

# FINANCIAL ECONOMICS

220: 393

Spring 2013

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Office Hours

Monday 10:30-11:45 AM

Wednesday 11:00-11:45 AM

Other times by appointment

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**Prerequisites:** (Upper-Level Elective) 220:320 Intermediate Microeconomics and 220:322 Econometrics

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## Texts:

**Thomas E. Copeland, J. Fred Weston, and Kuldeep Shastri, *Financial Theory and Corporate Policy*, 4<sup>th</sup> Edition, Pearson and *Student Solutions Manual for Financial Theory and Corporate Policy***

(The publisher, Pearson, sells the package of the hardback textbook and solutions manual at its online bookstore at a special price with a discount code. The university bookstore also sells the package for \$127.40.)

**Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, 10<sup>th</sup> Edition, McGraw-Hill and *Student Solutions*** (available at the Rutgers Bookstore in a binder version with chapters 2-5, 7-9, 13 for approximately \$58.00)

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**Basis of Evaluation:** Announced quizzes and econometric assignments will determine your grade. There will be no hourly or final examinations, **nor will any extra credit work be provided.** An absence at a quiz, for whatever reason, counts as a 0. However, you may drop your two lowest grades—**except the last quiz. Under no circumstances will a make-up be given for a quiz. Dropping two grades substitutes for make-ups.** There will be approximately ten quizzes and four econometric assignments. An average grade between 85 and 100 is an “A,” between 80 and 84, a “B+,” between 75-79, a “B,” between 70-75, a “C+,” between 65 and 69, a “C,” between 55-64, a “D,” and less than 55, an “F.”

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**Time Required for Class Preparation:** You are responsible for preparing the assignment before class. **The average time required to complete an assignment properly is 3 to 4 hours—less time and you are less likely to do well—less than 2 hours and you are unlikely to pass.** Simply reading the assignment will not insure your passing the course. Additional time is required to master financial analysis. Remember Ann Landers’ observation, “Opportunities are usually disguised as hard work so most people don’t recognize them.”

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**Learning Goals:** This course focuses on several learning goals adopted by the Department of Economics.

Economic Literacy – Students who complete Financial Economics should understand and be able to articulate, both orally and in writing, the core principles, concepts and theories that form the foundation of modern financial analysis and research. See the course outline below for a list of these principles, concepts, and theories. **In this course, we use collaborative group learning to master the essential tools of financial economics and problem solving. Groups present and discuss their solutions with the class.**

Economic Numeracy – Students who complete Financial Economics should be familiar with the tools, techniques and methods of empirical financial economics. **In this course we show how the basic tools of financial economics can be applied to data. Notably, we estimate asset-pricing models, and we apply event study methods to banking data around several recent failures of systemically important financial institutions to see how markets evaluate size and risk-taking among surviving institutions.**

Economic Citizenship – Upon completion of Financial Economics, students should be able to apply their understanding of core concepts and quantitative tools to analyze and research real world problems and to evaluate alternative policy proposals dealing with finance and financial markets. **In this course we focus on financial institutions during the recent crisis and public policy adopted during the crisis.**

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## Schedule of Assignments

CWS denotes Copeland, Weston, and Shastri, *Financial Theory and Corporate Policy*

BMA denotes Brealey, Meyers, and Allen, *Principles of Corporate Finance*

**Note: The problems assigned below prepare you for class. They are required but not collected in class.**

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### I. The Theory of Finance

#### A. Capital Markets, Consumption and Investment

**Students who have not yet requested or used [apps.rutgers.edu](https://apps.rutgers.edu), request access at <https://apps.rutgers.edu>**

#### B. Time Value of Money

##### 1. Discounting

#### Class 1

CWS, Chapter 1 (Problems 1.1-1.6)

#### Class 2

BMA, Chapter 2 (Select a variety of end-of-chapter problems to insure your mastery.)

CWS, Appendix A

##### 2. Valuing Bonds

#### Class 3

BMA, Chapter 3 (Problems 1-4, 8, 9, 11, 15, 16). Request access to [apps.rutgers.edu](https://apps.rutgers.edu) and practice logging on.

#### C. Investment Decisions: The Certainty Case

##### 1. Shareholder Wealth Maximization

#### Class 4

CWS, Chapter 2 (Problems 2.1, 2.3, 2.6, 2.8)

BMA, Chapter 4 (section 4.2) (Problems 1-7)

BMA, Chapter 5 (Problem 10)

##### 2. Capital Budgeting Techniques

#### Class 5 – Satellite Computer Lab

Sign up on Sakai for one of three time slots. You must be practiced in logging on to apps.

