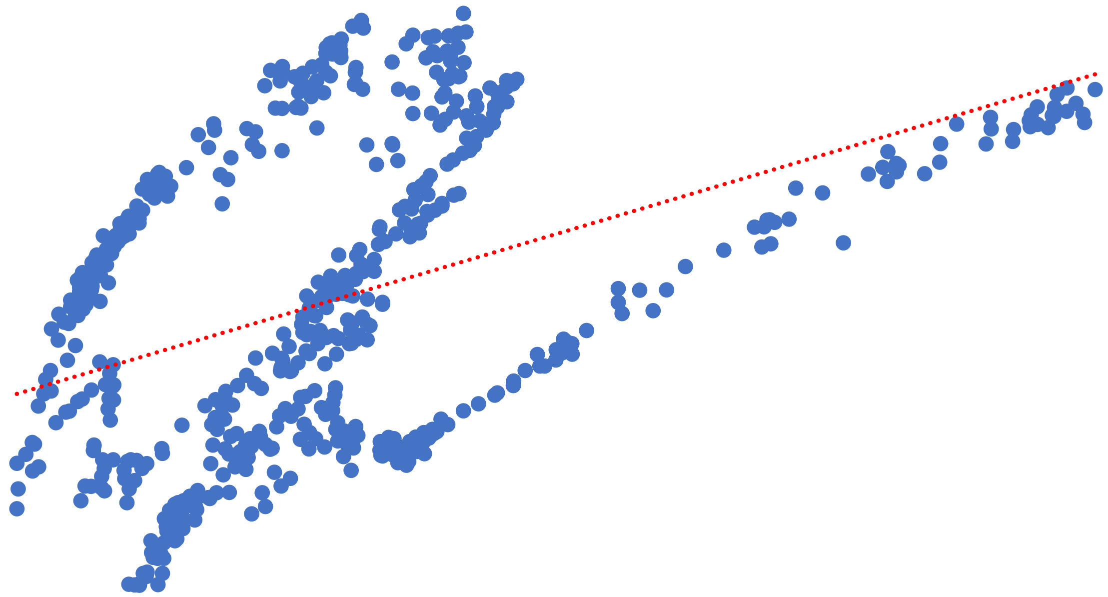
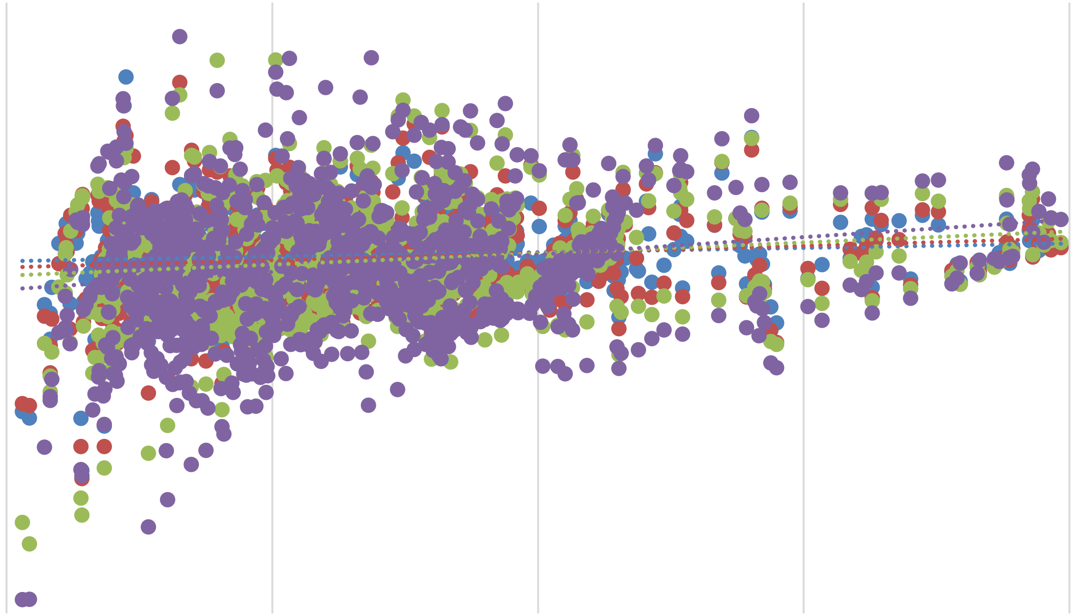
