The Economic Value of Business Cycle Forecasts for Potential Investors - Evidence from Germany

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Overview

1 Introduction

2 Theoretical Background
   - Related Research
   - Forecasts and Financial Market (Actors)

3 Method
   - Statistical Measures of Forecast Quality
   - Economical Measures of Forecast Quality

4 Empirical Results
   - Data
   - The Economic Value of Forecasts in Germany

5 Conclusion
Motivation

- The lion’s share of forecast evaluation based on statistical measures of forecast accuracy
- But this is not always the perspective taken by consumers of forecasts
- Potential investors might rather be interested in the economic value of business cycle forecasts
- The idea: use business cycle forecasts as a guide for investors, since most of the forecasts are publicly available
Research Question(s)

- Have business cycle forecasts an economic value for investors on financial markets?
  - Do actively managed portfolios based on such predictions systematically outperform passively managed benchmark portfolios by leading to higher "profit-based" measures?
  - Do they differ statistically significant from each other or from benchmark portfolios?
  - Differs statistical measures of forecast accuracy from "profit-based" measures of forecast quality?
Money(-Making) and Forecast Evaluation

- Leitch and Tanner (1991)
- Schnader and Stekler (1990) and Stekler (1994)
- Fair (1999)
- Crespo Cuaresma et al. (2014)
Financial analysts and portfolio manager emphasize the usefulness of information about the future stance of the business cycle for investment decisions, e.g.:

“The analysis of fundamental data belongs to the primary task of each analyst and portfolio manager”

Klude et al. (2016), analysts of the M.M. Warburg bank
Theoretical Foundation

- The academic debate towards a possible information content of macroeconomic variables for stock market returns has been sceptical (see, e.g., Hartmann et al., 2008)
  - The efficient market hypothesis (Fama, 1970)

- By contrast:
  - Pesaran and Timmermann (1995); Marquering and Verbeek (2004) argue that stock markets returns can be predicted by means of such information
  - Nofsinger (2001): importance of predictions of economic indicators
  - Some research address in the relationship between economic activity and stock prices (see e.g., Chen (1991); Birz and Lott (2011))
Forecasts and Stock Markets

- Presumed relationship between economic activity and stock prices: the fundamental model of stock prices
  - Stock price depends on expected (future) value, which is a function of expected future cash flow and the future discounting factor

- Macroeconomic news have an impact on stock prices via investors’ expectations about future economic activity (see, e.g, Chen, 1991)

- Fisher (1930): hypothetical relationship between asset returns and inflation
  - Nominal expected asset returns as a function of real interest rates and expected inflation
Portfolio Strategies

Trading Rule

switching trading strategy

acceleration of growth/inflation predicted

invest 100% in stocks

deceleration of growth/inflation predicted

invest 100% in bonds
All in all, results broadly confirm findings of previous studies, e.g. Heilemann and Stekler (2013)

- **ME**: growth forecasts are slightly negative, small tendency to overestimate, whereas no clear tendency could identified for inflation
- **MAE**: growth rate show values of round about one %-point; inflation half of it
- **MASE**: all forecasters do in fact a better job than the naive method
- **Unbiasedness**: the null hypothesis of unbiased growth and inflation forecasts cannot be rejected
- **Weak rationality**: indicates efficient growth and inflation forecasts for nearly all institutions
"Profit-Based" Measures of Business Cycle Forecasts

- Direction of Change Analysis (DoCA):
  - E.g. Stekler (1994) argues, that a forecast has economic value if it changes "the user’s prior distribution about the direction of the economy" (Stekler, 1994, p. 495)

- Sharpe-Ratio (Sharpe (1966))

- GRS-test (Gibbons et al. (1989))

- Multivariate GRS-tests
  - Samples span the three institutions with the highest, respectively lowest SR as well the three passively managed benchmark portfolios

- Final wealth
Empirical Results

Data

- Data collected by Consensus Forecast\textsuperscript{TM} (2016)
- Annual data ranging from 1990 to 2016 covering 16 institutions and 18 different forecasts
  - Formally politically independent public research institutes
  - Private, co-operative, and public banks, who are themselves involved in trading on financial markets
- All forecasts refer to the same forecasting date (end of December in year $t$) and horizon $(t + 1)$
- Actual outcome: consensus mean for GPD growth or inflation at the end of December of each year $t$
- Stocks: Dax performance index; Bonds: REX performance index; Cash: EURIBOR
The Economic Value of Forecasts under Different Portfolio Strategies

