

A blue parallelogram and a light green parallelogram are positioned in the top-left corner of the slide. The blue shape is partially behind the green one. Both shapes are oriented diagonally, with their longer sides running from the top-left towards the bottom-right.

A Random Walk through SP500 DataSet

Harnek Dadiala, Matt Puttroff



Are fund managers worth their Wall Street Salary



Blindfolded Monkeys

In 1973, Princeton University economics professor Burton Malkiel made a bold claim in what went on to become his best-selling book “A Random Walk down Wall Street” that “A blindfolded monkey throwing darts at a newspaper’s financial pages could select a portfolio that would do just as well as one carefully selected by experts”.

In the almost 50 years since professor Malkiel first published his book, now in its 12th edition, an unlimited amount of stock return data has given us infinite opportunities to test out his theory, and what we’ve learned, unequivocally, and what we will demonstrate to you today, is that the professor was wrong.





The performance of the experts

To get an idea of how professional money managers performed, we sought out highly-rated Large-Cap blend mutual funds, and charted their performance over a 20-year period, from January 1, 2000, to December 31, 2019.

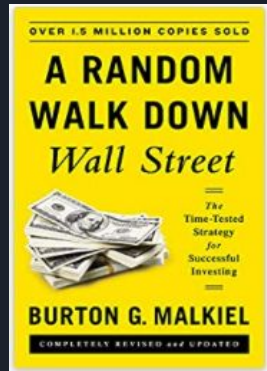
We analyzed the mutual fund performance by assuming an investor bought exactly \$10,000 worth of mutual fund shares on January 1, 2000, and measuring what the balance would be on December 31, 2019 if that investor never added money to, or withdrew from their mutual fund over the entire measurement period.

Sources of Data:



Yahoo Finance API:

<https://www.yahoofinanceapi.com/>

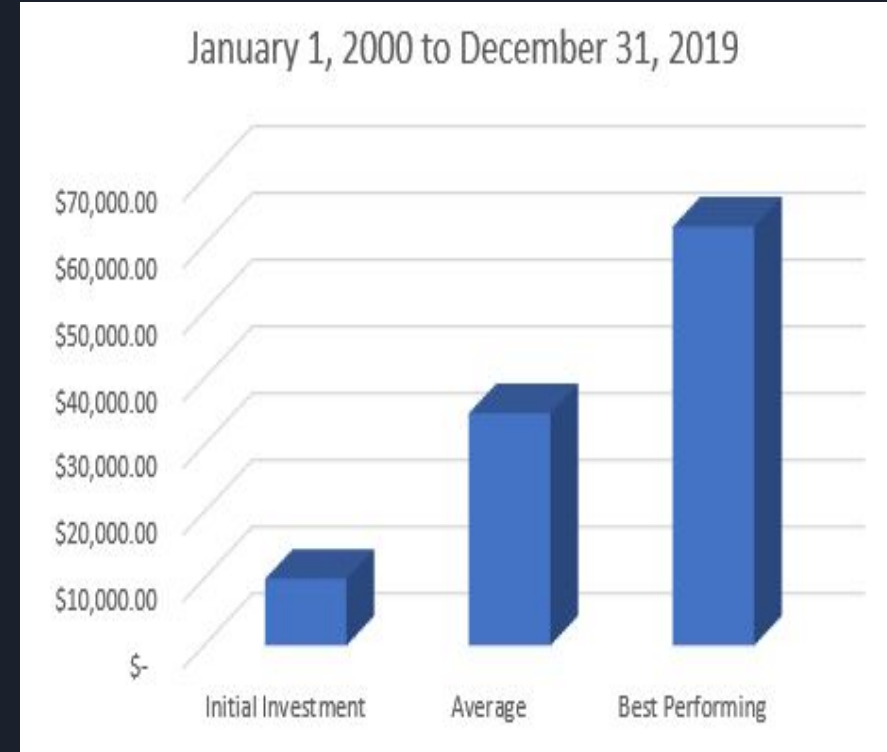
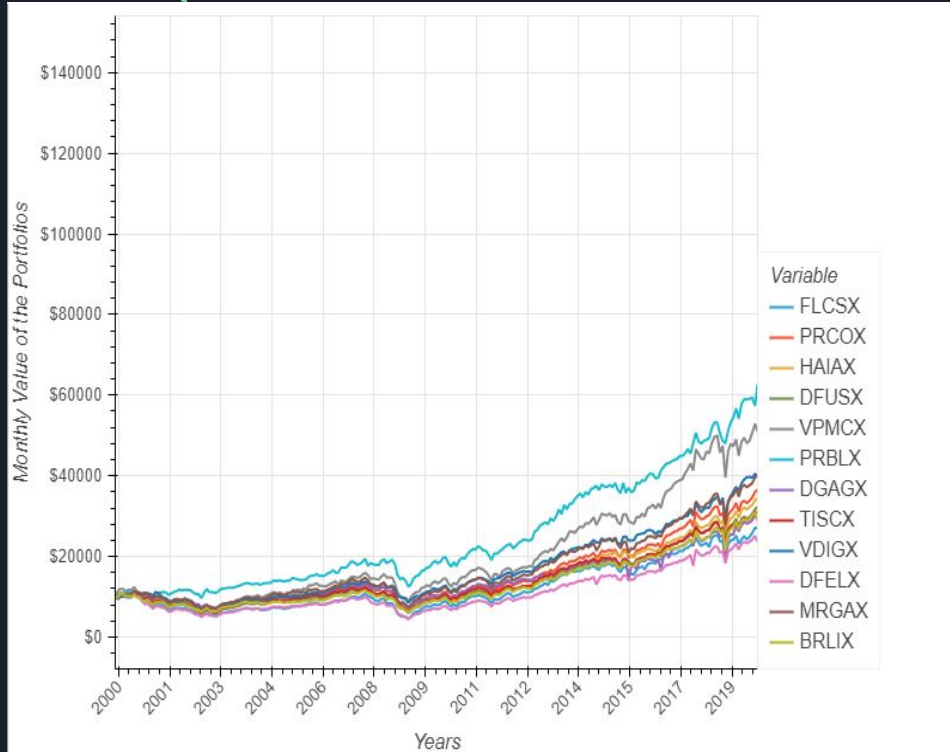


