# 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

$$\text{GP/A} := \frac{\text{Revenue} - \text{Cost of goods sold}}{\text{Total assets}}$$

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- This finding, by Novy-Marx (2013), has generated much attention. ($>$ 1000 Google scholar citations)

# 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 $\Longrightarrow$ High $D_{t+1}/P_t$ $\Longrightarrow$ 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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- Efficient market hypothesis (EMH) $\Rightarrow$ $P_t$ incorporates $E_t[D_{t+1}]$.

# This paper's explanation

- EMH $\Rightarrow$ 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 $j$:

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

  - $\gamma_x$ = premium for profitability
  - $\gamma_y$ = premium for growth
  - $\gamma_s$ = 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.

# Into the nitty-gritty

- The firm has physical capital $K$
- The firm chooses intermediate inputs $E$ to maximize profit

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

  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

# Comments

- 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.

# Publication bias

- 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.