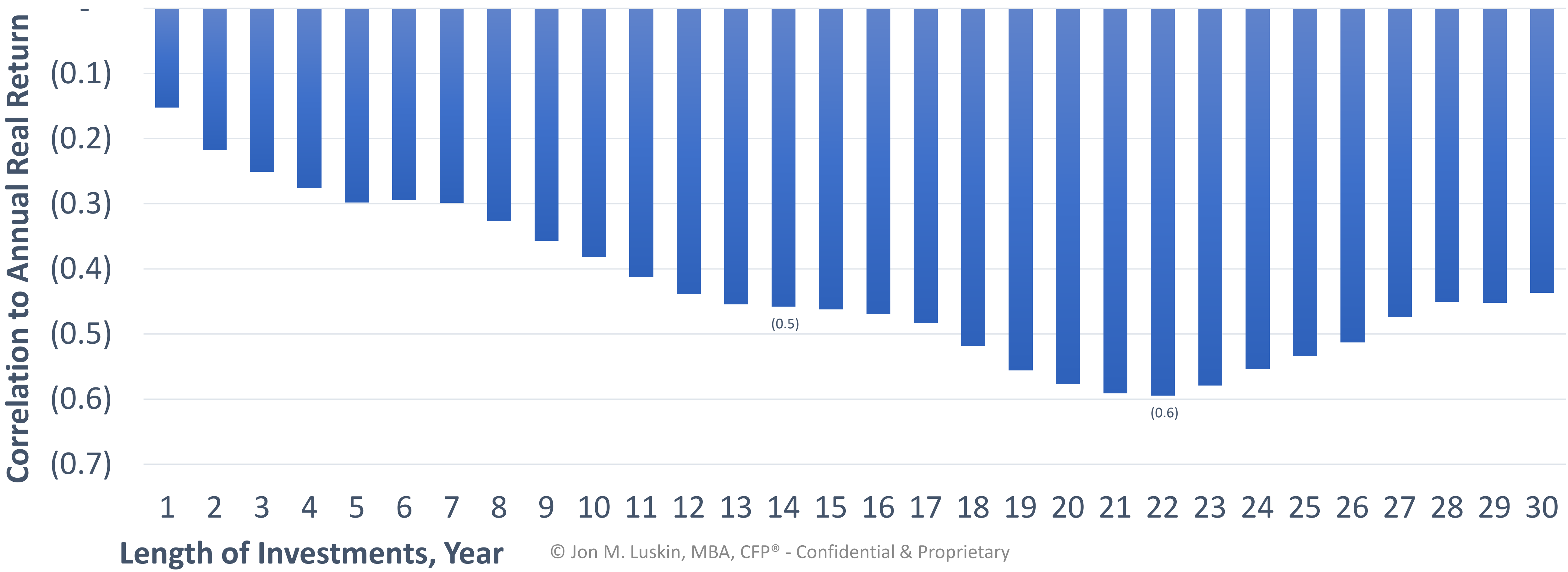