#### D. Agency Problems: Ownership Structure

##### 1. Measuring Performance with Tobin's $q$ Ratio

Jensen-Meckling Utility Maximization Problem (available on Sakai resources) based on Michael C. Jensen and William H. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure," *Journal of Financial Economics* 5, 305-360 [especially 305-319, 328-330] (available at the online library reserve)

##### 2. Measuring Performance with Stochastic Frontier Methods

#### Class 6

**Data Assignment 1** due at the start of class

#### Class 7

Randall Morck, Andrei Shleifer, and Robert W. Vishny, 1988, "Management Ownership and Market Valuation: An Empirical

Analysis,” *Journal of Financial Economics* 20, 293-316 (available at the online library reserve).

**Class 8**

**Data Assignment 2** due at the start of class

E. The Theory of Choice: Utility Theory Given Uncertainty

1. Axioms of Choice under Uncertainty
2. Utility Functions
3. Risk Aversion
4. Stochastic Dominance
5. Mean and Variance as Choice Criteria

F. State Preference Theory

1. Uncertainty and Alternative Future States
2. Pure (Arrow-Debreu) Securities
3. Complete Capital Market
4. No-Arbitrage Profit Condition
5. Economic Determinants of Security Prices
6. Optimal Portfolio Decisions
7. Efficient Set with Two Risky Assets
8. Firm Valuation, Fisher Separation Principle, and Optimal Investment Decisions

G. Objects of Choice: Mean-Variance Portfolio Theory

1. Measuring Risk and Return for a Single Asset
2. Measuring Portfolio Risk and Return
3. Efficient Set with Two Risky Assets
4. Efficient Set with One Risky and One Risk-Free Asset
5. Optimal Portfolio Choice: Many Assets
6. Portfolio Diversification and Individual Asset Risk

H. Market Equilibrium: CAPM and APT

1. Efficiency of the Market Portfolio
2. Derivation of the CAPM
3. Properties of the CAPM

**Class 9**

CWS, Chapter 3, pp. 45-59, 62-65  
(Problems 3.3, 3.4, 3.5, 3.8)

**Class 10**

**Data Assignment 3** due at the start of class

**Class 11**

CWS, Chapter 4 (Problems 4.2, 4.3)

**Class 12**

CWS, Chapter 5, 101-121 (5.6, 5.7)  
BMA, Chapter 7 (background) (7.1, 7.3, 7.14)

**Class 13**

CWS, Chapter 5, 121-141 (5.9, 5.11)  
BMA, Chapter 8, 186-192

**Class 14**

CWS, Chapter 6, 147-158 (6.1-6.5)  
BMA, Chapter 8, 192-195

4. Use of the CAPM for Valuation
5. Applications of the CAPM for Corporate Policy
6. Empirical Tests of the CAPM
7. The Market Risk Premium
8. Empirical Market Line
9. Arbitrage Pricing Theory
10. Empirical Tests of the Arbitrage Pricing Theory

I. Market Efficiency: Theory and Evidence

**Class 15**

CWS, Chapter 6, 159-176 (6.6-6.11)  
BMA, Chapter 8, 195-199

**Class 16**

CWS, Chapter 6, 176-188 (6.12, 6.13)  
BMA, Chapter 8, 199-203 (8, 21)

**Class 17**

BMA, Chapter 13 (1-7, 13, 18, 20, 21, 22)

**Class 18**

Albert A. Cannella, Jr., Donald R. Fraser, and D. Scott Lee, 1995, "Firm Failure and Managerial Labor Markets: Evidence from Texas Banking," *Journal of Financial Economics* 38, 185-210 (available at the online reserve)

J. Using Asset Pricing Models to Measure Risk

**Class 19**

Rebecca S. Demsetz and Philip E. Strahan, 1997, "Diversification, Size, and Risk at Bank Holding Companies," *Journal of Money, Credit, and Banking* 29, 300-313 (available at the online reserve)

K. Event Studies Based on Asset Pricing Models

**Class 20 Satellite Computer Lab**

**Data Assignment 4: Event Study of Earnings Announcements (BMA, Ch. 13, Problem 18** (due at the start of class)

1. Too-Big-to-Fail

**Class 21**

Maureen O'Hara and Wayne Shaw, 1990, "Deposit Insurance and Wealth Effects: The Value of Being 'Too Big to Fail,'" *Journal of Finance* 45, 1587-1600 (available at the online reserve)

**Class 22**

**Data Assignment 5: Event Study of Lehman's Failure** (due at the start of class)

2. Take-Over Discipline and Interstate Banking

**Class 23**

Yaron Brook, Robert Hendershott, and Darrell Lee, 1998, "The Gains from Takeover Deregulation: Evidence from the End of Interstate Banking Restrictions," *Journal of Finance* 53, 2185-2204 (available at the online reserve)

### 3. Personal Use of Corporate Jets by CEOs

#### **Class 24**

David Yermack, 2006, "Flights of Fancy: Personal Use of Corporate Jets by CEOs Corporate Jets, CEO Perquisites, and Inferior Shareholder Returns," *Journal of Financial Economics* 80, 211-242.

