



# Understanding Benchmarks Concepts

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# Understanding Benchmarks - Concepts

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Assumptions/Definitions

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How Should I Benchmark?

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Chocolate Coin/Spreadsheet Workshop



**WARNING**

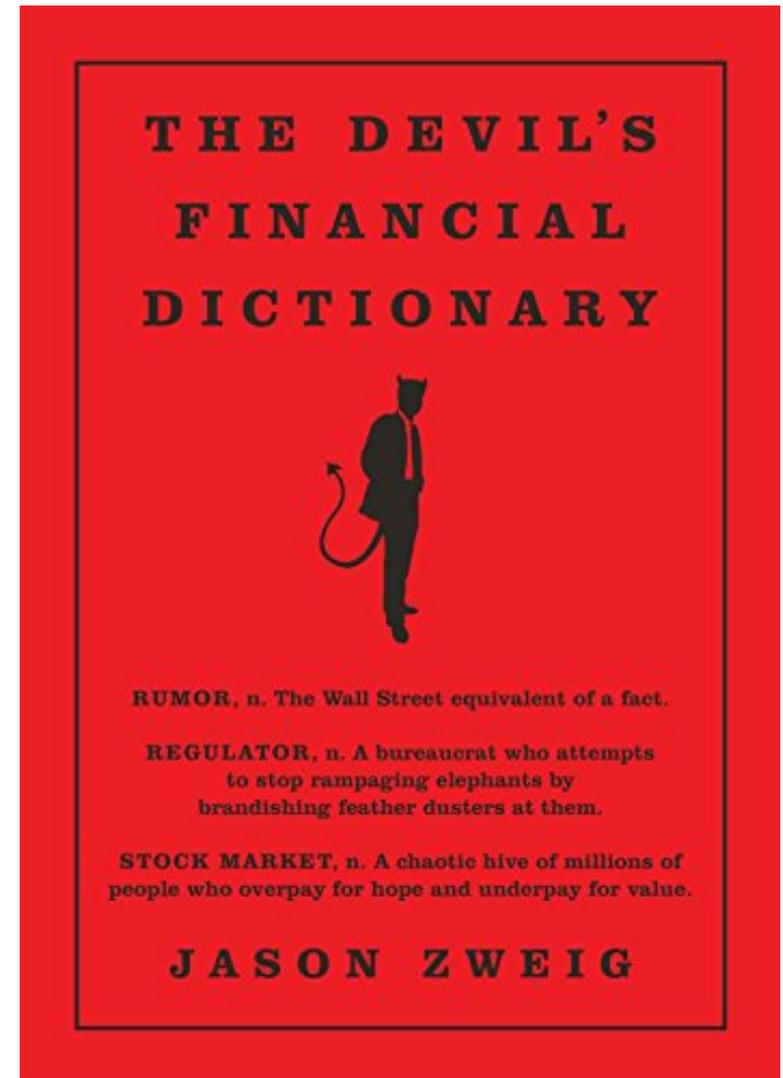
**ASSUMPTIONS  
A H E A D**

# Risk Defined

More things can happen than will happen.



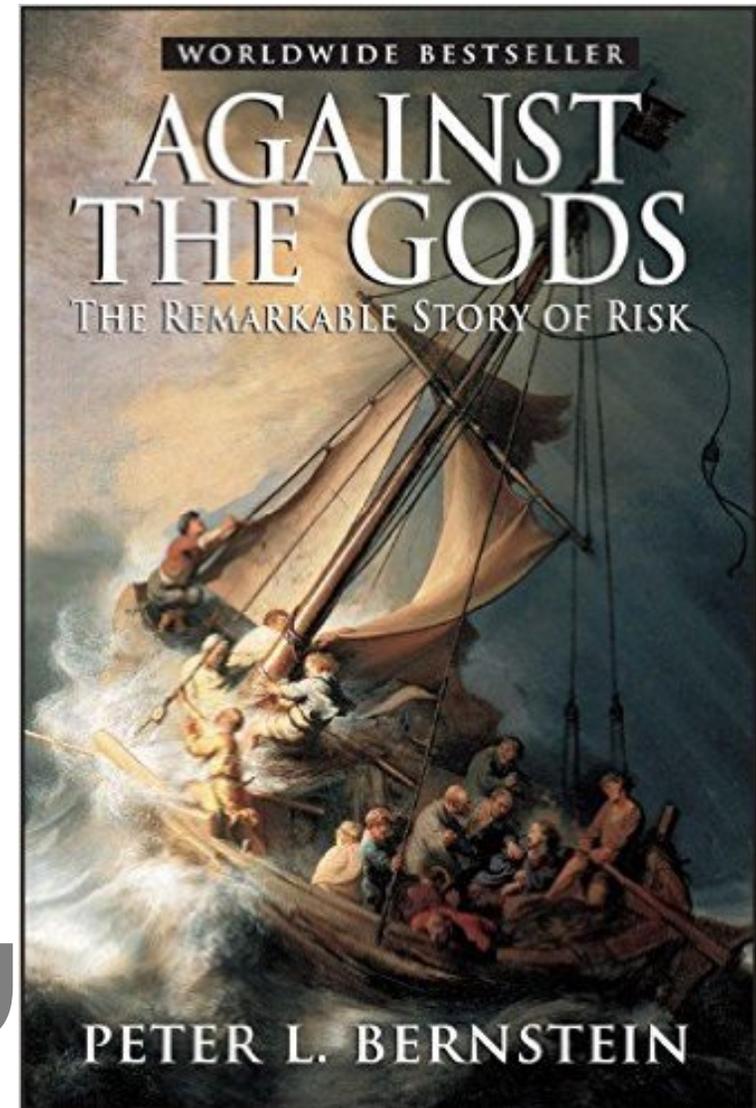
... It has been philosophically defined by finance professor Elroy Dimson of London Business School this way: ***“Risk means more things can happen than will happen.”*** In the end, risk is the gap between what investors think they know and what they end up learning— about their investments, about the financial markets, and about themselves.



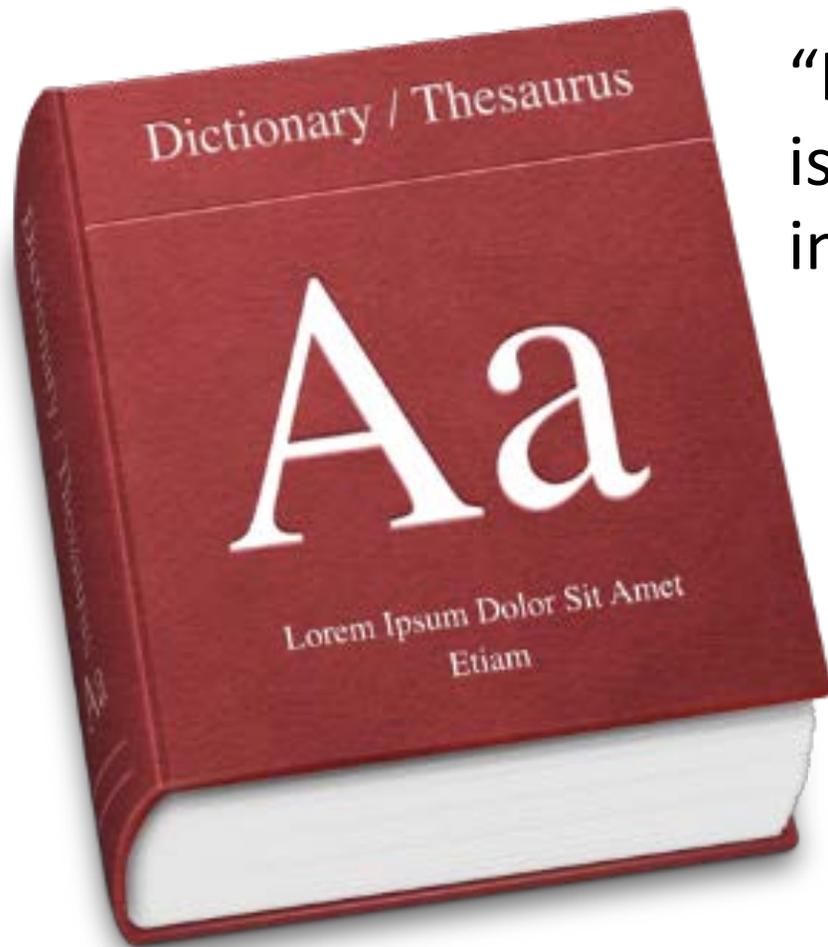
# Risk & Return are Related

Finding the right trade-off is the key

“\*The scientist who developed the Saturn 5 rocket that launched the first Apollo mission to the moon put it this way: ***"You want a valve that doesn't leak and you try everything possible to develop one. But the real world provides you with a leaky valve. You have to determine how much leaking you can tolerate."*** (Obituary of Arthur Rudolph, in The New York Times, January 3, 1996.)”



# Definitions



“Knowledge is knowing a tomato is a fruit; Wisdom is not putting it in a fruit salad.”



