Luck

And the United States Equity Premium

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1 Luck

Outcomes of many events are uncertain.

Ex-post winners: successful traders, richest individuals, etc.

How much was due to skill (ex-ante) or luck (ex-post)?

In stock markets, focus on the *ex-post* winner: the United States.

Many other countries, far worse outcomes.

If *random* outcomes, one country will look good by chance.

Were US investors simply lucky?

> I argue *yes:*
>
> *US out-performance can be explained wholly by luck.*
>
> *There is no "Equity Premium Puzzle" in US stocks*
>
> *Long-run stock returns are consistent with a zero equity premium*

Some perspective first:

Global equity markets in the 20th Century, 1930 to 1995

Argentina, Chile, Columbia, Venezuela, Mexico, Peru, Austria, Belgium, Germany, Denmark, France, Finland, Italy, Netherlands, Norway, Portugal, Spain, Switzerland, Sweden, USA, South Africa, UK, Canada, Ireland, New Zealand, India, Egypt, Israel, Japan, Lebanon

Real index values, in excess of inflation.

(Thanks to William Goetzmann, Yale School of Management)

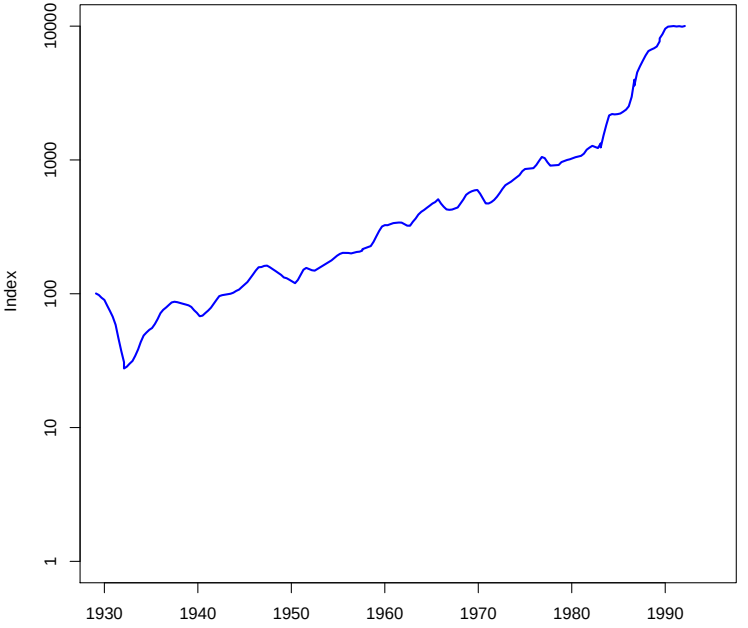

