

Statistic study of historical performance of Mutual funds

PY 538 Econophysics

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“Compound Interest” is the Eighth Wonder of the World”

---- Albert Einstein

Outline

- Background
- How the power law works in the growth of wealth?
- Secret: cumulative compound interest
- Mutual funds and the performance of auto-investment plan (AIP)
- Summary

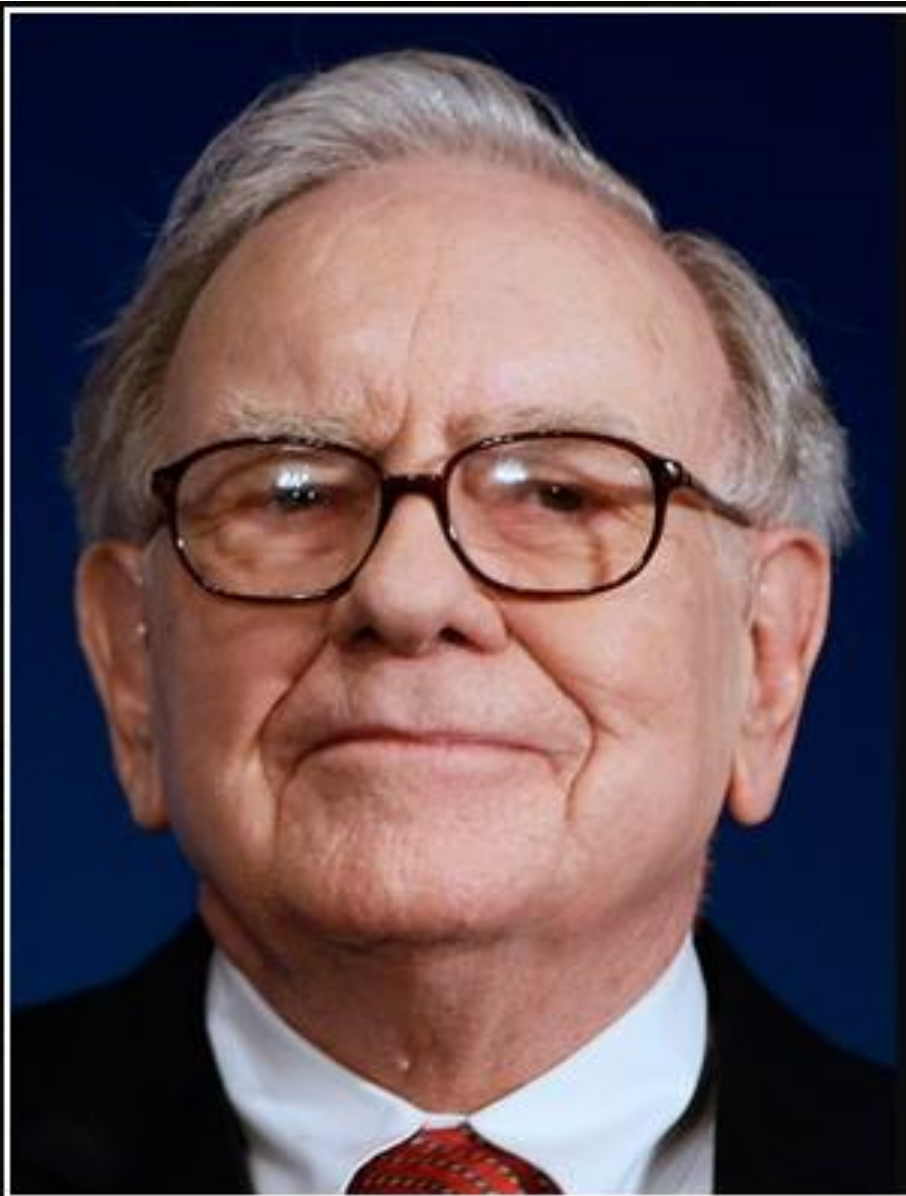
Background

- Short-term stock price is like Brownian motion, in which $\bar{W} = 0$;
- Long-term stock price is affected by the black swan events.

The market turns after a series of independent events!

How can personal investor benefit from it?





Life is like a snowball. The important thing is finding wet snow and a really long hill.

