How the Wealth Was Won: Factor Shares as Market Fundamentals, by Greenwald, Lettau and Ludvigson

Discussant: Annette Vissing-Jorgensen, University of California Berkeley

Objective: Explain movements in stock market level (not returns)

Clearly an important exercise:

- Stock market runup is tightly linked to the increase in wealth inequality
- Result should affect our equity premium estimate going forward
  - Essential for optimal portfolio choice and cost of capital

Main results:

- Increased profit share has been a key driver of a large market increase
- A lot (3%) of realized excess return since 1952 is not a risk premium but instead due to surprisingly good news about future outlook for shareholders
Some multiples to convey the main idea

**Market equity**

\[
\frac{\text{Market equity}}{\text{GDP}} \times \text{GDP} = \frac{\text{Market equity}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP}
\]

\[
= \frac{\text{Market equity}}{\text{Corp profits}} \times \frac{\text{Corp profits}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP}
\]

**Start from the right:** Market equity depends on

- Size of the economy, GDP
- Size of corporate sector in GDP, \(\frac{\text{Corp Net Value Added}}{\text{GDP}}\)
- Fraction of corporate output that goes to shareholders, \(\frac{\text{Corp profits}}{\text{Corp Net Value Added}}\)
- Shareholders willingness to pay for profits, \(\frac{\text{Market equity}}{\text{Corp profits}}\)
Market equity

\[ \frac{\text{Market equity}}{\text{GDP}} \times \text{GDP} \]

\[ = \frac{\text{Market equity}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP} \]

\[ = \frac{\text{Market equity}}{\text{Corp profits}} \times \frac{\text{Corp profits}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP} \]

Figure 1: Stock Market Ratios

- Strong increase in \( \frac{\text{Market equity}}{\text{Corp Net Value Added}} \)
- Smaller increase in \( \frac{\text{Market equity}}{\text{Corp profits}} \)
- Why? \( \frac{\text{Corp profits}}{\text{Corp Net Value Added}} \) has gone up (not in graph)
COMMENT 1. Study **ENTERPRISE VALUE** instead of **EQUITY VALUE**

\[
1 = \frac{\text{Labor compensation}}{\text{Corp Net Val Added}} + \left[ \frac{\text{Corp profits}}{\text{Corp Net Val Added}} + \frac{\text{Interest}}{\text{Corp Net Val Added}} \right] + \frac{\text{Taxes}}{\text{Corp Net Val Added}}
\]

**Paper:** Studies effect of profit share on equity value

- **Mechanically affected by capital structure** (e.g. Berk and DeMarzo, section 14.4)
- **Less debt --> Higher** \(\frac{\text{Corp profits}}{\text{Corp Net Value Added}}\) and higher \(\frac{\text{Market equity}}{\text{Corp profits}}\) (and P/E)
- **In the data, Interest/(Corp Net Value Added) does actually vary a lot over time**
Corporate finance: Studies enterprise value -- not affected by capital structure

- Lines up better with model, which is about total payout to investors (has no debt)

- **Enterprise value**
  \[
  \frac{\text{Enterprise value}}{\text{Corp Net Value Added}} = \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \frac{\text{Corp profits+Interest}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP}
  \]

- Decomposition results will differ somewhat, mainly before 1989 due to 5 pct point increase in interest share.
COMMENT 2. PROFIT SHARE: Quantify direct and indirect effects on market value

**Market equity**

$$\text{Market equity} = \frac{\text{Market equity}}{\text{Corp profits}} \times \frac{\text{Corp profits}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP}$$

$$\text{Market equity} = \frac{\text{Market equity}}{\text{Payout to equity}} \times \frac{\text{Payout to equity}}{\text{Corp profits}} \times \frac{\text{Corp profits}}{\text{Corp Net Value Added}} \times \frac{\text{Corp Net Value Added}}{\text{GDP}} \times \text{GDP} \times \text{Corp Net Value Added}$$

$$\ln\left(\frac{\text{Market equity}}{\text{Corp Net Value Added}}\right) = \ln\left(\frac{\text{Market equity}}{\text{Payout to equity}}\right) + \ln\left(\frac{\text{Payout to equity}}{\text{Corp Net Value Added}}\right)$$