Figure 1: **The United States**

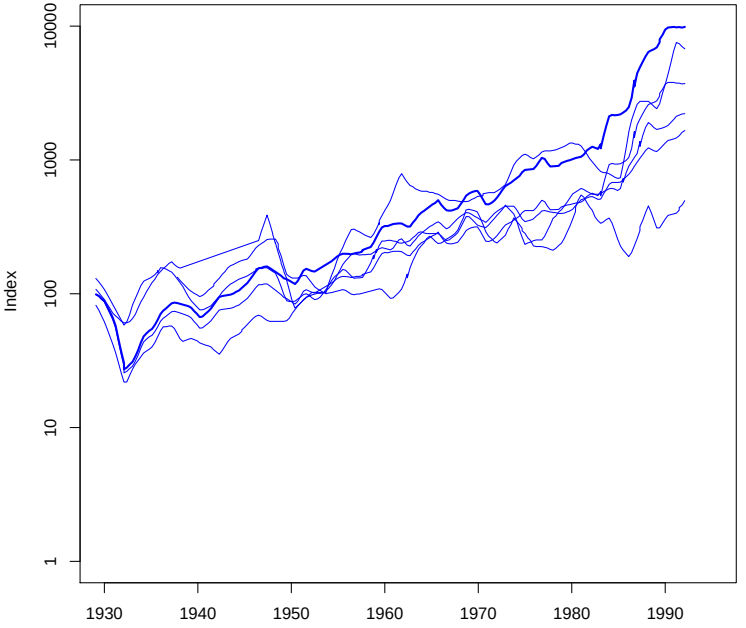

Figure 2: **The British Colonies**

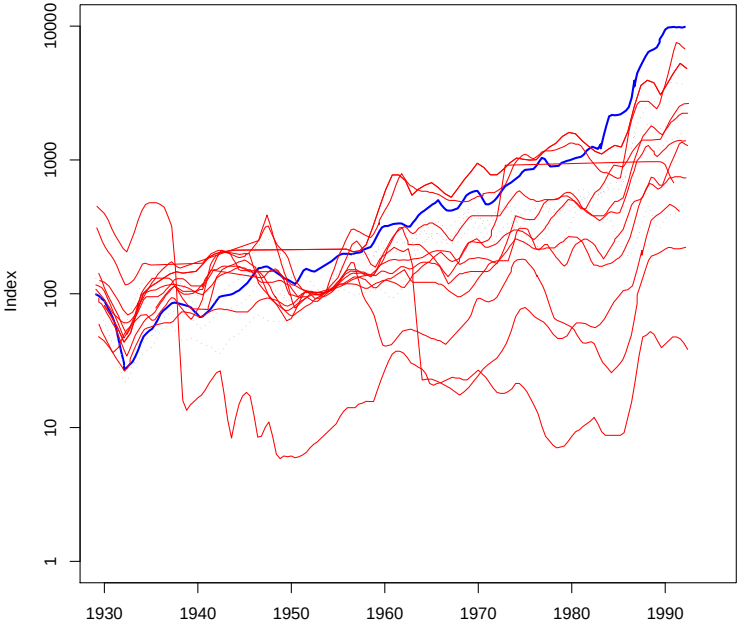

Figure 3: **Mainland Europe**

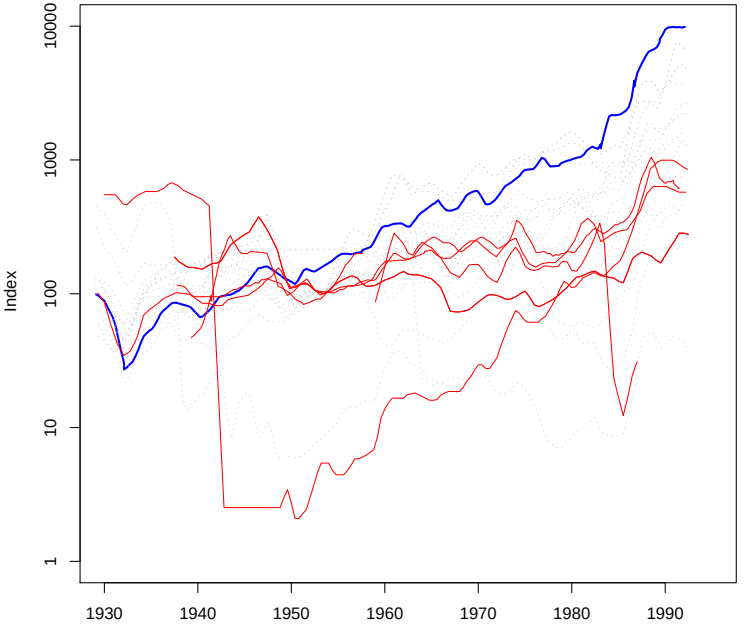

Figure 4: **East Asia and the Middle East**

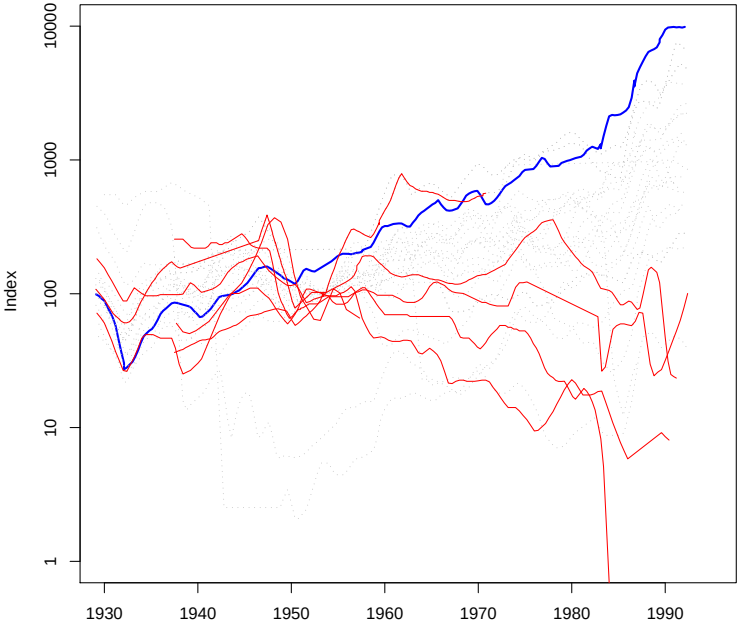

Figure 5: **South America**

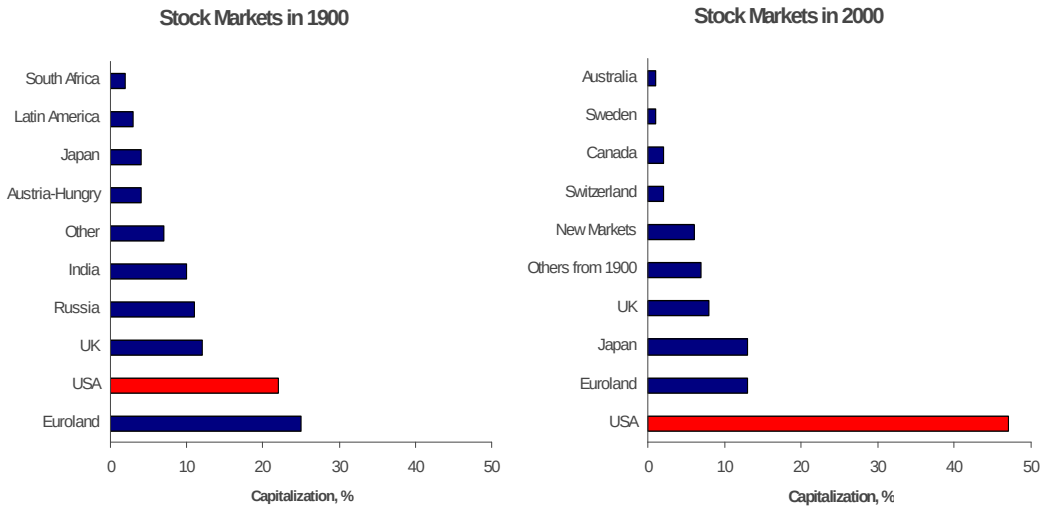

Figure 6: **Market Capitalization**, % of World Market (Dimson, Marsh & Staunton, 2002)

The US is the *ex-post* winner.

US real-return: $\sim$ 5-7% pa. Global real-return : $\sim$ 0-1% pa.

It wasn't clear to investors in 1900s that US would win financially.
– Russia and Argentina were the growth stocks.
– British Empire seemed unshakable.

But: WW1, WW2, Communism, Cold War, Major Financial Crises.
Many countries suffered great, unexpected ordeals.

Examples: Russia and China, -100% return on investment, 1900 to 2000.

Ex-ante vs Ex-post? Big difference, lots of noise.

2 US Equity Premium Puzzle

The US ex-post equity premium is **too** large: the *equity premium puzzle*. Historical returns justified only with extremely high risk-aversion ($\gamma > 50$).

Puzzle arises in the Hansen-Jagannathan bound,

$$\frac{|ER_t - R_f|}{\sigma(R_t)} \leq \frac{\sigma(m_t)}{E(m_t)}.$$

Many solutions tweak utility specification on RHS, "Habit Formations".

What about the LHS:
Perhaps *ex-ante* equity premium in the US may might be much lower than the *ex-post* premium.

A sufficiently small ex-ante premium automatically resolves the puzzle.

3 Self-Selection Bias in US premium

The EPP literature is studying the most successful financial market ever. We should *expect the best to appear* exceptional. It is not representative.

Akin to picking Berkshire Hathway as a representative stock.
(20% return, 30 years). Self-selects to be studied.

Easily modelled as self-selection problem. Observe and analyze the largest values only. The consequence is positively biased estimates.

Statistically, let $\overline{R}_1$ be the US 20th century average excess-return.

$$\underbrace{E[R_1|R_1 = \max(R_1, R_2, ..., R_N)]}_{expected\ \ ex-post} > \underbrace{E(R_1)}_{ex-ante}.$$

Self-selection bias equals the difference in the two terms.

4 The Model

I estimate the self-selection bias in US equity premium estimates.