### L. Pricing Contingent Claims: Option Pricing Theory and Evidence

#### **Class 25**

CWS, Chapter 7 (Problems TBA)

#### **Class 26**

CWS, Chapter 7 (Problems TBA)

## II. Capital Structure

### A. Modigliani-Miller Irrelevance Theorem

#### **Class 27**

CWS, Chapter 15, 557-564, 594-604

### B. Agency Problems in Involving Equity and Debt

#### **Class 28**

John J. McConnell and Henri Servaes, 1995, "Equity Ownership and the Two Faces of Debt," *Journal of Financial Economics* 39, 131-157.

# DATA ASSIGNMENT 1

Your work in programming the software, in organizing the output, and in interpreting it should be your own work. Do not borrow from anyone else. Bring it to class to submit. Staple or clip together all pages – no loose pages, please. **Submit it on time. If you cannot attend class, submit it to Sakai no later than the start of the class at which it is due.**

The data used in this assignment are described in *US Bank Holding Company Data 2007*. You should read this documentation before working on the assignment. To complete this assignment, use the econometrics software, SAS, found in the university computer labs or remotely on apps.rutgers.edu. Instructions for using SAS to complete this exercise are found in the document, *Using SAS to Investigate Financial Economics*, which is posted on the Sakai website for this course. The data file for the assignment, class2007sas7bdat, is also found on the Sakai website.

**Format your assignment so that the answer to each question below is given the number of the question. Put any tables required by the question in the text of the answer to the question, not at the end of your assignment.**

**Save your SAS program and attach it as an appendix to the assignment.**

1. Divide the sample of 142 banks into two groups based on the median value of the book-value asset size variable (*bvassets*). First, compute the summary statistics for asset size to determine the values of the median sized bank. (Don't forget that *bvassets* is measured in thousands so that 1,000,000 is given by *bvassets*=1,000.)

For the **full sample**, compute **in this order** the number of observations, the mean, median, standard deviation, and maximum and minimum values of the following variables **in this order**: book-value asset size (*bvassets*), managerial ownership (*mown*), blockholder ownership (*block*), the capital-to-assets ratio (*ecap\_assets*), Tobin's *q* ratio (*Tobins\_q*), the market-value inefficiency ratio (*in\_ratio*), the relative value of the bank's investment opportunities (*io\_ratio*), the ratio of nonperforming loans to total assets (*nonpofforo\_assets*), *num\_of\_states*, and *num\_of\_branches*. Paste the SAS output into your essay and give the output a heading that explains its content.

2. Use the median value of *bvassets* to divide the sample into the **larger half** and **smaller half**. For both subsamples, compute **in this order** the number of observations, the mean, median, standard deviation, and maximum and minimum values of the following variables **in this order**: book-value asset size (*bvassets*), managerial ownership (*mown*), blockholder ownership (*block*), the index of market power (*herf*), the capital-to-assets ratio (*ecap\_assets*), Tobin's *q* ratio (*Tobins\_q*), the market-value inefficiency ratio (*in\_ratio*), the relative value of the bank's investment opportunities (*io\_ratio*), the ratio of nonperforming loans to total assets (*nonpofforo\_assets*), *num\_of\_states*, and *num\_of\_branches*. Paste the SAS output into your essay and give the output headings that explain their content.

2. Use proc ttest to compare the means of these variables for the two groups: larger and smaller financial institutions for the following variables in this order: *ecap\_assets* and *nonpofforo\_assets*. Are the differences statistically significant at the .10 level or better? Show your test results and refer to them to explain how you reached your conclusion each of the variables. For each of the three variables, explain the results of the test of equality of variances and, given your conclusion on the test of the null hypothesis of equal variances, which test of the null hypothesis of equality of means you use and what you conclude about the null of equal means. (Do you accept or reject the nulls?)

3. Give the formal definition of Tobin's  $q$  ratio and explain how it is commonly measured (that is, what are the empirical proxies for its numerator and denominator of the formal definition)?
4. Consider a firm that has assets whose book value is 100, liabilities whose book value is 80, and equity whose market value is 30. The market value of a firm's assets is not usually directly observed. However, there is a commonly used approximation (empirical proxy) for this market value. Use it to determine the (approximate) market value of this firm's assets? Show your calculations.
5. Using the information in (4), calculate the commonly used proxy for Tobin's  $q$  ratio. Show your calculations.
6. Suppose stochastic frontier analysis shows that the best-practice (highest potential value) value of this firm's assets is 130. What is its market-value inefficiency ratio (*in\_ratio*)? Show your calculations.
7. Explain how the market-power index, *berf*, is computed. Illustrate its computation for the case of a market where there are five banks with the following market shares: .50, .20, .15, .10, and .05. Show your calculations.
8. What is meant by blockholder ownership (*block*)? What is meant by insider ownership (*mown*)?
9. While we are not going to do this, we could further partition the full sample into quartiles (dividing the halves above into two partitions of equal numbers of observations). Because there are many small banks and few very large banks, dividing the sample by quartiles results in three quartiles with relatively small banks and a fourth quartile with a mix of very large banks and moderately sized banks. Instead, to isolate large and very large banks, divide the sample into three groups based on
  - Group 1:  $bvassets < 5,000,000$  (5 billion—remember the definition of this variable),
  - Group 2:  $5,000,000 \leq bvassets < 50,000,000$  (5 billion to 50 billion),
  - Group 3:  $bvassets \leq 50,000,000$ .

