Matching Portfolios

David Kane
(joint work with Kevin Bartz)

Overview

How do we measure outperformance?

Important question for large investors

Unsatisfactory approaches (Characteristics)

Matching --- based on Rubin Causal Model

Who is this?

James Simons

Who is this?

Who is this?

David Einhorn

Who is this?

PHOTO: MATTHEW PORTER

Hint: Yacht named "Positive Carry"

How can we tell who will outperform in the future?

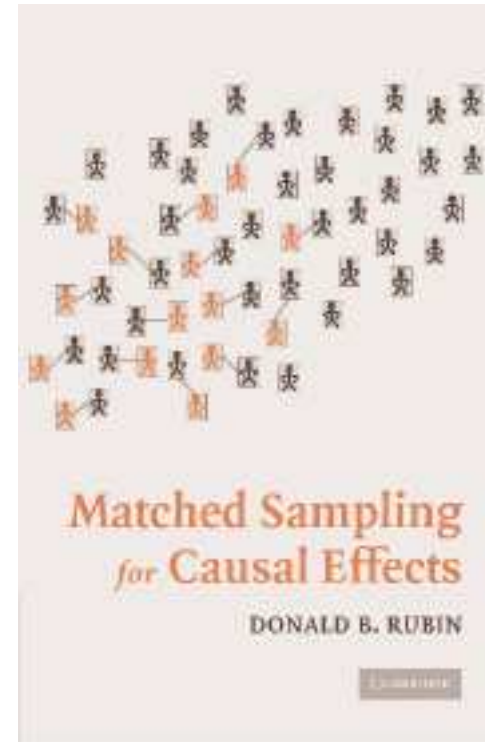John Devaney

James Simons

David Einhorn

Rubin Causal Model

What is the causal effect of
this lecture on 2010 income?

Commonsense

"Potential outcomes"

Applied Example: Starmine Smart Indicator

Simple Example

Data from January 31, 1995

3,724 equities from a global universe

2,497 rated by Starmine

Equal-weighted portfolio of 100 stocks
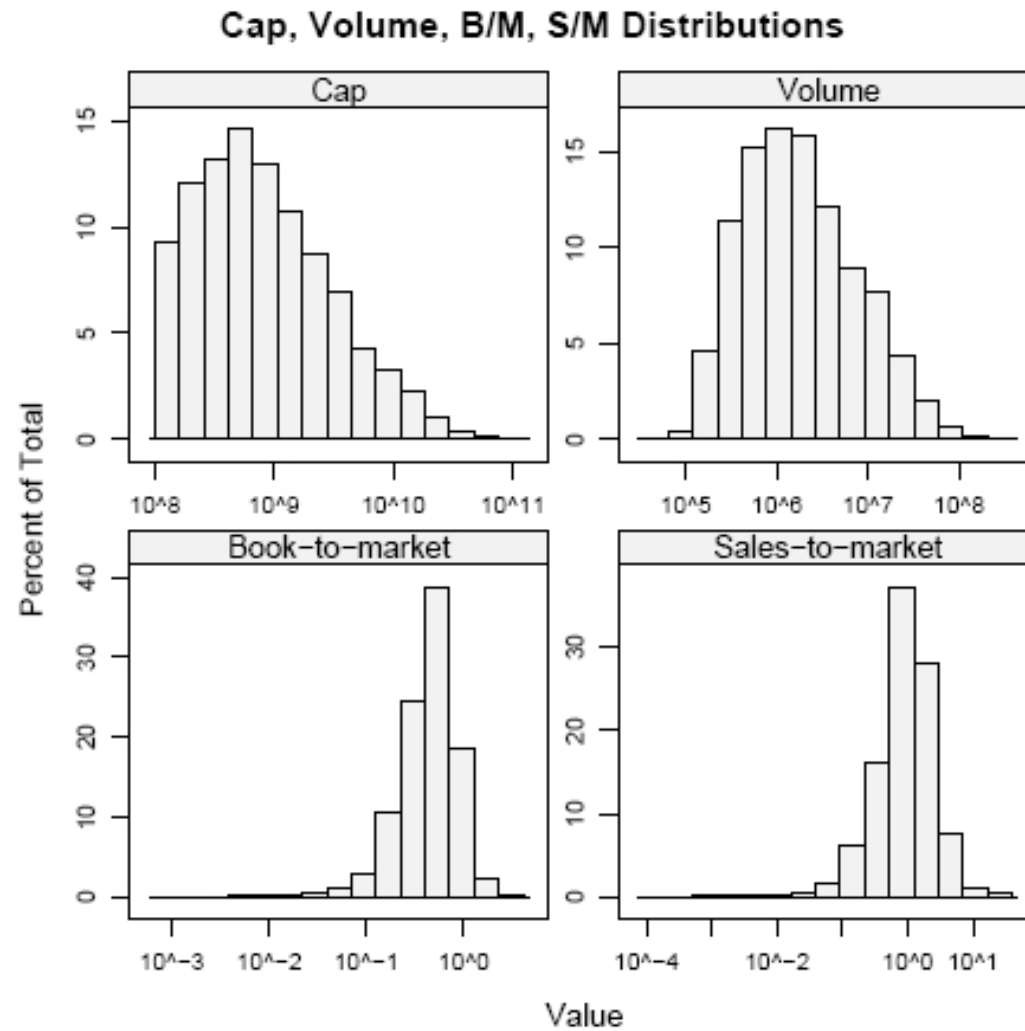
Figure 1: Histograms representing the makeup of the universe of stocks by market capitalization, 20-day mean dollar volume, book-to-market ratio and sales-to-market ratio. The complete universe of stocks is represented here, uncluding those unrated by StarMine.

