

The Financial Facts of Life

(Welch, Chapter 07-A)

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Maintained Assumptions

Perfect Markets

1. No differences in opinion.
2. No taxes.
3. No transaction costs.
4. No big sellers/buyers—infininitely many clones that can buy or sell.

plus unequal RoRs and uncertainty.

Add **risk aversion**.

A “Tour” of Asset Pricing

... for Corporate Finance.”

We need to cover:

1. Basic historical return patterns.
2. What risk aversion does.
3. How to measure risk and reward.
4. Benchmarks
5. The CAPCM formula and its inputs.
6. How to use the CAPCM.

Important Corp Fin Questions

Where does the discount rate $E(r)$ in the NPV formula come from?

What makes investors want to give us money?

Advice: A full investments course can help you understand the reasoning of your counterpart.

Asset Classes

We often use convenient large diversified portfolios to represent a swath of investment types—though inaccurately so, such as:

- ▶ Stocks: Large-firm stocks, Small-firm stocks, Foreign stocks, Value stocks, ...
- ▶ Bonds: Long-term bonds, Risky bonds, Foreign bonds, Mortgage bonds, ...

More Asset Classes

- ▶ Short-Term: Cash, Foreign Currency, Short-term bonds, ...
- ▶ Real Estate: Commercial, Retail, West-Coast, Russian, ...
- ▶ Art: Paintings, Renaissance sculpture, Rare Books, ...
- ▶ Commodities: Eggs, Bacon, Crude, ... Precious Metals: Gold, Silver, Platinum, ... Agricultural: Land, Grain, ...

The S&P500 (with Dividends), 1970-2019

	<u>Year</u>			
Decade	0	1	2	3
2nd Part	5	6	7	8
1970	3.5%	14.1%	18.7%	-14.5%
1975	36.9%	23.6%	-7.2%	6.4%
1980	31.5%	-4.8%	20.4%	22.3%
1985	31.1%	18.5%	5.7%	16.3%
1990	-3.1%	30.0%	7.4%	9.9%
1995	37.1%	22.7%	33.1%	28.3%
2000	-9.0%	-11.9%	-22.0%	28.4%
2005	4.8%	15.6%	5.5%	-36.6%
2010	14.8%	2.1%	16.0%	32.5%
2015	1.5%	9.5%	19.2%	-6.0%

Graph: Time-Series, 1990-2015

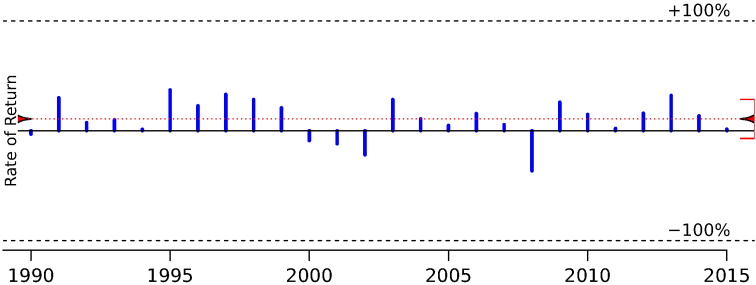


Figure 1: stock returns

Graph: Histogram, 1990-2015

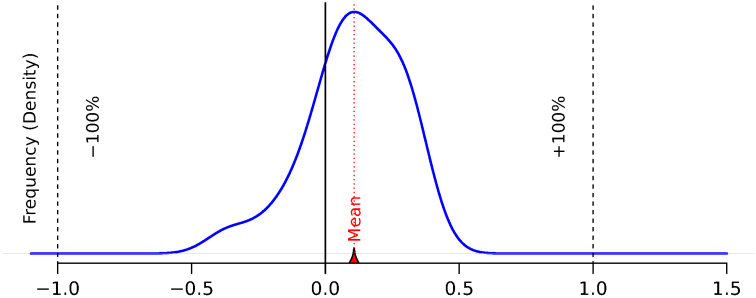


Figure 2: stock returns

Long-Run Rate of Return

Average Rate of Return = 10.7% per year.