Brandreth, Gyles. Oxford Dictionary of Humorous Quotations (Kindle Location 4265). OUP Oxford. Kindle Edition.  
See this useful Microsoft Help page for Microsoft Word on the definition/history of “Lorem Ipsum Dolor Sit Amet Etiam”:  
<https://support.microsoft.com/en-us/kb/114222>

# Benchmark

Definitions :

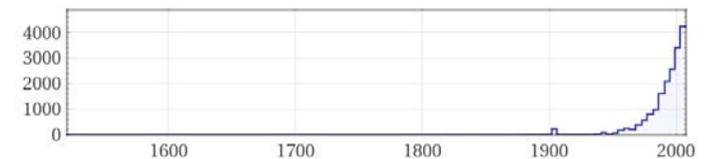
- 1 noun a standard by which something can be measured or judged

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- 2 noun a surveyor's mark on a permanent object of predetermined position and elevation used as a reference point

benchmark | Computed by Wolfram|Alpha

Word frequency history :



(from 1539 to 2007) (in occurrences per billion words per year)

benchmark | Computed by Wolfram|Alpha

Google Books Ngram Viewer

Graph these comma-separated phrases:   case-insensitive

between  and  from the corpus  with smoothing of



WolframAlpha, <http://www.wolframalpha.com/input/?i=benchmark&rawformassumption=%7B%22C%22,+%22benchmark%22%7D+%3E+%7B%22Word%22%7D&rawformassumption=%7B%22DPClash%22,+%22FinancialE%22,+%22benchmark%22%7D+%3E+%7B%22NYSE:BHE%22%7D> (December 30, 2016).

# Benchmarks ~ Expectations



# Index

Definitions :

- 1    noun    a numerical scale used to compare variables with one another or with some reference number

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- 2    noun    a number or ratio (a value on a scale of measurement) derived from a series of observed facts; can reveal relative changes as a function of time

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- 3    noun    a mathematical notation indicating the number of times a quantity is multiplied by itself

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- 4    noun    an alphabetical listing of names and topics along with page numbers where they are discussed

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- 5    noun    the finger next to the thumb

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- 6    verb    list in an index

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- 7    verb    provide with an index

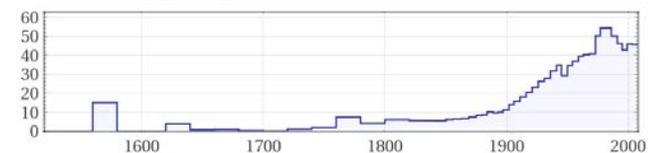
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- 8    verb    adjust through indexation

(8 meanings)

index | Computed by Wolfram|Alpha

Word frequency history :

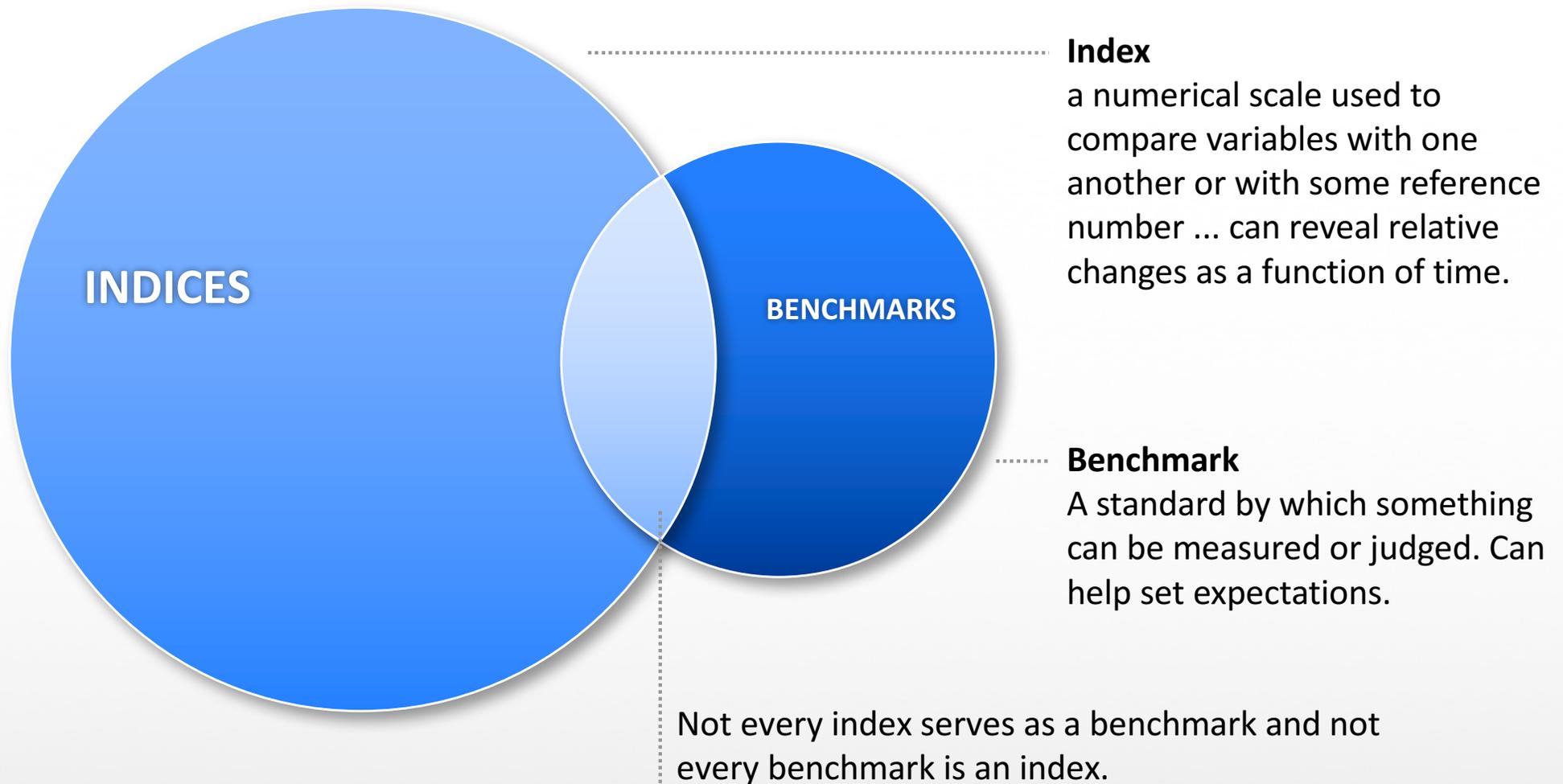


(from 1539 to 2007) (in occurrences per million words per year)