Forward Returns by Portfolio Type

Figure 4: Performance of the StarMine portfolio compared to performance of various benchmarks: the S&P 500, the equal-weighted complete universe, and the equal-weighted rated universe.

Characteristics Approach

5x5x5 boxes based on market capitalization, book-to-market and momentum.

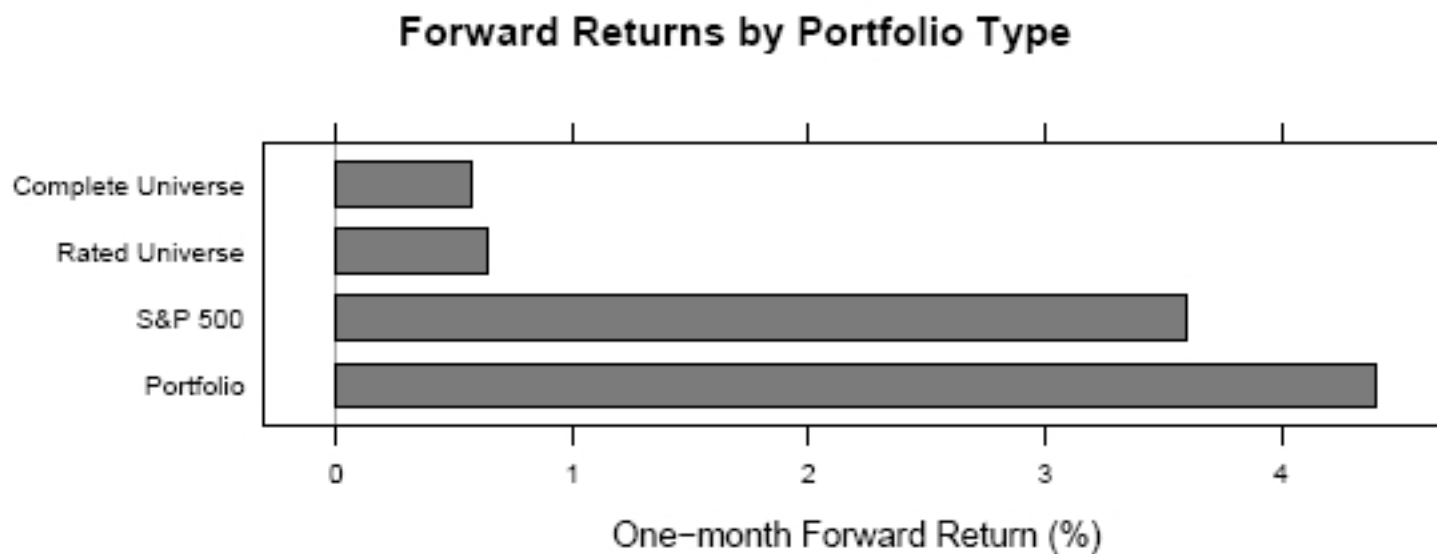"Measuring Mutual Fund Performance with Characteristic Based Benchmarks," by Kent Daniel, Sheridan Titman, Mark Grinblatt and Russ Wermers. The Journal of Finance 52(3), July 1997, p. 1035-1058.

