

**FINANCE 937**  
**Advanced Topics in Macro Finance**  
**Fall 2016**

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**DESCRIPTION**

Finance 937 is an advanced course in **quantitative theory** applied to macro and finance models. It is intended for doctoral students in finance, economics and related fields. The course discusses five interconnected literatures: (i) firm selection, investment and growth; (ii) models of corporate, household and sovereign debt; (iii) macro models with a financial sector; (iv) dynamic banking models; and (v) asset pricing models with a production sector.

My approach is to develop and discuss in detail a unified framework that is suited to address the central topics. Most of my classes and course notes summarize and combine the material from several key papers, using a consistent notation and methodology.

These core insights will then be used to discuss much of the related literature. Many of these discussions will be based on regular student presentations.

The reading list below is reasonably extensive. Past students found this to be a very useful reference for the remaining of their graduate studies and beyond. My expectation is that during term you will at least read the core papers and the ones I assign for possible presentation.

Despite the quantitative nature of the material I do not spend much time teaching numerical methods. Students interested in these topics are strongly encouraged to take the (excellent) classes offered in the Economics department.

**GRADES**

**Problem Sets 50%**

Early on, each subsection of the course concludes with a quantitative problem set. This is meant to help you appreciate the key issues involved in numerically solving a particular class of models. There should be 3, or perhaps 4, problem sets during the semester. To maximize learning they should be done in teams of 2 students.

## **Paper Presentations 50%**

As the semester evolves I will begin to assign two to three recent papers for presentation at the conclusion of each subsection. Everyone is expected to prepare a brief 10 slide (20 minute) summary discussion of **each** assigned paper. I will randomly select a student to present in **every** class. We will then have a general discussion about the paper after each presentation. There will probably be 3 such events during term.

**Please note: All homeworks and presentation should be submitted on Canvas before each class starts.**

**There is no final exam or midterm.**

## TOPICS AND READING LIST

### Firm Selection, Investment and Growth

#### Core Readings

- Abel, Andrew and Eberly, Janice, A Unified Model of Investment Under Uncertainty, *American Economic Review*, 1994
- Bloom, Nicholas, The Impact of Uncertainty Shocks, *Econometrica*, 2007
- Gomes, João, Financing Investment, *American Economic Review*, 2001
- Hopenhayn, Hugo, Entry, Exit, and Firm Dynamics in Long Run Equilibrium, *Econometrica*, 1992

#### Further Reading: Macro Investment

- Hall, Robert, The Stock Market and Capital, *American Economic Review*, 2001
- Lucas, Robert, and Prescott, Edward, Investment Under Uncertainty, *Econometrica*, 1971
- Philippon, Thomas, The Bond Market's Q, *Quarterly Journal of Economics*, 2009

#### Further Reading: Investment and Equilibrium in Continuous Time

- Dixit, Avinash, and Pindyck, Robert, Ch. 5, 6, 10 and 11, Investment Under Uncertainty, Princeton University Press, 1994

#### Further Reading: Firm Size and Selection without Investment

- Ericson, Richard and Pakes, Ariel, Markov Perfect Industry Dynamics: A Framework for Empirical Work, *Review of Economic Studies*, 1995
- Gabaix, Xavier, Granular Origins of Business Cycles, *Econometrica*, 2011
- Lucas, Robert, On the Size Distribution of Business Firms, *Bell Journal of Economics*, 1978
- Luttmer, Erzo, Selection, Growth and the Size Distribution of Firms, *Journal of Political Economy*, 2007

#### Further Reading: Empirical Patterns

- Andrade, Gregor, Mitchell, Mark, and Stafford, Eric, New Evidence and Perspective on Mergers, *Journal of Economic Perspectives*, 2001
- Axtell, Robert, Zipf Distribution of U.S. Firm Sizes, *Science*, 2001
- Doms, Mark, and Dunne, Timothy, Capital Adjustment Patterns in Manufacturing Plants, *Review of Economic Dynamics*, 1, 409-29, 1998