— *Warren Buffett* —

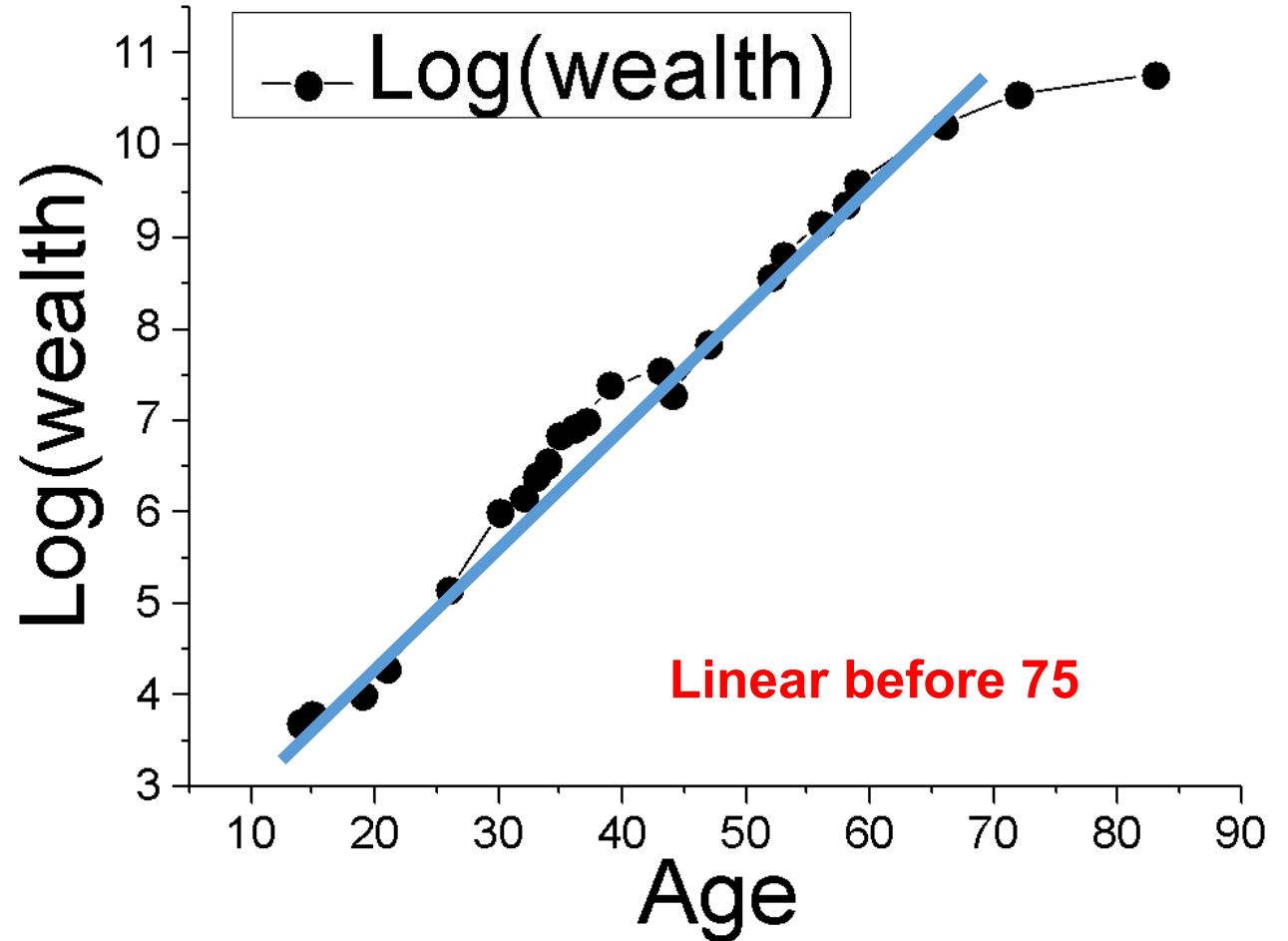
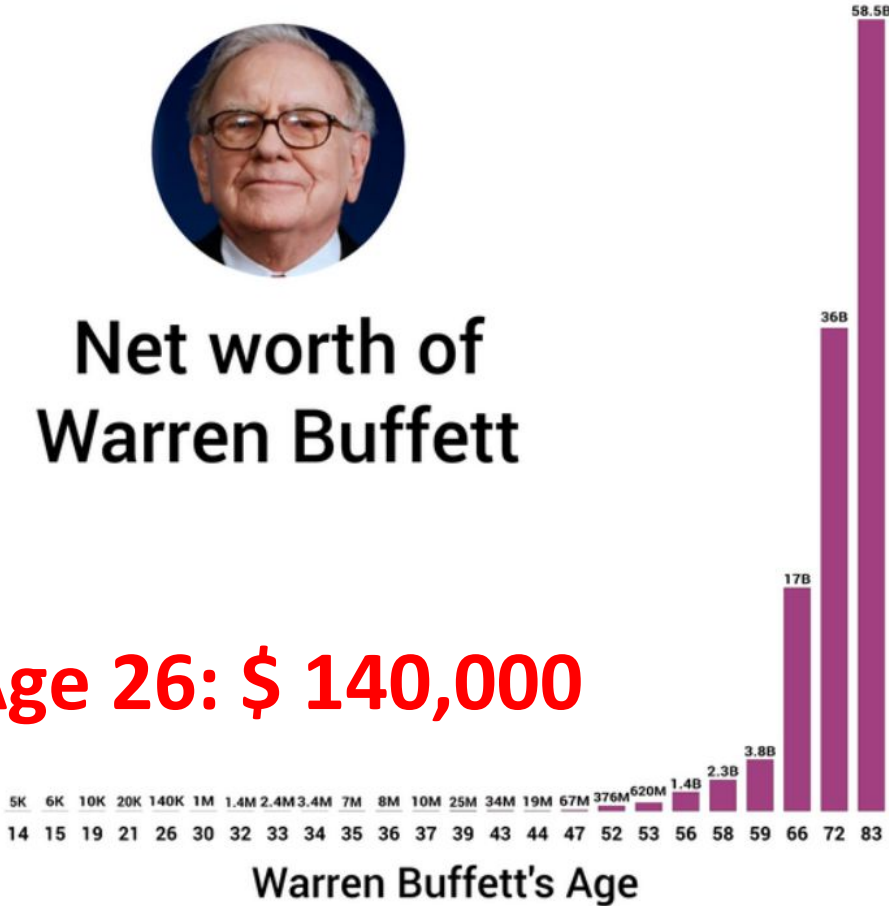
AZ QUOTES