"Evidence on the Characteristics of Cross-Sectional Variation in Stock Returns," by Kent Daniel and Sheridan Titman. The Journal of Finance 52(1), March 1997, p. 1-33.
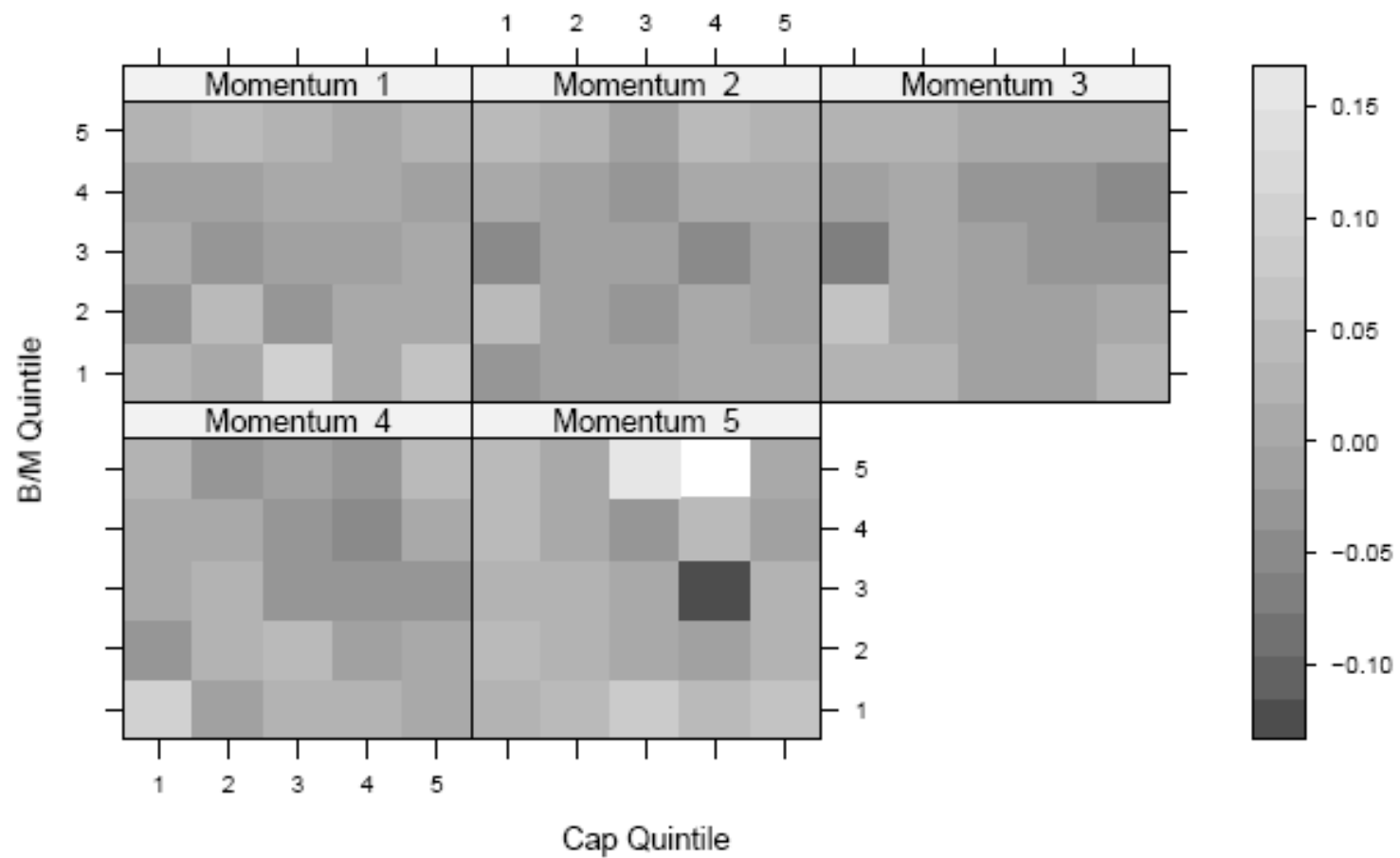
Figure 5: Performance of the 125 passive portfolios.

Problems

Countries, sectors and industries (!) can't be split into 5 boxes.

"Curse of Dimensionality" makes problem impossible.
How to choose among factors?

What about long/short?