#### Further Reading: Investment with Frictions

- Bond, Stephen, and Meghir, Costas, Dynamic Investment Models and the Firm's Financial Policy, *Review of Economic Studies*, 61, 1994
- Caballero, Ricardo, and Engel, Eduardo, Explaining the Investment Dynamics in U.S. Manufacturing: A Generalized (S,s) Dynamics, *Econometrica*, 1999
- DeMarzo, Peter, Michael Fishman, Zhiguo He, and Neng Wang, Dynamic Agency and the Q Theory of Investment, *Journal of Finance*, 2009
- Eisfeldt, Andrea and Rampini, Adriano, New or Used, Investment with Financing Constraints, *Journal of Monetary Economics*, 2007

- Whited, Toni, Debt, Liquidity Constraints, and Corporate Investment: Evidence from Panel Data, *Journal of Finance*, 1992

*Further Reading: Mergers and Corporate Restructuring*

- Fazzari, Steven, Hubbard, Glenn and Petersen, Bruce, Financing Constraints and Corporate Investment, *Brookings Papers on Economic Activity*, 1988
- Gomes, João and Livdan, Dmitry, Optimal Diversification: Reconciling Theory and Evidence, *Journal of Finance*, 2004
- Jovanovic, Boyan and Braguinsky, Sergey, Bidder Discounts and Target Premia In Takeovers, *American Economic Review*, 2004
- Jovanovic, Boyan and Rousseau, Peter, The Q-Theory of Mergers, *American Economic Review*, 2002.
- Warusawitharana, Missaka, Corporate Asset Purchases and Sales: Theory and Evidence, *Journal of Financial Economics*, 2008

*Further Reading: New Papers*

- Carvalho, Vasco and Grassi, Basile, Large Firms and the Business Cycle, unpublished manuscript, 2015
- Clementi, Gian Luca and Dino Palazzo, Entry, Exit, Firm Dynamics, and Aggregate Fluctuations, *American Economic Journal, Macroeconomics*, 2015
- Glover, Brent and Levine, Oliver, Uncertainty, Investment and Managerial Incentives, *Journal of Monetary Economics*, 2014

## **Model Corporate, Household and Sovereign Debt**

### **Core Readings**

- Arellano, Cristina, Default Risk and Income Fluctuations in Emerging Economies. *American Economic Review*, 2008
- Chatterjee, Satyajit, and Eyigungor, Burcu, Maturity, Indebtedness, and Default Risk, *American Economic Review*, 2012
- Hennessy, Christopher, and Toni Whited, Debt Dynamics, *Journal of Finance*, 2005
- Leland, Hayne, Corporate Debt Value, Bond Covenants, and Optimal Capital Structure, *Journal of Finance*, 1994

*Further Reading: Capital Structure*

- Altı, Aydogan, How Persistent Is the Impact of Market Timing on Capital Structure? *Journal of Finance*, 2006
- Goldstein, Robert, Ju, Nengjiu, and Leland, Hayne, An EBIT Based Model of Dynamic Capital Structure, *Journal of Business*, 2001.
- Hennessy, Christopher, and Toni M. Whited, How Costly is External Financing? Evidence from a Structural Estimation, *Journal of Finance*, 2007.
- Leland, Hayne, and Klaus Toft, Optimal Capital Structure, Endogenous Bankruptcy, and the Term Structure of Credit Spreads, *Journal of Finance*, 1996

- Rampini, Adriano and S. Viswanathan, Collateral and Capital Structure, *Journal of Financial Economics*, 2013.
- Riddick, Leigh, and Whited, Toni, The Corporate Propensity to Save, *Journal of Finance*, 2009
- Shleifer, Andrei, and Robert Vishny, Liquidation Values and Debt Capacity: A Market Equilibrium Approach, *Journal of Finance*, 1992
- Strebulaev, Ilya, Do Tests of Capital Structure Theory Mean What They Say? *Journal of Finance*, 2007.

*Further Reading: Credit Spreads*

- Almeida, Heitor, and Thomas Philippon, The Risk-Adjusted Cost of Financial Distress, *Journal of Finance*, 2007.
- Bhamra, Harjoat, Lars Alexander Kuehn and Ilya Strebulaev, The Levered Equity Risk Premium and Credit Spreads: A Unified Framework, *Review of Financial Studies*, 2010
- Chen, Hui, Macroeconomic Conditions and the Puzzles of Credit Spreads and Capital Structure, *Journal of Finance*, 2010
- Chen, Long, Pierre Collin-Dufresne, and Robert Goldstein, On the Relationship Between the Credit Spread Puzzle and the Equity Premium Puzzle, *Review of Financial Studies*, 2009
- Hackbarth, Dirk, Jianjun Miao, and Erwan Morellec, Capital Structure, Credit Risk, and Macroeconomic Conditions, *Journal of Financial Economics*, 2006
- He, Zhinguo and Milbradt, Konstantin, Endogenous Liquidity and Defaultable Bonds, *Econometrica*, 2013.
- Kang, Johnny and Pflueger, Carolin, Inflation Risk in Corporate Bonds, *Journal of Finance*, 2013

