On Persistence in Mutual Fund Performance

Mark M. Carhart

The Journal of Finance
Mar. 1997

Reviewer: Sungguk Cha

Most words are from the paper.

I will try my best to pretend
as if I am the author.

MINDs Lab
BRAIN

Any

critique

comment

correction

cuestion

are welcome.

MINDs Lab
BRAIN

Abstract

This paper demonstrates

common factors in stock returns and investment expenses

almost completely **explain**

persistence in equity mutual funds' mean and risk-adjusted **returns**.

Contents

Contents

Introduction

a. Abstract
b. Background
c. Motif
d. Experiment summaries

Introduction

a. Abstract
b. Background
c. Motif
d. Experiment summaries

Introduction

Lets say there is a persistently best performing fund.

Introduction

Lets say there is a persistently best performing fund.

We think there is a superior stock-picker.

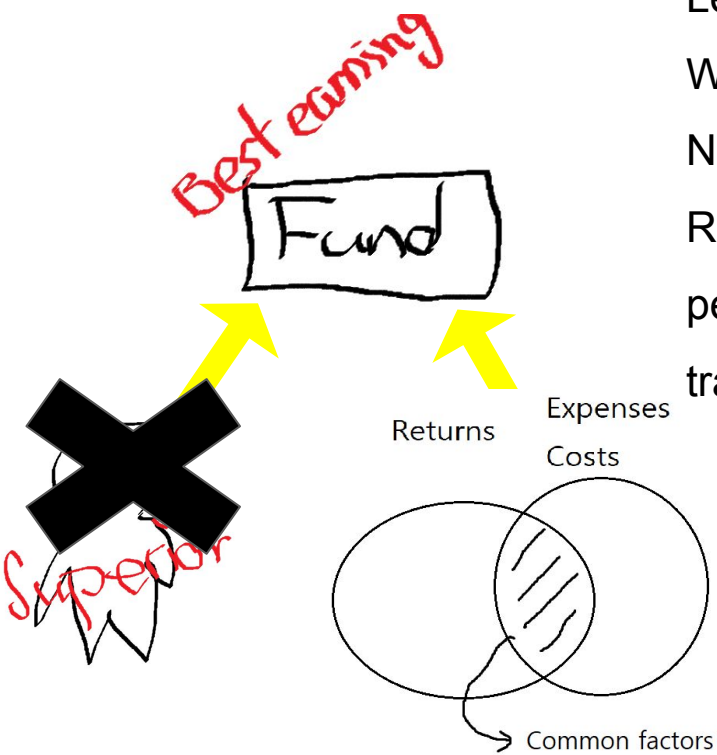
Introduction

Lets say there is a persistently best performing fund.

We think there is a superior stock-picker.

No no.

Introduction



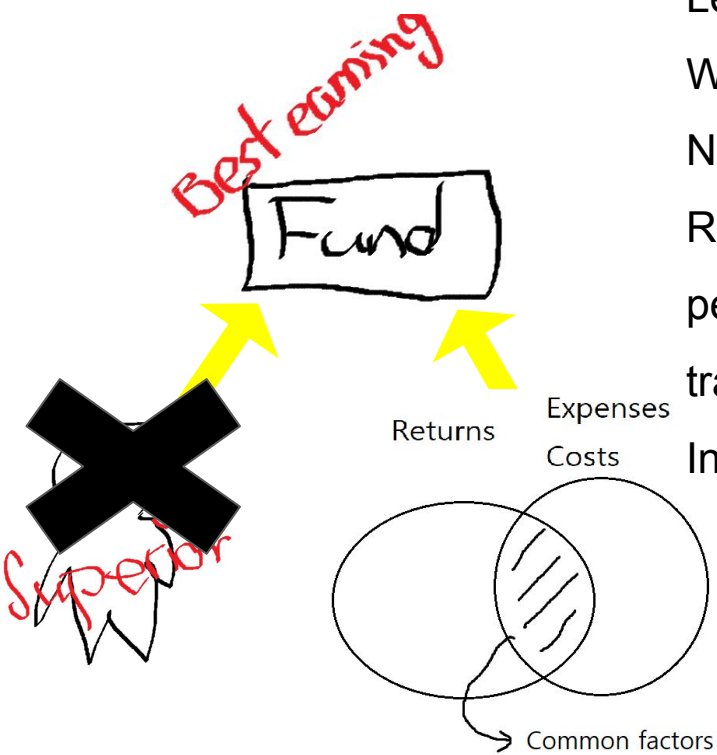
Lets say there is a persistently best performing fund.

We think there is a superior stock-picker.