Annualized = 9.2% per year.

Standard Deviation = 12.6% per year.

(From 2016-2019: 12.8% per year)

Buy-and-Hold vs Average?

Is the *average* RoR on an investment a good representation of the long-run RoR that a buy-and-hold investor receives?

Average Rates of Return

Compare two assets, A and B. They had equal average RoRs. However, A had a higher standard deviation than B.

You are not risk-averse but risk-neutral.

Would both investment have earned you the same?

Buy-and-Hold vs Avg

Is it possible to lose all your money on a buy-and-hold portfolio that had a positive average RoR?

Graph: Compound, 1990-2015

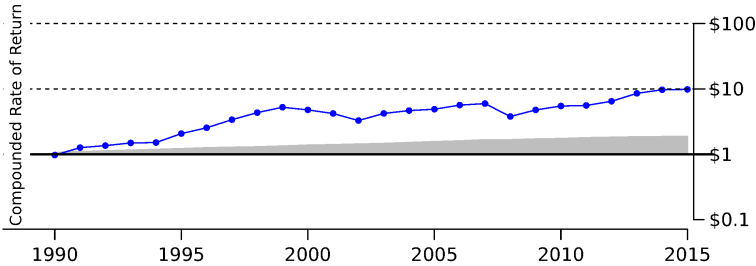


Figure 3: stock returns

Stocks End Result

\$1 in Jan 1990 became \approx \$10 in Dec 2015 (and \$15.70 in Dec 2019).

- ▶ (Accuracy is useless, because different market portfolios have different returns.)

\$1 \rightarrow \$9.82

Geo: $\sqrt[16]{9.82/1} - 1 = 9.2\%/yr.$

Ari: 10.7%/yr.

SD=18%/yr.

Graph: Stocks Time-Series

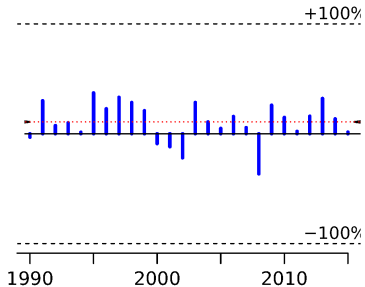


Figure 4: stock returns

Graph: Stocks Histogram

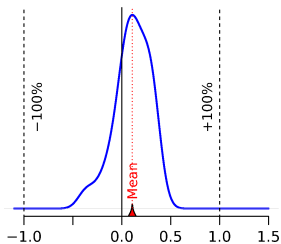


Figure 5: stock returns

Graph: Stocks Compound

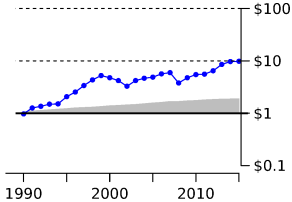


Figure 6: stock returns

Graph: T-Bonds Time-Series

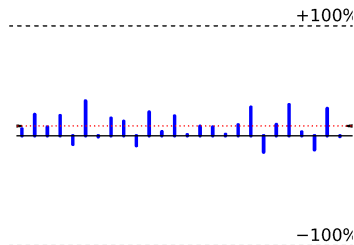


Figure 7: bond returns

\$1 \rightarrow \$7.64 (in 2015)

Geo: %/yr.

Ari: 8.1%/yr.

SD=13%/yr.

Graph: T-Bonds Histogram

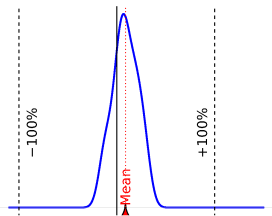


Figure 8: bond returns

Graph: T-Bonds Compound

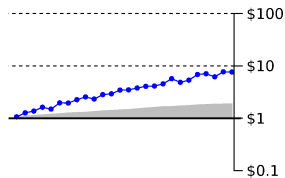


Figure 9: bond returns

Graph: Cash (Money-Market)

\$1 \rightarrow \$2.14

Geo: 2.9%/yr.