Use the *simplest* possible model. N countries, each country is *ex-ante* identical. Ex-post premia are drawn by

$$R_i \sim \mathcal{N}(\mu, \sigma^2)$$

All countries have same mean, variance, positively correlated.

Model parameters set to global averages in sample. $N = 40$ countries, $T = 50$ years (average), $\sigma^2 = 30\%$ (average)

I assume $\mu = 0$, a zero ex-ante equity premium. Pessimistic assumption, close to 20th century global average.

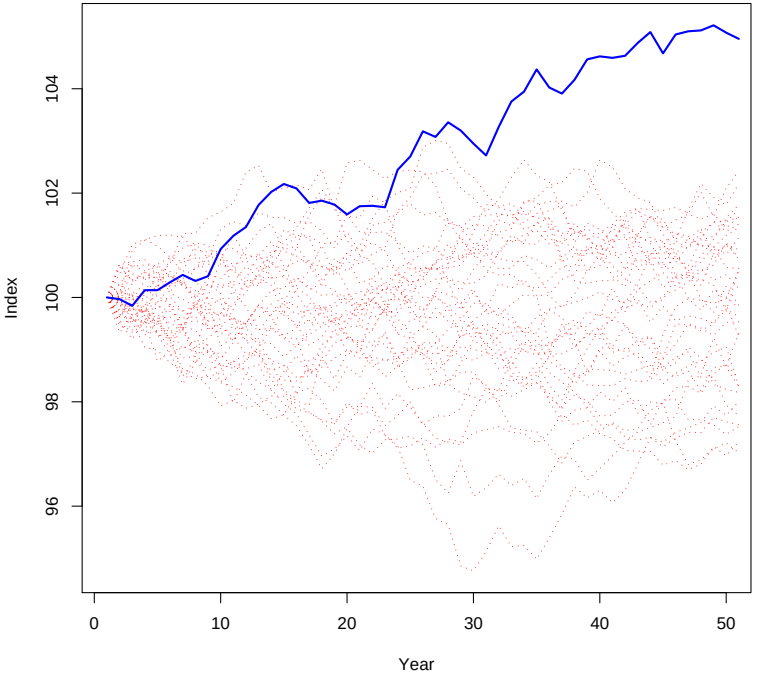

Figure 7: Model simulation, uncorrelated returns, *blue:* ex-post winner.

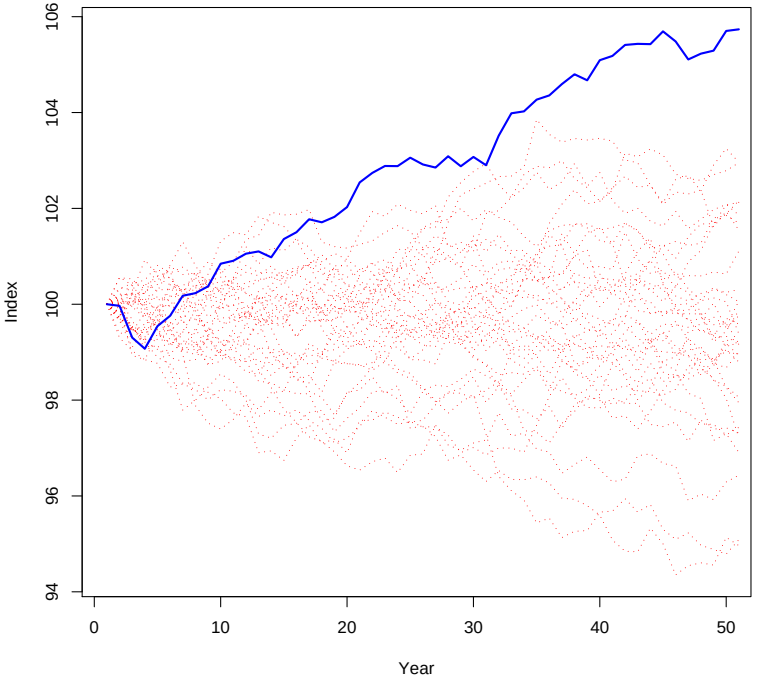

Figure 8: Model simulation, uncorrelated returns, *blue:* ex-post winner.