No no.

Rather, common factors in stock returns and the persistent difference in fund expenses and transaction costs **explain** it.

Introduction



Lets say there is a persistently best performing fund.

We think there is a superior stock-picker.

No no.

Rather, common factors in stock returns and the persistent difference in fund expenses and transaction costs **explain** it.

Instead, worst performing fund? I don't know.

Introduction

a. Abstract
b. Background
c. Motif
d. Experiment summaries

Introduction

Mutual fund persistence is well documented, but not well explained.

Introduction

Mutual fund persistence is well documented, but not well explained.

Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), and Wermers (1996) find evidence of **the persistence** over short-term horizons of one to three years.

Introduction

Mutual fund persistence is well documented, but not well explained.

Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), and Wermers (1996) find evidence of the persistence over short-term horizons of one to three years.

Grinblatt and Titman (1992), Elton, Gruber, Das, and Hlavka (1993), and Elton, Gruber, Das, and Blake (1996) document **mutual fund return predictability** over longer horizons of five to ten years, **attributing this to stock-picking talent**.

Introduction

Mutual fund persistence is well documented, but not well explained.

Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), and Wermers (1996) find evidence of the persistence over short-term horizons of one to three years.

Grinblatt and Titman (1992), Elton, Gruber, Das, and Hlavka (1993), and Elton, Gruber, Das, and Blake (1996) document mutual fund return predictability over longer horizons of five to ten years, attributing this to stock-picking talent.

Contrary evidence by Jensen (1969) who **does not find that good subsequent performance follows good past performance**.

Introduction

Mutual fund persistence is well documented, but not well explained.

Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995), and Wermers (1996) find evidence of the persistence over short-term horizons of one to three years.

Grinblatt and Titman (1992), Elton, Gruber, Das, and Hlavka (1993), and Elton, Gruber, Das, and Blake (1996) document mutual fund return predictability over longer horizons of five to ten years, attributing this to stock-picking talent.

Contrary evidence by Jensen (1969) who does not find that good subsequent performance follows good past performance.

Carhart (1992) shows that **persistence in expense ratios drives much of the long-term persistence**.

Introduction

a. Abstract
b. Background
c. Motif
d. Experiment summaries

Introduction

This paper's analysis indicates **Jegadeesh and Titman's (1993) one-year momentum** in stock returns **accounts for** Hendricks, Patel, and Zeckhauser's (1993) **hot hands effect** in mutual fund performance.

Introduction

This paper's analysis indicates Jegadeesh and Titman's (1993) one-year momentum in stock returns accounts for Hendricks, Patel, and Zeckhauser's (1993) hot hands effect in mutual fund performance.

Funds that earn higher one-year returns do so,
not because fund managers successfully follow momentum strategies,
but **because** some mutual funds **just happen by chance to hold relatively larger positions in last year's winning stocks**.

Introduction

This paper's analysis indicates Jegadeesh and Titman's (1993) one-year momentum in stock returns accounts for Hendricks, Patel, and Zeckhauser's (1993) hot hands effect in mutual fund performance.

Funds that earn higher one-year returns do so, not because fund managers successfully follow momentum strategies, but because some mutual funds just happen by chance to hold relatively larger positions in last year's winning stocks.

Individual mutual funds that appear to follow the one-year momentum strategy **earn significantly lower abnormal returns after expenses**.

Introduction

This paper's analysis indicates Jegadeesh and Titman's (1993) one-year momentum in stock returns accounts for Hendricks, Patel, and Zeckhauser's (1993) hot hands effect in mutual fund performance.

Funds that earn higher one-year returns do so, not because fund managers successfully follow momentum strategies, but because some mutual funds just happen by chance to hold relatively larger positions in last year's winning stocks.

Individual mutual funds that appear to follow the one-year momentum strategy earn significantly lower abnormal returns after expenses.

Thus, it concludes that **transaction costs consume the gains** from following a momentum strategy.

Introduction

a. Abstract
b. Background
c. Motif
d. Experiment summaries

Introduction

Fund performance is negatively affected by

expenses, and turnover.

Introduction

Fund performance is negatively affected by expenses, and turnover.

Variation in costs per transaction across mutual funds also **explains part** of the persistence in performance.

Introduction

Fund performance is negatively affected by expenses, and turnover.

Variation in costs per transaction across mutual funds also explains part of the persistence in performance.

Fund performance and load fees are strongly and negatively related.

Introduction

Funds with **high past alphas** demonstrate relatively **higher alphas and expected returns in subsequent periods**.

Introduction

Funds with high past alphas demonstrate relatively higher alphas and expected returns in subsequent periods.