Age – log (wealth) function



Net worth of
Warren Buffett

Age 26: \$ 140,000



<https://www.marketwatch.com/story/from-6000-to-67-billion-warren-buffetts-wealth-through-the-ages-2015-08-17>

What is the secret?

- The magic of the compound interest!!
- Power law!

Cumulative return in 30 years:

Compound return equation:

$$[(a + x) \cdot 1.0013 + x] \cdot 1.0013 + x \dots + x] \cdot 1.0013$$

“a” is the initial investment

“X” is the periodic contribution.

Input YEARLY interest

Decimal Points

Daily Rate :: 0.019 %

Weekly Rate :: 0.130 %

Monthly Rate :: 0.565 %

Quarterly Rate :: 1.706 %

http://www.datedial.com/datEquivalent_Interest_Rate.asp

1561

The magic of the compound interest

Step 1: Initial Investment

* Amount of money that you have available to invest initially. ▶

\$2,000

Step 2: Contribute

Amount that you plan to add to the principal every month. ▶

\$3,000

* Length of time, in years, that you plan to save. ▶

30

Step 3: Interest Rate

* Your estimated annual interest rate. ▶

7%

Range of interest rates (above and below the rate set above) that you desire to see results for. ▶

Step 4: Compound It

* Times per year that interest will be compounded. ▶

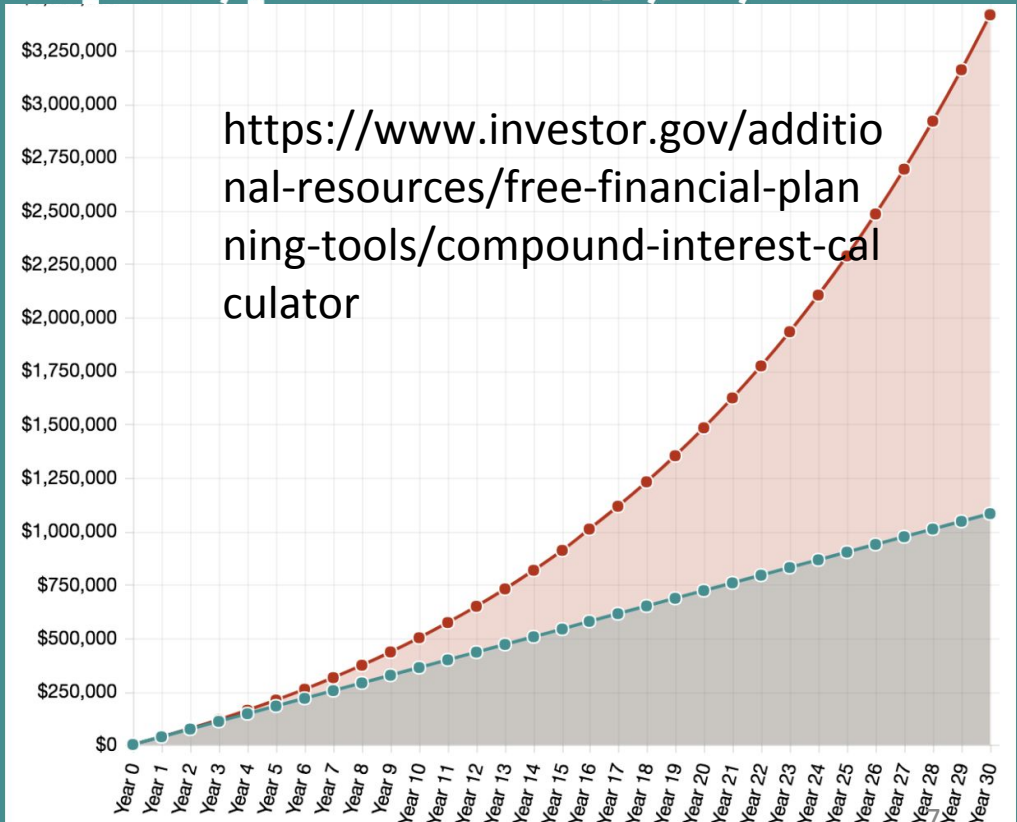
ANNUALLY ▼

CALCULATE

RESET

The Results Are In

In 30 years, you will have \$3,415,812.82



Compound interest growth for personal investor

- How can individual investor take the advantage of compound growth?

Suggestions:

- Minimize the impact of **loss**, **broker fee** and **Tax!**
- Accumulate the base (or “snow ball”), invest long enough
- **Mutual funds!**

What is mutual funds? Why?

- A **mutual fund** is an investment vehicle made up of a pool of moneys collected from many investors for the purpose of investing in securities such as stocks, bonds, money market instruments and other assets.
- The first modern-day mutual fund, **Massachusetts Investors Trust**, was created on March 21, 1924.

Advantage	Disadvantage
Passive investment	Positive return after a long while
Small initial amount	Less volatility