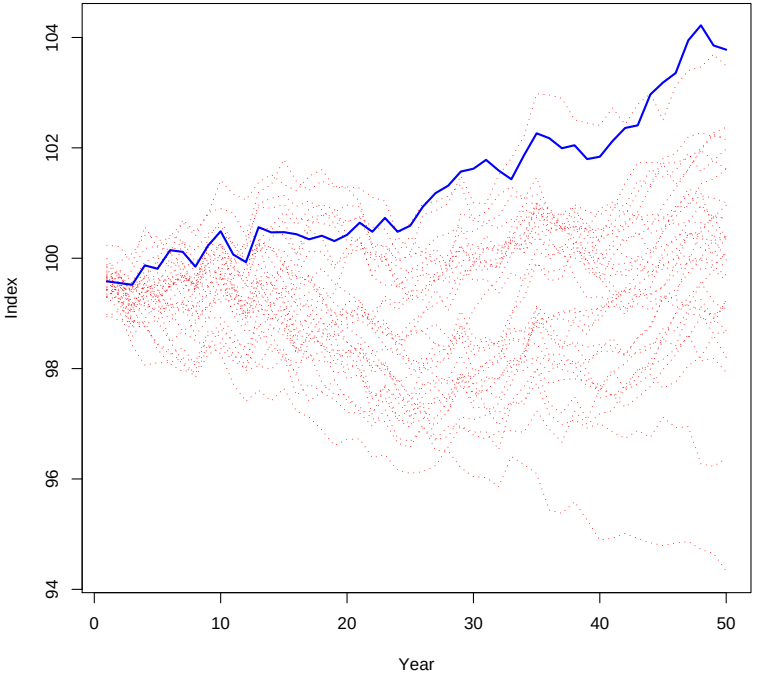

Figure 9: Model simulation, correlated returns $\rho = 0.4$, *blue:* ex-post winner.

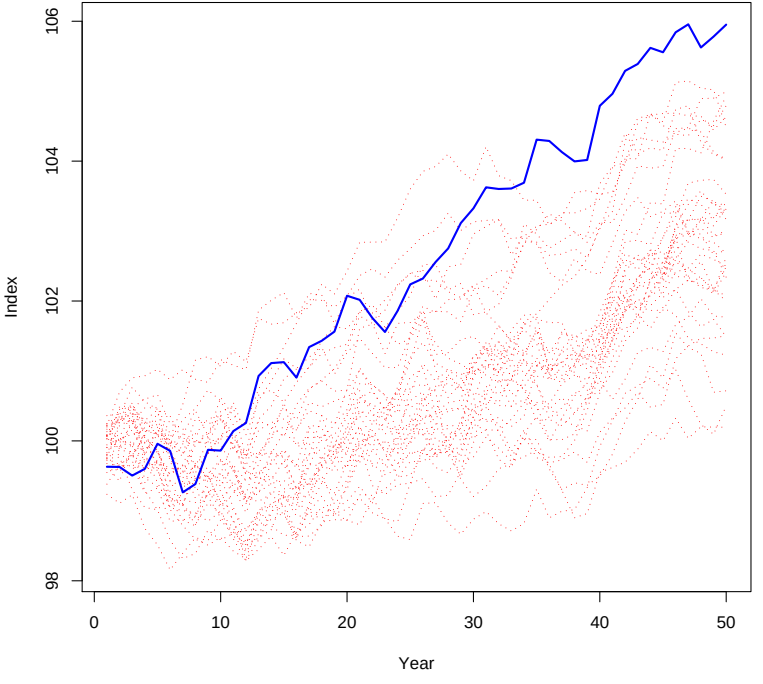

Figure 10: Model simulation, correlated returns $\rho = 0.4$, *blue:* ex-post win-