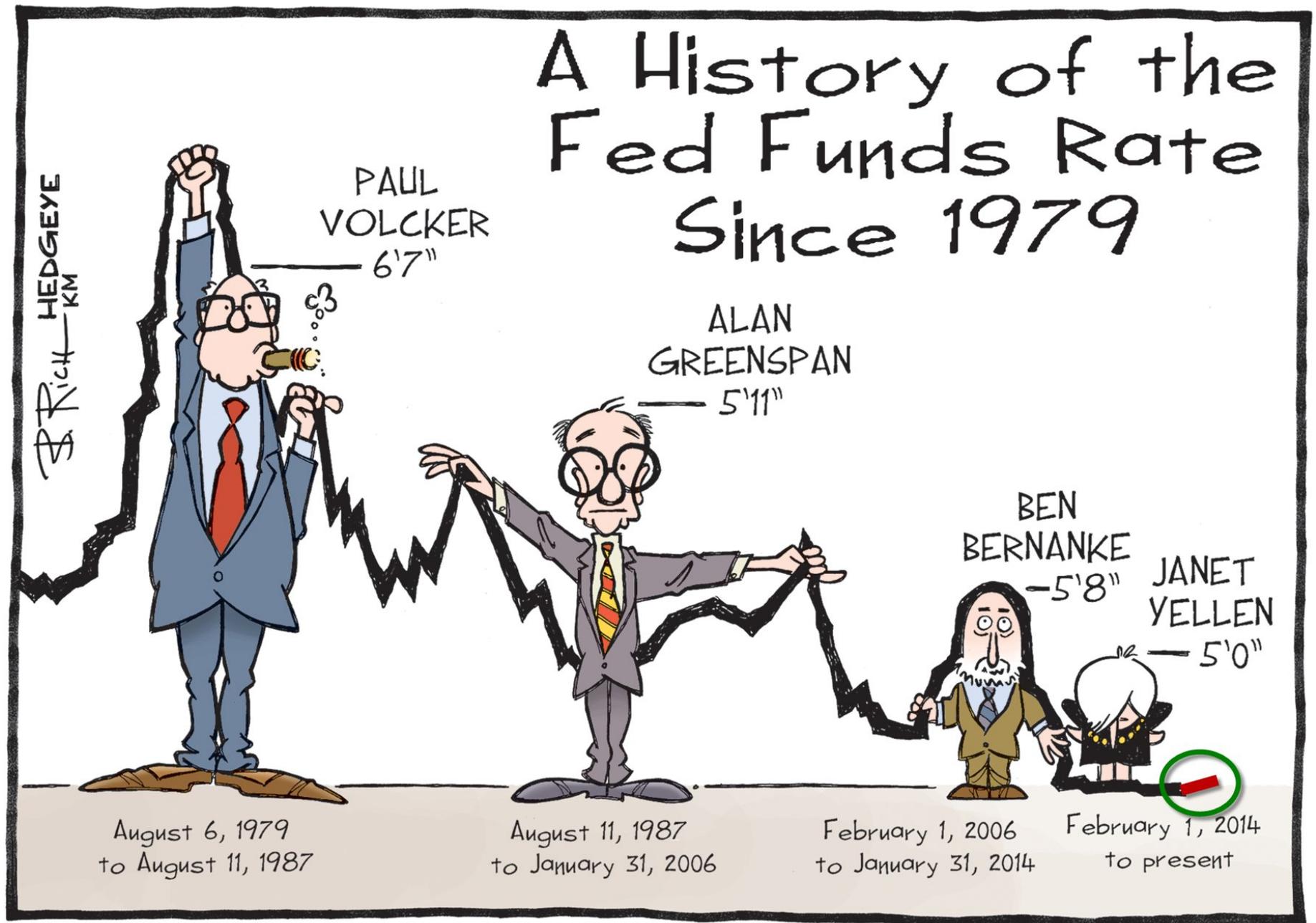
index | Computed by Wolfram|Alpha

# Benchmark/Index Examples

Benchmark does not necessarily mean an Index



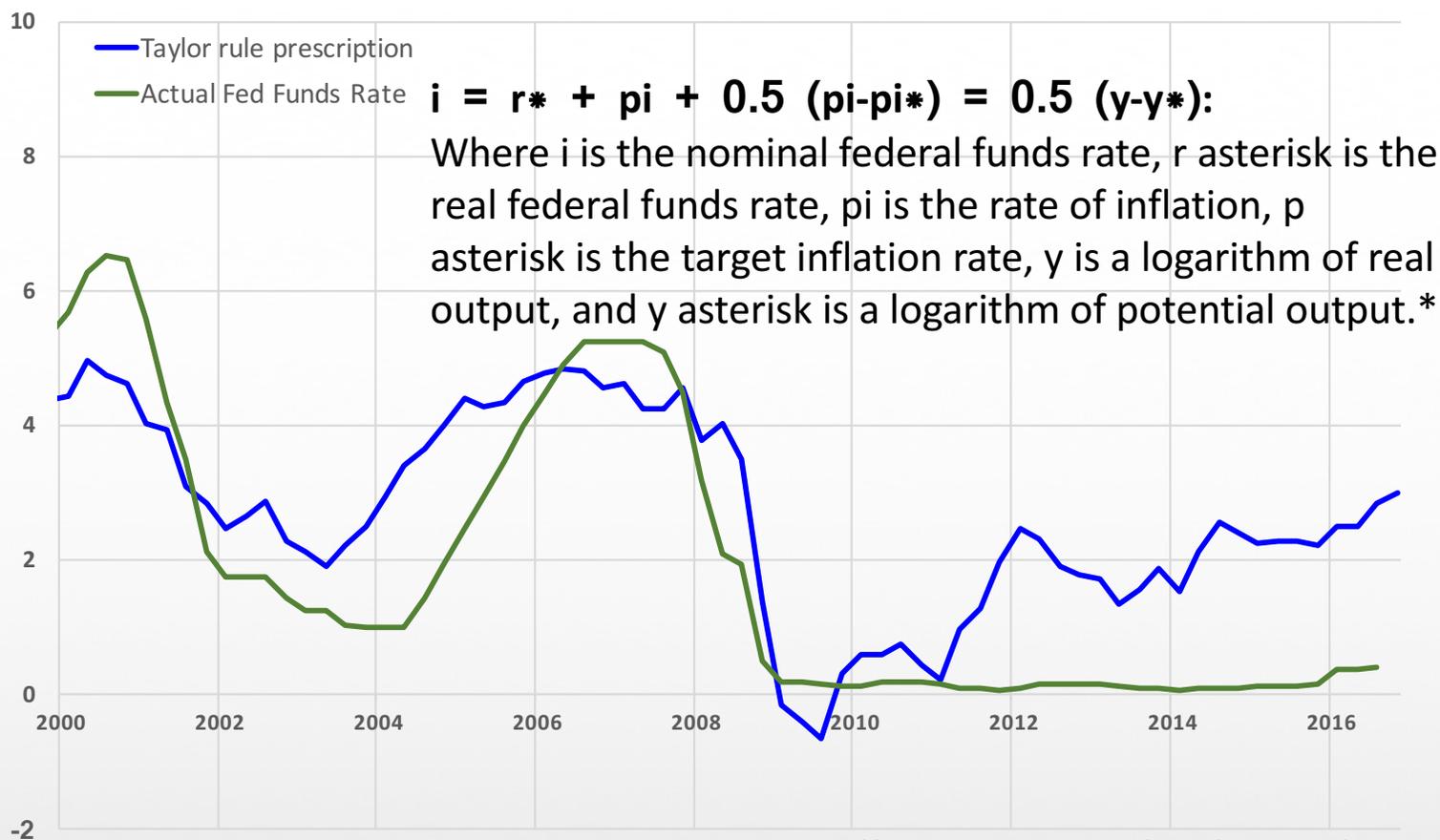
# Benchmarking Fed Funds?



# Pure Benchmark Example – The Taylor Rule

“The Taylor rule is an equation John Taylor introduced in a [1993 paper](#) that prescribes a value for the federal funds rate—the short-term interest rate targeted by the Federal Open Market Committee (FOMC)—based on the values of inflation and economic slack such as the output gap or unemployment gap.”

Effective federal funds rate and Taylor rule prescription  
Percent



$$i = r^* + \pi_i + 0.5 (\pi_i - \pi_i^*) = 0.5 (y - y^*)$$

Where  $i$  is the nominal federal funds rate,  $r^*$  is the real federal funds rate,  $\pi_i$  is the rate of inflation,  $\pi_i^*$  is the target inflation rate,  $y$  is a logarithm of real output, and  $y^*$  is a logarithm of potential output.\*

# Pure Index Example – Christmas Price Index

The PNC Christmas Price Index® shows the current cost for one set of each of the gifts given in the song "The Twelve Days of Christmas."



This represents the cumulative cost of all the gifts when you count each repetition in the song (364 gifts)

This version of the CPI removes the most unpredictable gift from the index - the Swans-a-Swimming.

The PNC Christmas Price index, <https://www.pnc.com/en/about-pnc/topics/pnc-christmas-price-index.html> (Dec 31, 2016).

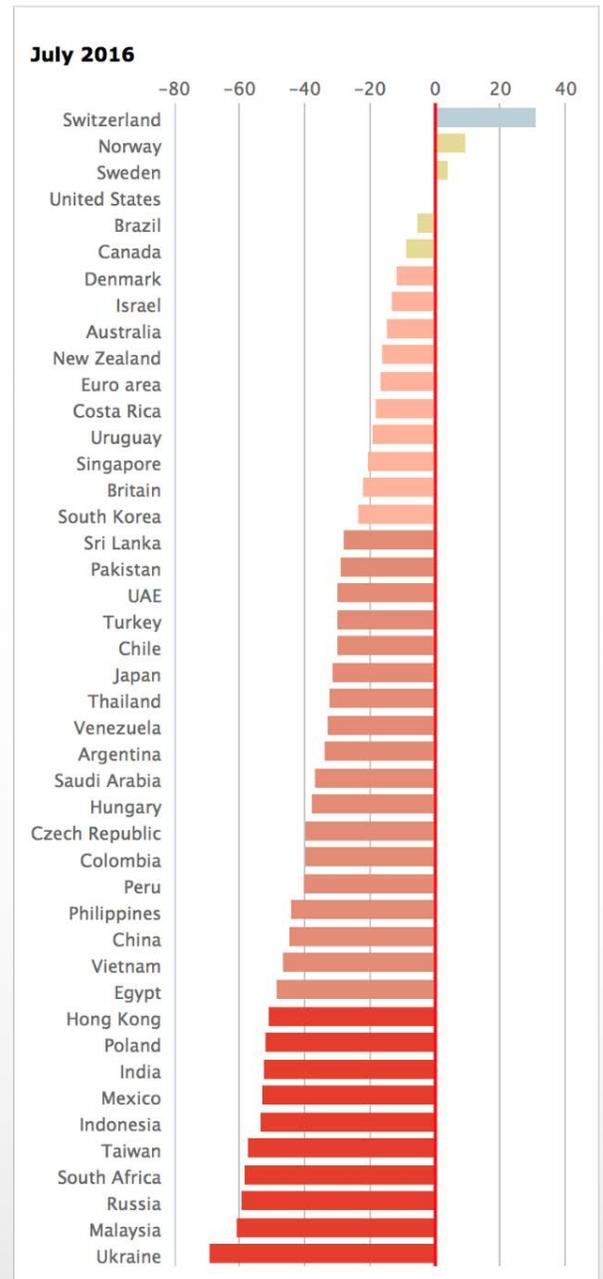
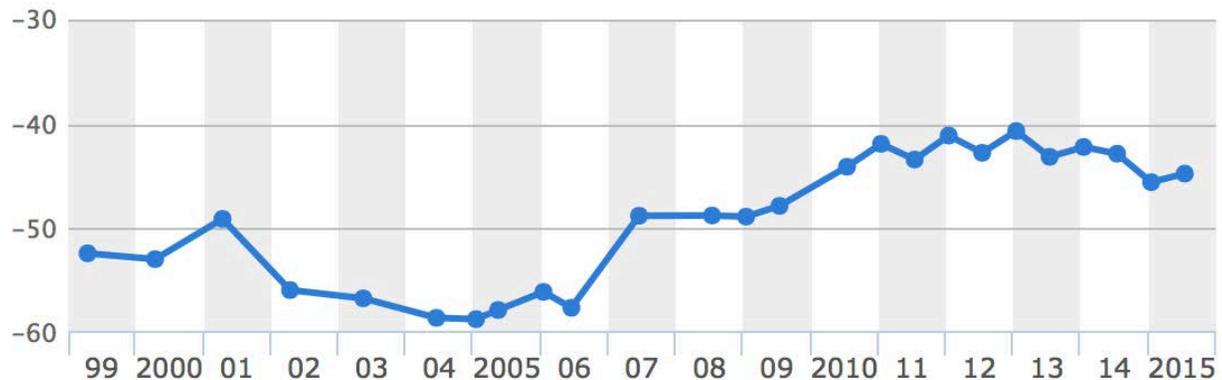
# Index as Benchmark Example – Big Mac Index