Postscript: Shorter timelines?

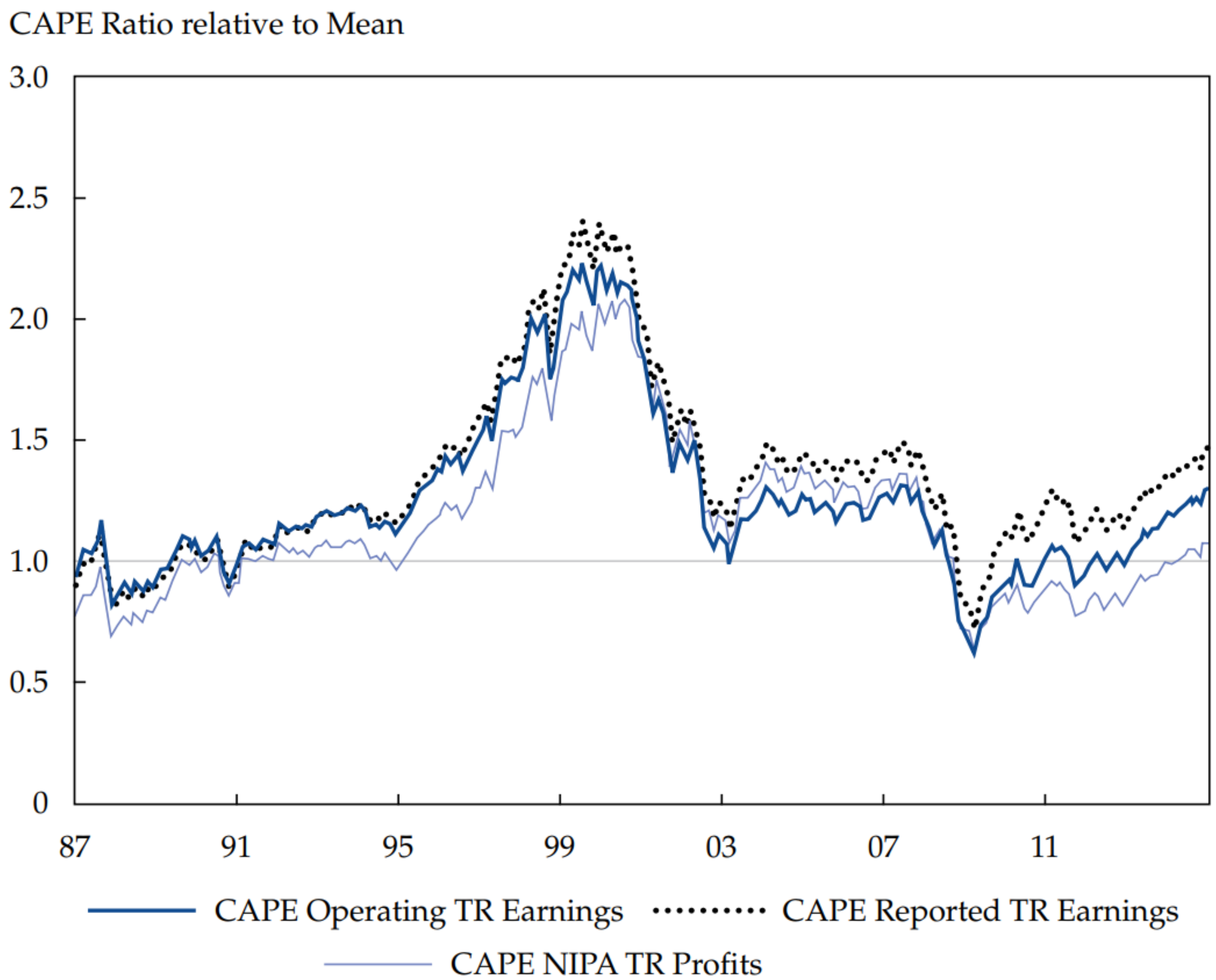
- CAPE most predictive on longer timelines