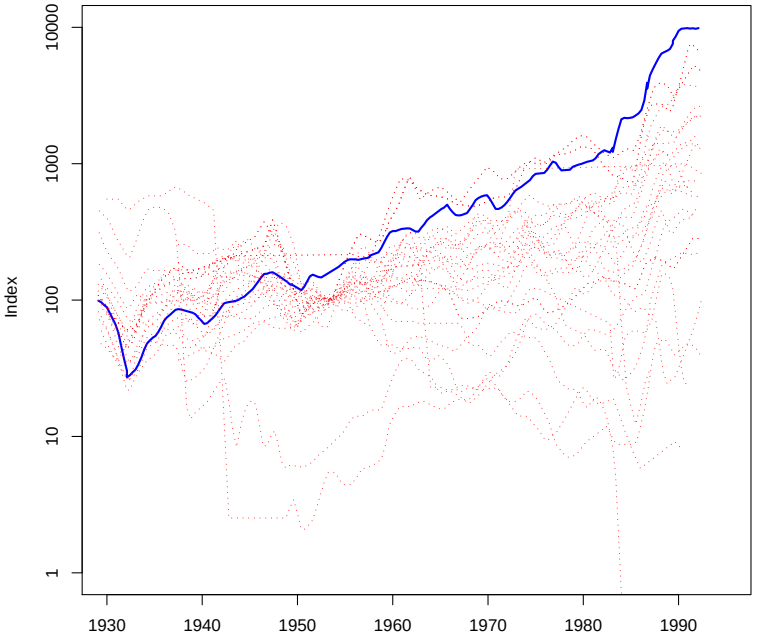

Figure 11: Actual 20th Century Equity performance, *blue:* USA

5 Tests of the Model

The model has four simple tests:

1. Does it predict the US ex-post premium and Sharpe ratio?
2. Does it predict the distribution of Global ex-post premia?
3. Does it predict the distribution of Global ex-post Sharpe ratios?
4. Does it predict the distribution of Global market capitalizations?

6 Results – US Premia

The model predicts the winner's ex-post premium of

$$E\overline{R}_1 = \frac{\sigma}{\sqrt{T}} \mathcal{Q} N \left(\frac{N - \alpha}{N - 2\alpha + 1} \right)$$

The expected winner's ex-post premium is **6.1%,** and the expected Sharpe ratio is **32%**

The historical US premium is **6.2**%, and Sharpe ratio is **37%** (Shiller, 2008).

There is no statistical difference between the US results and the predicted result.

Conclusion:
All of the US's superior performance can be explained by winner bias.

Results – Global Premia

The model predicts the cross-sectional distribution of global equity premia as

$$\overline{R} \sim \mathcal{N}(0, \frac{\sigma^2}{T})$$

It correctly predicts ex-post premia for the worst country (Greece) and best (USA).

The empirical distribution of world premia is statistically indistinguishable from the model prediction. A Wilcoxon test was applied, p-value = 43%

Conclusion:
All of the (ex-post) variation in countries performance can be explained by the simple model.

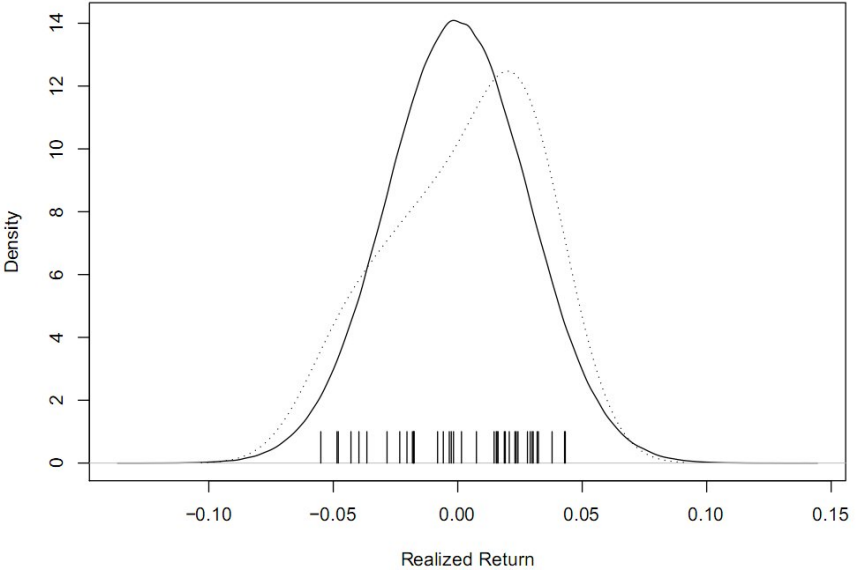

Figure 12: Distribution of Countries' ex-post equity premia (broken line). Average close to zero. Distribution predicted by model drawn in black. Statistically indistinguishable.

Results – Global Market Capitalizations

The model predicts that global capitalizations are log-normally distributed with

$$\mu_X = -\log(N) - \frac{T\sigma^2}{2} + \frac{T\sigma_X^2}{2}, \quad \sigma_X = \log\left[\frac{e^{\sigma^2 T^2} - 1}{N} + 1\right]$$

The expected maximum market capitalization with 40 markets is **29%**. The current US market capitalization is **30%**.