Extra money: like sands dribbling out of your grasp	Not so profitable and exciting as a stock
Less broker fee	

Selection criteria and results

Ratings and total assets through month-end. YTD through previous close.

<u>Search Criteria Review</u>			
-	<u>Manager Tenure</u>	- <u>greater than or equal to</u>	- <u>10 years</u>
--	<u>Minimum Initial Purchase</u>	- <u>less than or equal to</u>	- <u>\$ 500</u>
--	<u>No-load funds only</u>		
--	<u>Expense Ratio</u>	- <u>less than or equal to</u>	- <u>1.00 %</u>
--	<u>YTD Return</u>	- <u>greater than or equal to</u>	- <u>7 %</u>
--	<u>1-year Return</u>	- <u>greater than or equal to</u>	- <u>7 %</u>
--	<u>3-year Return</u>	- <u>greater than or equal to</u>	- <u>7 %</u>
--	<u>5-year Return</u>	- <u>greater than or equal to</u>	- <u>7 %</u>
--	<u>10-year Return</u>	- <u>greater than or equal to</u>	- <u>7 %</u>
--	<u>Turnover Ratio</u>	- <u>less than or equal to</u>	- <u>25 %</u>

U.S. equity

Oppenheimer global opportunities: OPGIX

Change Criteria
Results of Search
New Search | Analyst Insights | Instructions

View: Snapshot Results: 1-1 of 1 Previous 25 | Next 25

Check boxes to: [Test in a Portfolio](#) | [Add to my Portfolio](#) Score These Results

▲ Fund Name	Morningstar Category	Morningstar Rating	YTD Return (%)	Expense Ratio (%)	Total Assets (\$ mil)
<input type="checkbox"/> Oppenheimer Global Opport	World Small/Mid Sto	★★★★★	9.72	0.91	8,986
All Funds Avg			0.96	1.07	2,434
S&P 500					

Check boxes to: [Test in a Portfolio](#) | [Add to my Portfolio](#) Score These Results

View: Snapshot Results: 1-1 of 1 Previous 25 | Next 25

Historical performance (01/01/2003 - current)



Without restoration!!!

Historical performance (01/01/2003 - current)

800% 



Summary and next plan

- Compound interest is the most important secret of wealth growth.
- Auto investment in mutual funds is a smart way to accumulate compound interest.
- Further investigations would be conducted on not only equity funds but also bond funds and etc.
- Optimize a portfolio of mutual funds which be more robust under severe market volatility.

Thanks !!!