However, these results **are sensitive to model misspecification**, since **the same model** is used to **rank funds in both periods**.

Introduction

Funds with high past alphas demonstrate relatively higher alphas and expected returns in subsequent periods.

However, these results are sensitive to model misspecification, since the same model is used to rank funds in both periods.

In addition, **theses funds earn expected future alphas** that are insignificantly different from zero.

Introduction

Funds with high past alphas demonstrate relatively higher alphas and expected returns in subsequent periods.

However, these results are sensitive to model misspecification, since the same model is used to rank funds in both periods.

In addition, theses funds earn expected future alphas that are insignificantly different from zero.

Thus, the best past-performance funds appear to **earn back their expenses and transaction costs**.

Introduction

This study expands the existing literature by controlling for **survivor bias**, and by documenting **common-factor** and **cost-based explanations** for mutual fund persistence.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Section 2 presents models of performance measurement and their pricing error estimations.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Section 2 presents models of performance measurement and their pricing error estimations.

Section 3 explains the one-year persistence in mutual fund returns.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Section 2 presents models of performance measurement and their pricing error estimations.

Section 3 explains the one-year persistence in mutual fund returns.

Section 4 further interprets the results.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Section 2 presents models of performance measurement and their pricing error estimations.

Section 3 explains the one-year persistence in mutual fund returns.

Section 4 further interprets the results.

Section 5 examines and explains longer-term persistence.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Section 2 presents models of performance measurement and their pricing error estimations.

Section 3 explains the one-year persistence in mutual fund returns.

Section 4 further interprets the results.

Section 5 examines and explains longer-term persistence.

Section 6 concludes.

Introduction

This study expands the existing literature by controlling for survivor bias, and by documenting common-factor and cost-based explanations for mutual fund persistence.

Section 1, we deal with the database and its relation to other survivor-bias corrected data sets.

Section 2 presents models of performance measurement and their pricing error estimations.

Section 3 explains the one-year persistence in mutual fund returns.

~~Section 4 further interprets the results.~~

~~Section 5 examines and explains longer-term persistence.~~

Section 6 concludes.

1. Data

1. Data

The database covers diversified equity funds monthly (Jan. 1962 ~ Dec. 1993).

1. Data

The database covers diversified equity funds monthly (Jan. 1962 ~ Dec. 1993).

The data are free of survivor bias, since they include all known equity funds over this period.

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Total Net Asset

MINDs Lab BRAIN

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Percentage change

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Expense / TNA

Table I

Mutual Fund Database Summary Statistics

turnover + 0.5 flow

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993: Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

Table I

Mutual Fund Database Summary Statistics

Group	Total Number	Time-Series Averages of Cross-Sectional Average Annual Attributes, 1962–1993							
		Avg Number	Avg TNA ($ millions)	Avg Flow (%/year)	Avg Exp Ratio (%/year)	Avg Mturn (%/year)	Percentage with Load	Avg Max Load	Avg Age (years)
All funds	1,892	509.1	$217.8	3.4%	1.14%	77.3%	64.5%	7.33%	18.1
By fund category									
Aggressive growth	675	169.2	$ 95.6	5.0%	1.55%	99.7%	58.2%	7.38%	12.3
Long term growth	618	168.5	$221.4	5.5%	1.09%	79.5%	59.7%	7.38%	16.4
Growth & income	599	171.4	$328.5	1.5%	0.91%	60.9%	70.0%	7.27%	23.8
By current status									
Live funds	1,310	352.3	$268.7	4.3%	1.07%	76.2%	63.3%	7.29%	19.2
Dead funds	582	156.8	$ 46.8	−1.2%	1.44%	83.1%	68.5%	7.44%	14.9

2. Models of Performance Measurement

2. Models of Performance Measurement

This section describes following measurements

1. Capital Asset pricing Model (CAPM)
2. (Author’s) 4-factor model

2. Models of Performance Measurement

This section describes following measurements

1. Capital Asset pricing Model (CAPM)
2. (Author's) 4-factor model

and evaluates them on quantitatively-managed portfolios of New York Stock Exchange (**NYSE**), American Stock Exchange (**Amex**), and **Nasdaq** stocks.

Capital Asset Pricing Model (CAPM)

$$r_{it} = \alpha_{iT} + \beta_{iT}\mathrm{VWRF}_t + e_{it} \qquad t = 1, 2, \cdots, T$$

VWRF := the Center for Research in Security Prices (**CRSP**) value-weight **stock index minus** the one-month **treasury bill return**.