*Further Reading: Household and Sovereign Debt*

- Arellano, Cristina, and Ramanarayanan, Ananth Default and the Maturity Structure in Sovereign Bonds, *Journal of Political Economy* 2012
- Chatterjee, Satyajit, Corbae, Dean, Nakajima, Makoto and Rios-Rull, Jose-Victor, A Quantitative Theory of Unsecured Consumer Credit with Risk of Default, *Econometrica*, 2007
- Corbae, Dean, Quintin, Erwan, Leverage and the Foreclosure Crisis, *Journal of Political Economy*, 2015
- Hatchondo, Juan Carlos, Martinez, Leonardo and Saprizza, Horacio, Quantitative Properties of Sovereign Default Models: Solution Methods Matter, *Review of Economic Dynamics* 2010
- Mendoza, Enrique, and Yue, Vivian, A General Equilibrium Model of Sovereign Default and Business Cycles, *Quarterly Journal of Economics*, 2012.

*Further Reading: Empirical Work*

- Andrade, Gregor, and Steven N. Kaplan, How Costly is Financial (Not Economic) Distress? Evidence from Highly Leverage Transactions that Became Distressed, *Journal of Finance*, 1998

- Covas, Francisco, and den Haan, Wouter, The Cyclical Behavior of Debt and Equity Finance, *American Economic Review*, 2009
- Graham, John, Debt and the Marginal Tax Rate, *Journal of Financial Economics*, 1996
- Kaplan, Steve and Stein, Jeremy, How Risky is the Debt in Highly Leveraged Transactions?, *Journal of Financial Economics*, 1990
- Korteweg, Arthur, The Net Benefits to Leverage, *Journal of Finance*, 2010
- Leary, Mark and Roberts, Michael, Do Firms Re-Balance Their Capital Structures? *Journal of Finance*, 2005
- Lemmon, Michael, Roberts, Michael and Zender, Jaime, Back to the Beginning: Persistence and the Cross-Section of Corporate Capital Structure, *Journal of Finance*, 2008
- Rajan, Raghuram, and Zingales, Luigi, What do we Know About Capital Structure? Some Evidence From International Data, *Journal of Finance*, 1995
- Welch, Ivo, Capital Structure and Stock Returns, *Journal of Political Economy*, 2004.

*Further Reading: Corporate Investment with Leverage*

- Begenau, Juliane and Salomao, Juliana, Firm Financing over the Business Cycle, working paper, Harvard Business School, 2015
- Bolton, Patrick, Hui Chen, and Neng Wang, A Unified Theory of Tobin's Q, Corporate Investment, Financing, and Risk Management, *Journal of Finance*, 2009.
- Hennessy, Christopher, Tobin's Q, Debt Overhang, and Investment, *Journal of Finance*, 2004

*Further Reading: Classic References and Useful Frameworks*

- Cole, Harold, and Kehoe, Timothy, Self-Fulfilling Debt Crises, *Review of Economic Studies*, 2000
- Eaton, Jonathan, and Gersovitz, Mark, Debt with Potential Repudiation: Theoretical and Empirical Analysis, *Review of Economic Studies*, 1983
- Fischer, Edwin, Heinkel, Robert, and Zechner, Josef, Dynamic Capital Structure Choice: Theory and Tests, *Journal of Finance*, 1989
- Miller, Merton, Debt and Taxes, *Journal of Finance*, 1977

*Further Reading: New Papers*

- Atkeson, Andrew, Eisfeldt, Andrea and Weill, Pierre-Olivier, Measuring the Financial Soundness of US Firms, 1926-2012, working paper, UCLA, 2014
- Glover, Brent, The Expected Cost of Default, *Journal of Financial Economics*, 2014