Universe: Holdings and Non-holdings

Market Cap in USD
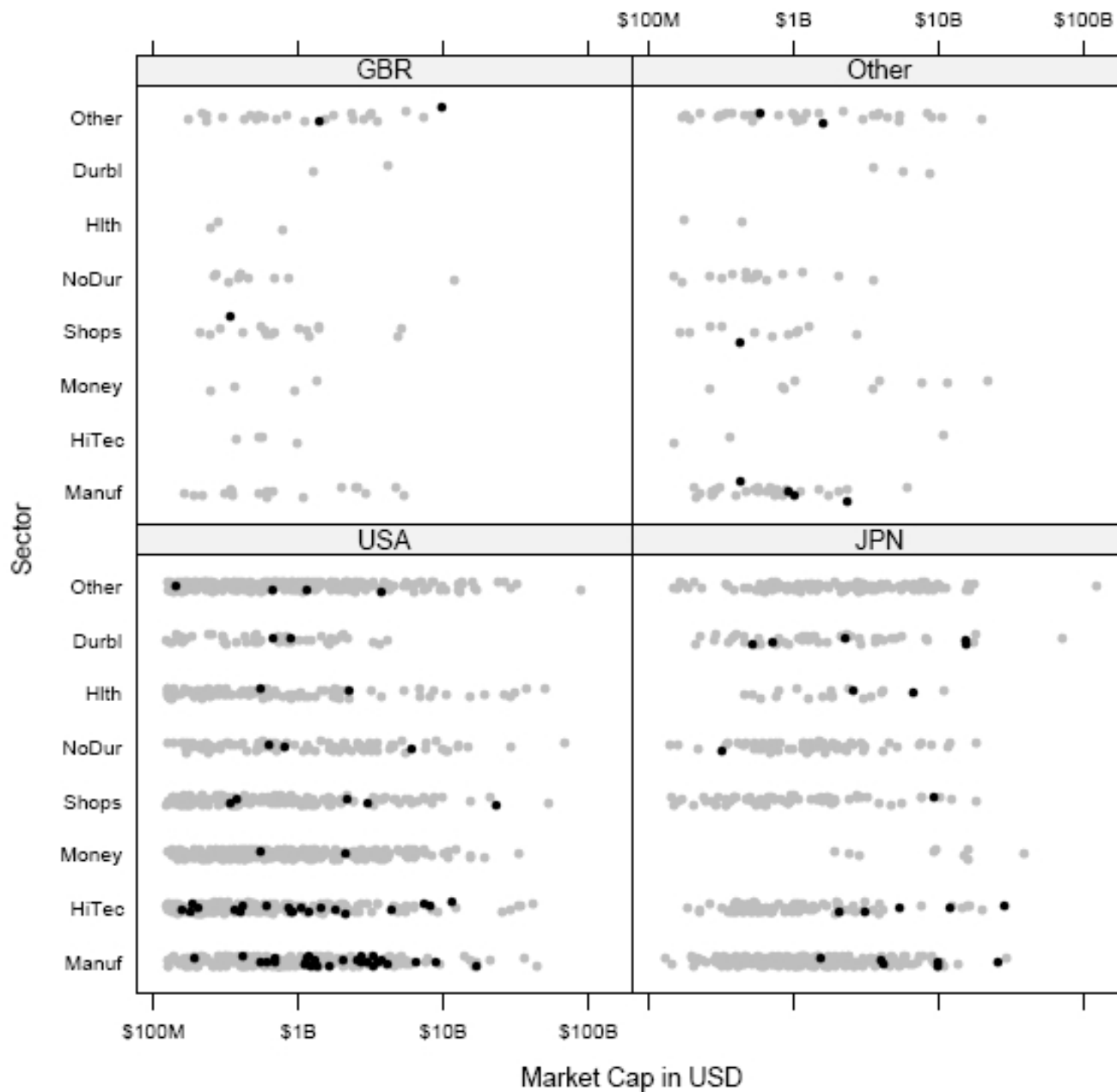
Solution: Matching

Not a lecture on how matching works.

Propensity score or other distance metrics.

