ECON 504: Advanced Economic Statistics

August 23, 2011

- Elementary Economic Statistics, a Review
  - Elementary Business and Economic Statistics, Alva M. Tuttle. New York: McGraw-Hill Book Company, 1957
  - Review: James B. Hassler, (Untitled), Journal of Farm Economics, Vol. 39, No. 4 (Nov., 1957), pp. 1034-1036

- Statistics to include two parts: descriptive and analytic
- Tabular and graphic presentation of data comprises one-third of the book. It is well done
- Statistical inference
  - discussion of frequency distributions
  - A "cook-book" consideration of estimation and testing hypotheses about one or two population means follows.

- Tuttle's chapter on index numbers is probably the best in the book.
- Most authors give a confusing presentation of the analytic areas of estimation, hypothesis testing, and correlation or regression theory.
- Mechanical consideration of time series is given exaggerated significance. Fleeting remarks alluding to more complex, analytic methods are not sufficient.

- The utility of tables on logarithms, squares, roots, reciprocals, and random digits is not clear.

Other Courses/Books

- Elementary Economic Statistics and Econometrics," S. K. Lin and C. Li, in A Series of Popular Economics Books for Institutional Transition in China Vol. 13, Shanghai People's Publishing House and Hong Kong's Intelligent Book Ltd, 1993 (in Chinese).
- Boston College: EC 15102 Elementary Economic Statistics. Text: Brase/ & Brase, Understanding Basic Statistics, 4th Ed.

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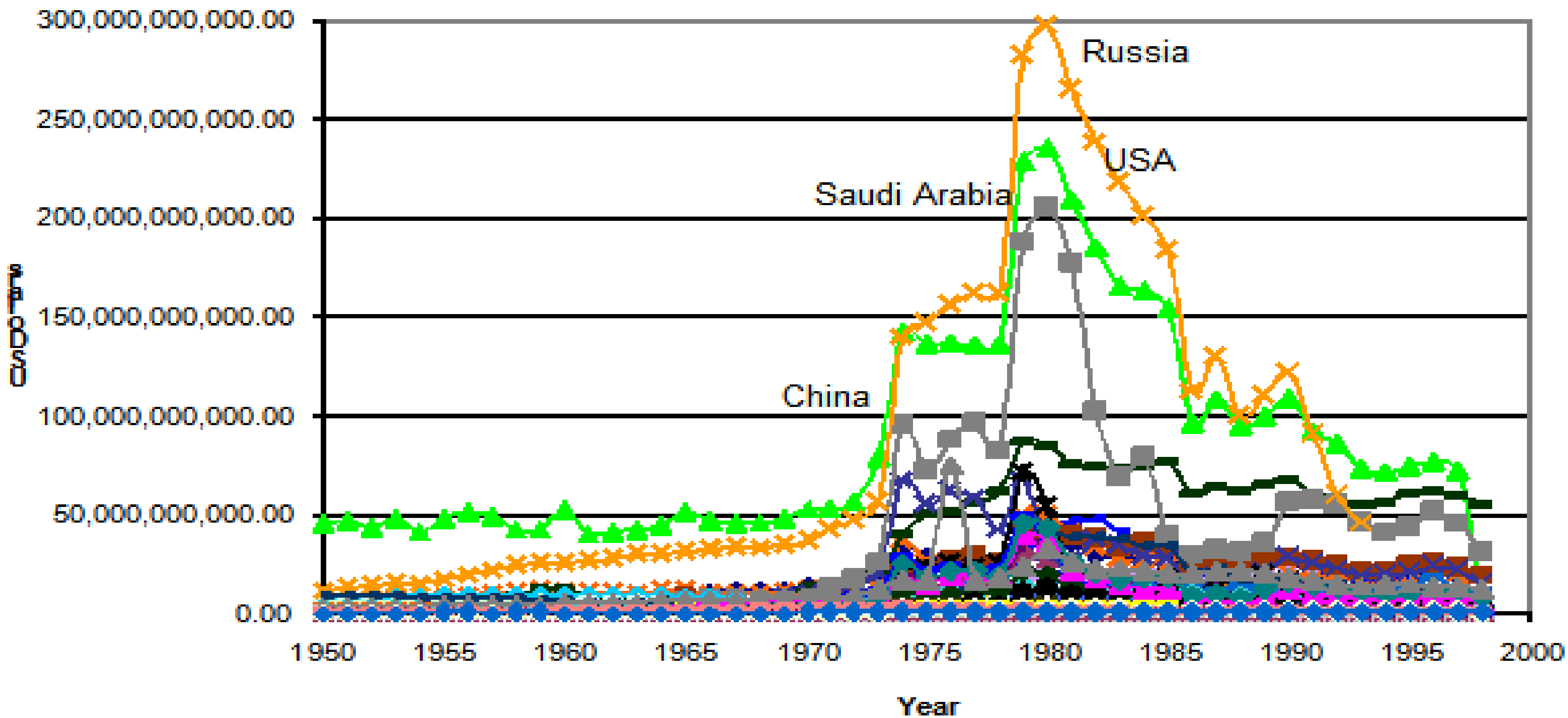
Other Courses/Books