4-factor model

4-factor model := Fama and French's (1993) 3-factor model + JT one-year momentum

$$r_{it} = \alpha_{iT} + b_{iT}\mathrm{RMRF}_t + s_{iT}\mathrm{SMB}_t + h_{iT}\mathrm{HML}_t + p_{iT}\mathrm{PR1YR}_t + e_{it}$$
$$t = 1, 2, \cdots, T$$

4-factor model

4-factor model := Fama and French's (1993) 3-factor model + JT one-year momentum

$$r_{it} = \alpha_{iT} + b_{iT}\mathrm{RMRF}_t + s_{iT}\mathrm{SMB}_t + h_{iT}\mathrm{HML}_t + p_{iT}\mathrm{PR1YR}_t + e_{it}$$
$$t = 1, 2, \cdots, T$$

RMRF := **the excess return** on a value-weighted **aggregate market proxy**

4-factor model

4-factor model := Fama and French's (1993) 3-factor model + JT one-year momentum

$$r_{it} = \alpha_{iT} + b_{iT}\mathrm{RMRF}_t + s_{iT}\mathrm{SMB}_t + h_{iT}\mathrm{HML}_t + p_{iT}\mathrm{PR1YR}_t + e_{it}$$
$$t = 1, 2, \cdots, T$$

RMRF := the excess return on a value-weighted aggregate market proxy

SMB := corporate value

4-factor model

4-factor model := Fama and French's (1993) 3-factor model + JT one-year momentum

$$r_{it} = \alpha_{iT} + b_{iT}\mathrm{RMRF}_t + s_{iT}\mathrm{SMB}_t + h_{iT}\mathrm{HML}_t + p_{iT}\mathrm{PR1YR}_t + e_{it}$$
$$t = 1, 2, \cdots, T$$

RMRF := the excess return on a value-weighted aggregate market proxy

SMB := corporate value

HML := 1/PBR

4-factor model

4-factor model := Fama and French's (1993) 3-factor model + JT one-year momentum

$$r_{it} = \alpha_{iT} + b_{iT}\mathrm{RMRF}_t + s_{iT}\mathrm{SMB}_t + h_{iT}\mathrm{HML}_t + p_{iT}\mathrm{PR1YR}_t + e_{it}$$
$$t = 1, 2, \cdots, T$$

PR1YR := one-year JT momentum model

Table II

Performance Measurement Model Summary Statistics, July 1963 to December 1993

Factor Portfolio	Monthly Excess Return	Std Dev	*t*-stat for Mean = 0	Cross-Correlations				
				VWRF	RMRF	SMB	HML	PR1YR
VWRF	0.44	4.39	1.93	1.00				
RMRF	0.47	4.43	2.01	1.00	1.00			
SMB	0.29	2.89	1.89	0.35	0.32	1.00		
HML	0.46	2.59	3.42	−0.36	−0.37	0.10	1.00	
PR1YR	0.82	3.49	4.46	0.01	0.01	−0.29	−0.16	1.00