For each of the three groups, compute in this order the number of observations, the mean, median, standard deviation, and maximum and minimum values of *bvassets*, *mown*, *block*, *Tobins\_q*, *in\_ratio*, *io\_ratio*. Paste the SAS output into your essay and give the output headings that explain their content.

10. Discuss any patterns you observe over the four size groups in the means of *mown*, *in\_ratio*, and *io\_ratio*. In discussing the patterns, give specifics: for example, "the mean variable increased from 0.XX in the smallest group to 0.YY in the largest."

**Remember: Save your SAS program and attach it as an appendix to the assignment.**

## DATA ASSIGNMENT 2

Your work in programming the software, in organizing the output, and in interpreting it should be your own work. Do not borrow from anyone else. Bring it to class to submit. Staple or clip together all pages – no loose pages, please. **Submit it on time. If you cannot attend class, submit it to Sakai no later than the start of the class at which it is due.**

**Format your assignment so that the answer to each question below is given the number of the question. Put any tables required by the question in the text of the answer to the question, not at the end of your assignment.**

1. Divide the sample of 142 banks into three ownership groups where (managerial ownership)  $mown \leq 0.05$ ,  $0.05 < mown \leq 0.25$ , and  $mown > 0.25$ . For each of the three groups, compute **in this order** the number of observations, the mean, median, standard deviation, and maximum and minimum values of *bvassets*, *mown*, *block*, *Tobins\_q*, *in\_ratio*, *io\_ratio*. Paste the SAS output into your essay and give the output headings that explain their content.
2. How does the mean market-value inefficiency change as insider ownership increases? Be specific: give the values of the means. How does the mean in each group compare with the mean of the full sample? Again, be specific. Describe the Jensen-Meckling hypothesis? Does this finding agree with it?
3. How does the mean size of the bank vary as insider ownership increases? Again, be specific.
4. How does mean ownership by outside blockholders vary over these subsamples as insider ownership increases? Be specific.
5. Divide the sample at the median level of market-value inefficiency (*in\_ratio*) into the more efficient half and the less efficient half of the sample. For each of the two groups, compute **in this order** the number of observations, the mean, median, standard deviation, and maximum and minimum values of *bvassets*, *mown*, *block*, *Tobins\_q*, *in\_ratio*, *io\_ratio*. Paste the SAS output into your essay and give the output headings that explain their content.
6. Use proc ttest to compare the means of these variables in (5) for the two groups: more and less efficient financial institutions. Are the differences statistically significant at the .10 level or better? Show your test results and refer to them to explain how you reached your conclusion each of the variables. For each of the three variables, explain the results of the test of equality of variances and, given your conclusion on the test of the null hypothesis of equal variances, which test of the null hypothesis of equality of means you use and what you conclude about the null of equal means. (Do you accept or reject the nulls?)
7. In the tables, embolden the values of means that are significantly different from each other and explain the meaning of the bold values in the table heading.
8. Do you see any interesting differences in means between the more and less efficient halves? Explain carefully. Be specific when discussing the values of variables. No credit will be given for a setchy answer.

**Remember: Save your SAS program and attach it as an appendix to the assignment.**

## DATA ASSIGNMENT 3

Your work in programming the software, in organizing the output, and in interpreting it should be your own work. Do not borrow from anyone else. Bring it to class to submit. Staple or clip together all pages – no loose pages, please. **Submit it on time. If you cannot attend class, submit it to Sakai no later than the start of the class at which it is due.**

**Format your assignment so that the answer to each question below is given the number of the question. Put any tables required by the question in the text of the answer to the question, not at the end of your assignment.**

1. Consider again the relationship between performance and insider ownership investigated in assignment 2. The mean market-value inefficiency ratio increases from the subsample with the lowest insider ownership to the one with the highest insider ownership. What factors besides insider ownership might explain the increasing mean inefficiency as insider ownership increases.

2. What is the relationship between asset size and insider ownership? Between asset size and market-value inefficiency? Between asset size and the investment opportunity ratio?

3. While these univariate comparisons suggest an interesting relationship of performance and managerial ownership, they do not control for other factors that might influence managerial performance such as asset size, investment opportunities, and the influence of owners of blocks of stock. Multivariate regression analysis permits a controlled investigation of the relationship of firm performance and insider ownership. Regress market-value inefficiency (*in\_ratio*) on *mown* and control for blockholder ownership, *block*, investment opportunities, *io\_ratio*, and the log of size (*lnba9412*). You will need to create a new variable, *lnba9412*, which is the natural log of total assets. Add the options to test for heteroskedasticity and to generate White robust standard errors. See p. 17 of *Using SAS to Investigate Financial Economics* for instructions on how to add these options to the regression procedure.

