# Bad Benchmarks, Passive Investing and ETFs

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# Introduction

- The last decade has brought about a massive increase in the use of passive strategies by both institutional (index funds) and retail investors (ETFs).

- In turn, this has lead to a material proliferation of thousands of "benchmark indices" that describe some way of purportedly investing passively in some defined set of securities.

- While many of the concepts and strategies embodied in these benchmark indices are quite sound, many indices now being marketed by index data providers have material conceptual problems.

- In this presentation, we first define four purposes for which benchmark indices are used. We will show that many indices cannot possibly fulfill all these purposes effectively

- Finally we will show what can be done to mitigate a couple of the various problems that arise.

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# Early Applications of Financial Market Indices

- The Dow Jones Transportation Average was established in 1885 and the DJ Industrial Average followed in 1896.
  - The purpose of the "averages" was a *journalistic* one, providing investors with general information about the day to day price changes in popular stocks without having to collect and compute price changes and returns on the large number of individual equity issues being traded even in those early days. Today every exchange where financial assets are traded produces a set of indices that are meant to conveniently convey information.

- The second purpose to which indices are put is to as a *representation of an asset class for the formulation of capital market assumptions* in asset allocation studies.
  - The massive number of indices has created the bizarre situation that large cohorts indices routinely exist representing approximately the same opportunity set (e.g. the S&P 500, the S&P 100, the Russell 1000, the NYSE index and a couple dozen more all purportedly represent investing in US large cap stocks).

# Modern Applications of Financial Market Indices

- The third purposes of benchmark indices is to act as a *fair benchmark* for active managers participating in a given opportunity set.
  - Managers set benchmarks or negotiate with clients as to which benchmark is to be applied, managers have business incentives to pick "slow rabbits" or mislead investors as to the appropriate benchmark.
  - Numerous studies have confirmed this has been a common practice including diBartolomeo and Witkowski (1997), Brown and Goetzmann (1997) and Kim, Shukla, and Thomas (2000).
- Financial market indices are used as *the basis of actual passive investments* and related derivative contracts such as index funds, ETFs, options, and futures).
  - Using indices at the basis of actual investments implies management of capacity as liquidity is not infinite in financial products.
  - While derivatives rely on the actual index composition, many index funds and ETFs rely only on statistical sampling of index constituents due to liquidity considerations.

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# Summarizing

- So we have four basic purposes for financial market indices:
  - The journalistic purpose of summarizing financial market events in way which is convenient to market participants.
  - Acting as the representation of an asset class for the purposes of asset allocation
  - Acting as the benchmark for active managers operating within a given opportunity set
  - Being the basis for actual investments or derivative contracts

- While it can be argued that many financial market indices do a reasonable job at all four purposes, it can be equally argued that *many published indices are unsuitable for one or more of these uses.*
  - In addition, there are clear cases when fulfilling one of the purposes contributes to poor fulfillment of one of the others.

# *Assumed* Attributes

- If indices are going to successfully fulfill the four enumerated purposes, they must have certain attributes which are logically required.   Investors typically assume that all indices have all the needed properties.

- For the *journalistic purpose*, an index must have two obvious properties
  - The construction and calculation of the index must be highly transparent so typical investors understand what they are observing.
  - The index must have relevance to investors as a reasonable representation of the central tendency of distribution of behavior of the financial assets comprising the index.

- For the purpose of forming *capital market assumptions for asset classes*, an index must economically span the known attributes of the asset class.
  - The index must be informative of the influences on the underlying real economy that are necessary to formulate long term expectations.

# More *Assumed* Attributes

- To fulfill the purpose of *being a benchmark for active managers* an index must have a number of attributes.

    - The index must be investible. You certainly can't hold a manager responsible to produce the performance of holding financial assets which are not available to them as portfolio holdings.

    - The index must "clear" the market in the sense that not only must the index be investible, it must be investible for all market participants *simultaneously,* which usually implies capitalization weighting.