Make the matched portfolio look "like" the target portfolio by every metric *except* those for which the manager claims skill.
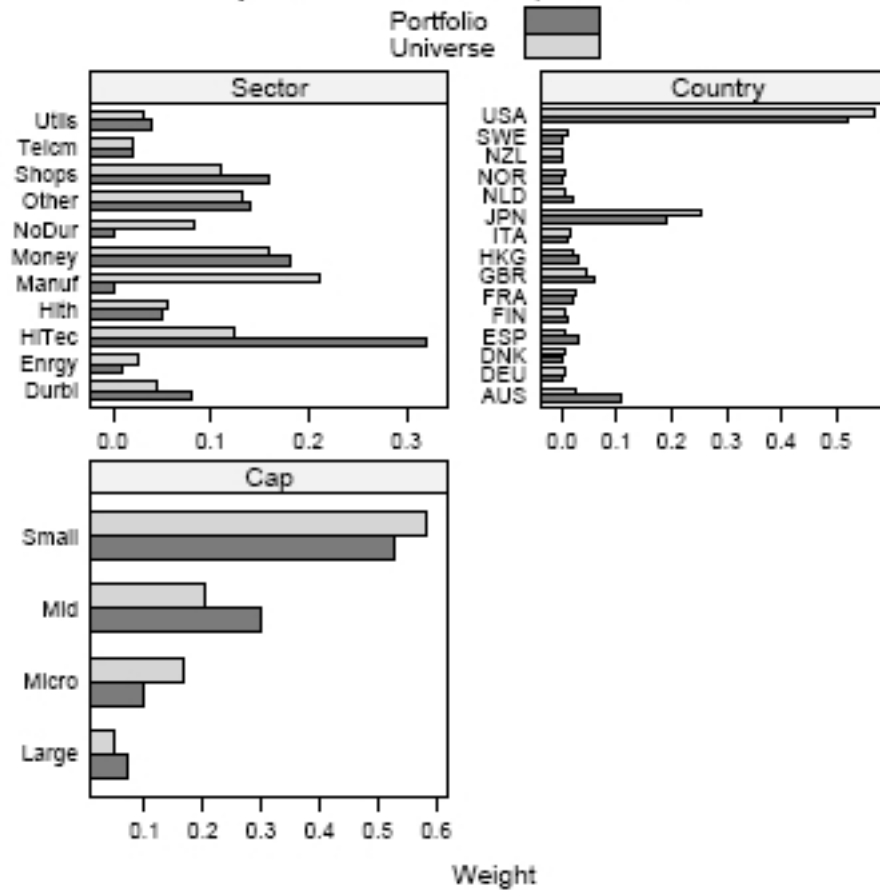
Figure 2: Exposures of the StarMine portfolio to sector, country and market cap. Also shown are exposures of an equal-weighted index of stocks in the rated universe.

MatchIt: R package

MATCHIT: NONPARAMETRIC PREPROCESSING FOR PARAMETRIC CAUSAL INFERENCE

Daniel Ho, Kosuke Imai, Gary King, Elizabeth Stuart

"At MatchIt, we don't make parametric models, we make parametric models work better."

Version: 2.4-10

MatchIt implements the suggestions of Ho, Imai, King, and Stuart (2007) for improving parametric statistical models by preprocessing data with nonparametric matching methods. MatchIt implements a wide range of sophisticated matching methods, making it possible to greatly reduce the dependence of causal inferences on hard-to-justify, but commonly made, statistical modeling assumptions. The software also easily fits into existing research practices since, after preprocessing data with MatchIt, researchers can use whatever parametric model they would have used without MatchIt, but produce inferences with substantially more robustness and less sensitivity to modeling assumptions. MatchIt is an R program, and also works seamlessly with Zelig.

- Documentation: HTML or PDF

- Installation and Downloads

- All questions, bugs and requests: MatchIt Mailing List: [Un]Subscribe, or Browse/Search Archives

We're pleased to report that the article on which MatchIt is based won the *Warren Miller Prize* for the best paper in *Political Analysis* that year and, separately, has been named a *Fast Breaking Paper* by Thomson Reuters' ScienceWatch, for being the article with the largest percentage increase in citations among those in the top 1% of total citations across the social sciences in the last two years. (You may be interested in this interview: HTML | PDF)