Paste your regression output into the text of your answer to (3) and give it a heading that explains its content.

4. From (3), consider the negative values of the fitted regression coefficients on blockholder ownership and asset size – the inverse relationship of market-value inefficiency to these two variables. Why do you think they are negative?

5. From (3), is the value of the fitted coefficient on managerial ownership statistically different from zero? Explain carefully.

6. The linear relationship of market-value inefficiency to managerial ownership does not allow the relationship (slope) to vary with the level of ownership. The Morck-Shleifer-Vishny finding suggests that it changes sign twice over the range of managerial ownership. If we add a squared ownership term, the derivative of inefficiency with respect to managerial ownership becomes a function of insider ownership. (See the SAS tutorial for details.) If the sign of fitted coefficient on *mown* differs from that on *mown*<sup>2</sup>, the sign of the derivative changes for some value of *mown*. If we add a cubic term, *mown*<sup>3</sup>, the derivative becomes a function of *mown* and *mown*<sup>2</sup> and it is possible that the sign of the derivative can change a second time – a result which could resemble that obtained by Morck-

Shleifer-Vishny. To explore these specifications, regress market-value inefficiency ( $in\_ratio$ ) on  $mown$  and  $mown^2$  and control for blockholder ownership,  $block$ , the square of blockholder ownership,  $block^2$ , investment opportunities,  $io\_ratio$ , and the log of size ( $\ln ba9412$ ). You will need to create three new variables,  $\ln ba9412$ , which is the natural log of total assets, and  $mown2$ , which is the square of  $mown$ , and  $block2$ , the square of  $block$ .

Paste your regression output into the text of your answer and give it a heading.

7. Using the fitted values of the regression equation in (6), write the derivative of the  $in\_ratio$  with respect to  $block$ .

8. Compute the value of blockholder ownership where the derivative of inefficiency in (7) equals zero. *Show your work.* What is the sign of the derivative when the value of blockholder ownership is less than this value you calculated? Explain.

9. The paper by Morck, Shleifer, and Vishny used a piece-wise linear specification of insider ownership in their regressions, which consisted of three components to allow for three “regimes” defined by the empirical relationship between performance and insider ownership. The regression specified above allows for only two regimes since insider ownership is specified only up to its squared value. Allow for three regimes by including cubic term,  $mown^3$ . Hence, regress  $in\_ratio$  on  $mown$ ,  $mown^2$ ,  $mown^3$ , and control for blockholder ownership,  $block$ , the square of blockholder ownership,  $block^2$ , investment opportunities,  $io\_ratio$ , and the log of size ( $\ln ba9412$ ).

Paste your regression output into the text of your answer and give it a heading.

10. Using the fitted values of the regression coefficients in (9), write the derivative of market-value inefficiency with respect to managerial ownership.

11. Compute the two values of insider ownership where the derivative of inefficiency with respect to  $mown$  equals zero. To calculate your answers, you may choose to use the quadratic equation calculator at <http://www.1728.com/quadratc.htm>

12. Refer to your results you obtained from (9 – 11). What is the sign of the derivative of market-value inefficiency with respect to managerial ownership at  $mown = 0.05$ ? While both the entrenchment and alignment-of-interest effects are operative, which one dominates at this level of insider ownership? Explain carefully.

**Remember: Save your SAS program and attach it as an appendix to the assignment.**

**DATA ASSIGNMENT 4**  
**EVENT STUDY: EARNINGS ANNOUNCEMENTS**  
**BREALEY, MYERS, ALLEN**  
**CHAPTER 13, PROBLEM 18**

*Your work in programming the software, in organizing the output, and in interpreting it should be your own work. Do not borrow from anyone else.* Bring it to class to submit. Staple or clip together all pages – no loose pages, please. **Submit it on time. If you cannot attend class, submit it to Sakai no later than the start of the class at which it is due.**

**Format your assignment so that the answer to each question below is given the number of the question. Put any tables required by the question in the text of the answer to the question, not at the end of your assignment.**

When a firm's earnings announcement conveys unexpected news, the news is captured in its stock's abnormal return. Problem 18 in Brealey, Myers, and Allen presents monthly returns for two firms, Executive Cheese and Paddington Beer, and for the British FTSE 100 index from May 2007 through February 2009. Both firms announced their earnings in February. Table 13.1 from Brealey, Myers, and Allen is shown below.