The Big Mac index was invented by The Economist in 1986 as a lighthearted guide to whether currencies are at their “correct” level. It is based on the theory of purchasing-power parity (PPP) ... For example, the average price of a Big Mac in America in July 2016 was \$5.04; in China it was only \$2.79 at market exchange rates. So the "raw" Big Mac index says that the yuan was undervalued by 45% at that time.

<b>Undervalued by:</b>	<b>Overvalued by:</b>	<b>China</b>	<b>July 2016</b>
<ul style="list-style-type: none"> <li><span style="color: red;">■</span> &gt;50%</li> <li><span style="color: orange;">■</span> 25-50%</li> <li><span style="color: lightcoral;">■</span> 10-25%</li> </ul>	<ul style="list-style-type: none"> <li><span style="color: yellow;">■</span> +/- 10%</li> <li><span style="color: lightblue;">■</span> 10-50%</li> <li><span style="color: teal;">■</span> 50-100%</li> <li><span style="color: darkblue;">■</span> &gt;100%</li> </ul>	Price: \$2.79 (Yuan 18.60) Raw index: undervalued by 44.7% Actual exchange rate: 6.68 Implied exchange rate*: 3.69	

## China

Under(-)/over(+) valuation against the dollar, %





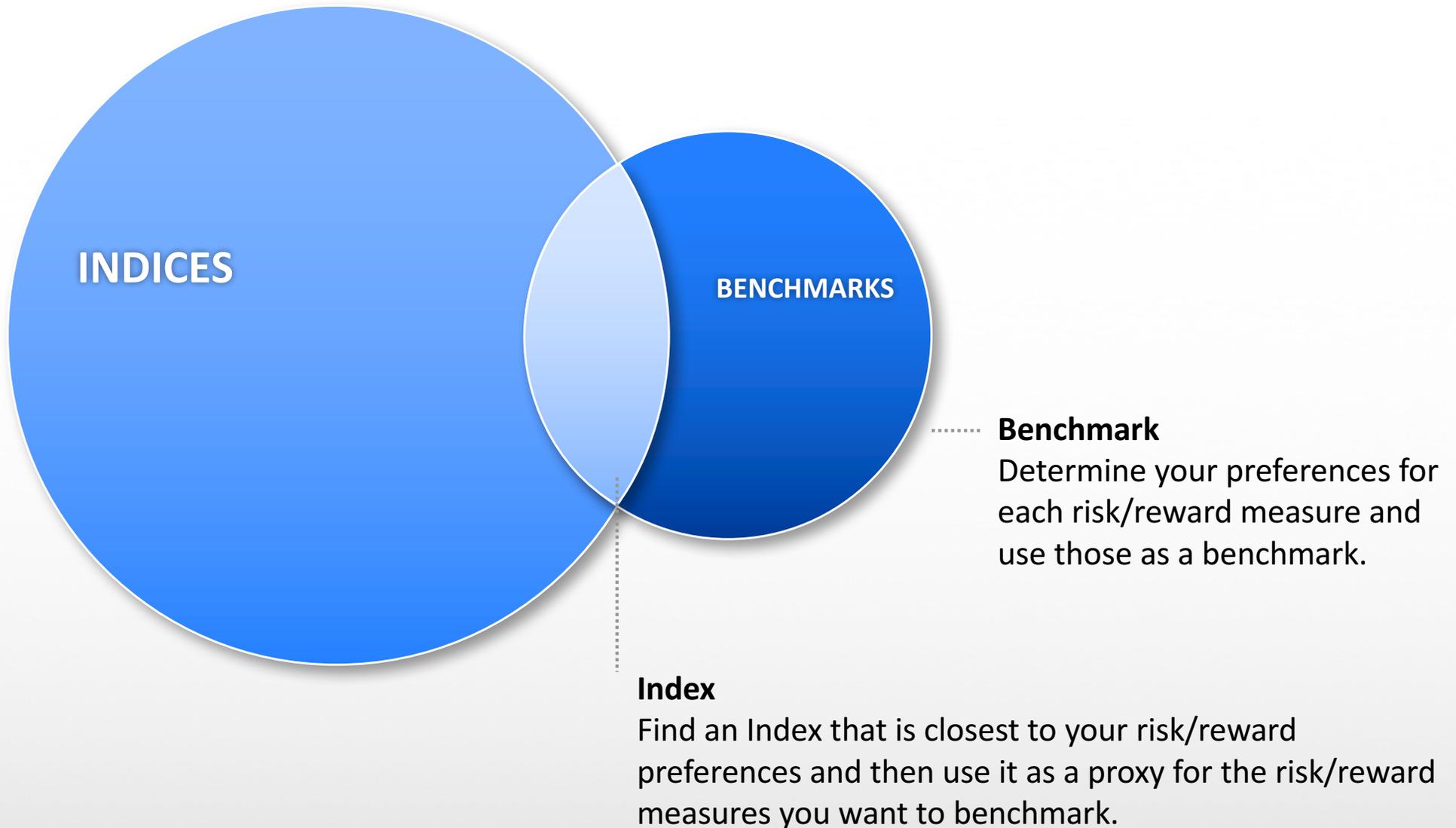
# What Measures to Benchmark?

## The 5 Points of Suitability



# How Should I Benchmark?

Use an Index or Benchmark Individual Risk/Reward Measures?