GARY KING

R is Good

Measure bias as absolute value of weight differences across buckets

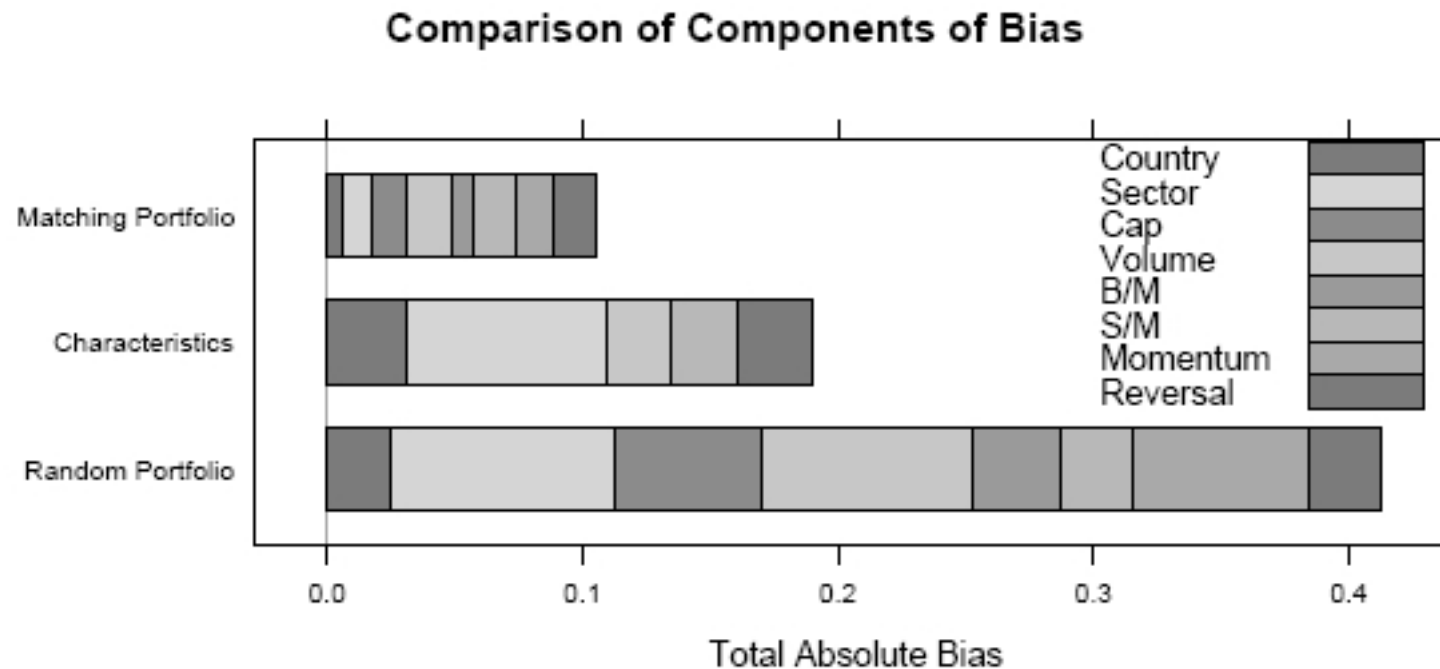**Comparison of Components of Bias**

Total Absolute Bias

Figure 7: Absolute bias of three types of benchmarks – random portfolios, characteristics and matching portfolios – broken into characteristic-wise components. The size of each chunk represents the characteristic's contribution to bias. Our method, matching portfolios, has the lowest bias, which means that it matches the original portfolio most closely of the three methods.