These data are contained in the SAS data file, **bmareturns.sas7bdat**, found on the Sakai site.

date	market	execcheese	paddington
200705	2.7	-3	1.6
200706	-0.2	2.3	-0.8
200707	-3.8	-5.1	0.3
200708	-0.9	-0.7	-1.6
200709	2.6	3.1	2.8
200710	3.9	13	2.1
200711	-4.3	-2.1	-6
200712	0.4	6.2	-1.7
200801	-8.9	-4	-5
200802	0.1	0.4	-0.4
200803	-3.1	-2.1	-2
200804	6.8	4.6	3.2
200805	-0.6	-0.3	0.4
200806	-7.1	-12.7	-7.3
200807	-3.8	1.1	-4.1
200808	4.2	7.2	2.3
200809	-13	-18.1	-8.7
200810	-10.7	-6.2	-12
200811	-2	0.5	-4.2
200812	3.4	4.7	2.7
200901	-6.4	-8.1	-0.4
200902	-7.7	-2.1	-9.4

1. Use proc contents to display the contents of the data file, bmareturns.sas7bdat. Paste the contents output as your answer.
2. Use proc means to display the following summary statistics: n mean median std min max. Paste the output as your answer.
3. To obtain the abnormal returns during the announcement month, estimate the market model for Executive Cheese. Remember to exclude its announcement month, February 2009. Show the output of your estimation of the market model.
4. Show the SAS programming code you used to estimate the market model for Executive Cheese.
5. Show the SAS programming code you used to calculate the abnormal return of Executive Cheese.
6. Show the calculations and amount of the abnormal return of Executive Cheese.
7. To obtain the abnormal returns during the announcement month, estimate the market model for Paddington Beer. Remember to exclude its announcement month, February 2009. Show the output of your estimation of the market model.
8. Show the SAS programming code you used to calculate the abnormal return of Paddington.
9. Show the calculations and amount of the abnormal return of Paddington.
10. Create a dummy variable, **announcement**, that takes the value 1 in the month of the announcement, February 2009. Then estimate the market model for Paddington over the entire period, including February 2009. Add the dummy variable to the estimation so that the monthly return of Paddington is a function of the market return and the dummy variable, **announcement**.

Hint: If the data are called **temp**, here is the data step that creates the dummy variable:

```
data temp;
set temp;
if date=200902 then announcement=1;
else announcement=0;
run;
```

Show the output from your regression.

11. In 10 above, what is the interpretation of the fitted value of the regression coefficient on **announcement**?

# **DATA ASSIGNMENT 5**

## **LEHMAN BROTHERS FAILURE: AN EVENT STUDY OF INSTITUTIONS ONCE BELIEVED TOO-BIG-TO-FAIL**

Around the world, the failure of Lehman Brothers on Monday, September 15, 2008, shocked participants in financial markets who had believed that the U. S. banking authorities would invoke the Too-Big-To-Fail Doctrine to rescue Lehman as they had done with the failure of Bear Stearns in March 2008 and with Fannie Mae and Freddie Mac earlier in September 2008. Their shock translated into fear that many other systemically important financial institutions in the U. S. might be in similar financial condition and at risk of failure. Investors, gripped with fear, sold the common stock of these institutions. Thus, on Monday, September 15, the stock price of many of the largest financial institutions fell precipitously, much more than the general fall in stock prices that day.

The price of Citigroup dropped 15.1 percent from a close of \$17.96 on Friday, September 12, to \$15.24 on Monday's close. Wachovia's price declined from \$14.27 on Friday to \$10.71 on Monday – a fall of 24.9 percent. The market index declined 4.6 percent Monday.

Not all large financial institutions suffered this fate. While the market index declined 4.6 percent, the price of Suntrust Bank dropped only 2.98 percent from \$47.31 to \$45.90.

Did the market's reaction to the Lehman failure reflected in the stock price movements of these systemically important financial institutions accurately predict how these institutions would perform in the coming months and years? In short, how efficient are financial markets? Wachovia subsequently failed. And Citigroup soon after had a brush with death. Suntrust, though, prospered.

So the market fell 4.6 percent on September 15, and Wachovia, 24.9 percent. How much of Wachovia's fall result from the tide going out – the overall fall in the market? This question is especially interesting in the case of Suntrust whose price fell only 2.98 percent. If we can estimate the sensitivity of these stock prices to movements in the market index, we can isolate the portion of the change in price not correlated with the market – the “abnormal” return that we can attribute, at least hypothetically, to the market's evaluation of the bank's future given the day's defining event, the failure of Lehman. Then we can ask if the market's assessment was accurate as measured by the bank's subsequent financial performance.

To estimate the sensitivity of a bank's stock return to movements in the market index, we shall employ the market model, which is inspired by the Capital Asset Pricing Model. The data describe 22 banks from April 26, 2007 through September 11, 2009. In this exercise, we investigate the 22 banks and market efficiency by estimating their betas and abnormal returns during the period of Lehman's failure. Then we'll look at their subsequent financial performance.

## THE DATA: CLASSLEHMAN.SAS7DBAT

The data, obtained from the Center for Research on Security Prices (CRSP), record daily stock returns, various market indices, and yields on treasury securities. The St. Louis Federal Reserve Bank provides the daily Moody's Baa bond index. And the Federal Reserve Y9-C data give the measure of the book value of total assets.