- DoCA: IC cannot be rejected for vast majority of growth but for inflation forecasts
- Final Wealth: mixed results
  - growth: do not systematically outperform passively managed benchmark portfolios by leading to a higher final wealth
  - inflation: systematically outperform passively managed benchmark portfolios, at least at a 5%-level
- GRS-tests as regards to risk adjusted returns:
  - Differences in SR statistically insignificant for the vast majority of institutions
  - Multivariate test statistics: null hypothesis of equal SR cannot be rejected for growth as well inflation forecasts
- Robustness checks:
  - ”Combined Portfolios” as well ”Credibility-Portfolios” leaves the main conclusion unaffected
Conclusion

- Overall, limited economic value of business cycle forecasts for investors
- Robustness checks leaves the main conclusion unaffected
- Finally, ranking of forecast quality based on economic measures differs markedly from rankings derived from purely statistical measures of accuracy
**Figure**: Statistical Accuracy and Economic Value

(a) Growth Forecasts

(b) Inflation Forecasts

Source: own calculation. Shaded area represents 95% confidence area.
Further Research - What can we do better?

- Allow and test results for transaction costs
- Introduce e.g. a more advanced reinforcement learning algorithm for investor’s counting of ”Credibility”, e.g. with adaptive learning rate
References I


Consensus Forecast™ (2016): G7 and Western Europe.


Conclusion

(a) Growth Forecasts

(b) Inflation Forecasts
The presumed relationship between economic activity and stock prices may be seen in the fundamental model of the price of a stock:

\[ P_t = E \left( \sum_{\tau=1}^{\infty} \frac{C_{t+\tau}}{1 + k_{t+\tau}} \right) \]  

(1)

- where \( E \) is the expected value, \( P_t \) is the price of a stock at time \( t \), \( C_{t+\tau} \) is the expected future cash flow paid at time \( t + \tau \), and \( k_{t+\tau} \) is the future discounting factor.

- Macroeconomic news have an impact on stock prices via investors’ expectations about future economic activity, because economic conditions in the future will affect cash flows and the discounting factor.
Fisher hypothesis

- Fisher (1930): hypothetical relationship between asset returns and inflation
- Fisher hypothesis:
  \[ r = i + \Pi^e \]  
    (2)

  - Nominal expected asset returns as a function of real interest rates and expected inflation
  - Referring to stock markets: the Fisher hypothesis postulates a positive one-to-one relation between stock returns and inflation
  - Given that stocks represent claims against the real assets of a business they should - in principle - serve as a hedge against inflation
Portfolio Strategies

Trading Rule – „Combined-Portfolio“

switching trading strategy

acceleration of growth and inflation predicted

invest 100% in stocks

invest 50% in stocks and 50% in bonds

otherwise

deceleration of growth and inflation predicted

invest 100% in bonds
Portfolio Strategies

Trading Rule – „Credibility-Portfolio“

switching trading strategy

- acceleration of growth/inflation predicted
- deceleration of growth/inflation predicted

invest \( \pi \)% in stocks and 
(1- \( \pi \))% in cash

invest \( \pi \)% in bonds and 
(1- \( \pi \))% in cash
## Conclusion

Institution | Mean error | Mean absolute error | Mean absolute scaled error | Test for unbiasedness | Test for weak efficiency |
--- | --- | --- | --- | --- | --- |
BayernLB | -0.30 | 1.03 | 0.64 | 0.63 | 0.41 |
BHF-Bank | -0.19 | 0.82 | 0.51 | 0.34 | 0.11 |
Commerzbank | -0.17 | 0.90 | 0.56 | 0.57 | 0.36 |
Sal.Oppenheim | -0.16 | 0.90 | 0.56 | 0.52 | 0.10 |
UniCredit | -0.01 | 0.82 | 0.51 | 0.67 | 0.14 |
WGZ Bank | -0.22 | 0.91 | 0.56 | 0.35 | 0.41 |
Consensus | -0.16 | 0.84 | 0.52 | 0.15 | 0.26 |
No change forecast | -0.09 | 1.61 | 1.00 | 0.00 | 0.05 |

**Panel A: Growth Forecasts**

BayernLB | -0.15 | 0.50 | 0.77 | 0.45 | 0.14 |
BHF-Bank | -0.12 | 0.38 | 0.58 | 0.45 | 0.04 |
Commerzbank | -0.03 | 0.53 | 0.82 | 0.93 | 0.02 |
Sal.Oppenheim | -0.14 | 0.46 | 0.70 | 0.37 | 0.17 |
UniCredit | -0.16 | 0.51 | 0.79 | 0.29 | 0.55 |
WGZ Bank | 0.01 | 0.51 | 0.78 | 0.98 | 0.22 |
Consensus | -0.08 | 0.43 | 0.67 | 0.73 | 0.11 |
No change forecast | -0.09 | 0.65 | 1.00 | 0.12 | 0.89 |