    - The index construction must be sufficiently transparent that it defines a known set of opportunities so that managers know what is and is not economically (rather than legally) permissible under a given benchmark relative mandate.

    - There must be some reason to believe that the *index has the expectation of being representative of an efficient market.* If the index has no special properties we could just rank active managers against each other.

# Liquid, "Semi" and Illiquid Market Indices

- One might assume that indices representing asset returns would only be constructed for highly liquid markets where we can assume that current prices (and hence change in prices) can be accurately determined.

- However, a large number of indices have evolved over the years purporting to illustrate returns for illiquid markets such as private equity, venture capital and real estate (both residential and commercial).

- If we contrast the attributes where these two cohorts of indices seem to pass or fail on our criteria, we can make sensible inferences about indices that represent "semi-liquid" markets such as high yield bonds or equities in many emerging markets.
  - An extensive analysis of a high yield bond index appeared in our newsletter in 2013, https://www.northinfo.com/documents/546.pdf

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# Illiquid Asset Indices – Journalistic & CMA

- Several of our assumed attributes for indices can be illustrated to fail with respect to indices for various illiquid assets.
  - Several studies such as Kaplan and Schoar (2005) illustrate that the cross-sectional distribution of returns to private equity and venture capital have high degrees of positive skew.  In any given year, most of the profits to the whole PE/VC market are earned by a small number of super-successful deals where you make your money many times over.
  - The average returns to the remaining deals are well below published PE/VC index averages.   In these cases, the median of the distribution of "deal level" returns is well below the published return.
  - Some types of private investment are even more extreme in this respect.  One notable example is investor returns from financing feature motion pictures.
    - While the average return on a movie is positive, the median return is actually negative (you lose money most of the time) but when you win, you win big.  Typically only full time film studios can be sufficiently diversified across many, many films to capture the long right tail.

# Illiquid Assets – Capital Market Assumptions

- There is a very extensive literature which illustrates that when financial assets are illiquid, the returns which arise from using "appraisal" rather than transaction prices are "smoothed"
  - For real estate Geltner (1991) and Geltner, MacGregor and Schwann (2003)
  - For all low liquidity assets  Getmansky, Lo and Makarov (2004)
  - The smoothing process is indicated by first order auto-correlation in returns

- The smoothing process biases returns upward and volatility downward
  - Lin and Liu (2008)

- An approximate correction for return volatility is:
  - Vol (corrected) =  Vol (observed) * $((1+R)/(1-R))^{.5}$ where R is the first order autocorrelation coefficient.
  - For some illiquid indices (e.g. NCREIF) R values as high as .8 have been observed.

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# Illiquid Assets – Asset Manager Benchmarks

- Some forms of illiquid assets, most notably commercial real estate have the attribute of being *indivisible.*

  – For all assets that are indivisible, a single investor must own each individual asset.

  – As such, the index cannot be investible. If I own a particular building, everybody else can't.

  – The index can only vaguely define the opportunity set for active managers.

  – Gold (1995) derives that the efficient frontier for real estate is "fuzzy" and only vaguely defined with "optimal weights" having only range values.

    – Such an index cannot be defined as having the special property of the expectation of market efficiency.

# Liquid Equity Indices – Benchmarks

- Even very traditional capitalization weighted equity indices in relatively liquid markets can fail to possess one or more of the assumed attributes.
  - In many countries such as China, there are still material restrictions on foreign ownership of voting equity shares. As such, the inclusion of restricted shares into multinational equity indices is problematic.
    - To date major index vendors have differed in their treatment of this issue.
  - Another issue is government ownership of traded companies.
    - Generally, government stakes in large enterprises are unavailable to be traded through financial markets.
    - Index providers differ in their treatment of this issue in terms of weighting of index constituents and determination of "float".