3. Persistence in One-Year Return-Sorted Mutual Fund Portfolios

3. Persistence in One-Year Return-Sorted Mutual Fund Portfolios

A. Common-Factor Explanations of One-Year Mutual Fund Persistence

B. Characteristics of the Mutual Fund Portfolios

C. Characteristics of Individual Mutual Funds

~~D. Cross-Sectional Variation in Transaction Costs~~

A. Common-Factor Explanations of One-Year Mutual Fund Persistence

Table III

Portfolios of Mutual Funds Formed on Lagged 1-Year Return

Portfolio	Monthly Excess Return	Std Dev	CAPM			4-Factor Model					
			Alpha	VWRF	Adj R-sq	Alpha	RMRF	SMB	HML	PR1YR	Adj R-Sq
1A	0.75%	5.45%	0.27%	1.08	0.777	−0.11%	0.91	0.72	−0.07	0.33	0.891
			(2.06)	(35.94)		(−1.11)	(37.67)	(19.95)	(−1.65)	(11.53)	
1B	0.67%	4.94%	0.22%	1.00	0.809	−0.10%	0.86	0.59	−0.05	0.27	0.898
			(2.00)	(39.68)		(−1.08)	(40.66)	(18.47)	(−1.38)	(10.63)	
1C	0.63%	4.95%	0.17%	1.02	0.843	−0.15%	0.89	0.56	−0.05	0.27	0.927
			(1.70)	(44.65)		(−1.92)	(49.76)	(20.86)	(−1.61)	(12.69)	
1 (high)	0.68%	5.04%	0.22%	1.03	0.834	−0.12%	0.88	0.62	−0.05	0.29	0.933
			(2.10)	(43.11)		(−1.60)	(50.54)	(23.67)	(−1.86)	(13.88)	
2	0.59%	4.72%	0.14%	1.01	0.897	−0.10%	0.89	0.46	−0.05	0.20	0.955
			(1.75)	(57.00)		(−1.78)	(66.47)	(22.95)	(−2.25)	(12.43)	
3	0.43%	4.56%	−0.01%	0.99	0.931	−0.18%	0.90	0.34	−0.07	0.16	0.963
			(−0.08)	(70.96)		(−3.65)	(76.80)	(18.99)	(−3.69)	(11.52)	
4	0.45%	4.41%	0.02%	0.97	0.952	−0.12%	0.90	0.27	−0.05	0.11	0.971
			(0.33)	(85.70)		(−2.81)	(90.03)	(18.18)	(−3.12)	(9.40)	
5	0.38%	4.35%	−0.05%	0.96	0.960	−0.14%	0.90	0.22	−0.05	0.07	0.970
			(−1.10)	(93.93)		(−3.31)	(89.65)	(14.42)	(−3.27)	(6.18)	
6	0.40%	4.36%	−0.02%	0.96	0.958	−0.12%	0.90	0.22	−0.04	0.08	0.968
			(−0.46)	(91.94)		(−2.82)	(86.16)	(14.02)	(−2.37)	(6.01)	
7	0.36%	4.30%	−0.06%	0.95	0.959	−0.14%	0.90	0.21	−0.03	0.04	0.967
			(−1.39)	(92.90)		(−3.09)	(85.73)	(13.17)	(−1.62)	(2.89)	
8	0.34%	4.48%	−0.10%	0.98	0.951	−0.13%	0.93	0.20	−0.06	0.01	0.958
			(−1.86)	(85.14)		(−2.52)	(75.44)	(10.74)	(−3.16)	(0.84)	
9	0.23%	4.60%	−0.21%	1.00	0.926	−0.20%	0.93	0.22	−0.10	−0.02	0.938
			(−3.24)	(67.91)		(−3.11)	(60.44)	(9.69)	(−3.80)	(−1.17)	
10 (low)	0.01%	4.90%	−0.45%	1.02	0.851	−0.40%	0.93	0.32	−0.08	−0.09	0.887
			(−4.58)	(46.09)		(−4.33)	(42.23)	(9.69)	(−2.23)	(−3.50)	

Portfolio	Monthly Excess Return	Std Dev	CAPM			4-Factor Model					
			Alpha	VWRF	Adj R-sq	Alpha	RMRF	SMB	HML	PR1YR	Adj R-Sq
10A	0.25%	4.78%	−0.19%	1.00	0.864	−0.19%	0.91	0.33	−0.11	−0.02	0.891
			(−2.05)	(48.48)		(−2.16)	(42.99)	(10.27)	(−3.20)	(−0.76)	
10B	0.02%	4.92%	−0.42%	1.00	0.817	−0.37%	0.91	0.32	−0.09	−0.09	0.848
			(−3.84)	(40.67)		(−3.45)	(35.52)	(8.24)	(−2.16)	(−2.99)	
10C	−0.25%	5.44%	−0.74%	1.05	0.736	−0.64%	0.98	0.32	−0.04	−0.17	0.782
			(−5.06)	(32.16)		(−4.49)	(28.82)	(6.29)	(−0.73)	(−4.09)	
1-10 spread	0.67%	2.71%	0.67%	0.01	−0.002	0.29%	−0.05	0.30	0.03	0.38	0.231
			(4.68)	(0.39)		(2.13)	(−1.52)	(6.30)	(0.53)	(10.07)	
1A-10C spread	1.01%	3.87%	1.00%	0.02	−0.002	0.53%	−0.07	0.40	−0.02	0.50	0.197
			(4.90)	(0.42)		(2.72)	(−1.61)	(5.73)	(0.32)	(8.98)	
9-10 spread	0.22%	1.22%	0.23%	−0.02	0.004	0.20%	−0.01	−0.10	−0.01	0.07	0.118
			(3.64)	(−1.60)		(3.13)	(−0.40)	(−4.30)	(−0.60)	(3.87)	