**Panel B: Inflation Forecasts**

See text for details. Values are rounded to two decimal places. For the tests for rationality p-values are reported.
## Economic measures - results

<table>
<thead>
<tr>
<th></th>
<th>BayernLB</th>
<th>BHF-Bank</th>
<th>Commerzbank</th>
<th>DekaBank</th>
<th>Deutsche Bank</th>
<th>DIW - Berlin Institute</th>
<th>DZ Bank</th>
<th>Consensus</th>
<th>100% DAX</th>
<th>100% REX</th>
<th>1/N</th>
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<tbody>
<tr>
<td><strong>Sharpe Ratio</strong></td>
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<tr>
<td>GRS-Test Active vs. 100% DAX</td>
<td>0.30 0.46 0.22 0.25 0.23</td>
<td>0.79 0.20 0.76 0.92 0.81</td>
<td>0.03 0.13</td>
<td>0.81</td>
<td>0.27 0.54 0.36</td>
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<tr>
<td>GRS-Test Active vs. 100% REX</td>
<td>0.11 0.44 0.07 0.08 0.07</td>
<td>0.37 0.69 0.07</td>
<td>- - -</td>
<td></td>
<td>0.10 0.05 0.11 0.05 0.31</td>
<td>0.24 0.39 0.16</td>
<td>- - -</td>
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</tr>
<tr>
<td>GRS-Test Active vs. 1/N</td>
<td>0.64 0.40 0.38 0.46 0.41</td>
<td>0.07 0.25 0.41</td>
<td>- - -</td>
<td></td>
<td>0.57 0.29 0.64 0.26 0.57</td>
<td>0.72 0.45 0.91</td>
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<tr>
<td><strong>Final Wealth</strong></td>
<td>650 830 446 508 465</td>
<td>1 657 1 079 465</td>
<td>641 455 669</td>
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|                |          |          |             |          |               |                        |         |           |          |          |     |
| **Sharpe Ratio** |          |          |             |          |               |                        |         |           |          |          |     |
| GRS-Test Active vs. 100% DAX | 0.29 0.16 0.30 0.13 0.42 | 0.40 0.45 0.35 | 0.27 0.54 0.36 | - - - |         |          |          |          |          |     |
| GRS-Test Active vs. 100% REX | 0.88 0.57 0.78 0.51 0.29 | 0.36 0.23 0.55 | - - - |         | 0.10 0.05 0.11 0.05 0.31 | 0.24 0.39 0.16 | - - - |          |          |          |     |
| GRS-Test Active vs. 1/N | 0.10 0.05 0.11 0.05 0.31 | 0.24 0.39 0.16 | - - - |         | 0.57 0.29 0.64 0.26 0.57 | 0.72 0.45 0.91 | - - - |          |          |          |     |
| **Final Wealth** | 634 362 633 311 859 | 919 1 097 756 | 641 455 669 |          |         |           |          |          |          |          |     |
# Robustness Portfolios

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Description</th>
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<tbody>
<tr>
<td><strong>Active:</strong>&lt;br&gt;Switching trading strategy &quot;Combined&quot; Portfolio</td>
<td>The strategy instructs the investor to invest 100% in stocks (market portfolio) if the predicted growth and inflation are higher than the growth and inflation of the previous year. If growth and inflation projection reports a deceleration of growth and inflation, the actor should invest 100% in bonds. All mixture prediction urge the investor to invest 50% in stocks and 50% in bonds.</td>
</tr>
<tr>
<td><strong>Active:</strong>&lt;br&gt;Switching trading strategy &quot;Credibility&quot; Portfolio</td>
<td>The strategy instructs the investor to invest $\pi%$ in stocks (market portfolio) and $(1-\pi)%$ in cash investment (German three month EURIBOR) if the predicted growth (inflation) is higher than the growth (inflation) of the previous year. Otherwise the investor should invest $\pi%$ in bonds and $(1-\pi)%$ in cash investment.</td>
</tr>
<tr>
<td><strong>Passive:</strong>&lt;br&gt;I. 100% stocks&lt;br&gt;II. 100% bonds&lt;br&gt;III. 1/N portfolio</td>
<td>100% is invested in the market portfolio.&lt;br&gt;100% is invested in bonds&lt;br&gt;50% is invested in the market portfolio and 50% in bonds.</td>
</tr>
</tbody>
</table>