Ari: 3.0%/yr.

SD=2.4%/yr.

Graph: Cash Time-Series

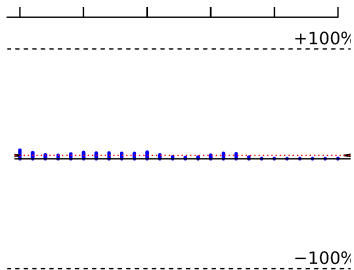


Figure 10: cash returns

Graph: Cash Histogram

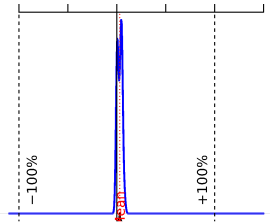


Figure 11: cash returns

Graph: Cash Compound

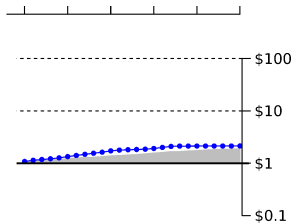


Figure 12: cash returns

One Stock, UAL

\$1 \rightarrow \$0

Geo: $-100\%/yr.$

Ari: $-9.4\%/yr.$

SD= $8\%/yr.$

Graph: UAL Time-Series

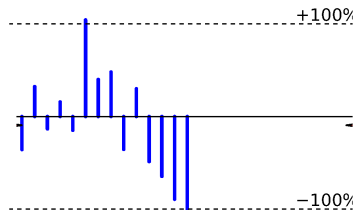


Figure 13: UAL returns

Graph: UAL Histogram

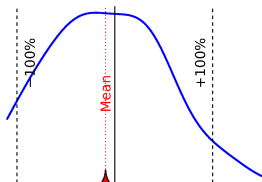


Figure 14: UAL returns

Graph: UAL Compound

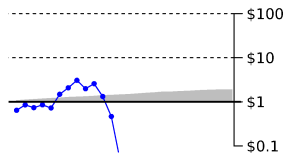


Figure 15: UAL returns

Graph: INTC Timeseries

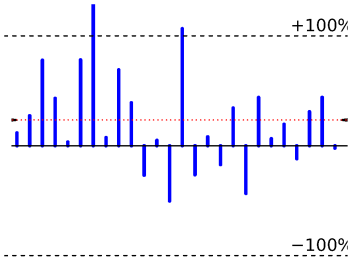


Figure 16: Intel Corp

Graph: INTC Histogram

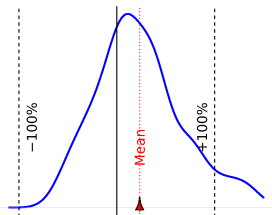


Figure 17: Intel Corp

Graph: INTC Compound

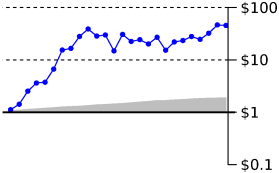


Figure 18: Intel Corp

One Stock, INTC

\$1 → \$45

Geo: %/yr.

Ari: 23%/yr.

SD=18%/yr.

Asset Classes

Which of these asset classes (and stocks) generally offer higher average RoRs?

Asset Class Risk

Which of these asset classes (and stocks) were riskier?

Asset Class Risk

Could you have lost your shirt?

Asset Class Risk-Return

Is there a risk-return relationship?

Positive Avg RoR

Do assets with a positive average RoR always make you money?