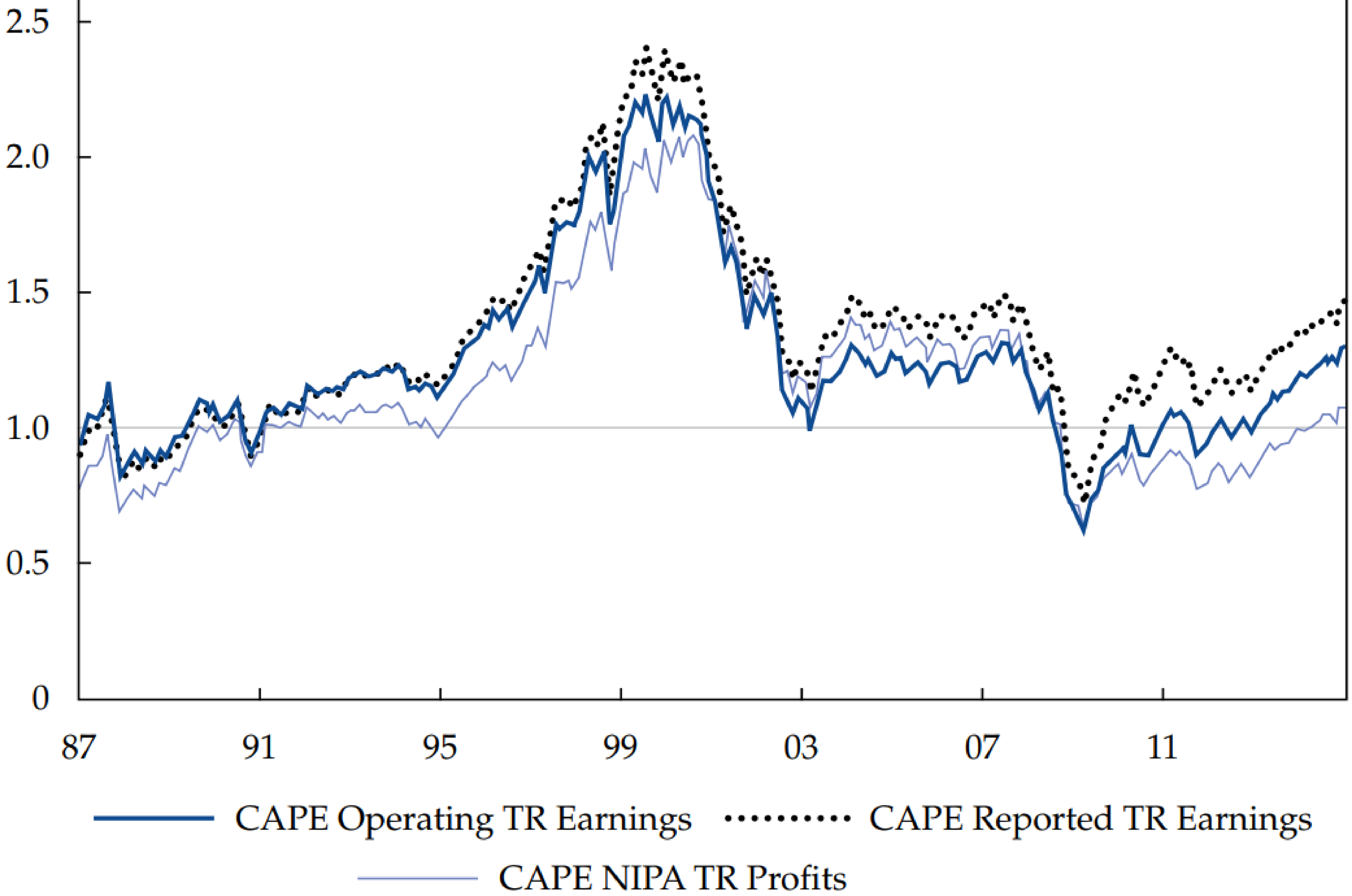


Postscript: CAPE is Broken

- Accounting standards changed, making CAPE today different (Seigel, 2016)
  - National Income and Product Accounts (NIPA)