- Brace & Brace – TOC
  - 2. Organizing Data
  - 3. Averages and Variation
  - 4. Correlation and Regression
  - 5. Elementary Probability Theory
  - 6. The Binomial Probability Distribution and Related Topics
  - 7. Normal Curves and Sampling Distributions
  - 8.1 Estimating μ When σ is Known
  - 8.2 Estimating μ When σ is Unknown
  - 8.3 Estimating p in the Binomial Distribution
  - 9.2 Testing the Mean of μ
  - 9.3 Testing a Proportion p
  - 10. Inferences About Differences
  - 11.1 Chi-Square: Tests of Independence
  - 11.2 Chi-Square: Goodness of Fit
  - 11.3 Testing a Single Variance or Standard Deviation
  - Part II: Inferences Relating to Linear Regression
  - 11.4 Inferences for Correlation and Regression
- Supposed to know - Basic notation and defintions

Resource Valuation in real US dollars



- Econometric Analysis, 6th Edition (Greene)
  - Chapter 2. The Classical Multiple Linear Regression Model
  - Chapter 3. Least Squares
  - Chapter 5. Inference and Prediction
  - Chapter 6. Functional Form and Structural Change
  - Chapter 8. The Generalized Regression Model
  - Chapter 9. Models for Panel Data
  - Chapter 11. Nonlinear Regressions and Nonlinear Least Squares
  - Chapter 15. Minimum Distance Estimation and The Generalized Method of Moments
  - Chapter 16. Maximum Likelihood Estimation
  - Chapter 17. Simulation Based Estimation and Inference
  - Chapter 18. Bayesian Estimation and Inference
  - Chapter 19. Serial Correlation
  - Chapter 21. Time-Series Models
  - Chapter 22. Non-stationary Data
  - Chapter 24. Truncation, Censoring and Sample Selection
  - Chapter 25. Models for Counts and Duration
  - Appendix D. Large Sample Distribution Theory

- Option Bounds, Victor H. De La Peña, Rustam Ibragimov and Steve Jordan, Journal of Applied Probability, Vol. 41, Stochastic Methods and Their Applications (2004), pp. 145-156

2. Sharp bounds on the expected payoffs and prices of European call options

Let $\mathcal{F}_0 \subseteq \mathcal{F}_1 \subseteq \cdots \subseteq \mathcal{F}_t$ be a sequence of σ-algebras on a probability space $(\Omega, \mathcal{F}_t, \mathrm{P}_t)$. Throughout the paper, we deal with a complete and arbitrage-free securities market consisting of two assets. One asset is the risky asset with price $S_t \geq 0$ for $t \geq 0$. The sequence (S_t) is adapted to the sequence of information sets $(\mathcal{F}_t)$ and the nonnegativity constraint reflects the limited-liability condition inherent in a contingent claim. The second asset is a money-market account with a risk-free rate of return r. In what follows, $\mathrm{E}_t[\cdot] = \mathrm{E}_t[\cdot \mid \mathcal{F}_t]$ denotes the day-t conditional expectation and $\mathrm{P}_t = \mathrm{P}_t(\cdot \mid \mathcal{F}_t)$ denotes the day-t conditional probability.