Contents [hide]	
1	S&P 500 component stocks
2	Selected changes to the list of S&P 500 components
3	See also
4	References
5	External links

S&P 500 component stocks [edit]

Symbol	Security	SEC filings	NYSE Sector	NYSE Sub-Industry	Headquarters Location	Date first added	CIK	1902	Founded
MMM	3M	reports	Industrials	Industrial Conglomerates	Saint Paul, Minnesota	1976-08-09	0000066740	1902	
ABT	Abbott Laboratories	reports	Health Care	Health Care Equipment	North Chicago, Illinois	1964-03-31	0000001800	1888	
ABBV	AbbVie	reports	Health Care	Pharmaceuticals	North Chicago, Illinois	2012-12-31	0001551152	2013 (1888)	
ABMD	Abiomed	reports	Health Care	Health Care Equipment	Danvers, Massachusetts	2018-05-31	0000815094	1981	
ACN	Accenture	reports	Information Technology	IT Consulting & Other Services	Dublin, Ireland	2011-07-06	0001467373	1989	
ATVI	Activision Blizzard	reports	Communication Services	Interactive Home Entertainment	Santa Monica, California	2015-08-31	0000718877	2008	
ADBE	Adobe	reports	Information Technology	Application Software	San Jose, California	1997-05-05	0000796343	1982	
AMD	Advanced Micro Devices	reports	Information Technology	Semiconductors	Santa Clara, California		0000024480	1969	
AAP	Advance Auto Parts	reports	Consumer Discretionary	Automotive Retail	Raleigh, North Carolina	2015-07-09	0001158449	1932	
AES	AES Corp	reports	Utilities	Independent Power Producers & Energy Traders	Arlington, Virginia	1998-10-02	0000874761	1981	
AFL	Affac	reports	Financials	Life & Health Insurance	Columbus, Georgia	1999-05-28	0000004977	1955	
AIG	Agilent Technologies	reports	Health Care	Health Care Equipment	Santa Clara, California	2000-06-05	0001090872	1999	
APD	Air Products & Chemicals	reports	Materials	Industrial Gases	Allentown, Pennsylvania	1985-04-30	0000002969	1940	
AKAM	Akamai Technologies	reports	Information Technology	Internet Services & Infrastructure	Cambridge, Massachusetts	2007-07-12	0001086222	1998	
ALK	Alaska Air Group	reports	Industrials	Airlines	Seattle, Washington	2016-05-13	0000766421	1985	
ALB	Albemarle Corporation	reports	Materials	Specialty Chemicals	Charlotte, North Carolina	2016-07-01	0000915913	1994	
ARE	Alexandria Real Estate Equities	reports	Real Estate	Office REITs	Pasadena, California	2017-03-20	0001035443	1994	
ALGN	Align Technology	reports	Health Care	Health Care Supplies	San Jose, California	2017-06-19	0001097149	1997	
ALLE	Allegion	reports	Industrials	Building Products	New York City, New York	2013-12-02	0001579241	1908	
LNT	Alliant Energy	reports	Utilities	Electric Utilities	Madison, Wisconsin	2016-07-01	0000352541	1917	
ALL	Allstate Corp	reports	Financials	Property & Casualty Insurance	Northfield Township, Illinois	1995-07-13	0000099051	1931	
GOOGL	Alphabet (Class A)	reports	Communication Services	Interactive Media & Services	Mountain View, California	2014-04-03	0001652044	1998	
GOOG	Alphabet (Class C)	reports	Communication Services	Interactive Media & Services	Mountain View, California	2006-04-03	0001652044	1998	
MO	Altria Group	reports	Consumer Staples	Tobacco	Richmond, Virginia	1957-03-04	0000764180	1985	
AMZN	Amazon	reports	Consumer Discretionary	Internet & Direct Marketing Retail	Seattle, Washington	2005-11-18	0001018724	1994	

