A Production-Based Economic Explanation for the Gross Profitability Premium

Discussion by
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What is the profitability premium?

First define profitability

- Gross Profitability (GP): Revenue − Cost of goods sold
- This will be large for large firms
- So look at

\[
GP/A := \frac{\text{Revenue} - \text{Cost of goods sold}}{\text{Total assets}}
\]
What is the profitability premium?

- Take public US firms (CRSP universe), and sort into 5 portfolios based on GP/A:
  - Portfolio 1: Low GP/A
  - Portfolio 5: High GP/A

Average portfolio return over the next month:
- Portfolio 1: 4.8%
- Portfolio 5: 8.5%

Difference: 3.7%

α relative to the 3-factor model: 6.4%

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Why is this a puzzle?

- $P_t$ is the stock price today.
- $P_{t+1}$ is the stock price in one month
- $D_{t+1}$ is the dividend in one month
- Return over the month:

$$R_{t+1} = \frac{P_{t+1} + D_{t+1} - P_t}{P_t} = \frac{D_{t+1}}{P_t} + \frac{P_{t+1} - P_t}{P_t}$$

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- The return is the dividend yield plus the price appreciation.
- High GP/A $\Rightarrow$ High $D_{t+1}/P_t$ $\Rightarrow$ High $R_{t+1}$
Gordon Growth Model

- \( g \) = growth rate of dividends, \( r \) = discount rate
- Stock price:
  \[
P_t = \frac{E_t[D_{t+1}]}{r - g}
  \]
- Stock return:
  \[
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- Expected stock return:
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- Efficient market hypothesis (EMH) \( \Rightarrow P_t \) incorporates \( E_t[D_{t+1}] \).
EMH \Rightarrow \text{only risk can determine expected returns}

This paper has an Arbitrage Pricing Theory-type model with profitability, growth, and investment factors.

Expected return on portfolio $j$:

$$r_j = \beta_{xj} \gamma_x + \beta_{yj} \gamma_y + \beta_{sj} \gamma_s$$

- $\gamma_x = \text{premium for profitability}$
- $\gamma_y = \text{premium for growth}$
- $\gamma_s = \text{premium for capital investment}$
This paper’s explanation (cont.)

Model:

\[ r_j = \beta_{xj}\gamma_x + \beta_{yj}\gamma_y + \beta_{sj}\gamma_s \]

- The authors derive the $\beta$s from first principles.
- They show that firms with high GP/A have high $\beta_{xj}$ in the model.
- They find supporting evidence in the data.
- If $\gamma_x$ is high, high GP/A firms will have high returns.
The firm has physical capital $K$

The firm chooses intermediate inputs $E$ to maximize profit

$$\pi = X \left[ (ZE)^{\frac{n-1}{\eta}} + K^{\frac{n-1}{\eta}} \right]^{\frac{\eta}{\eta-1}} - EP$$

where $\eta > 0$ the elasticity of substitution between $E$ and $K$.

Think of $\eta$ as a low number (they are far from perfect substitutes)

An aggregate shock is a shock to $P$.

$E$ becomes expensive $\Rightarrow$ firm substitutes toward $K$ $\Rightarrow$ this hurts production because scale is suboptimal.

High $Z$ firms suffer (relatively) more
This is very plausible.

However, consider the pattern in market betas in the data.

- Lowest productivity portfolio: $\beta = 0.92$
- Middle portfolios, $\beta > 1$.  
- Highest-productivity portfolio: $\beta = 0.94$

Standard deviations follow a similar pattern

The very highest profitability firms have low risk, not high risk.
Alternative explanations

1. $\beta$s are wrong
2. The EMH fails
3. The result is spurious
Alternative explanation 1: $\beta$s are wrong

- If returns are normally distributed, $\beta$s and standard deviations are measured with enormous precision.
  - Much more so than expected returns
- If returns have fat tails, rare events can lead true $\beta$s to differ from observed $\beta$s
- Perhaps highly profitable firms do especially badly in times of market stress.
Alternative explanation 2: EMH Failure

- Some firms receive a positive shock to their profitability.
- For these firms, the shock means that profitability is not just high today, but also high next month.
- Investors underestimate this persistence (persistence is hard to measure).
- Thus they under-react to profitability news today.
- Next month, they receive more “good news,” implying high returns.
- They don’t understand this “good news” was predictable in advance.
Alternative explanation 3: spuriousness

- Profitability barely clears the hurdle for statistical significance relative to the CAPM.
- The $t$-statistic on the $\alpha$ relative to the CAPM is 2.2.
- 3% per annum is half the size of value and a third of momentum.
- The $t$-statistic relative to the 3-factor model is higher, but we have no reason to think that the 3-factor model is true in the first place.
- Since 2014, the anomaly has been significantly reduced.
Researchers advance their career by publishing articles in scientific journals.

To be published, a result has to be novel.

Researchers look around for novel results.

If you search through 100 combinations of spurious results, 5% will clear the significance hurdle by chance.

This may be the case with profitability.
Conclusion

- Profitability is an interesting and subtle anomaly
- You need to understand quite a bit of finance to understand why it even is an anomaly.
- This paper offers an explanation for this anomaly.
- Because the benchmark theory is the EMH, this explanation is based on risk
- Specifically it is based on the production risks these firms take.
- Alternative explanations: rare events, under-reaction, or that the finding is simply spurious to begin with.
- Practical consequence: If you have a value strategy, might want to consider a profitability strategy as a hedge.