Comments on “Stock Price Cycles and Business Cycles” by Klaus Adam and Sebastian Merkel

Monetary Policy Conference: Bridging Science and Practice, October 7-8, ECB.
Disclaimer: This paper should not be reported as representing the views of the European Central Bank (ECB). The views expressed are those of the authors and do not necessarily reflect those of the ECB.
Overview

1. Summary
2. Comment I: Policy implications
3. Comment II: The stochastic discount factor
4. Comment III: The co-movement puzzle
5. Comment IV: Model performance
6. Conclusion
Departing from rational expectations (RE)

• What explains the high volatility of stock prices?

• Joint behaviour of stock prices and macro variables

• Motivated by survey data on stock prices
Expectations of Future Stock Returns and S&P 500 Past Returns

*Expectations of returns are built from a Gallup survey of individual investors' expectations*

Main innovation

• Learning in Boldrin, Christiano and Fisher (2001)

• Agents form beliefs about expected stock prices:

\[ \ln Q_{s,t} = \ln Q_{s,t-1} + \ln \beta_{s,t} + \ln \epsilon_{s,t}, \]

• Observe current prices but not shocks

• To forecast future prices need to estimate persistence
Belief formation mechanism

• Agents’ capital gain expectations:

$$E_t^P \left[ \frac{Q_{s,t+1}}{Q_{s,t}} \right] = m_{s,t}$$

Where:

$$\ln m_{s,t} = \ln m_{s,t-1} + g (\ln Q_{s,t-1} - \ln Q_{s,t-2} - \ln m_{s,t-1}) + g \ln \varepsilon_{s,t}^1$$
Model performance

### Table 6
Empirical model fit

<table>
<thead>
<tr>
<th></th>
<th>Data (std.dev.)</th>
<th>Subjective Belief Model</th>
<th>RE Model</th>
<th>RE Model with inv. shocks</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Cycle Moments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\sigma(Y)$</td>
<td>1.72 (0.25)</td>
<td>1.83$^*$</td>
<td>1.90$^*$</td>
<td>1.85$^*$</td>
</tr>
<tr>
<td>$\sigma(C)/\sigma(Y)$</td>
<td>0.61 (0.03)</td>
<td>0.67$^*$</td>
<td>0.75$^*$</td>
<td>0.66$^*$</td>
</tr>
<tr>
<td>$\sigma(I)/\sigma(Y)$</td>
<td>2.90 (0.35)</td>
<td>2.90$^*$</td>
<td>1.88$^*$</td>
<td>2.79$^*$</td>
</tr>
<tr>
<td>$\sigma(H)/\sigma(Y)$</td>
<td>1.08 (0.13)</td>
<td>1.06$^*$</td>
<td>0.31$^*$</td>
<td>0.56$^*$</td>
</tr>
<tr>
<td>$\rho(Y, C)$</td>
<td>0.88 (0.02)</td>
<td>0.84$^*$</td>
<td>0.93$^*$</td>
<td>0.86$^*$</td>
</tr>
<tr>
<td>$\rho(Y, I)$</td>
<td>0.86 (0.03)</td>
<td>0.89$^*$</td>
<td>0.97$^*$</td>
<td>0.90$^*$</td>
</tr>
<tr>
<td>$\rho(Y, H)$</td>
<td>0.75 (0.03)</td>
<td>0.70$^*$</td>
<td>0.89$^*$</td>
<td>0.80$^*$</td>
</tr>
<tr>
<td><strong>Financial Moments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E[P/D]$</td>
<td>152.3 (25.3)</td>
<td>150.0$^*$</td>
<td>174.6$^*$</td>
<td>166.0$^*$</td>
</tr>
<tr>
<td>$\sigma(P/D)$</td>
<td>63.39 (12.39)</td>
<td>44.96$^*$</td>
<td>7.00$^*$</td>
<td>8.28$^*$</td>
</tr>
<tr>
<td>$\rho(P/D)$</td>
<td>0.98 (0.003)</td>
<td>0.97$^*$</td>
<td>0.96</td>
<td>0.95</td>
</tr>
<tr>
<td>$E[r^e]$</td>
<td>1.87 (0.45)</td>
<td>1.25$^*$</td>
<td>0.77</td>
<td>0.57</td>
</tr>
<tr>
<td>$\sigma(r^e)$</td>
<td>7.98 (0.35)</td>
<td>7.07$^*$</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>$E[r^f]$</td>
<td>0.25 (0.13)</td>
<td>0.78</td>
<td>0.77</td>
<td>0.58</td>
</tr>
<tr>
<td>$\sigma(r^f)$</td>
<td>0.82 (0.12)</td>
<td>0.06</td>
<td>0.09</td>
<td>0.06</td>
</tr>
<tr>
<td>$\sigma(D_{t+1}/D_t)$</td>
<td>1.75 (0.38)</td>
<td>2.46$^*$</td>
<td>1.19$^*$</td>
<td>1.69$^*$</td>
</tr>
<tr>
<td><strong>Other Moments</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\rho(H, P/D)$</td>
<td>0.51 (0.17)</td>
<td>0.79</td>
<td>-0.97</td>
<td>-0.95</td>
</tr>
<tr>
<td>$\rho(I/Y, P/D)$</td>
<td>0.58 (0.19)</td>
<td>0.69</td>
<td>-0.97</td>
<td>-0.94</td>
</tr>
<tr>
<td>$\rho(E^{p}[r^e], P/D)$</td>
<td>0.79 (0.07)</td>
<td>0.52</td>
<td>-0.99</td>
<td>-0.98</td>
</tr>
</tbody>
</table>