# Markets: Equities = Indices / Bonds = Yields?

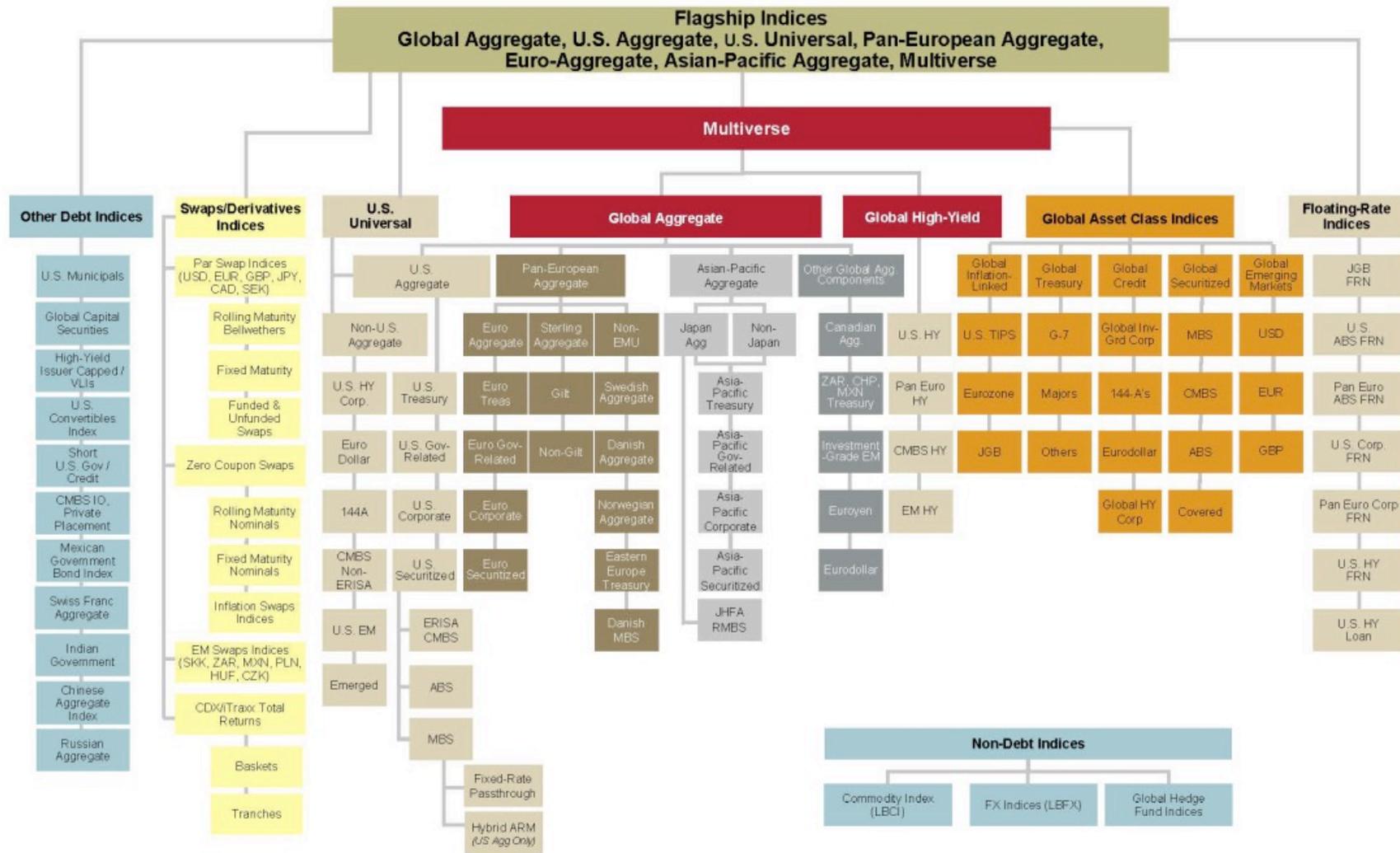
## Markets Data



# Bond Market Indices Overview

Lehman Brothers | A Guide to the Global Family of Indices

Figure 1. Lehman Brothers Global Family of Indices-Index Map as of January 2008



A Guide to the Lehman Brothers Global Family of Indices – Global Family of Indices 35<sup>th</sup> Anniversary 1973-2008, page 8, March 2008. Note: Barclays purchased Lehman Brothers assets (including the indices) after Lehman’s bankruptcy in Sep-08. Barclay’s current guide can be found here: <https://index.barcap.com/Home/Guides and Factsheets>

# Bond Market Indices are Rule Based

## BASIC PRINCIPLES OF THE LEHMAN BROTHERS INDICES

*Lehman Brothers indices are rule-based benchmarks whose composition is reset monthly.*

### A Guide to the Lehman Brothers Global Family of Indices



Although each of the Lehman indices has been constructed to reflect the essential characteristics of the securities and markets it covers, all Lehman indices conform to certain general index construction standards and guidelines.

**1) Rule-Based:** Our indices are rule-based benchmarks whose composition is reset monthly. To be included in a Lehman index, a security must meet all published eligibility criteria.

Thus, our indices are representative of the marketplace, replicable and reliable. They are unbiased, in that subjective factors, such as Lehman security inventory or whether it managed the underwriting, do not enter into the selection process whatsoever. This is in contrast to portfolio-based indices, in which the performance benchmark is an arbitrarily-selected basket of securities.

The criteria are specified so that, in most cases, a given security can contribute to only one index or group of indices. For example, within the U.S. Aggregate Index, a security cannot be part of both the U.S. Credit Index and the Securitized Index. However, it can be part of both the U.S. Credit Index and the higher-level U.S. Aggregate Index. In both cases, the security is contributing to only one index<sup>2</sup>.

Since launching our first index in 1973, we have expanded our index offerings to new geographic regions and asset classes, meeting the needs of index users with objective rules-based benchmarks. We add new benchmarks to the Global Family of Indices based on three criteria:

- Relevance of an asset class;
- Investor demand for a performance metric; and
- Availability of security-level pricing and analytics to create a rules-based benchmark.

# 1-5Yr Bond Market Indices Overview as of 12/31/16

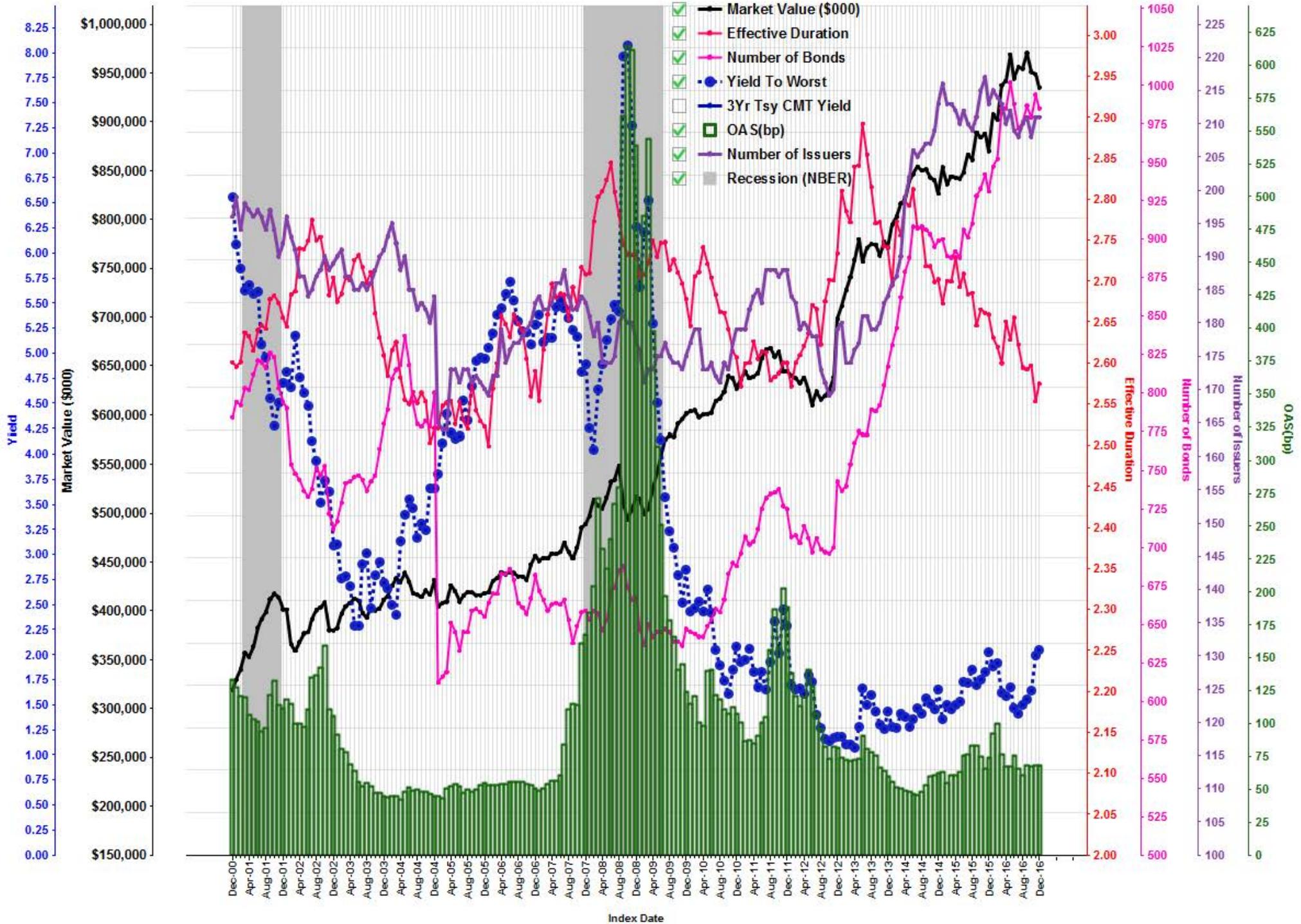
1-5Yr US Corp A-AAA  
Market Value: 804,851  
Yield: 2.1040  
Years: 2.8610  
ModDur: 2.6810  
EffDur: 2.6850  
EffCvx: 0.098  
# Bonds: 870

1-5Yr Agency Bullet  
Market Value: 284,363  
Yield: 1.4310  
Years: 2.5150  
ModDur: 2.4010  
EffDur: 2.4080  
EffCvx: 0.081  
# Bonds: 179

1-5Yr Treasury  
Market Value: 5,288,918  
Yield: 1.4160  
Years: 2.8180  
ModDur: 2.7000  
EffDur: 2.7130  
EffCvx: 0.101  
# Bonds: 156