The distribution of predicted market capitalizations matches actual capitalizations of the top 40 countries. A Wilcoxon test passes with p =18.4%

Conclusion:
Variation in market values can also be explained by the simple model.

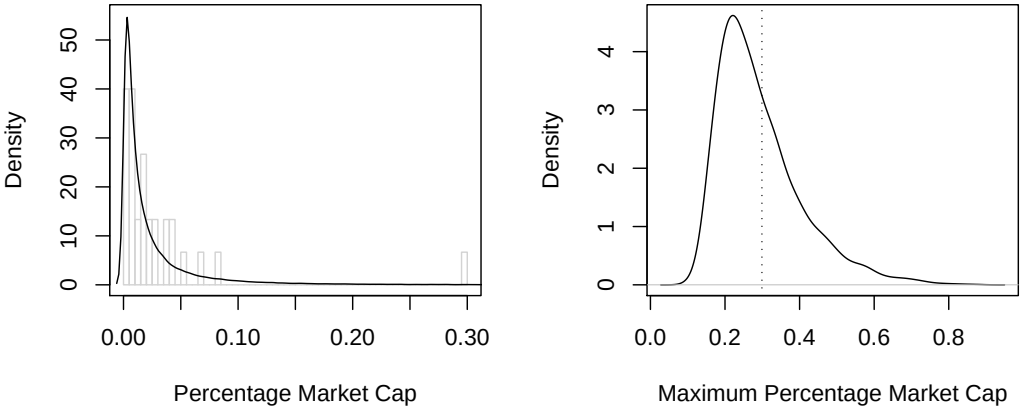

Figure 13: Distribution of predicted market capitalizations (*left*) and actual capitalizations. Distribution of maximum predicted capitalization and the current US value.

7 The Future Equity Premium

Paper shows that the historical US equity premium is a positively biased estimator of ex-ante equity premium due to winner bias.

US investors should expect future observed premium to be lower, equal to the ex-ante ("regress to the mean", Galton).

So what is the actual ex-ante premium? Paper shows that the US (and global) returns are *consistent* with ex-ante premium of 0.

Pessimistic? Best prediction: use consumption asset pricing result

$$E(R_t - R_f) = -\rho(r_t, m_t)\sigma(R_t)\frac{\sigma(m_t)}{E(m_t)} \approx 1\%$$

8 Future Stock Market Winners

Even if ex-ante premium is 0%, we still expect some countries to have much higher ex-post realizations.

The more volatile the country, the larger are ex-post outcomes.

Unlikely that the US will remain 21st century winner. In the simple model, has $1/N$ chance, or ~2%.

The riskiest markets have the highest chance of claiming the title.
Candidates: Brazil, Russia, India and China?

Best strategy under these conditions then is:
diversify across different countries, different instruments.

9 Conclusion

- Have tested the hypothesis: US high ex-post premium due to luck.
- The US 5-7% historical premium consistent with self-selection bias.
- Constructed the simplest possible model, ex-ante identical countries.
- Simple model explains quite a lot:
  - US ex-post premium and Sharpe ratio
  - Distribution of ex-post premia and SR for 40 countries
  - Distribution of market capitalizations across 40 countries.
- Provides the simplest possible solution to the equity premium.

Thank You! Now time for Questions.

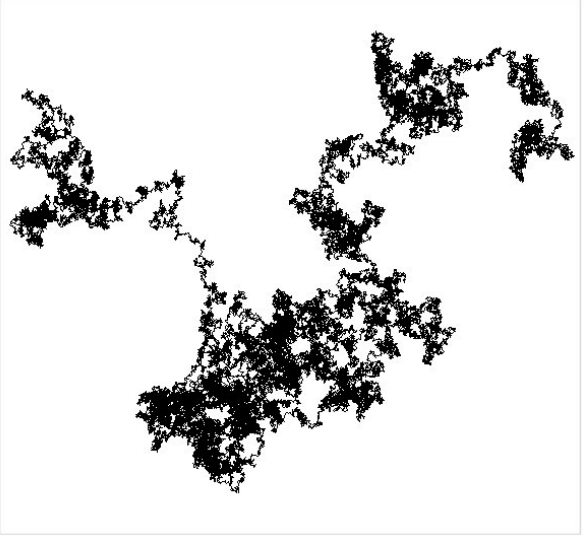

Figure 14: *A Brownian Motion.* If only financial markets behaved this nicely.