Random Portfolio Approach

Absolute Bias Over Simulation Trials
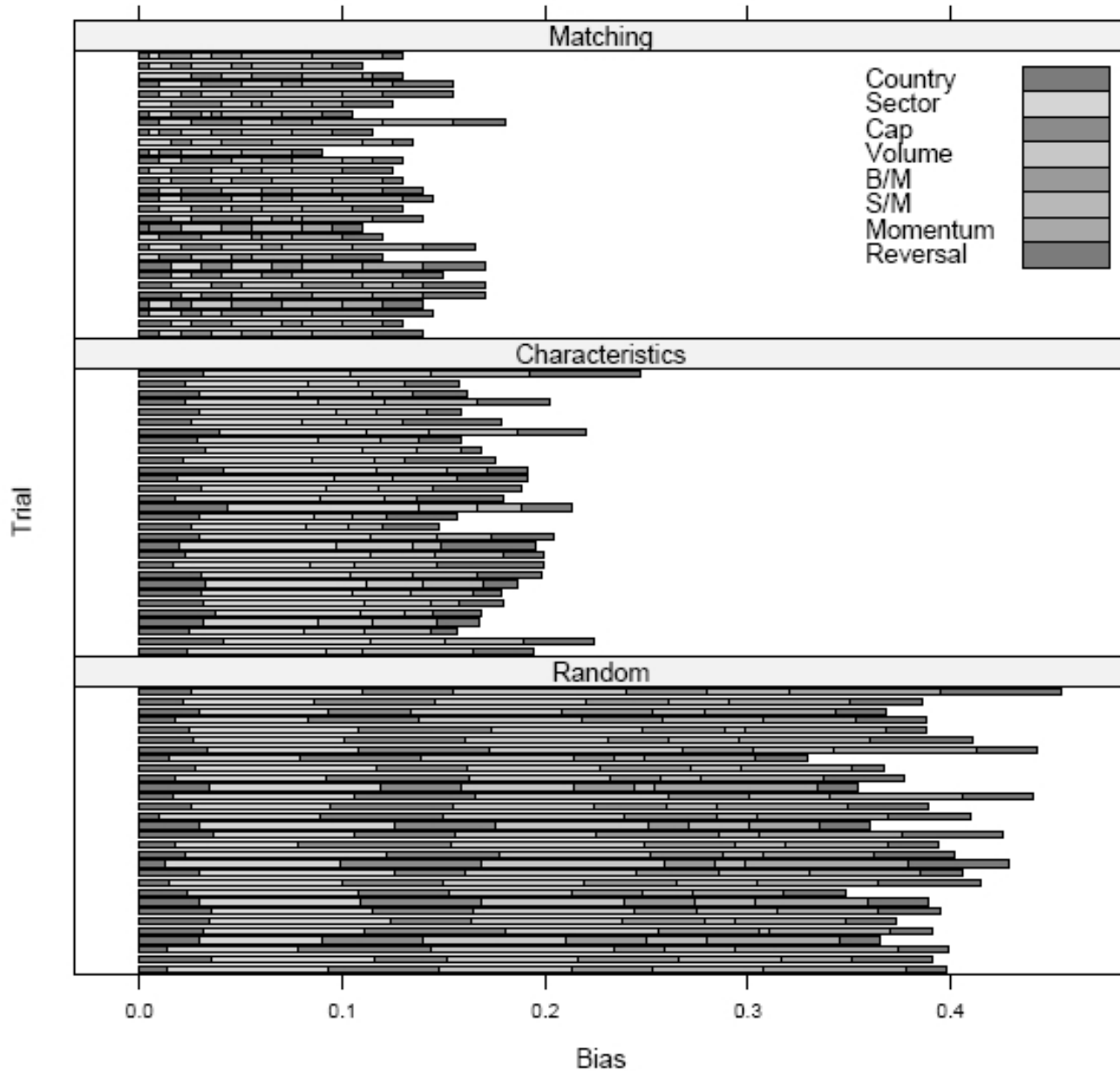
Long-Short Example

100 stocks long and 100 stocks short, equal weighted.

Want the matches portfolio to "look like" the target portfolio, just as the audience and non-audience for this talk should be similar.

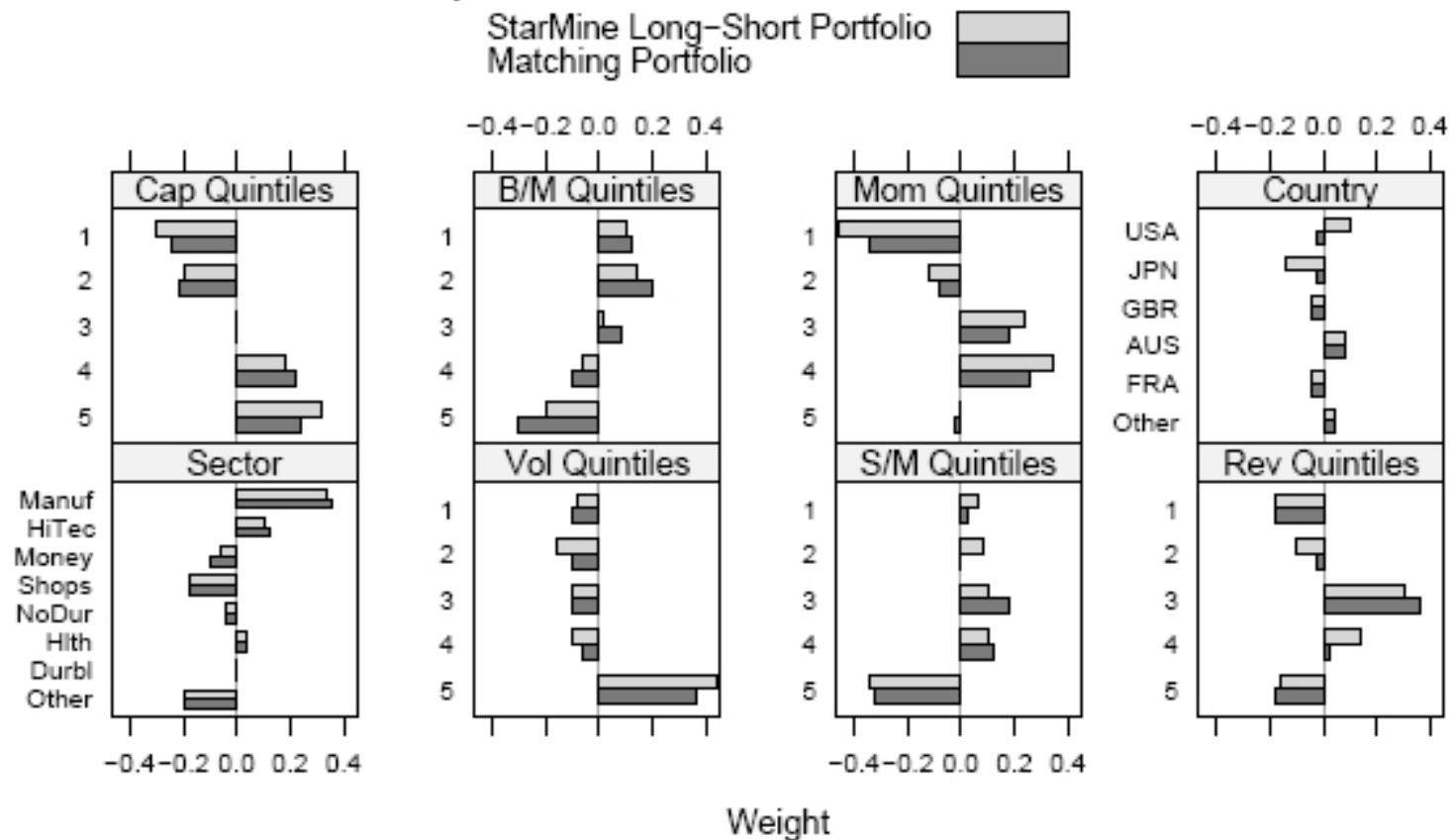There are many possible portfolio matches. None is "right."