Portfolio	Monthly Excess Return	Std Dev	CAPM Alpha	CAPM VWRF	CAPM Adj R-sq	4-Factor Model Alpha	RMRF	SMB	HML	PR1YR	Adj R-Sq
1A	0.75%	5.45%	0.27%	1.08	0.777	−0.11%	0.91	0.72	−0.07	0.33	0.891
			(2.06)	(35.94)		(−1.11)	(37.67)	(19.95)	(−1.65)	(11.53)	
1B	0.67%	4.94%	0.22%	1.00	0.809	−0.10%	0.86	0.59	−0.05	0.27	0.898
			(2.00)	(39.68)		(−1.08)	(40.66)	(18.47)	(−1.38)	(10.63)	
1C	0.63%	4.95%	0.17%	1.02	0.843	−0.15%	0.89	0.56	−0.05	0.27	0.927
			(1.70)	(44.65)		(−1.92)	(49.76)	(20.86)	(−1.61)	(12.69)	
1 (high)	0.68%	5.04%	0.22%	1.03	0.834	−0.12%	0.88	0.62	−0.05	0.29	0.933
			(2.10)	(43.11)		(−1.60)	(50.54)	(23.67)	(−1.86)	(13.88)	
2	0.59%	4.72%	0.14%	1.01	0.897	−0.10%	0.89	0.46	−0.05	0.20	0.955
			(1.75)	(57.00)		(−1.78)	(66.47)	(22.95)	(−2.25)	(12.43)	
3	0.43%	4.56%	−0.01%	0.99	0.931	−0.18%	0.90	0.34	−0.07	0.16	0.963
			(−0.08)	(70.96)		(−3.65)	(76.80)	(18.99)	(−3.69)	(11.52)	
4	0.45%	4.41%	0.02%	0.97	0.952	−0.12%	0.90	0.27	−0.05	0.11	0.971
			(0.33)	(85.70)		(−2.81)	(90.03)	(18.18)	(−3.12)	(9.40)	
5	0.38%	4.35%	−0.05%	0.96	0.960	−0.14%	0.90	0.22	−0.05	0.07	0.970
			(−1.10)	(93.93)		(−3.31)	(89.65)	(14.42)	(−3.27)	(6.18)	
6	0.40%	4.36%	−0.02%	0.96	0.958	−0.12%	0.90	0.22	−0.04	0.08	0.968
			(−0.46)	(91.94)		(−2.82)	(86.16)	(14.02)	(−2.37)	(6.01)	
7	0.36%	4.30%	−0.06%	0.95	0.959	−0.14%	0.90	0.21	−0.03	0.04	0.967
			(−1.39)	(92.90)		(−3.09)	(85.73)	(13.17)	(−1.62)	(2.89)	
8	0.34%	4.48%	−0.10%	0.98	0.951	−0.13%	0.93	0.20	−0.06	0.01	0.958
			(−1.86)	(85.14)		(−2.52)	(75.44)	(10.74)	(−3.16)	(0.84)	
9	0.23%	4.60%	−0.21%	1.00	0.926	−0.20%	0.93	0.22	−0.10	−0.02	0.938
			(−3.24)	(67.91)		(−3.11)	(60.44)	(9.69)	(−3.80)	(−1.17)	
10 (low)	0.01%	4.90%	−0.45%	1.02	0.851	−0.40%	0.93	0.32	−0.08	−0.09	0.887
			(−4.58)	(46.09)		(−4.33)	(42.23)	(9.69)	(−2.23)	(−3.50)	