Figure 5. Total Return CAPE Ratio relative to Long-Term Mean, 1987–January 2015

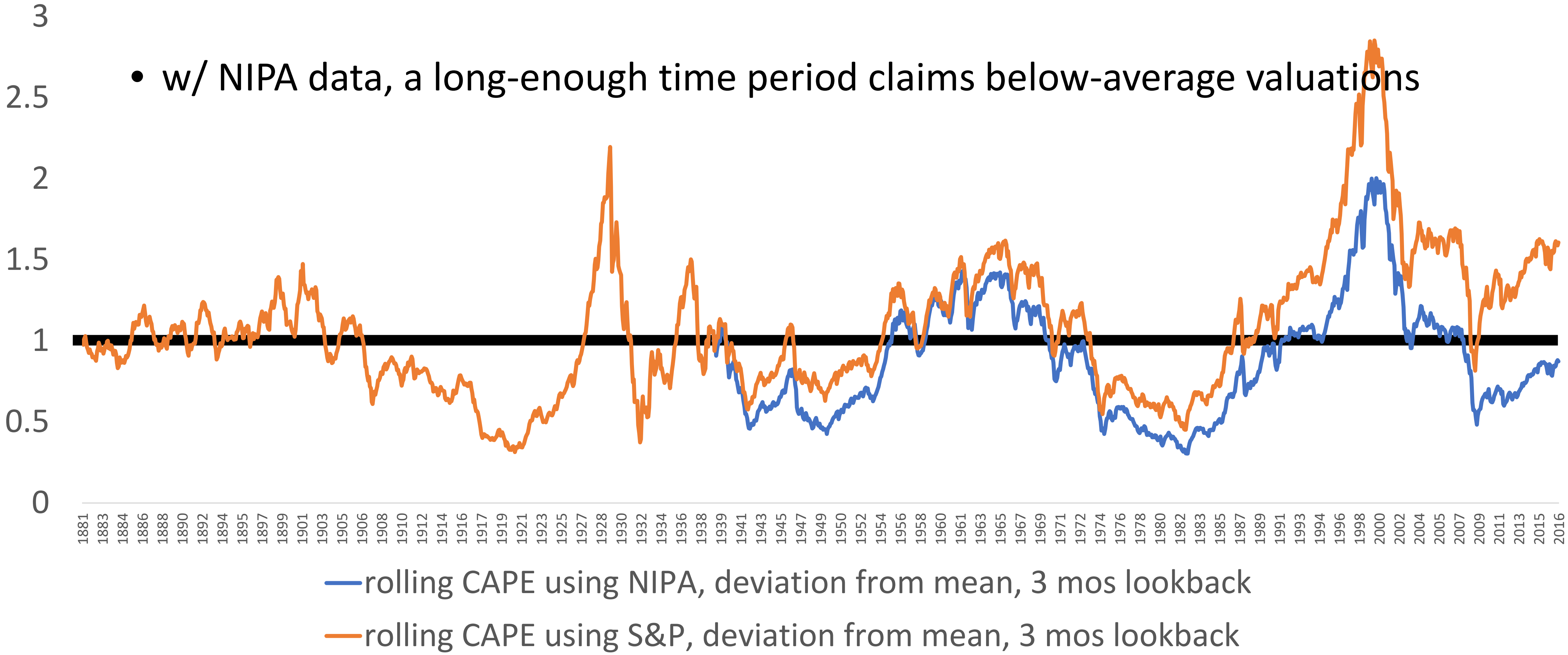




2.5
2.0
1.5
1.0
0.5
0
87
91
95
99
03
07
11
CAPE Operating TR Earnings
CAPE Reported TR Earnings
CAPE NIPA TR Profits

Postscript: CAPE is Broken

- w/ NIPA data, a long-enough time period claims below-average valuations



Postscript: CAPE is Broken

- Incorporating real bond yield can improve forecasting (Vanguard, 2017)

Figure 8: *Two-step "fair-value" CAPE model—Reasonable out-of-sample performance*