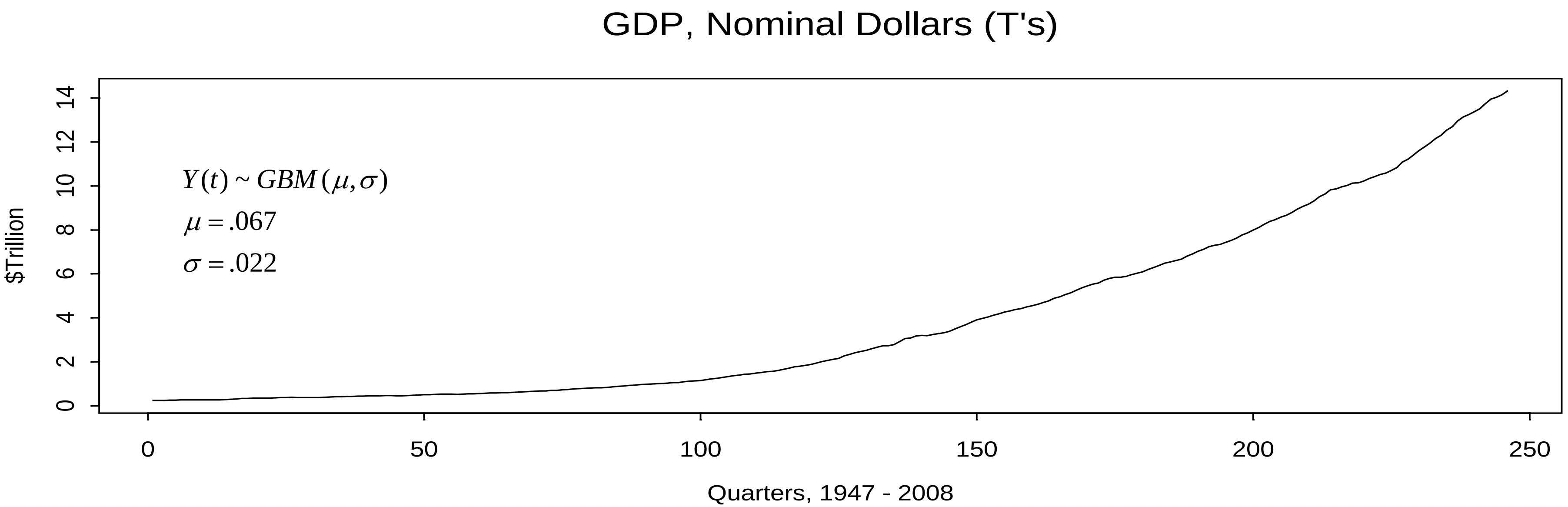
Let us begin by recalling the results on an option's expected payoff and current price obtained by Lo (1987) and Grundy (1991). Consider a European call option on the risky asset with strike price K and expiring at time T. The day-t expected payoff of the option is $\mathrm{E}_t \max(S_T - K, 0)$ and its day-t risk-neutral price is $\mathrm{e}^{-r(T-t)} \mathrm{E}_t^* \max(S_T - K, 0)$, where E_t^* denotes the expectation with respect to the unique equivalent probability measure. Lo (1987) showed that the day-t expectation $\mathrm{E}_t \max(S_T - K, 0)$ satisfies the following sharp inequalities:

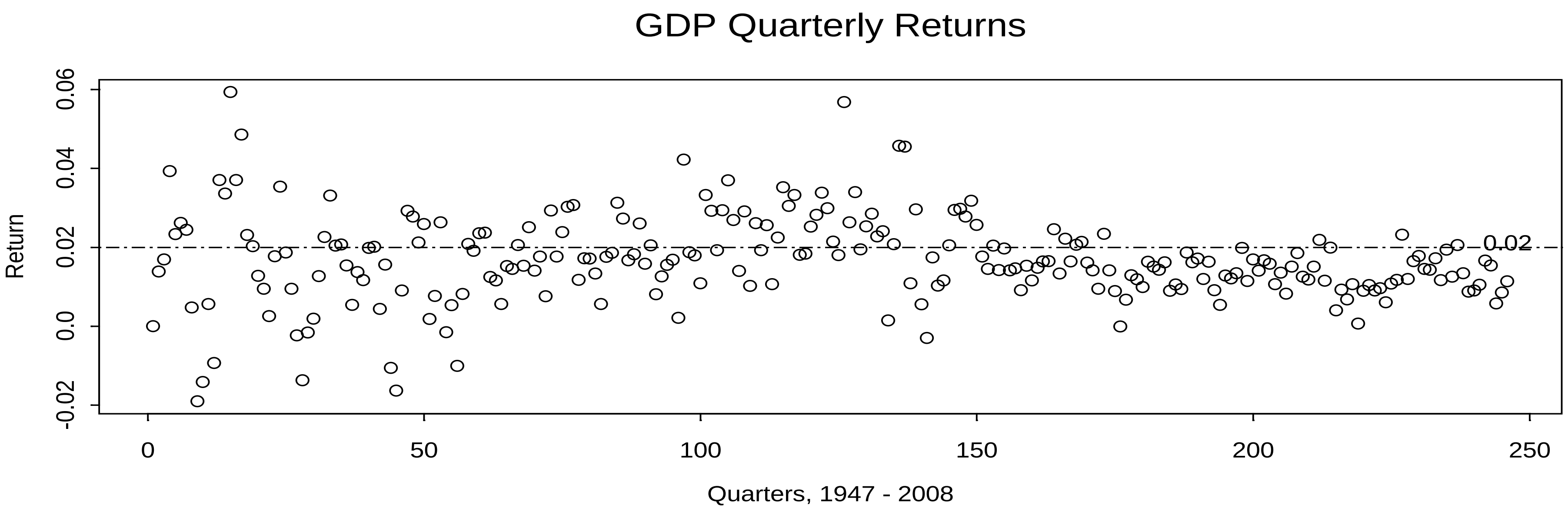
$$\mathrm{E}_t \max(S_T - K, 0) \leq \begin{cases} \mu_t - K \dfrac{\mu_t^2}{\sigma_t^2 + \mu_t^2} & \text{if } K \leq \dfrac{\sigma_t^2 + \mu_t^2}{2\mu_t}, \\ \frac{1}{2}[\mu_t - K + \sqrt{(K - \mu_t)^2 + \sigma_t^2}] & \text{otherwise,} \end{cases} \qquad (1)$$

where

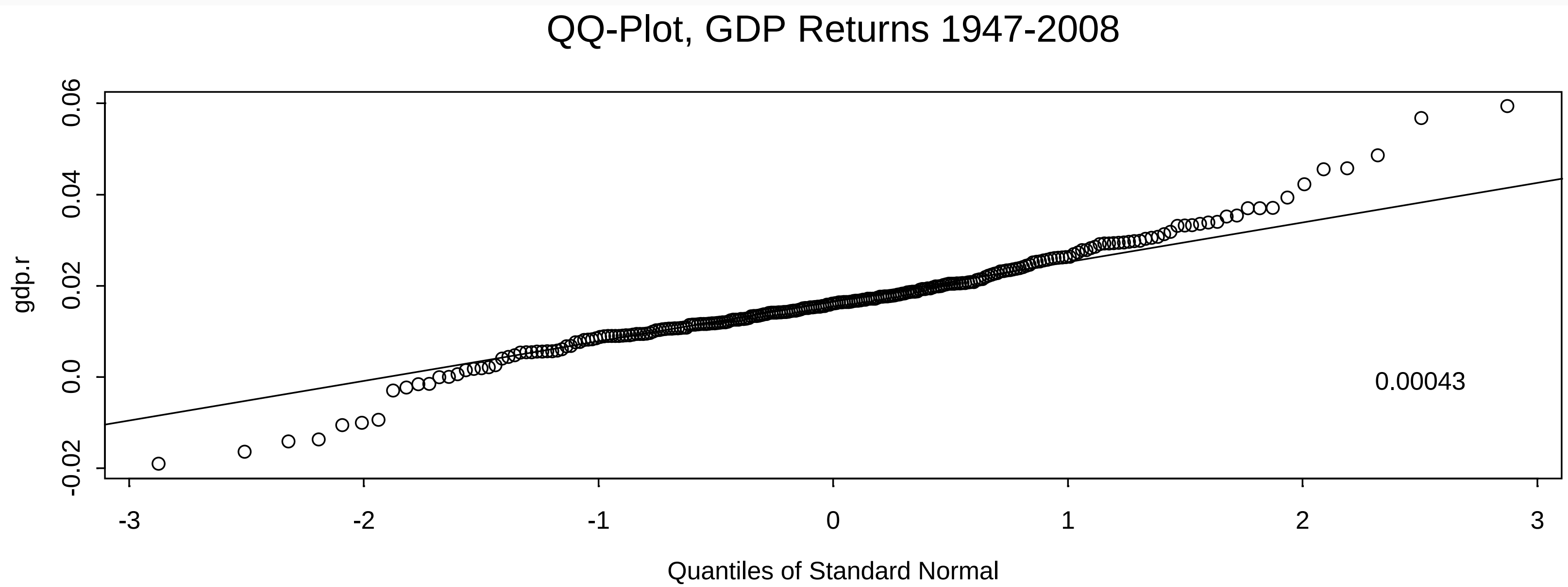
$$\mu_t = \mathrm{E}_t\, S_T \quad \text{and} \quad \sigma_t^2 = \mathrm{E}_t\, S_T^2 - \mu_t^2.$$