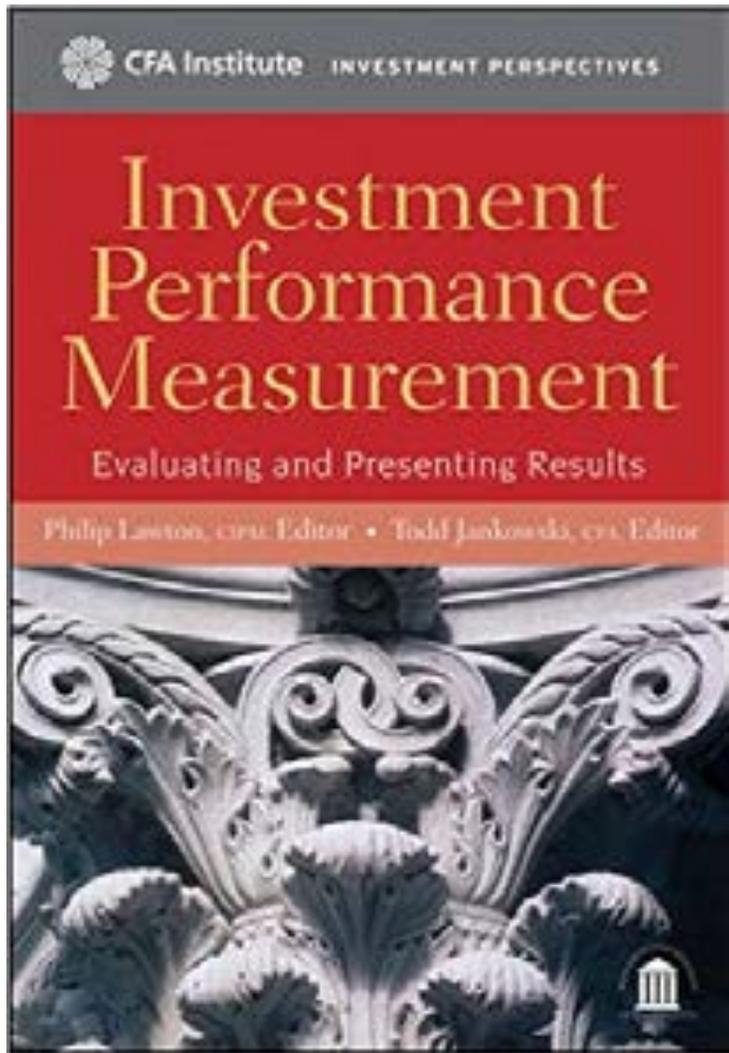
1-5Yr Agency Callable  
Market Value: 69,976  
Yield: 1.5550  
Years: 2.4090  
ModDur: 2.3430  
EffDur: 1.9900  
EffCvx: -0.919  
# Bonds: 196

# 1-5Yr Corp US/A-AAA Overview 12/31/00 to 12/31/16



# Problems Using Bond Indices as Benchmarks

Bums & Duration



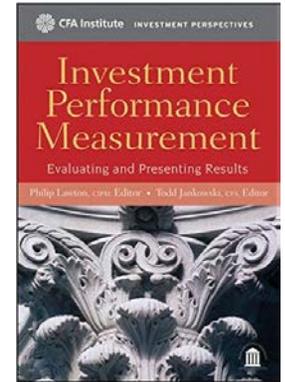
“ Fixed-income benchmarks embody a great many complex issues ... two issues: the duration problem and the “bums” problem. ...The duration problem is the fact that the duration of the benchmark comes from issuer preferences and is not necessarily the duration that a given investor should hold. The bums (or deadbeats) problem is that the biggest debtors (whether companies, countries, or other entities) have the largest weights in the benchmark.”

Investment Performance Measurement: Evaluating and Presenting Results (CFA Institute Investment Perspectives) (Kindle Locations 4006-4012). Wiley. Kindle Edition.

# The Duration Problem

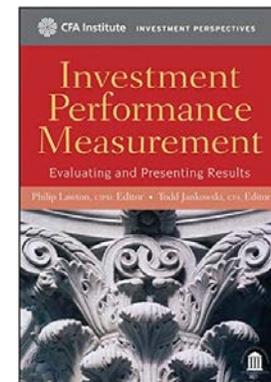
“ The duration structure of a cap-weighted bond benchmark—that is, the proportions of bonds in short-, intermediate-, and long-term categories—reflects the maturity or duration preferences of issuers, who are seeking to minimize their (apparent) cost of capital. Investors, however, are not trying to minimize their returns (which are the issuers’ costs of capital) but to maximize returns. Moreover, an investor usually has specific time-horizon preferences that make one duration more advantageous than another. These preferences do not necessarily match those of issuers in the aggregate, whose preferences are reflected in the benchmark. ...

***Because the benchmark duration is a historical accident, the optimal portfolio for an investor with no defined time horizon should be set by that investor’s risk tolerance rather than by matching the duration of the benchmark.***”



# The “bums” Problem

“Because the issuers who manage to go deepest into debt—the biggest bums—have the largest weights in a cap-weighted benchmark, such a benchmark is not likely to be mean-variance efficient. If you are tracking such a benchmark, when someone issues a security, you have to buy it in proportion to its capitalization weight to minimize tracking error to the benchmark, even if the security is only marginally of high enough quality to make it into the benchmark and even if the size of the issue, and hence its weight in the benchmark, is inordinately large. Such securities would seem to be the most likely to be downgraded or to default. The bums problem applies to countries in an international sovereign bond benchmark just as it does to corporations in a U.S. bond benchmark.”



# Suitability Benchmark Process

You decide your benchmarks. Don't let an index decide.

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## 1. Liquidity

Examine historical cash flows to determine optimal liquidity.

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## 4. Market Rate of Return

Use indices or liabilities to determine optimal market rate of return benchmark point/range.



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## 2. Interest Rate Risk

Use Treasury Bellwethers to get a "feel" for your interest rate risk preference.

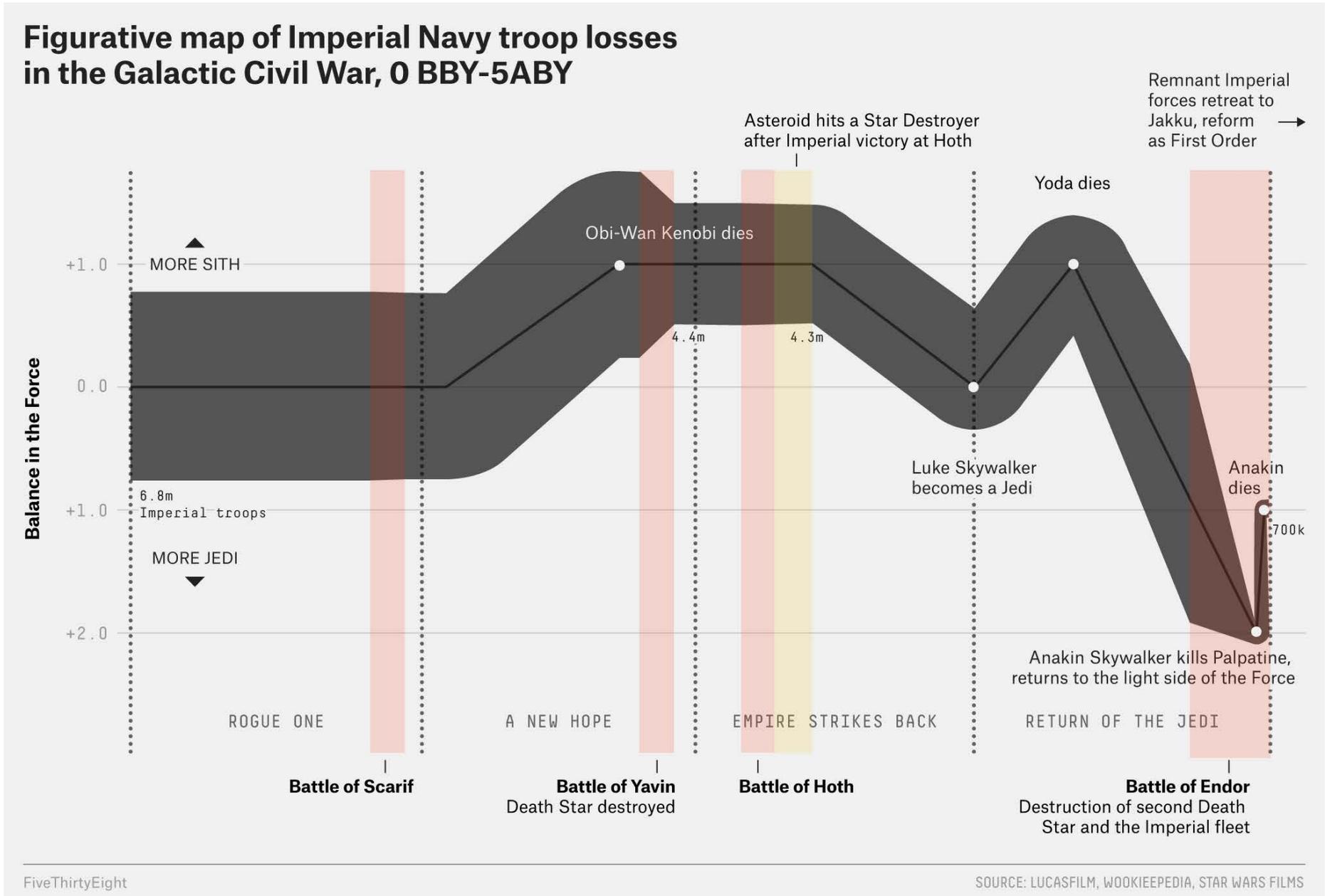
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## 3. Credit Risk

Use credit analysis to determine preference for credit volatility.