Fct. of latent comp’s for riskless rate, risk premium and payout growth

⇒ System for $$\ln\left(\frac{\text{Market equity}}{\text{Corp Net Value Added}}\right)$$, riskless, risk premium, profit share, corp NVA.
The profit share, \( s = \ln \left( \frac{\text{Corp profits}}{\text{Corp Net Value Added}} \right) \), matters via 3 channels (green).

Provide the decomposition of the 42.53% main result into:

1) Direct effect of factor share on payouts – I think more than half of the 42.53%
2a) Indirect effect of factor share via expected payout growth
2b) Indirect effect of factor share on risk premium

Table 3: Growth Decomposition: Baseline

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>1405.81%</td>
<td>151.23%</td>
<td>477.34%</td>
</tr>
<tr>
<td>Factor Share ( s_t )</td>
<td>18.57%</td>
<td>-23.34%</td>
<td>42.53%</td>
</tr>
<tr>
<td>( \delta_{LF,t} )</td>
<td>17.05%</td>
<td>-21.59%</td>
<td>37.88%</td>
</tr>
<tr>
<td>( \delta_{HF,t} )</td>
<td>1.52%</td>
<td>-1.75%</td>
<td>4.64%</td>
</tr>
<tr>
<td>Risk Price ( x_{\perp,t} )</td>
<td>25.73%</td>
<td>20.46%</td>
<td>24.42%</td>
</tr>
<tr>
<td>( x_{LF,t} )</td>
<td>0.05%</td>
<td>-0.32%</td>
<td>24.32%</td>
</tr>
<tr>
<td>( x_{HF,t} )</td>
<td>25.68%</td>
<td>20.78%</td>
<td>0.10%</td>
</tr>
<tr>
<td>Risk-free Rate ( \delta_t )</td>
<td>2.16%</td>
<td>-8.52%</td>
<td>8.48%</td>
</tr>
<tr>
<td>( \delta_{LF,t} )</td>
<td>2.11%</td>
<td>-8.57%</td>
<td>8.35%</td>
</tr>
<tr>
<td>( \delta_{HF,t} )</td>
<td>0.05%</td>
<td>0.05%</td>
<td>0.13%</td>
</tr>
<tr>
<td>Real PC Output Growth</td>
<td>53.54%</td>
<td>111.41%</td>
<td>24.57%</td>
</tr>
</tbody>
</table>

- You want 2b) to be small (maybe something else lowered risk-premium post-1989)
COMMENT 3. RISKFREE RATE

Use SURVEY data to further argument that riskfree rate is not crucial driver post-1989

Current paper: Fall in real rate has had little effect on stock valuation

- Assume a mean-reverting process for $r_f$: Very nice idea
- It’s estimated persistence of (low freq component) is substantially below 1: 0.93 in quarterly data
- Think of less persistent changes as smaller changes in the constant growth model:

\[
\frac{\text{Market equity}}{\text{Payout to equity}} = \frac{1}{(r_f+rp)\cdot g}
\]
Related papers: Farhi and Gourio (2019), Corhay, Kung and Schmid (2020)

- Assume changes in $r_f$ are permanent.
- Then you need an increase in equity premium to avoid counterfactually large increase in price multiples as $r_f$ falls
- But that’s counterfactual based on the VIX-based equity premium not increasing
Suggestion for further improvements to current paper’s approach to modeling riskless rate process

Issue 1: Estimation

- In finite samples, when you estimate an AR(1) process
  \[ y_t = \alpha + \phi y_{t-1} + \varepsilon_t \]
  the estimated \( \phi \) is too low (too far below 1).
- Suggestion: Use a bias adjustment to \( \phi \) (and \( \alpha \)). Using the Kendall adjustment

\[
\hat{\phi}^{Bias-Adjusted} = \hat{\phi} + \frac{1 + 3\hat{\phi}}{T} = 0.93 + \frac{1 + 3 \times 0.93}{T} \\
\hat{\alpha}^{Bias-Adjusted} = (1 - \hat{\phi}^{Bias-Adjusted}) \bar{y}
\]
Issue 2: Is the AR(1) process stable?