Correlation and (Market-) Beta

Graph: S&P500

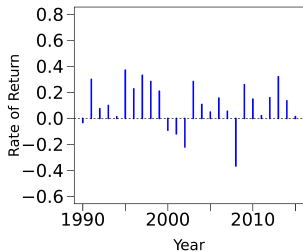


Figure 19: 3 Stocks-sp

Graph: INTC

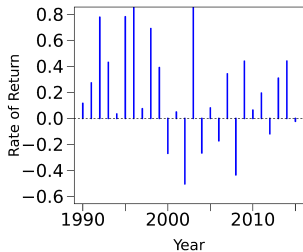


Figure 20: 3-Stocks Intel

Graph: INTC vs S&P500

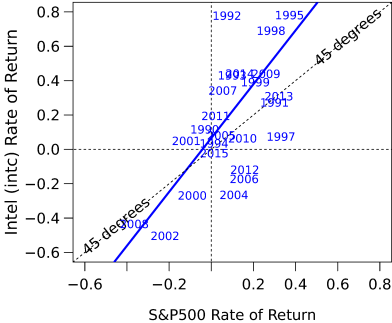


Figure 21: 3 Stocks-xy

Stock Co-Movement

Do stocks move together? Intuitively, can we exploit any non-synchronicity?

Why Multiple Stocks?

Is there anything special to multiple-stock investments?

History?

Can you trust history?

History vs Future — AGAIN

Finance has a lot of data

- ▶ big advantage over other economic fields,
- ▶ ... but maybe not representative!

Physics vs History

Statisticians use historical distribution (means, SDs., etc.) to stand in for future distribution.

- ▶ If we knew the physics of ball drawing, we would not need history.
- ▶ We could work out the expected risk and reward from physics; maybe check it w/ history.
- ▶ We do *not* know the underlying physics of financial investments, so we try to infer it from historical data.

Historical Data Problems

Historical data is helpful—but it can also mislead if it is not used carefully.

- ▶ Correlations and variances are “stable” (“reliable”), esp. with much daily data.
- ▶ Average RoRs are unstable for anything except asset classes. . . and even those are not very stable.
- ▶ Tail risk is very difficult to estimate.

Historical Data Alternative?

The only reason why we use historical data is because the alternative is *no* data

and this would be *WAY* worse.

Geometric and Arithmetic RoRs

Can you translate geometric to arithmetic returns and vice-versa?

- ▶ Only approximately, YMMV.
- ▶ **If** RoRs are approximately normally distributed, then the ari mean is higher than the geo mean by about half the variance.
- ▶ Stocks here: $10.7\% - 18\%^2/2 \approx 9.1\%$.
- ▶ Correct $\approx 9.2\%$. (great approx here!)
- ▶ But terrible for, e.g., UAL.

Subtle But Not Obscure

There are some not-so-obscure issues how to think about historical RoRs for predicting future geometric and arithmetic RoRs.

They are explained in the book. This is often neglected and is a tricky statistical problem.

Causality vs Correlation

Does correlation mean causation?

One of the most important questions in finance, economic, and business.

Everyone knows but most consulting reports get this *deliberately* wrong.

Regression Discontinuity is unusually good at causality with empirical evidence—but not all questions can be addressed by it.

Market Institutions — See Book

Brokers: Retail vs Prime Brokers

- ▶ (Execution and Margin.)

Market vs Limit orders.

Various order modifications: Fill-or-kill, Good for the day, etc.

Exchanges and non-Exchanges. Mostly computerized, batched auction or continuous, electronic crossing.

OTC. (Pink sheets.)

Market Makers and Regulation

Regulation: Congress, SEC, Exchanges(?!).

Seeing the order book is huge advantage.

Mutual Funds (more funds than stocks today!)

Open-end vs Closed-end funds.

SEC vs Non-SEC

Investment companies under the 1940 Act: UITs, open-end=mutual fund in the US, closed-end.

Many other investment vehicles, e.g., hedge funds, private equity funds, venture capital funds, ADRs, trust funds, etc.

Trust accounts (and churning).

Market Entry and Exit

Entry of corporate securities into the financial markets: IPOs, underwriters, reverse mergers, SEOs.

Exit of corporate funds from the financial markets: Dividends, repurchases, delisting, limited liability, financial distress.

Coming Attractions

Don't miss the **eggulibrium!**