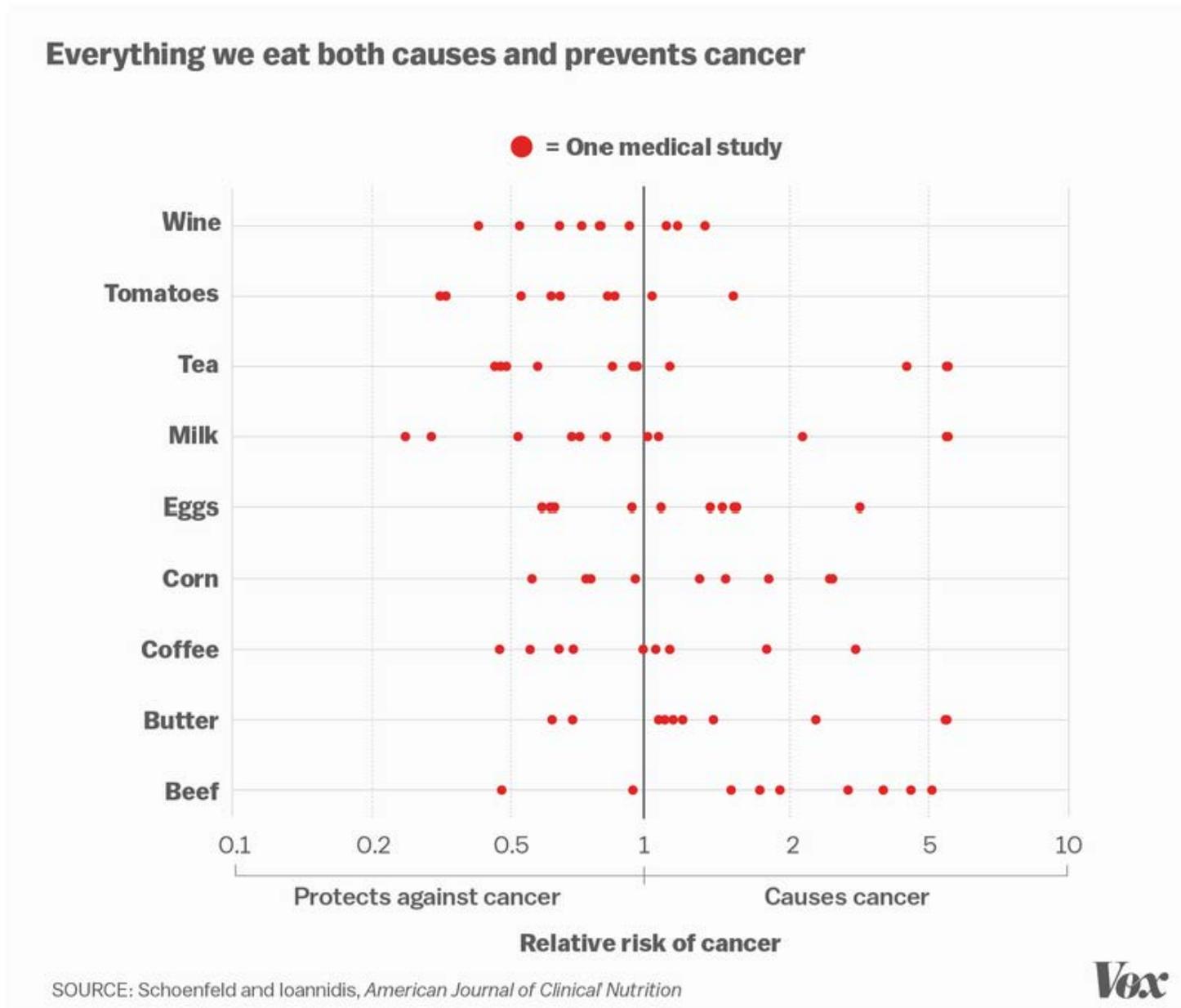
# Visualizing the Portfolio versus the Benchmarks

Good visualizations bring together a complex narrative...



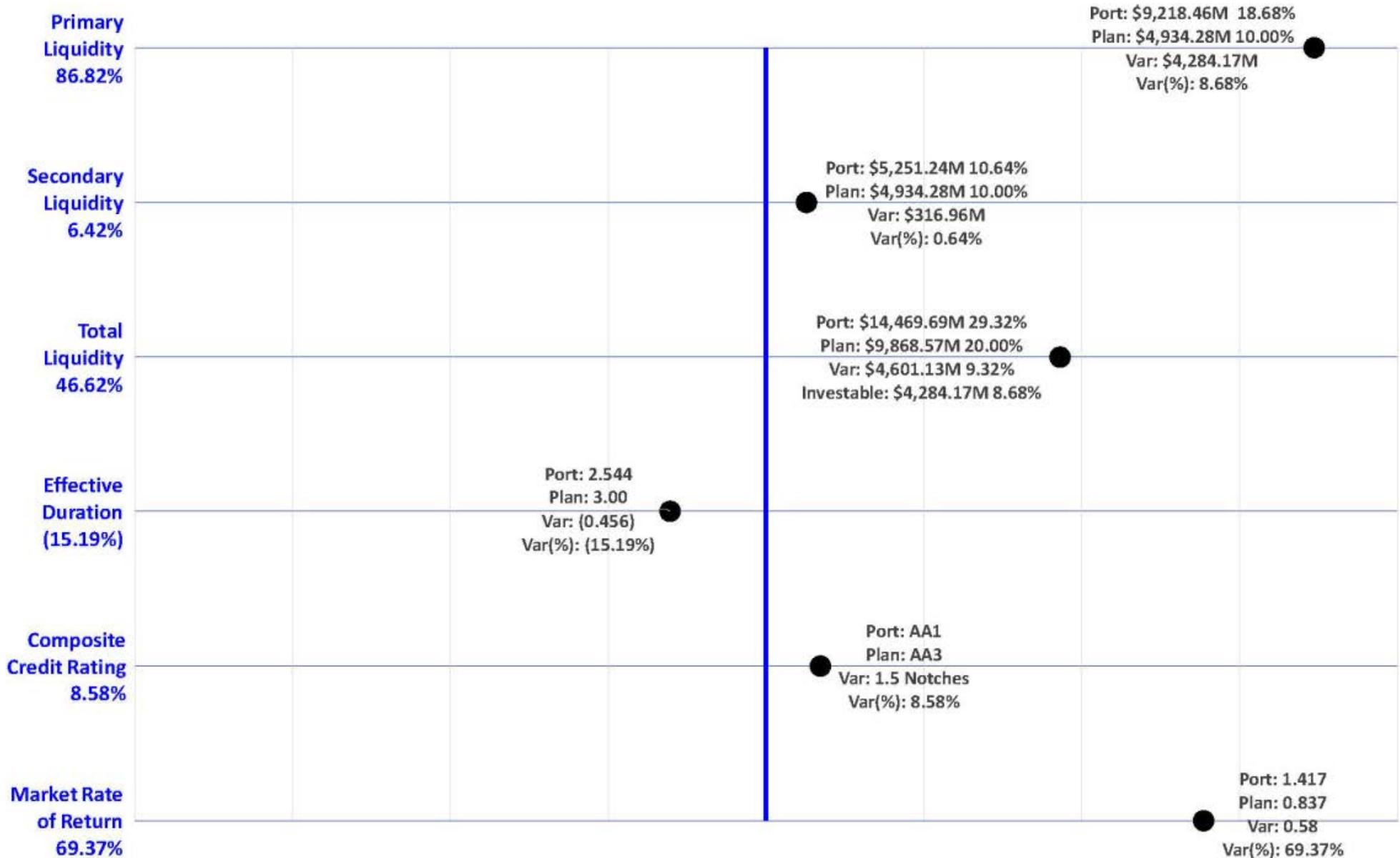
# Visualizing the Portfolio versus the Benchmarks

... and allow relative comparisons across different measures.



# Webb-o-matic Suitability Benchmark Visualization Analysis

Vertical blue line represents benchmark for each measure.