Performance of the Wall Street Brains:

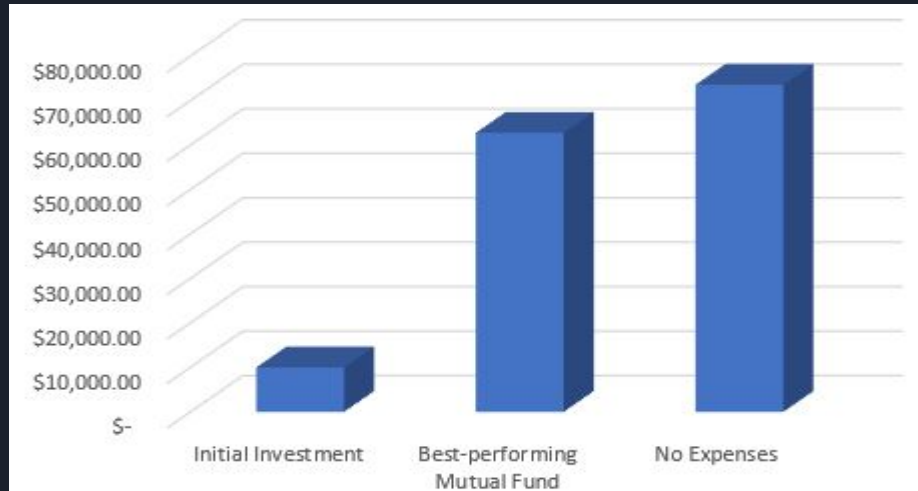


Why does this matter?

Investment Expenses!

This would have made her \$10,000 portfolio grow to be \$73,572 instead of \$62,780!

That's almost \$10,800 of investment returns lost to fees over a 20 year period.





Stock Selection

Professor Malkiel's bold claim has actually been tested in the past by academics and market analysis groups!

The point of the claim is that random-chance is as effective at selecting stocks to own in a portfolio as hiring professional stock analysts to make stock buying decisions is.

To measure the stock-selecting proficiency of random chance, we used Python to select at random a portfolio of stocks from the S&P 500, and then analyzed the return performance of the stocks selected at random over the same 20-year time period assuming the \$10,000 was distributed evenly across the randomly-selected stocks.

Because the mutual funds we selected to represent the 'pros' are all benchmarked (measured against) the S&P 500, the comparison provides a fair critique of the value professional stock-pickers deliver for their investors.

How did we blindfold our Monkeys?

- We started with all 505 listed stocks in the S&P 500, and because we wanted to have at least 20 years of performance data to use, we filtered out all of the stocks that became a component of the index after January 1, 2020
- We filtered out all other stocks that showed bad or incomplete data by setting our start date as 1/1/1901
- This left us with ~160 stock symbols.

We used the Yahoo Finance API to import the stock price data for all of our randomly selected portfolios, repeating the random-selection process 10x for each portfolio size of 5, 10, or 15 random stock selections.