## **Macroeconomic Models with Financial Imperfections**

### **Core Papers**

- Bernanke, Ben, Gertler, Mark and Gilchrist, Simon, The Financial Accelerator in a Quantitative Business Cycle Framework, *Handbook of Macroeconomics*, 1999
- Cooley, Thomas, Marimon, Ramon, and Quadrini, Vincenzo, Aggregate Consequences of Limited Contract Enforceability, *Journal of Political Economy*, 2004

- Gomes, João, Jermann, Urban and Schmid, Lukas, Sticky Leverage, *American Economic Review*, 2016
- Jermann, Urban and Quadrini, Vincenzo, Macroeconomic Effects of Financial Shocks, *American Economic Review*, 2011

*Further Reading: Monetary Policy*

- Bhamra, Harjoat, Fischer, Adlai and Kuehn, Lars-Alexander, Monetary Policy and Corporate Default, *Journal of Monetary Economics*, 2013
- De Fiore, Fiorella, Teles, Pedro and Tristani, Oreste, Monetary Policy and the Financing of Firms, *American Economic Journal: Macroeconomics*, 2011
- Gertler, Mark and Peter Karadi, A Model of Unconventional Monetary Policy, *Journal of Monetary Economics*, 2011
- Goodfriend, Marvin and McCallum, Bennett, Banking and Interest Rates in Monetary Policy: A Quantitative Exploration, *Journal of Monetary Economics*, 2008

*Further Reading: Macro Models with Financing Frictions*

- Bigio, Saki, Endogenous Liquidity and the Business Cycle, *American Economic Review*, 2015.
- Brunnermeier, Markus and Yuliy Sannikov, A Macroeconomic Model with a Financial Sector, *American Economic Review*, 2013
- Carlstrom, Charles and Fuerst, Timothy, Agency Costs, Net Worth and Business Fluctuations: A Computable General Equilibrium Approach, *American Economic Review*, 1997
- Di Tella, Sebastian Uncertainty Shocks and Balance Sheet Recessions, *American Economic Review*, 2015
- Kiyotaki, Nobuhiro and John Moore, Credit Cycles, *Journal of Political Economy*, 1999

*Further Reading: Quantifying Financing Frictions*

- Chari, V. Kehoe, Patrick and McGrattan, Ellen, Accounting for Business Cycles, *Econometrica*, 2007
- Christiano, Lawrence and Davis, Joshua, Two Flaws in Business Cycle Accounting, Working Paper, Northwestern University, 2008
- Christiano, Lawrence, Motto, Roberto, and Rostagno, Massimo, Financial Factors in Business Cycles, working paper, Northwestern University, 2009
- Hall, Robert, Quantifying the Forces Leading to the Collapse of GDP after the Financial Crisis, Working Paper, Stanford University, 2012
- Phillipon, Thomas, Has the U.S. Finance Industry Become Less Efficient? *American Economic Review*, 2015

*Further Reading: Models with Heterogeneous Firms*

- Crouzet, Nicolas, Corporate Debt Structure and the Macroeconomy, working paper, Columbia University, 2014
- Gilchrist, Simon, Sim, Jae and Zakrajsek, Egon, Uncertainty, Financial Frictions, and Investment Dynamics, Working Paper, Boston University, 2013
- Khan, Aubhik and Julia K. Thomas, Credit Shocks and Aggregate Fluctuations in an

Economy with Production Heterogeneity, *Journal of Political Economy*, 2014

*Further Reading: Empirical Work*

- Gilchrist, Simon, and Zakrajsek, Egon, Credit Spreads and Business Cycle Fluctuations *American Economic Review*, 2012

## **Quantitative Banking Models**

### **Core Papers**

- Corbae, Dean and Pablo D'Erasmus, A Quantitative Model of Banking Industry Dynamics, working paper, University of Wisconsin, 2011
- Van den Heuvel, The Welfare Cost of Bank Capital Requirements, *Journal of Monetary Economics*, 2006

*Further Reading: Financial Stability*

- Allen, Franklin, Elena Carletti and Douglas Gale, Money, Financial Stability and Efficiency, *Journal of Economic Theory*, 2012
- Gertler, Mark and Nobuhiro Kiyotaki, Bank Liquidity and Bank Runs in an Infinite Horizon Economy, Working Paper, Princeton University, 2013