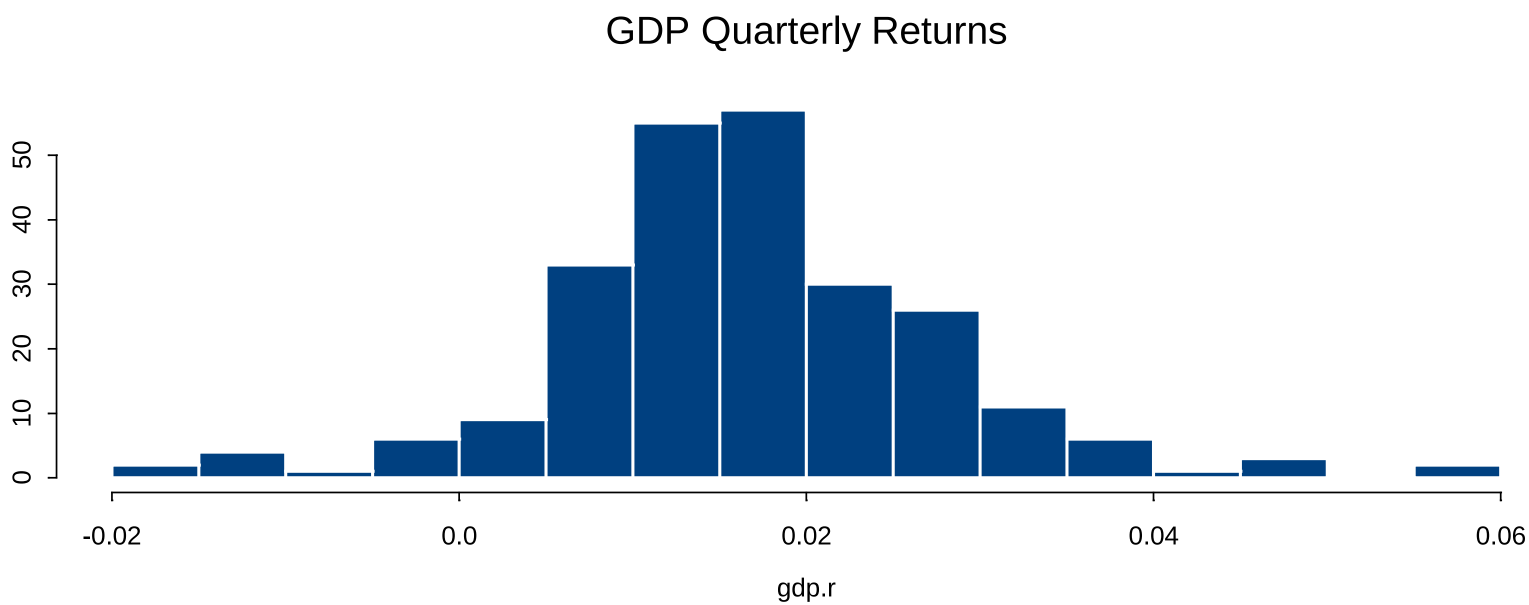
Back to Elementary





GDP Example


QQ-Plot, GDP Returns 1947-2008
gdp.r
0.06
0.04
0.02
0.0
-0.02
-3
-2
-1
0
1
2
3
Quantiles of Standard Normal
0.00043


GDP Quarterly Returns
50
40
30
20
10
0
-0.02
0.0
0.02
0.04
0.06
gdp.r

GDP Example

$$Y = C + I + G + X$$

- What is the DGP?
- How to Model?

- Introduction to probability theory – description and analysis of probability models
- Mathematic statistics and concepts. Learning about the features of probability model based on data.

Conclusion

- What to Expect
  - More of this! Worse than this!
  - Remember the violin story