#	Portfolio 1	Portfolio 2
0	MO	FDX
1	LUMN	CL
2	PCAR	TGT
3	CTXS	DE
4	AFL	TFC

#	Portfolio 1	Portfolio 2	Portfolio 3
0	AVY	DUK	HES
1	GIS	WFC	SWK
2	UNP	AMAT	TFC
3	CVS	SHW	EXC
4	K	KO	MMM
5	IBM	AES	UNP
6	YUM	WMB	EIX
7	HIG	F	ABT
8	MRO	PH	VZ
9	GL	CMI	WBA

#	Portfolio 1	Portfolio 2	Portfolio 3
0	SO	LLY	SEE
1	ADI	PG	CMI
2	GPC	BDX	CAG
3	SYN	CI	CAH
4	CSCO	YUM	MRK
5	BBY	MRK	MO
6	MSFT	XOM	TJX
7	CVS	LOW	LUV
8	MO	ABT	DOV
9	CPB	XLNX	CVX
10	OXY	BBWI	LLY
11	APA	ORCL	GD
12	CNP	HAS	SNA
13	JNJ	AAPL	AFL
14	LMT	PPG	MRO



Challenges

- When we first scraped the stock data from Wikipedia, we used the 'read_html()' function, however, we observed throughout the project that the column that showed the date added to the S&P 500 index was removed from the table on Wikipedia (Wikipedia is not a reliable data source), so we instead saved our stock ticker list in a .csv file so that we had a consistent list of stocks to load into our dataframe.
- We first attempted to use Python's random function to generate random portfolios, but we noticed that we weren't getting unique results each time we ran the function (the same tickers kept repeating for each portfolio that was designed to be random).
- We ultimately used Python's sample() method to select our random portfolios, which were comprised of a set of 5, 10, or 15 stocks from our final list of stocks with a minimum of 20-years of daily return data.

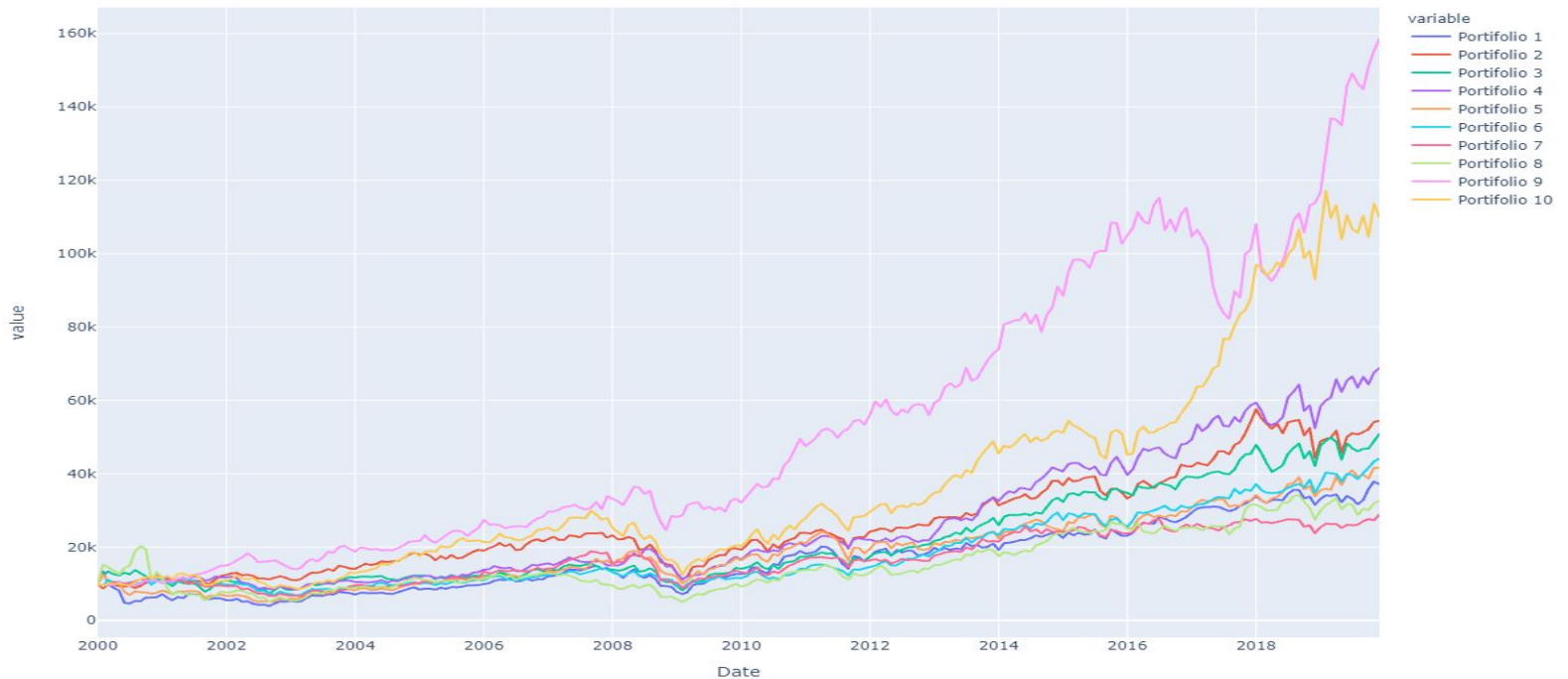
How did the blindfolded Monkeys do?