Figure 11: The long and short exposures of the original long-short StarMine portfolio and the portfolio matched to it using the generalized propensity score. Both the long and short exposures line up very nicely.
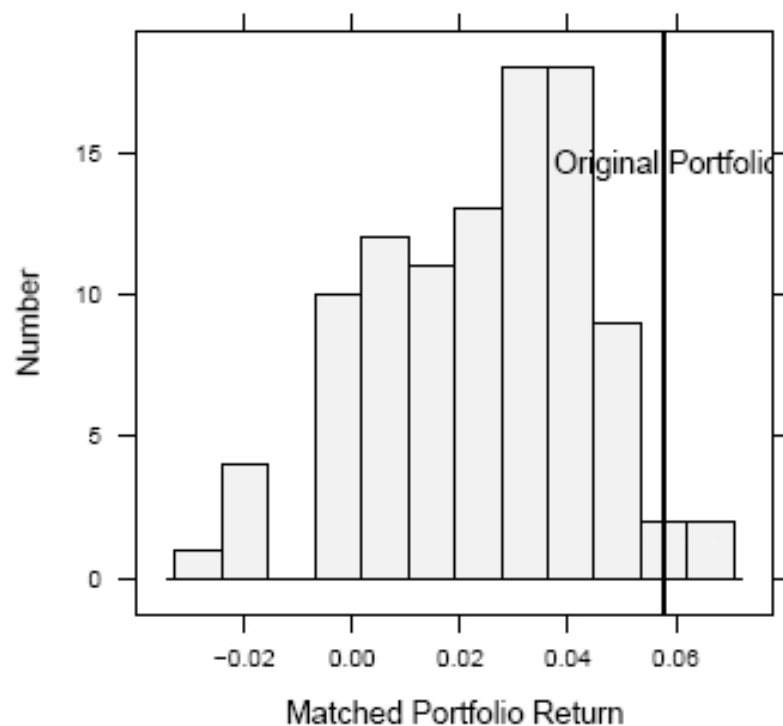
Distribution of Random Portfolios' Returns

Figure 12: Histogram showing the returns of random portfolios matched to the long-short StarMine portfolio. The thick vertical line represents the return realized by the StarMine decile portfolio. It stands at the 97.0% percentile of the random returns, suggesting that the StarMine portfolio's excess return is indeed due to stock-picking ability.

Conclusion

Use Matching Portfolios to measure performance.

Requires holdings information. Harder to do than it looks . . .

No better approach: Handles arbitrary numbers of factors and portfolio weights.

Easy to match on everything *except* what the manager claims skill on.