# A Note on Total Return / Market Rate of Return

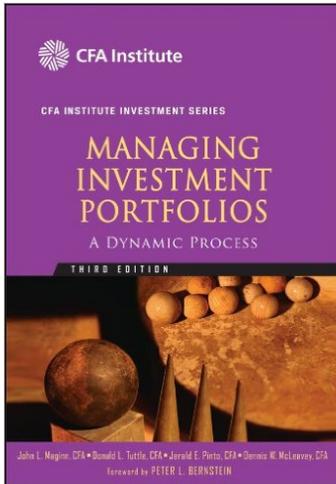


It is not the return on my  
investment that I am concerned  
about; it's the return of my  
investment

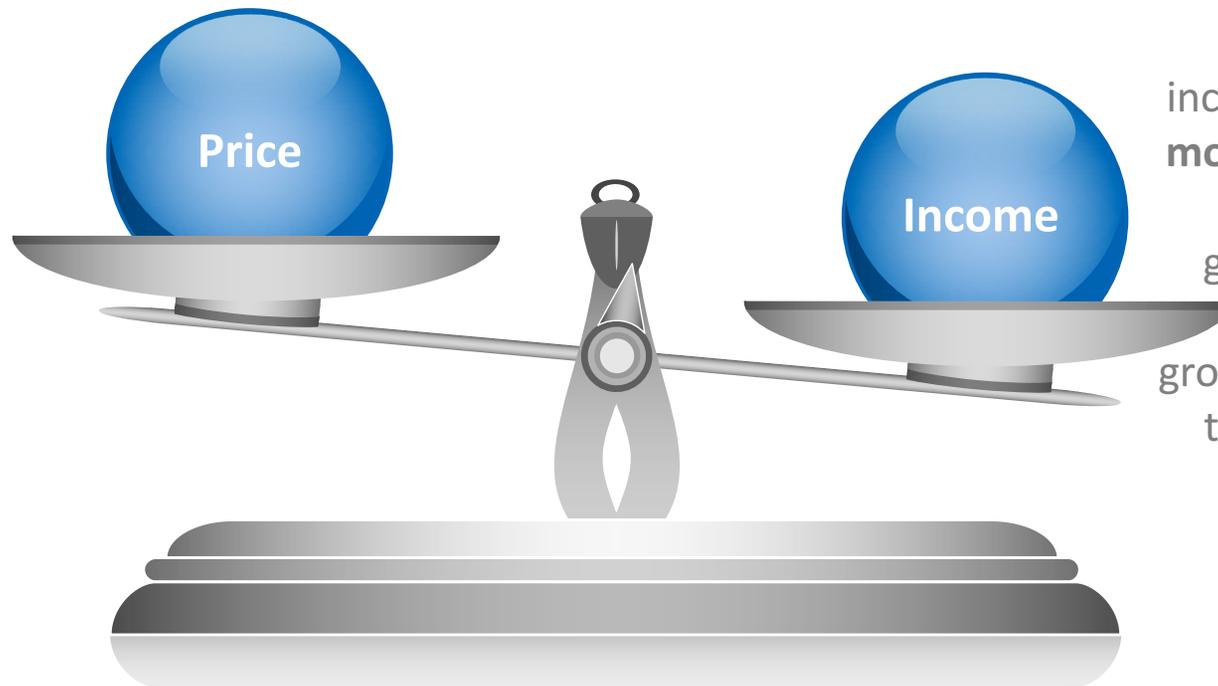
— *Will Rogers* —

# What are your Return Preferences?

Total Return assumes indifference between Price return & Income return.



Total rate of return measures the increase in the investor's wealth due to both investment income (for example, dividends and interest) and capital gains (both realized and unrealized). ***The total rate of return implies that a dollar of wealth is equally meaningful to the investor whether that wealth is generated by the secure income from a 90-day Treasury bill or by the unrealized appreciation in the price of a share of common stock.***



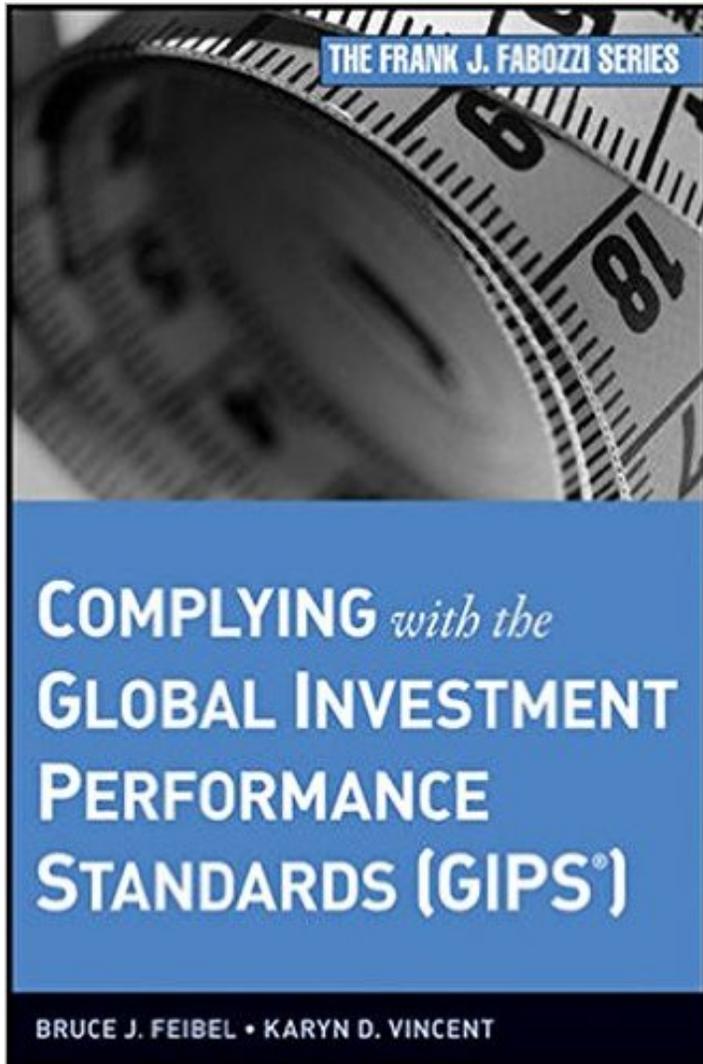
## Income

Most public funds are income oriented and **put more weight on income.**

If you don't budget gains/losses and aren't tasked with portfolio growth from investments then you likely have an income preference.

# What about GIPS?

The Global Investment Performance Standards



“ The GIPS standards are typically used when performance information is communicated between an investment firm and prospective institutional investors ... there is no law that an investment firm must create its marketing materials according to the GIPS standards ... ”

Feibel, Bruce J.; Vincent, Karyn D.. Complying with the Global Investment Performance Standards (GIPS) (Frank J. Fabozzi Series) (Kindle Locations 321-326). Wiley. Kindle Edition.

# The first thing I get asked about the portfolio is...

Return is last for primary objectives but usually the first question asked...

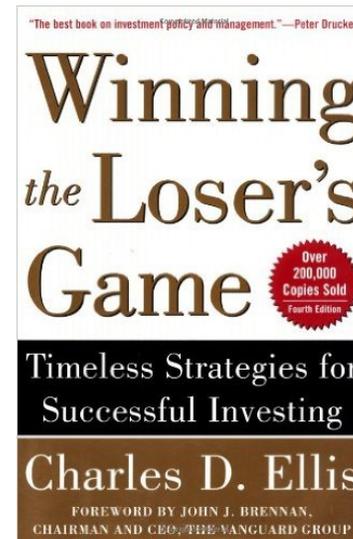
"...the basic assumption that most institutional investors can outperform the market is false. The institutions are the market. They cannot, as a group, outperform themselves. In fact, given the cost of active management—fees, commissions, and so forth—most investment managers will, over the long term, underperform the overall market. ...

For any one manager to outperform the other professionals, he must be so skillful and so quick that he can regularly catch other professionals making errors—and can systematically exploit those errors faster than other professionals can. ...

The beginning of wisdom for you is to understand that few—if any—major investment organizations will outperform the market averages over long periods of time and that it is very difficult to estimate which managers will outperform. ...

The truly important but not very difficult task to which investment managers and their clients could and should devote themselves involves four steps: (1) understanding the client's real needs, (2) defining realistic investment objectives that can meet a client's realistic needs, (3) establishing the right asset mix for each particular portfolio, and (4) developing well-reasoned, sensible investment policies designed to achieve the client's realistic and specified long-term investment objectives. In this work, success can be easily achieved."

*Ellis, Charles D.. Winning the Loser's Game: Timeless Strategies for Successful Investing (Winning the Loser's Game, 3rd ed) (Kindle Locations 243-540). McGraw-Hill Education. Kindle Edition.*



## GFOA [Sample IPS](#)

### General Objectives

"The primary objectives, in priority order...

#### 1. Safety

Safety of principal is the foremost objective... ***The goal will be to mitigate credit risk and interest rate risk.***

#### 2. Liquidity

The investment portfolio shall ***remain sufficiently liquid*** to meet all operating requirements that may be reasonably anticipated.

#### 3. Return

The investment portfolio shall be designed with the objective of attaining a ***market rate of return throughout budgetary and economic cycles***, taking into account the investment risk constraints of safety and liquidity needs."

*GFOA Sample Investment Policy, accessed 12/31/16, pages 1-2. Emphasis added.*

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