The reason we can say with confidence that Professor Malkiel was wrong is, as it turns out, portfolios of stocks selected at random did not perform “just as well” as the professionally-managed portfolios.

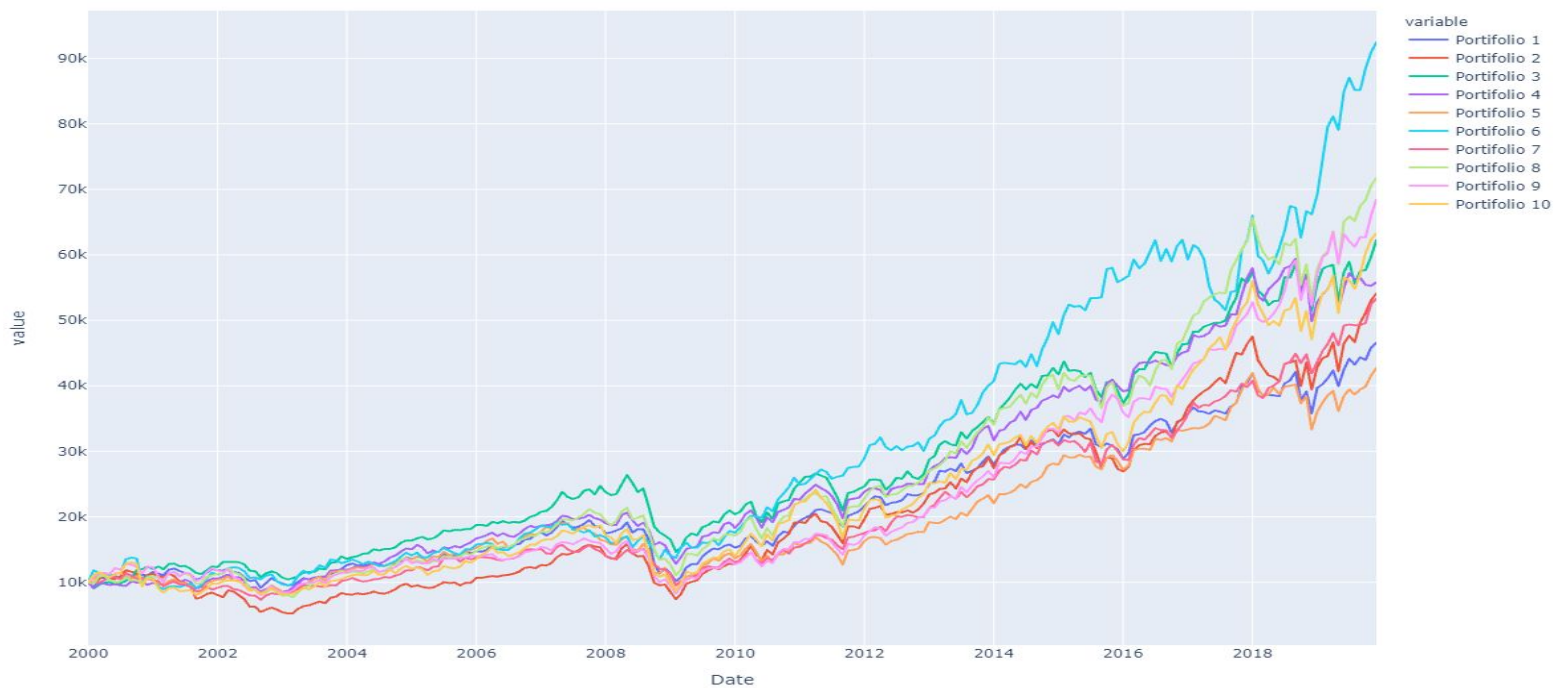
They performed significantly *better* than the Wall Street fund managers!!