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# Liquid Equity Indices – Capital Market Assumptions

- There are some countries where entire enterprises are nationalized and hence are not included in local equity indices at all.
  - Extreme examples are Middle Eastern countries like Saudi Arabia and Bahrain where oil sector assets, if traded, would dominate local market capitalization.
  - The current market capitalization of the Saudi exchange is around $530 Billion. The national oil enterprise ARAMCO has been trying to organize an IPO at around $2 Trillion, or almost four times the capitalization of the entire Saudi equity market.
  - *A local index cannot span local economic activity in these cases.*
- Some index providers have suggesting partially getting around this problem in multinational indices by using GDP rather than capitalization weighting by countries
  - See Wilcox (1994)
  - We routinely "complete" local indices for CMA purposes by imposing ETFs for missing sectors.

# Fixed Income Indices - Benchmarks

- Many popular fixed income indices are weighted by market value similar to market capitalization in equity indices.

  - Capitalization weighting for equities has a basis in both having the market clear and in the theoretical equilibrium argument of CAPM.

  - No such argument is compelling in fixed income, where dealer trading of "inventory" represents clearing the market.

  - Market value weighting also has the unintuitive consequence that as a borrower gets deeper and deeper into debt, the greater should be a lender's willingness to lend to them. *Most banks wouldn't see it that way.*

  - Many fixed income assets such as bonds and loans are repackaged into securitizations (CMO, REMIC, ABS, CDO, etc.). To the extent a fixed income index covers both the underlying assets and the securitizations the value of some assets may be double counted and hence unavailable for actual investment.

# Global Daily Indices – Capital Market Assumptions

- Almost all indices of financial market returns are now calculated on a daily basis. This has the side effect that returns are asynchronous across time zones.
  - Estimating the correlation of a pair of markets that cross a time zone will be biased downward.
    - If the US equity market experiences a big down move *today*, there is a higher than usual likelihood that Asian markets will follow in a downward direction *tomorrow.*
  - It also gives *the appearance of serial correlation* in global market indices
  - Perry (1985), Wood and McNish (1985), Shanken (1987),  Engle, Mezrich and Burns (1998)
- With the popularity of index futures and ETFs on international market indices, it is now relatively easy to estimate, synchronous  24 hour returns for all traded assets.

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# Fixed Income Indices – Journalistic, CMA and ETFs

- Bonds and loans have the property of being able to default.
  - The return distribution of a single bond or loan will have negative skew.
  - Many popular fixed income indices are hyper-diversified (up to 20,000 bond issues) to diversify away the influence of higher moments on index returns (via the Central Limit Theorem)
  - See https://www.northinfo.com/Documents/849.pdf
  - Most investors do not have portfolios large enough to hold tens of thousands of issues and so the index is not generally indicative of real investor returns.
    - There are periods when almost all managers underperform and periods when all managers outperform popular indices.
- Such "hyper diversified" index portfolios will contain many issues that have very low liquidity.
  - As such, most bond ETFs hold only a "stratified sample" of two or three hundred liquid issues to represent the returns of indices with many thousands of constituents.
  - Many ETFs are in worse shape (i.e. the vol trading ETF crisis February 2018).

# Theoretical Conflict

- Roll (1992) presents an interesting interpretation of a practical conflict.
  - Let's assume we have the typical situation that the same benchmark index is being used by an investor both as a representation of an asset class for the purposes of capital market assumptions and is also being used as the benchmark for active managers in that asset class.
- In order for the index to make sense as the representation of a given asset class, we must assume that capital invested in that asset class is invested in a relatively "index" like way.
  - As the actual portfolio held moves away from the index (i.e. active) the appropriateness of the index for CMA purposes is reduced.
- However, Roll argues that if active managers are actually confident of beating the index as a benchmark it is the investor's best interest for managers to take on a high degree of active risk.
  - Should managers worry about being similar to a benchmark you are confident you can beat?

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# Passive Product Contributors to Illusions of Liquidity

- ETFs and related ETNs have grown exponentially in recent years.