Variable Name	Description
DATE	date of the trading day
NAME	bank holding company name
PERMNO	unique permanent security identification number assigned by CRSP to each security
bvassets_2007	book value of assets at end of 2007
SHROUT	shares outstanding
PRC	price or bid/ask average
RET	returns
EWRETD	CRSP NYSE/Amex/NASDAQ/Arca Equal-Weighted Market Index-including dividends
VWRETD	CRSP NYSE/Amex/NASDAQ/Arca Value-Weighted Market Index-including dividends
TCMNOM_M1	treasury constant maturity 1-month
TCMNOM_M3	treasury constant maturity 3-month
TCMNOM_M3_CHANGE	daily change in treasury constant maturity 3-month
TCMNOM_M6	treasury constant maturity 6-month
TCMNOM_Y1	treasury constant maturity 1-year
TCMNOM_Y10	treasury constant maturity 10-year
TCMNOM_Y10_CHANGE	daily change in treasury constant maturity 10-year
SPREAD	spread between treasury constant maturity 10-year & 3-month
SPREAD_CHANGE	daily change in spread TCM 10-year & 3-month
baa_yield	Moody's Baa Corporate Bond Index

**Format your assignment so that the answer to each question below is given the number of the question. Put any tables required by the question in the text of the answer to the question, not at the end of your assignment.**

**Save your SAS program (the code you ran to obtain output) and attach it as an appendix to the assignment.**

**Bring it to class to submit. Staple or clip together all pages – no loose pages.**

**Submit it on time in the section in which you are registered.**

**If you cannot attend class, submit it to Sakai no later than the start of the class at which it is due. Submit it to Sakai ONLY IF YOU CANNOT ATTEND CLASS.**

***Your work in programming the software, in organizing the output, and in interpreting it should be your own work. Do not borrow from anyone else.***

1. Check the contents of the data file, **classlehman.sas7dbat**. Report the list of variables you obtained from the output. Do not use the nolabels option so that the list of variables includes labels.

2. Sort the data first by date and then in descending order by the book value of assets at the end of 2007. Print the data of September 15, 2008 for the variables in this order: *name*, *bvassets\_2007*, *permno*, *prc*, *ret*, and *ewretd*.

Hint: follow the programming below. In this example, the data are named **crsp**, but you may choose another name. Note how SAS is instructed to sort the data in descending size of assets. (The default sorting is in ascending order.) For each date, the banks are ordered from largest to smallest. Also note the treatment of the date in the restriction to print only one day, the day of Lehman's failure.

```
proc sort data=crsp;
by date descending bvassets_2007;
run;

proc print data=crsp;
where date='15SEP2008'd;
var name bvassets_2007 permno prc ret ewretd;
run;
```

Show your output. Describe the returns on that day and note any pattern you see in the returns and the asset size of the bank.

3. Sort the data by date and then for each date, by return:

```
proc sort data=crsp;
by date ret;
run;
```

For all banks, print the data of Friday, September 12, for the following variables in this order: *date*, *name*, *bvassets\_2007*, *prc*, *ret*, and *ewretd*. Give the output a heading that describes its content.

For all banks, print the data of Monday, September 15, for the following variables in this order: *date*, *name*, *bvassets\_2007*, *prc*, *ret*, and *ewretd*. Give the output a heading that describes its content.

For all banks, print the data of Tuesday, September 16, for the following variables in this order: *date*, *name*, *bvassets\_2007*, *prc*, *ret*, and *ewretd*. Give the output a heading that describes its content.

Describe how the pattern of returns differs over the three days.

4. What important event happened on Tuesday, September 16, that probably accounts for the striking difference in returns between Monday and Tuesday? Explain carefully why this event probably accounts for the difference in returns. (Consult the “Crisis Timeline” and Stewart’s “Eight Days” found on Sakai in the Financial Crisis Event Studies folder.)

5. For **Citigroup**, print the data of September 12 and 15, 2008, for the variables in this order: *name*, *bvassets\_2007*, *permno*, *prc*, *ret*, and *ewretd*. Hint: follow the programming below.

```
proc print data=crsp;
where permno=70519 and (date ge '12sep2008'd and date le '15sep2008'd);
var date name permno bvassets_2007 prc ret ewretd;
run;
```

Show your output. Using the information on stock prices, show how the return, -0.151448, on September 15 was calculated. Compare Citi’s return on the 15<sup>th</sup> to that of the market on that day. Why do you think they differ so much?

6. For **Wachovia**, print the data of September 12 and 15, 2008, for the variables in this order: *name*, *bvassets\_2007*, *permno*, *prc*, *ret*, and *ewretd*. Check the *permno* in the output of 2 above to restrict the sample to Wachovia.

Show your output. Using the information on stock prices, show how the return, -0.249474, on September 15 was calculated. Compare Wachovia’s return on the 15<sup>th</sup> to that of the market on that day. Why do you think they differ so much?

7. For **Suntrust**, print the data of September 12 and 15, 2008, for the variables in this order: *name*, *bvassets\_2007*, *permno*, *prc*, *ret*, and *ewretd*. Check the *permno* in the output of 2 above to restrict the sample to Suntrust.