Five randomly-selected Stocks



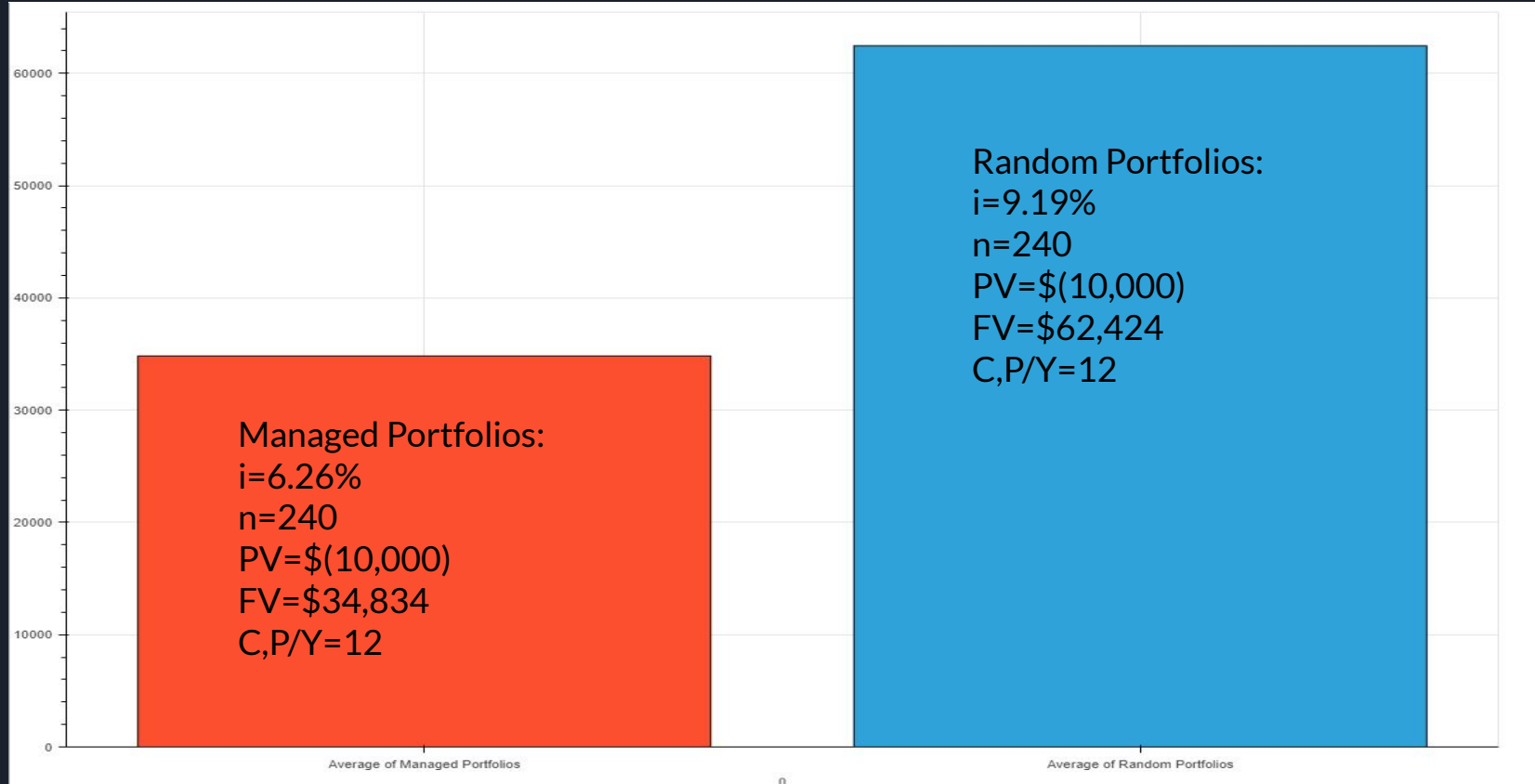
Ten randomly-selected Stocks



Fifteen randomly-selected Stocks



Averages Compared





Factors affecting results

- Random portfolios don't have to follow a specific investment-policy
- No marketing/distribution factors
- Ability to pick smaller companies



Conclusion -- Pay yourself instead!

When we look at the investment returns over a 20-year-period, the majority of professionally-managed funds wouldn't even outperform the blindfolded Monkeys even if they *weren't* seeking to profit from their investors holdings.

What would be the *value* gained when paying over 100% of your initial investment 20 years ago to Wall Street when you would be more likely to realize even better investment performance by selecting a few dozen stocks at random, and splitting your investment dollars evenly among them?