Portfolio	Monthly Excess Return	Std Dev	CAPM Alpha	CAPM VWRF	CAPM Adj R-sq	Alpha	RMRF	SMB	HML	PRIYR	Adj R-Sq
1A	0.75%	5.45%	0.27%	1.08	0.777	−0.11%	0.91	0.72	−0.07	0.33	0.891
			(2.06)	(35.94)		(−1.11)	(37.67)	(19.95)	(−1.65)	(11.53)	
1B	0.67%	4.94%	0.22%	1.00	0.809	−0.10%	0.86	0.59	−0.05	0.27	0.898
			(2.00)	(39.68)		(−1.08)	(40.66)	(18.47)	(−1.38)	(10.63)	
1C	0.63%	4.95%	0.17%	1.02	0.843	−0.15%	0.89	0.56	−0.05	0.27	0.927
			(1.70)	(44.65)		(−1.92)	(49.76)	(20.86)	(−1.61)	(12.69)	
1 (high)	0.68%	5.04%	0.22%	1.03	0.834	−0.12%	0.88	0.62	−0.05	0.29	0.933
			(2.10)	(43.11)		(−1.60)	(50.54)	(23.67)	(−1.86)	(13.88)	
2	0.59%	4.72%	0.14%	1.01	0.897	−0.10%	0.89	0.46	−0.05	0.20	0.955
			(1.75)	(57.00)		(−1.78)	(66.47)	(22.95)	(−2.25)	(12.43)	
3	0.43%	4.56%	−0.01%	0.99	0.931	−0.18%	0.90	0.34	−0.07	0.16	0.963
			(−0.08)	(70.96)		(−3.65)	(76.80)	(18.99)	(−3.69)	(11.52)	
4	0.45%	4.41%	0.02%	0.97	0.952	−0.12%	0.90	0.27	−0.05	0.11	0.971
			(0.33)	(85.70)		(−2.81)	(90.03)	(18.18)	(−3.12)	(9.40)	
5	0.38%	4.35%	−0.05%	0.96	0.960	−0.14%	0.90	0.22	−0.05	0.07	0.970
			(−1.10)	(93.93)		(−3.31)	(89.65)	(14.42)	(−3.27)	(6.18)	
6	0.40%	4.36%	−0.02%	0.96	0.958	−0.12%	0.90	0.22	−0.04	0.08	0.968
			(−0.46)	(91.94)		(−2.82)	(86.16)	(14.02)	(−2.37)	(6.01)	
7	0.36%	4.30%	−0.06%	0.95	0.959	−0.14%	0.90	0.21	−0.03	0.04	0.967
			(−1.39)	(92.90)		(−3.09)	(85.73)	(13.17)	(−1.62)	(2.89)	
8	0.34%	4.48%	−0.10%	0.98	0.951	−0.13%	0.93	0.20	−0.06	0.01	0.958
			(−1.86)	(85.14)		(−2.52)	(75.44)	(10.74)	(−3.16)	(0.84)	
9	0.23%	4.60%	−0.21%	1.00	0.926	−0.20%	0.93	0.22	−0.10	−0.02	0.938
			(−3.24)	(67.91)		(−3.11)	(60.44)	(9.69)	(−3.80)	(−1.17)	
10 (low)	0.01%	4.90%	−0.45%	1.02	0.851	−0.40%	0.93	0.32	−0.08	−0.09	0.887
			(−4.58)	(46.09)		(−4.33)	(42.23)	(9.69)	(−2.23)	(−3.50)	

CAPM explains nothing

Portfolio	Monthly Excess	Std	CAPM Alpha	CAPM RMRF	CAPM Adj R-Sq	4-Factor Model Alpha	4-Factor Model RMRF	4-Factor Model SMB	4-Factor Model HML	4-Factor Model PR1YR	4-Factor Model Adj R-Sq
1A						−0.11%	0.91	0.72	−0.07	0.33	0.891
						(−1.11)	(37.67)	(19.95)	(−1.65)	(11.53)	
1B	0.67%	4.94%	0.22%	1.00	0.809	−0.10%	0.86	0.59	−0.05	0.27	0.898
			(2.00)	(39.68)		(−1.08)	(40.66	(18.47)	(−1.38)	(10.63)	
1C	0.63%	4.95%	0.17%	1.02	0.843	−0.15%	0.89	0.56	−0.05	0.27	0.927
			(1.70)	(44.65)		(−1.92)	(49.76	(20.86)	(−1.61)	(12.69)	
1 (high)	0.68%	5.04%	0.22%	1.03	0.834	−0.12%	0.88	0.62	−0.05	0.29	0.933
			(2.10)	(43.11)		(−1.60)	(50.54	(23.67)	(−1.86)	(13.88)	
2	0.59%	4.72%	0.14%	1.01	0.897	−0.10%	0.89	0.46	−0.05	0.20	0.955
			(1.75)	(57.00)		(−1.78)	(66.47	(22.95)	(−2.25)	(12.43)	
3	0.43%	4.56%	−0.01%	0.99	0.931	−0.18%	0.90	0.34	−0.07	0.16	0.963
			(−0.08)	(70.96)		(−3.65)	(76.80	(18.99)	(−3.69)	(11.52)	
4	0.45%	4.41%	0.02%	0.97	0.952	−0.12%	0.90	0.27	−0.05	0.11	0.971
			(0.33)	(85.70)		(−2.81)	(90.03	(18.18)	(−3.12)	(9.40)	
5	0.38%	4.35%	−0.05%	0.96	0.960	−0.14%	0.90	0.22	−0.05	0.07	0.970
			(−1.10)	(93.93)		(−3.31)	(89.65	(14.42)	(−3.27)	(6.18)	
6	0.40%	4.36%	−0.02%	0.96	0.958	−0.12%	0.90	0.22	−0.04	0.08	0.968
			(−0.46)	(91.94)		(−2.82)	(86.16	(14.02)	(−2.37)	(6.01)	
7	0.36%	4.30%	−0.06%	0.95	0.959	−0.14%	0.90	0.21	−0.03	0.04	0.967
			(−1.39)	(92.90)		(−3.09)	(85.73	(13.17)	(−1.62)	(2.89)	
8	0.34%	4.48%	−0.10%	0.98	0.951	−0.13%	0.93	0.20	−0.06	0.01	0.958
			(−1.86)	(85.14)		(−2.52)	(75.44	(10.74)	(−3.16)	(0.84)	
9	0.23%	4.60%	−0.21%	1.00	0.926	−0.20%	0.93	0.22	−0.10	−0.02	0.938
			(−3.24)	(67.91)		(−3.11)	(60.44	(9.69)	(−3.80)	(−1.17)	
10 (low)	0.01%	4.90%	−0.45%	1.02	0.851	−0.40%	0.93	0.32	−0.08	−0.09	0.887
			(−4.58)	(46.09)		(−4.33)	(42.23	(9.69)	(−2.23)	(−3.50)	