*Further Reading: Banking Regulation*

- Begenau, Julianne, Capital Requirements, Risk Choice and Liquidity Provision in a Business Cycle Model, working paper, Harvard Business School, 2015.
- Begenau, Julianne and Tim Landvoigt, Financial Regulation in a Quantitative Model of the Modern Banking System, working paper, Harvard Business School, 2016.
- Boissay, Frederic, Collard, Fabrice and Smets, Frank, Booms and Systemic Banking Crises, Working Paper, European Central Bank 2012
- Nguyen, Thien, Bank Capital Requirements: A Quantitative Analysis, Working Paper, Wharton School, 2014

## **Firms, Production and Asset Prices**

### **Core Papers**

- Cochrane John, Production-Based Asset Pricing and the Link Between Stock Returns and Economic Fluctuations, *The Journal of Finance*, 1991
- Gomes, João, Leonid Kogan and Lu Zhang, Equilibrium Cross Section of Returns, *Journal of Political Economy*, 2004
- Gomes, João and Lukas Schmid, Levered Returns, *Journal of Finance*, 2010
- Gomes, João and Schmid, Lukas, Equilibrium Asset Pricing with Leverage and Default, Working Paper, Wharton School, 2016
- Jermann, Urban, Asset Pricing in Production Economies, *Journal of Monetary Economics*, 1998



- Kaltenbrunner, Georg and Loechster, Lars, Long Run Risk Through Consumption Smoothing, *Review of Financial Studies*, 2008

*Further Reading: Equity Prices in Partial Equilibrium*

- Belo, Frederico, Production-Based Measures of Risk for Asset Pricing, *Journal of Monetary Economics*, 2010
- Gomes, João, Yaron, Amir and Zhang, Lu, Asset Pricing Implications of Firms' Financing Constraints, *Review of Financial Studies*, 2006
- Liu Laura, Whited, Toni, and Zhang, Lu, Investment-Based Expected Stock Returns, *Journal of Political Economy*, 2009
- Restoy, Fernando, and Rockinger, Michael, On Stock Market Returns and Returns on Investment, *Journal of Finance*, 1994
- Vassalou, Maria, News Related to Future GDP Growth as a Risk Factor in Equity Returns, *Journal of Financial Economics*, 2003

*Further Reading: Asset Prices in Aggregate Models*

- Boldrin, Michele, Christiano, Lawrence and Fisher, Jonas, Habit Persistence, Asset Returns and the Business Cycle, *American Economic Review*, 1999
- Christiano, Lawrence, and Fischer, Jonas, Stock Market and Investment Good Prices: Implications for Macroeconomics, Working Paper, NBER, 2003
- Croce, Mariano, Long Run Productivity Risk, working paper, UNC, 2013
- Gourio, Francois, Credit Risk and Disaster Risk, *American Economic Journal: Macroeconomics*, 2013
- Guvenen, Fatih, A Parsimonious Macroeconomic Model for Asset Pricing: Habit Formation or Cross-sectional Heterogeneity?, *Econometrica*, 2010
- McGrattan, Ellen, and Prescott, Edward, Taxes, Regulation and the Value of UK and US Corporations, *Review of Economic Studies* 2005
- Rouwenhorst, Geert, Asset Pricing Implications of Equilibrium Business Cycle Models, in *Frontiers of Business Cycle Research*, Thomas Cooley (ed.), Princeton University Press, 1995

*Further Reading: Macro Models with Risk Premia*

- Gomes, João, Amir Yaron and Lu Zhang, Asset Prices and Business Cycles with Costly External Finance, *Review of Economic Dynamics* 2003
- Favilukis, Jack, Ludvigson, Sydney and Van Nieuwerburgh, Stijn, The Macroeconomic Effects of Housing Wealth, Housing Financing and the Limited Risk-Sharing in General Equilibrium, *Journal of Political Economy*, 2016
- Gourio, Francois, Disaster Risk and Business Cycles, *American Economic Review*, 2012
- Kung, Howard and Schmid, Lukas, Innovation, Growth, and Asset Prices, *Journal of Finance*, 2014
- Ward, Colin, Is the IT Revolution Over? An Asset Pricing View, Working Paper, Wharton School 2013

*Further Reading: Equity Prices in Aggregate Models with Frictions*

- Albuquerque, Rui, and Neng Wang, Agency Conflicts, Investment, and Asset Pricing,