Show your output. Using the information on stock prices, show how the return, -0.029803, on September 15 was calculated. Compare Suntrust’s return on the 15<sup>th</sup> to that of the market on that day. Why do you think they differ so little?

8. The differences in return of Citi, Wachovia, and Suntrust and the market on September 15 raise the question of how much of each bank's return on the 15<sup>th</sup> was due to the fall in the market and how much to investors' changed expectations for each bank as a result of the unexpected failure of Lehman. To answer these questions, we'll use the market model, which is related to the Capital Asset Pricing Model, to estimate the relationship of each of these bank's returns to the market return for a period of 255 trading days – one year excluding Saturday, Sunday, and holidays when the markets are closed – ending 45 days before Lehman's failure so that the market turmoil surrounding the failure does not corrupt the measurement. Thus, we'll apply this fitted equation *out of sample* to predict each bank's return during the period surrounding Lehman's failure. The difference between the bank's actual return and its predicted return is that part of the return that is “abnormal,” that is attributed to the day's unexpected event. Of course, there can be other factors, too, that influence the abnormal return, but the importance of the unexpected event is hypothesized to account for most of the abnormal return. And additional evidence in support of the hypothesis is usually sought. In these cases, future performance consistent with the predicted performance implied by the abnormal return would support attributing the most of the abnormal returns to the failure of Lehman.

First, regress the **daily return of Citi** on the **equally weighted market return** for the estimation period, date ge '09jul2007'd and date le '10jul2008'd. You should obtain 255 observations of Citi's daily return and the market return. Hint: here's the programming with the option not to print labels, which shortens lines. (You may have already used it in your program.)

```
options nolabel;

proc reg data=crsp;
where name='CITIGROUP INC' and date ge '09jul2007'd and date le '10jul2008'd;
model ret=ewret/white;
run;
```

Second, report the regression output and give it a heading that describes its content.

9. Suppose the market return increases by +0.01. Using the fitted coefficient on the market return in this regression (the “beta”), predict the change in Citibank's return? **Show your calculations.**

10. Calculate Citibank's predicted return for September 12 through September 16 and the difference between the actual return and the predicted return – the daily abnormal return for these three days. The estimated market model in (8) gives the predicted return:  $-0.00196 + 2.12009 \cdot \text{ewretd}$ . The abnormal return is the difference between the actual and predicted return:  $\text{ret} - (-0.00196 + 2.12009 \cdot \text{ewretd})$ . Here's some programming to calculate the abnormal return. A new data set, **citi**, is created from **crsp**.

```
data citi;
set crsp;
if name='CITIGROUP INC' then citi_ar_ew=ret-(-0.00196+(2.12009*ewretd));
else citi_ar_ew=.;
run;
```

Run this data step and print the results:

```
proc print data=citi;  
where date ge '12sep2008'd and date le '16sep2008'd and name='CITIGROUP INC';  
var name date citi_ar_ew;  
run;
```

Give the output a heading that explains its content.

11. Compare Monday's abnormal return for Citi with its actual return. Explain the difference.
12. From the Friday abnormal return, it appears that some information about Lehman may have leaked on Friday. Check the article, "Eight Days," to see if market participants may have had clues on Friday.

What may have been one of the clues?

What is the **cumulative abnormal return** over the two days, September 12 and 15?

13. Next, regress the **daily return** of **Wachovia** on the **equally weighted market return** for the estimation period, date ge '09jul2007'd and date le '10jul2008'd. Report the regression output and give it a heading that describes its content.
14. Suppose the market return increases by +0.01. Using the fitted coefficient on the market return in this regression (the "beta"), predict the response of Wachovia's return?
15. Calculate Wachovia's predicted return for September 12 through September 16 and the difference between the actual return and the predicted return – the daily abnormal return for these three days. Give the output a heading that explains its content.
16. Compare Monday's abnormal return for Wachovia with its actual return. Explain the difference.
17. What is Wachovia's **cumulative abnormal return** (CAR) over the two days, September 12 and 15? Compare it to Citi's CAR.
18. Regress the **daily return** of **Suntrust** on the **equally weighted market return** for the estimation period, date ge '09jul2007'd and date le '10jul2008'd. Report the regression output and give it a heading that describes its content.
19. Suppose the market return increases by +0.01. From the fitted coefficient on the market return in this regression (the "beta"), what can you predict to be the response of Suntrust's return?

20. Calculate Suntrust's predicted return for September 12 through September 16 and the difference between the actual return and the predicted return – the daily abnormal return for these three days. Give the output a heading that explains its content.

21. Compare Monday's abnormal return for Suntrust with its actual return. Explain the difference.

22. What is Suntrust's **cumulative abnormal return** (CAR) over the two days, September 12 and 15? Compare it to Wachovia and Citi's CARs.

**Remember: Save your SAS program (the code you ran to obtain output) and attach it as an appendix to the assignment.**