Size and momentum are sensitive to the return

MINDs Lab BRAIN

B. Characteristics of the Mutual Fund Portfolios

Table IV

Characteristics of the Portfolios of Mutual Funds Formed on Lagged 1-Year Return

Average Annual Portfolio Attributes

Portfolio	Age (years)	TNA ($ millions)	Expense Ratio	Mturn	Maximum Load
1A	11.7	110.0	1.38	116.2	3.93
1B	14.0	148.8	1.16	86.9	3.99
1C	16.5	127.4	1.11	75.8	4.62
1 (high)	14.1	128.7	1.22	92.9	4.18
2	16.6	190.8	1.08	75.3	4.97
3	17.3	194.3	1.10	76.3	4.72
4	17.6	183.7	1.11	67.2	4.82
5	18.3	185.9	1.09	68.4	4.71
6	17.5	199.1	1.15	65.8	4.33
7	18.3	169.7	1.14	62.2	4.50
8	17.5	149.3	1.13	65.3	4.76
9	15.8	145.6	1.22	75.1	4.59
10 (low)	13.6	77.1	1.92	81.4	4.38
10A	14.5	91.9	1.55	76.8	4.55
10B	14.4	87.4	1.71	76.7	4.57
10C	11.9	52.0	2.51	88.8	4.02

Average Annual Portfolio Attributes

Portfolio	Age (years)	TNA ($ millions)	Expense Ratio	Mturn	Maximum Load
1A	11.7	110.0	1.38	116.2	3.93
1B	14.0	148.8	1.16	86.9	3.99
1C	16.5	127.4	1.11	75.8	4.62
1 (high)	14.1	128.7	1.22	92.9	4.18
2	16.6	190.8	1.08	75.3	4.97
3	17.3	194.3	1.10	76.3	4.72
4	17.6	183.7	1.11	67.2	4.82
5	18.3	185.9	1.09	68.4	4.71
6	17.5	199.1	1.15	65.8	4.33
7	18.3	169.7	1.14	62.2	4.50
8	17.5	149.3	1.13	65.3	4.76
9	15.8	145.6	1.22	75.1	4.59
10 (low)	13.6	77.1	1.92	81.4	4.38
10A	14.5	91.9	1.55	76.8	4.55
10B	14.4	87.4	1.71	76.7	4.57
10C	11.9	52.0	2.51	88.8	4.02

C. Characteristics of Individual Mutual Fund

Table IV

Characteristics of the Portfolios of Mutual Funds Formed on Lagged 1-Year Return

Relation between alphas (performance) and following variables.

Independent Variables (Coefficients × 100)	Estimate	*t*-statistic
Expense ratio (t)	−1.54	(−5.99)
Turnover (t) (Mturn)	−0.95	(−2.36)
ln TNA (t-1)	−0.05	(−0.66)
Maximum Load (t-1)	−0.11	(−3.55)
Buy turnover (t)	−0.43	(−1.16)
Sell turnover (t)	−1.26	(−3.00)

Syncopation

Conclusion

Three Important Rules-of-Thumb

Three Important Rules-of-Thumb

1. Avoid funds with persistently poor performance.

Three Important Rules-of-Thumb

1. Avoid funds with persistently poor performance.
2. Funds with high returns last year have higher-than-average expected returns next year, but not in years thereafter.

Three Important Rules-of-Thumb

1. Avoid funds with persistently poor performance.
2. Funds with high returns last year have higher-than-average expected returns next year, but not in years thereafter.
3. The investment costs of expense ratios, transaction costs, and load fees all have a direct, negative impact on performance.

Thanks for listening

Any critique / comment / correction / cuestion are welcome.