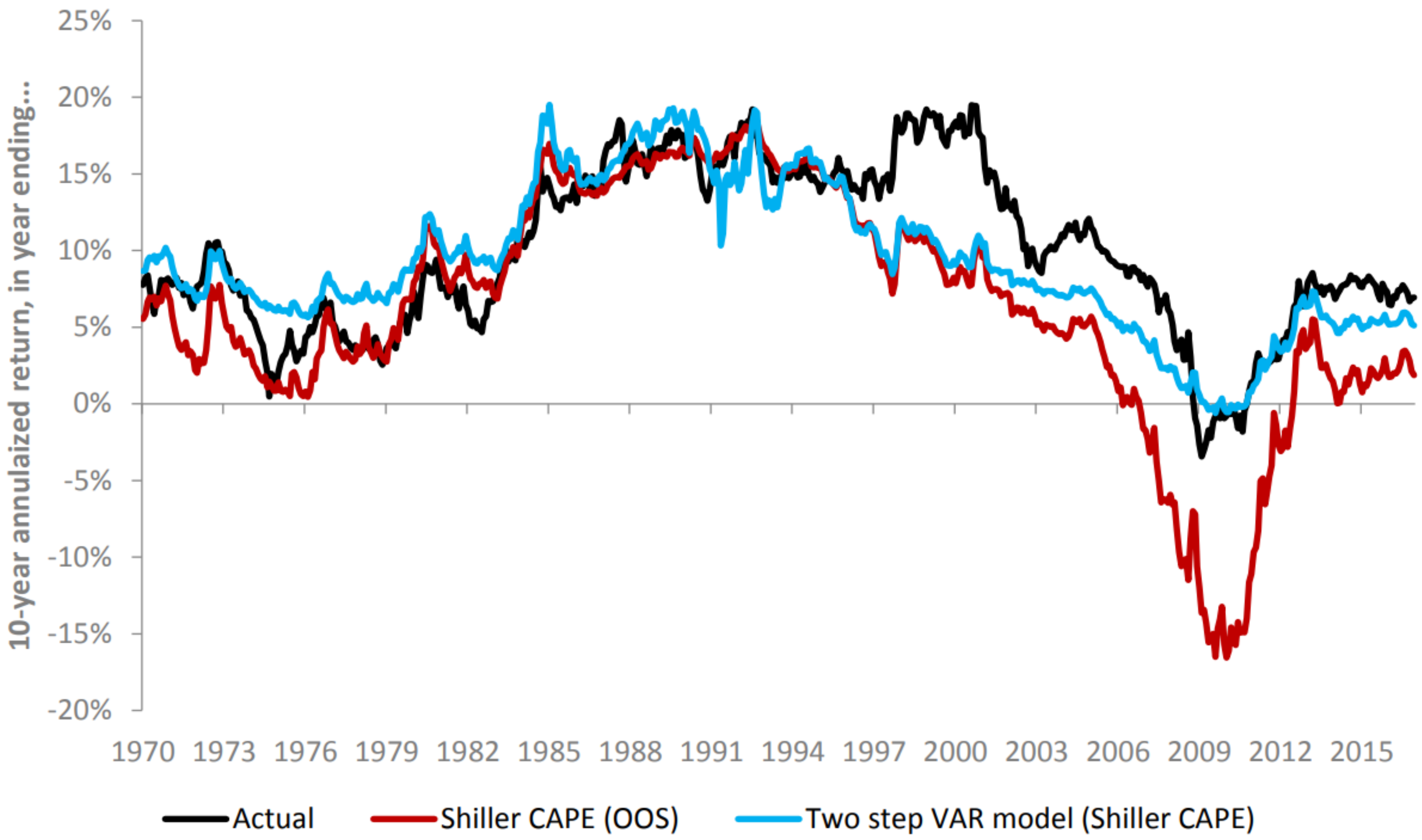
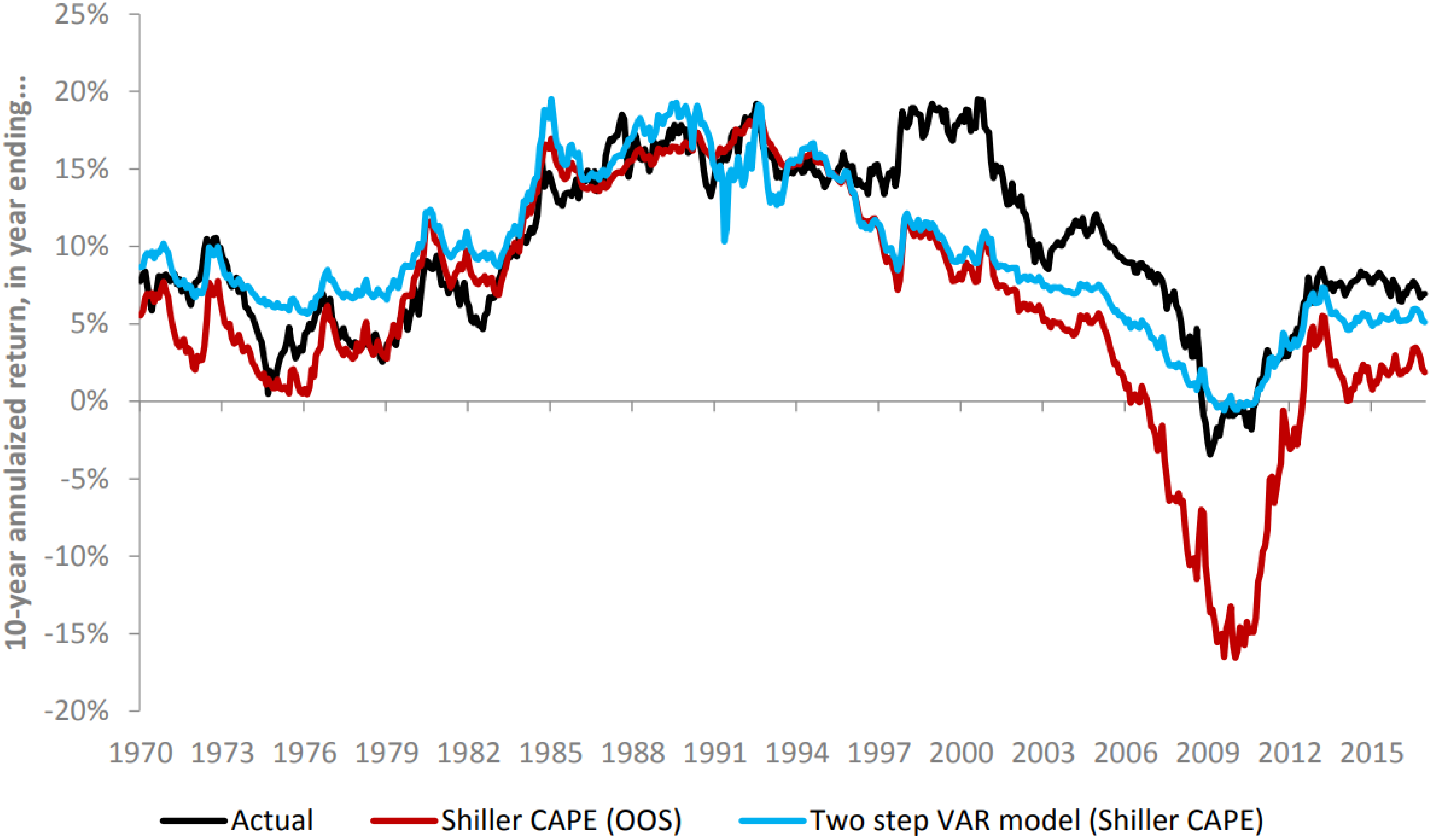


Figure 8: *Two-step "fair-value" CAPE model—Reasonable out-of-sample performance*



Successive Research

- Testing this same strategy
  - Using NIPA data
  - Vanguard’s algorithm incorporating real bond yields

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