Notes: Model moments marked with an asterisk have been targeted in the estimation. The label of the moments symbols can be found in tables 1, 2 and 3. Financial return moments are expressed in quarterly rates of return. Similarly, the P/D ratio is defined as the price over quarterly dividend payments.
Summary

Stock price cycles

- Optimism shock
- Boom-bust cycles
Asymmetries

- State of pessimism vs. optimism
- Skewed PD ratio distribution
Overview

1. Summary

2. Comment I: Policy implications

3. Comment II: The stochastic discount factor

4. Comment III: The co-movement puzzle

5. Comment IV: Model performance

6. Conclusion
Comment I: Policy implications

Inefficient fluctuations

- Adam and Merkel (2019): “A large part of the observed volatility of stock prices, investment and hours worked is inefficient”
- RE outcome interpreted as efficient
- “Excess volatility” due to belief-driven boom and bust cycles
- Compare subjective belief model with RE counterpart
### Table 7
The effects of shutting down subjective price beliefs

<table>
<thead>
<tr>
<th></th>
<th>Data</th>
<th>Subjective Belief Model</th>
<th>REE Implied by Subj. Belief Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Cycle Moments</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\sigma(Y)$</td>
<td>1.72 (0.25)</td>
<td>1.83</td>
<td>1.60</td>
</tr>
<tr>
<td>$\sigma(C)/\sigma(Y)$</td>
<td>0.61 (0.03)</td>
<td>0.67</td>
<td>0.89</td>
</tr>
<tr>
<td>$\sigma(I)/\sigma(Y)$</td>
<td>2.90 (0.35)</td>
<td>2.90</td>
<td>1.59</td>
</tr>
<tr>
<td>$\sigma(H)/\sigma(Y)$</td>
<td>1.08 (0.13)</td>
<td>1.06</td>
<td>0.12</td>
</tr>
<tr>
<td>$\rho(Y, C)$</td>
<td>0.88 (0.02)</td>
<td>0.84</td>
<td>0.96</td>
</tr>
<tr>
<td>$\rho(Y, I)$</td>
<td>0.86 (0.03)</td>
<td>0.89</td>
<td>0.91</td>
</tr>
<tr>
<td>$\rho(Y, H)$</td>
<td>0.75 (0.03)</td>
<td>0.70</td>
<td>0.70</td>
</tr>
<tr>
<td><strong>Financial Moments</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$E[P/D]$</td>
<td>152.3 (25.3)</td>
<td>150.0</td>
<td>199.7</td>
</tr>
<tr>
<td>$\sigma(P/D)$</td>
<td>63.39 (12.39)</td>
<td>44.96</td>
<td>8.99</td>
</tr>
<tr>
<td>$\rho(P/D)$</td>
<td>0.98 (0.003)</td>
<td>0.97</td>
<td>0.99</td>
</tr>
<tr>
<td>$E[r^e]$</td>
<td>1.87 (0.45)</td>
<td>1.25</td>
<td>0.68</td>
</tr>
<tr>
<td>$\sigma(r^e)$</td>
<td>7.98 (0.35)</td>
<td>7.07</td>
<td>0.19</td>
</tr>
<tr>
<td>$E[r^f]$</td>
<td>0.25 (0.13)</td>
<td>0.78</td>
<td>0.68</td>
</tr>
<tr>
<td>$\sigma(r^f)$</td>
<td>0.82 (0.12)</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>$\sigma(D_{t+1}/D_t)$</td>
<td>1.75 (0.38)</td>
<td>2.46</td>
<td>0.92</td>
</tr>
</tbody>
</table>
Stock prices in the RE model

- Zero risk premium under RE
- Dramatic decline in the volatility of stock return under RE
- Is a real business cycle model with RE the relevant benchmark?
- Many RE models in which fluctuations can be inefficient
Welfare cost of uncertainty

• Compare subjective belief model with deterministic version

• Equity premium falls from 1.9% to 0%

• How much extra consumption needed to compensate for uncertainty?

