



The Relationship between Macroeconomic Uncertainty and Interest Rates in China

MACS 30200 Project Proposal

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Motivation

Uncertainty

- Uncertainty about future economic growth is thought to have a broad impact on the economy
- Volatility \rightarrow Uncertainty: Using conditional variance to present uncertainty

Interest Rates

- The real risk-free interest rate is determined by two economic forces
- Inter-temporal smoothing— a positive relation between the interest rate and expectations of economic growth
- precautionary savings — a negative relation between the interest rate and uncertainty, the conditional variance of growth



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Model

Basic Model:

$$r_t = \beta_0 + \beta_1 E_t[g_{t+1}] + \beta_2 Var_t[g_{t+1}]$$

r_t is the log of the time t to t+1 risk-free rate,

g_{t+1} is the log economic growth rate in the subsequent period,

E_t is the expectation conditioning on information at time t,

Var_t is the variance conditioning on information at time t.



Data Source

Measures of Economic Growth Rate:

Consumption Expenditure:

Private Final Consumption Expenditure in China
(<https://fred.stlouisfed.org/series/CHNPFCEADSMEI>)

GDP:

Real GDP at Constant National Prices for China
(<https://fred.stlouisfed.org/series/RGDPNACNA666NRUG>)

Industrial Production:

Total Industry Production Excluding Construction for China
(<https://fred.stlouisfed.org/series/RGDPNACNA666NRUG>)



Data Source

Main Interest Rate Data:

3-Month or 90-day Rates and Yields: Treasury Securities for China

Federal Reserve Bank of St. Louis
(<https://fred.stlouisfed.org/series/IR3TTS01CNM156N>)

China Interest Rate

Trading Economics

Interest Rates for China:

Federal Reserve Bank of St. Louis



Method

Estimates of Expected economic growth and the variance of economic growth:

Model growth as ARMA(1,1):

$$g_{t+1} = \phi g_t + \theta \epsilon_t + \mu + \epsilon_{t+1}$$

Two methods to estimate variance:

(1) the square of the residuals in period t: $(\hat{g}_t - g_t)^2$

(2) using a GARCH(1,1) model (Engle 1982; Bollerslev 1986) :

$$g_{t+1} = \phi g_t + \theta \epsilon_t + \mu + \epsilon_{t+1}$$

$$Var_t(\epsilon_{t+1}) = \gamma + \alpha_1 \epsilon_t^2 + \alpha_2 \sigma_t^2$$



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Method

Using Alternative Forecasts:

Professional Forecasts:

China Economic Forecasts

(http://www.consensuseconomics.com/China_Economic_Forecasts.htm)

Data of other Developing Countries:

India, Brazil, South Africa and etc.



Reference

Engle, R. F. 1982. Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. *Econometrica* 50:987–1007.

Fisher, I. 1907. *The rate of interest: Its nature, determination and relation to economic phenomena*. London: The Macmillan Company.

Bollerslev, T. 1986. Generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics* 31:307–327.

Samuel M. Hartzmark; Economic Uncertainty and Interest Rates, *The Review of Asset Pricing Studies*, Volume 6, Issue 2, 1 December 2016, Pages 179–220