- While the routine operations of these securities imply liquidity as both an exchange traded asset, and the creation/destruction of units.  There is also the structural possibility of *in-kind contributions and withdrawals of securities*

- Most ETFs and ETNs are based on passive indices.  Some more exotic ETFs (levered, inverse, VIX related) have daily rebalancing rules required by the prospectus.

- The rebalancing of the underlying portfolios is predictable to a material extent, putting a bound on "normal" trading. Some funds also use prearranged "in kind" flows of securities around rebalances to reduce realization of taxable capital gains.

- Debt funded market makers and hedge funds have been providing liquidity for rebalances in return for transaction spreads, *particularly those securities with low trading volume.*

# A Blast From the Past



By Dan DiBartolomeo
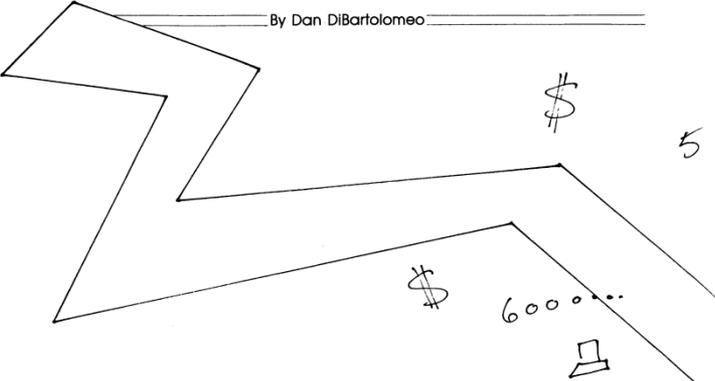
## COMPUTERS AND THE CRASH: DID THE MACHINES REALLY DO IT?

A lot of people blamed computers for last year's stock market crash. We look at the role they really played.

The stock market crash on October 19, 1987, reduced the wealth of every man, woman, and child in the United States by an average of $5,000. In total, more than $1 trillion in the value of traded stocks was wiped out in the span of just seven hours. The morning newspapers of Tuesday, October 20, began the inevitable fingerpointing. One of the most popular rationalizations was that computer-aided trading practices, which had come into vogue in recent years, had gone haywire. In short, it was all "the computer's fault."

To begin to understand the role computers played in what has come to be realized as a near-total collapse of the world's capital markets, we first must come to grips with the enormity of the financial events themselves. In addition to a one-day loss of nearly a third of the value of all stocks traded in the United States, every major stock exchange in the world dealt with near-panic conditions. Total losses around the world exceeded $2 trillion in a matter of a few days. This sum is greater than the accumulated national debt of the United States, which has taken over 200 years to accrue. In Hong Kong, things got so bad they simply closed the stock exchange for a week, bringing finance and commerce to a near standstill.

The Dow Jones Industrial Average lost 508 points, over 23 percent of its value, on October 19. This percentage is more than double the 11.2-percent loss recorded on October 29, 1929, the event normally cited as having triggered the Great Depression. The likelihood of such an event happening randomly, given the history of stock market ups and downs, is so small as to be nearly incalculable.

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# The October 1987 Crash

- The preceding page is an illustration of an article I wrote on the October 19th, 1987 stock market crash.

- The factual data was taken from federal study known as the Brady Commission Report. Lead investigator was Robert Glauber (now at Harvard). The report is named for Nicholas Brady who went on to be Treasury Secretary. I know both and have discussed the events.

- The seminal feature is that the value of the US stock market dropped by $1 Trillion or 23%. Globally the effect was roughly $2 Trillion or 20%.

- Total volume traded in the US markets was only around $15 Billion.

- Even if we assume that every transaction was initiated by a seller, the market impact was 70 times the total volume of trading, or a market impact of 7000%

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# Conclusions

- The proliferation of financial market indices and financial products such as index derivatives and ETFs has come with relatively little scrutiny of the many of the theoretical and practical considerations.

- Investors should pay close attention to the attributes of the financial market indices they use in their investing activities.

- Many indices are very appropriate to one or more purposes but may be less well suited to other routine purposes of index data.