*Journal of Finance*, 2008

- Krishnamurthy, Arvind, and Zhiguo He, Intermediary Asset Pricing, *American Economic Review*, 2013

*Further Reading: The Cross Section of Equity Returns*

- Berk, Jonathan B, Richard C. Green and Vasant Naik, Optimal Investment, Growth Options, and Security Returns, *Journal of Finance*, 1999
- Carlson, Murray, Adlai Fisher, and Ronald Giammarino, Corporate Investment and Asset Price Dynamics: Implications for the Cross-Section of Returns, *Journal of Finance*, 2004
- Cooper, Ilan, Asset Pricing Implications of Non-Convex Adjustment Costs of Investment, *Journal of Finance*, 2004
- Garleanu, Nicolae, Kogan, Leonid and Panageas, Stavros, Displacement Risk and Asset Returns, *Journal of Financial Economics*, 2012
- Garleanu, Nicolae, Panageas, Stavros, and Yu, Jiangfeng, Technological Growth and Asset Pricing, *Journal of Finance*, 2012
- Kogan, Leonid and Papanikolaou, Dimitris, Firm Characteristics and Stock Returns: The Role of Investment Specific Shocks, *Review of Financial Studies*, 2013
- Kogan, Leonid and Papanikolaou, Dimitris, Growth Opportunities, Technology Shocks and Asset Prices, forthcoming, *Journal of Finance*, 2014
- Lettau, Martin and Jessica Wachter, Why is Long Horizon Equity Less Risky? A Duration Based Explanation of the Value Premium, *Journal of Finance* 2007.
- Loualiche, Eric, Asset Pricing with Entry and Imperfect Competition, working paper, MIT 2016
- Menzly Lior, Tano Santos, Pietro Veronesi, The Time Series of the Cross Section of Asset Prices, *Journal of Political Economy*, 2004.
- Zhang, Lu, The Value Premium, *Journal of Finance*, 2005

*Further Reading: Fundamentals and the Cross Section of Equity Returns*

- Belo, Frederico, Vito Gala and Jun Li, Government Spending, Political Cycles and the Cross-Section of Stock Returns, *Journal of Financial Economics*, 2013
- Bena, Jan and Lorenzo Garlappi, Corporate Innovation and Returns, Working Paper, UBC, 2013
- Gomes, João, Leonid Kogan and Motohiro Yogo, Durability of Output and the Cross Section of Expected Returns, *Journal of Political Economy*, 2004
- Eisfeldt, Andrea and Dimitris Papanikolaou, Organizational Capital and the Cross Section of Expected Returns, *Journal of Finance*, 2014
- Garlappi, Lorenzo and Yan, Hong, Financial Distress and the Cross Section of Expected Returns, *Journal of Finance*, 2011
- Palazzo, Dino, Cash Holdings, Risk and Expected Returns, *Journal of Financial Economics*, 2012
- Papanikolaou, Dimitris, Investment Shocks and Asset Prices, *Journal of Political Economy*, 2011
- Tuzel, Selale, Corporate Real Estate Holdings and the Cross Section of Stock Returns, *Review of Financial Studies*, 2010

*Further Reading: Interactions between Finance and Labor Markets*

- Donangelo, Andres, Labor Mobility: Implications for Asset Pricing, *Journal of Finance*, 2013
- Favilukis, Jack and Xiaoji, Lin, Wage Rigidity: A Quantitative Solution to Several Asset Pricing Puzzles, working paper, London School of Economics, 2013
- Kuehn, Lars-Alexander, Nicolas Petrosky-Nadeau, and Lu Zhang, Endogenous Disasters and Asset Prices, working paper, The Ohio State University, 2013
- Merz, Monika, and Eran Yashiv, Labor and the Market Value of the Firm, *American Economic Review*, 2007.
- Weber, Michael, Nominal Rigidities and Asset Prices, Working Paper, University of Chicago, 2014
- Zhang, Mindy, Who Bears Firm Level Risk, Working Paper, UCLA, 2014

*Further Reading: Empirical Work*

- Fama, Eugene and Kenneth French, Common Risk Factors in Stocks and Bonds, *Journal of Financial Economics*, 1993
- Davis, James, Eugene Fama, and Kenneth French, Characteristics, Covariances, and Average Returns: 1929-1997, *Journal of Finance*, 2000