• Lucas (2003), Tallarini (2000)
Overview

1. Summary

2. Comment I: Policy implications

3. Comment II: The stochastic discount factor

4. Comment III: The co-movement puzzle

5. Comment IV: Model performance

6. Conclusion
What is a bad state of the world?

- Risk premium to compensate agents when marginal utility is high
- Marginal utility is a measure of “hunger”

\[ C_t = W_t, \]
\[ Q_{c,t} = \beta E^P_t \left[ \frac{W_t}{W_{t+1}} \left( (1 - \delta_c) Q_{c,t+1} + R_{c,t+1} \right) \right], \]
\[ Q_{i,t} = \beta E^P_t \left[ \frac{W_t}{W_{t+1}} \left( (1 - \delta_i) Q_{i,t+1} + R_{i,t+1} \right) \right], \]
What is a bad state of the world?

- Here SDF determined by real wages
- High expected marginal when agents expect difficult times ahead
- But real wages only very imperfectly correlated with consumption, especially since late 90’s
Comment II: The SDF

Real wages not a good measure of “hunger”

Source: BLS for real earnings and BEA for real consumption. Normalized data.
Why is the SDF determined by wages?

• Assume infinite Frisch elasticity of labor supply (e.g., Boldrin, Christiano and Fisher 2001)

• Linear disutility of labor (e.g., Hansen 1985)

• But recent evidence suggests much smaller values

• Hall (2009): “The model embodies the findings of research that the Frisch elasticity of labor supply is less than one.”

• Chetty et al. (2011): “Calibrate representative agent macro models to match a Frisch elasticity of aggregate hours of 0.75.”
Low Frisch elasticity is not key

- Argue that labor market frictions are key: “Infinite Frisch elasticity to maximally distinguish our setup.”

- Vary Frisch from 0.55 to 5.3 in RBC model that matches financial moments

- Key is to reduce wealth elasticity of labor supply

Source: Jaccard (2014)
Overview

1. Summary

2. Comment I: Policy implications

3. Comment II: The stochastic discount factor

4. Comment III: The co-movement puzzle

5. Comment IV: Model performance

6. Conclusion
Co-movement of inputs in a two-sector model

• Difficult to reproduce positive co-movement between hours and investment in a two-sector model


• Here investment in capital good sector exogenous

• Hours in the consumption good sector are constant

• Capital share in investment good sector (implausibly?) high

• Average consumption and investment to output ratios?
Costs and benefits of two-sector assumption

• Advantage of two-sector specification: asset prices affect allocation of resources

• But since here allocation of inputs partly exogenously and restricted, also comes at a cost

• In the end, study concludes that welfare cost is small

• Most points could be made in a one sector model to avoid many of these issues
Overview

1. Summary

2. Comment I: Policy implications

3. Comment II: The stochastic discount factor

4. Comment III: The co-movement puzzle

5. Comment IV: Model performance

6. Conclusion
Several contributions

- Consistent with new survey evidence on expected returns
- Asymmetries
- Strong endogenous propagation mechanism
- Volatility of stock returns
- Volatility of dividends
Potential inconsistencies

- At quarterly frequency, autocorrelation close to zero
- Not a problem for existing models with RE
Comparison with a RE model  (Jaccard, JEEA 2018)

- Sample of 200 simulated observations
- At quarterly frequency, autocorrelation close to zero
- Increases with the horizon, as in the data
Mean reversion of realized returns

- Subjective belief model can explain return expectation from survey data
- But not clear that it can explain very low persistence of realized returns at quarterly frequency
- Maybe more suited for house prices?
Risk-free rate puzzle

• Weil (1989)

• 1.0% in the data vs. 3.1% in the model

• Precautionary saving plays a much smaller role

• Compare with BCF for example
Volatility of dividends

- Introduce payout ratio parameter
- No counterpart in the literature
- Capital can be securitized via shares
- Micro-foundation not entirely clear
- Volatility of dividends probably biggest remaining issue in this literature
- Especially if firm leverage is countercyclical (e.g., Kekre 2016)
Impact of risk-free rate on boom-bust cycles

• Argue that economy more stable when risk-free rates are higher

• But really a statement about time-discount factor, not risk-free rate dynamics

• Lower time-discount rate implies higher average/steady state risk-free rate

• In RE model, risk-free rate increase after positive shock

• What happens in this model?
Overview

1. Summary

2. Comment I: Policy implications

3. Comment II: The stochastic discount factor

4. Comment III: The co-movement puzzle

5. Comment IV: Model performance

6. Conclusion
Main takeaways

• New approach to asset pricing in production economies
• Consistent with data on survey expectations
• First attempts will necessary be inconsistent with some other empirical facts
• Details about implementation
Rich dynamics

![Diagram showing the dynamics of various economic indicators over time.](image)
Comments on “Stock Price Cycles and Business Cycles” by Klaus Adam and Sebastian Merkel

THANK YOU FOR YOUR ATTENTION!