- Suggestion: Test whether a stable process with the (updated) estimated persistence leads to a good fit of survey data for expected real riskless rates (next 10 years in Survey of Professional Forecasters)

Even better: Address issue 1 & 2 in one step by estimating $\phi$ (and $\alpha$) to fit survey data

Assume a value for $\phi$ (and set $\alpha = (1 - \phi)\bar{y}$ to match sample mean)

- At each $t$, use actual real rate + AR(1) model to calculate:
  GLL: Predicted avg real bill rate, next 10 years
- Compare this series to the survey measure of the same variable:
  SURVEY: Expected avg real bill rate, next 10 years
  available in the Survey of Professional Forecasters

Pick a different $\phi$ until the series are close. (Set this up as an estimation.)
GLL: Pred avg real bill rate, next 10 yr

phi=0.5  phi=0.9
phi=0.95  phi=0.98
Pred avg real bill rate, next 10 yr

-2 -1 0 1 2 3 4 5

01jan1960 01jan1980 01jan2000 01jan202

phi=0.5 phi=0.9
phi=0.95 phi=0.98

SURVEY: Exp. avg bill, next 10yr - Exp. avg infl, next 10yr

-2 -1 0 1 2 3 4 5

01jan1960 01jan1980 01jan2000 01jan202

phi=0.5 phi=0.9
phi=0.95 phi=0.98

SURVEY: Exp. avg bill, next 10yr - Exp. avg infl, next 10yr
GLL: Pred avg real bill rate, next 10 yr (using low-freq prosess)

SURVEY: Exp. avg bill, next 10yr - Exp. avg infl, next 10yr

phi=0.93
GLL: Pred avg real bill rate, next 10 yr (using low-freq prosess)
SURVEY: Exp. avg bill, next 10yr - Exp. avg infl, next 10yr

\( \phi = 0.95 \)
GLL: Pred avg real bill rate, next 10 yr (using low-freq prosess)
SURVEY: Exp. avg bill, next 10yr - Exp. avg infl, next 10yr

\[ \phi = 0.96 \]
Based on both suggested approaches (bias-adjustment/survey):

- **The correct value for $\phi$ is higher** than what’s currently used, but not 1
- True **role of declining real rate** is larger than estimated, but probably modestly so
COMMENT 4. RISK PREMIUM

Could also use SURVEY data to support risk premium findings (no increase)

Again using the Survey of Professional Forecasters: Expected avg’s for next 10 years
COMMENT 5. COVID

Cox, Greenwald and Ludvigson (2020): Use GLL setup to study stock market in 2020

- 2020Q2 output drop (10%) explains almost none of stock market drop, given realistic persistence
- Most of market drop still unexplained if adding realistic fall in corporate profit share
- Therefore, market drop, and recovery, must have been driven mainly by risk premium changes, though no risk premium data are used
1. Update Ian Martin’s risk premium data (from S&P500 options) and document risk premium (across horizons) over 2020: Large spike in March.
2. Use data on VIX ETF to document a **large effect of the Fed’s March 23 announcement** on the **risk premium** even in intraday data
   - Project VIX ETF on 1-year risk premium to estimate risk premium change: -2 pp
The fact that the Fed drives the stock market via the risk premium is not new


Stock returns over the FOMC cycle:  

Equity premium over FOMC cycle:
For the authors:

A lot of our intuition for thinking falling real rate should be crucial comes from looking at the fall in real long interest rate (e.g. 10-year Treasury yield-Expected inflation)

- It falls more than expected avg short rate (falling term premium)

Note: Based on SPF expectations

- Would be helpful to discuss this in the paper.