Band 69

Bertram Steininger

Implications of Securitization

International Real Estate Business School
Universität Regensburg

Schriften zu Immobilienökonomie und Immobilienrecht

Bertram Steininger

Implications of Securitization

Die Deutsche Bibliothek – CIP Einheitsaufnahme

Steininger, Bertram
Implications of Securitization
Bertram Steininger
Regensburg: Universitätsbibliothek Regensburg 2014
(Schriften zu Immobilienökonomie und Immobilienrecht; Bd. 69)
Zugl.: Regensburg, Univ. Regensburg, Diss., 2012
ISBN 978-3-88246-344-6

ISBN 978-3-88246-344-6

Verlag: Universitätsbibliothek Regensburg, Regensburg 2014

Zugleich: Dissertation zur Erlangung des Grades eines Doktors der Wirtschaftswissenschaften, eingereicht an der Fakultät für Wirtschaftswissenschaften der Universität Regensburg
Tag der mündlichen Prüfung: 27. Januar 2012
Berichterstatter: Prof. Dr. Steffen Sebastian
Prof. Dr. Wolfgang Schäfers

Acknowledgments

This book owes an enormous intellectual gratitude to my co-authors Marcel Marekwica, Christian Rehring and Ralf H. Hohenstatt. I am grateful to all my colleagues at the University of Regensburg, and to seminar and conference participants for many fruitful discussions about my research projects. I also thank several generations of students at the University of Regensburg for sharing my first experiences in teaching my ideas.

I thank my doctoral thesis supervisors Steffen P. Sebastian and Wolfgnag Schäfers as well as the anonymous reviewers of my conferences and journals for their wise comments.

I would like to thank my wife Ramona and my family for standing beside me throughout the first steps of my career and the process of writing this thesis.

Comments and suggestions are most welcome.

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Executive Summary

My alma mater defines the conferral of a doctorate in economics as further education in a specific science with state-of-the-art methods beyond the postgraduate level. According to Encyclopædia Britannica, science can be defined as, "[...] any system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truths or the operations of fundamental laws."[1] Accordingly, science can be divided into two major categories, the natural sciences, which is the systematic study of natural phenomena, and the social sciences, which is the systematic study of human behavior and societies.

Critics argue that economists often try to sound like natural scientists by using mathematic tools and by conveying the impression they are providing incontrovertible conclusions. By contending that natural scientists can draw on a set of irrevocable principles, critics neglect the fact that the current 'incontrovertible' state of knowledge in the natural sciences is the result of a long line of errors of judgment and continues to remain error-prone. Furthermore, they fail, perhaps due to the narrowness of the human mind and its inability to fully conceive the phenomena or perhaps because the phenomena are expanding like the universe itself, to take into consideration that this process of knowledge creation is most likely infinite. It is also necessary to bear in mind that utilizing the structural science of mathematics in the natural sciences is not a matter of course. In ancient times, Aristotle's Metaphysics made the following point, "The minute accuracy of mathematics is not to be demanded in all cases, but only in the case of things which have no matter. Hence method is not that of natural science; for presumably the whole of nature has matter."[2] Mathematics did not prove to be the most accurate method of describing natural phenomena until the 17^{th} century. For example, Immanuel Kant

[1] See e.g. Encyclopædia Britannica (2009).

[2] For an English version of Aristotle's 'Metaphysics', 995a 14-17 see e.g. Aristotle and Ross (1953)

emphasized mathematics as the fundamental structure and content of the natural sciences, stating, "In any special doctrine of Nature, there is only as much genuine science as there is mathematics."[3]

In economics, mathematics was not considered a powerful tool and framework for generating new knowledge until the 19$^{\text{th}}$ century. In his 1926 seminal article, "Sur un problème d'èconomie pure", Ragnar Frisch proclaimed the notion of unifying economic theory, statistics and mathematics, referring to it as 'econometrics'.[4] The empirical experimentation and observation of economic phenomena based on the economic theory associated with applying econometric methods to the collected data provide the basis for revealing economic relationships. The objective of applied econometrics, which involves assessing economic theories and developments with respect to probability, is to gain a deeper understanding of economic relationships. However, as Albert Einstein concludes,[5]

> *"[...] as far as the propositions of mathematics refer to reality, they are not certain; and as far as they are certain, they do not refer to reality"*

As a result, with the evolution of the use of mathematics in economics as my point of departure, the goal of this doctoral thesis is to bridge the gap between scientific research and 'phenomena' in practice by using state-of-the-art econometric techniques. In order to remain tethered to reality and to promote the application-oriented relevance of my research, three different economic fields will be examined: mutual fund fee structures, real estate swap pricing and the capital structure of real estate companies.

[3] For an English version of Kant's 'Metaphysical Foundations of Natural Science', A VIII see e.g. Kant and Friedman (2004)

[4] Frisch (1936) states that the meaning of the earlier reference by Ciompa (1910) lies more on the descriptive side of what is now called econometrics and that, consequently, the term was first employed by Frisch (1926).

[5] For an English version of Einstein's 'Geometry and Experience' Lecture before the Prussian Academy of Sciences on January 27, 1921 see Einstein (1922).

Research Objectives, Methods and Scientific Contributions

Are Mutual Fund Fees Too High?

The mutual fund industry has grown into a 25 trillion dollar business worldwide, representing 39% of the world's GDP by the end of 2010. Investors can choose between incredible 70,000 different funds.[6] Proponents of this trend emphasize that mutual funds provide investors with management services and the desirable option of gaining access to a well-diversified portfolio, even when they can only invest a small amount. Additionally, these investment vehicles can adjust their portfolio at substantially lower transaction costs than private investors. However, for their services, mutual funds charge management and administration fees. Pundits argue, among them academics and even the Deutsche Bundesbank[7], that the costs of actively managed mutual funds bear no proportion with their benefit, which raises the issue of whether direct equity investments are perhaps more appealing to a wide range of individual investors than mutual funds.

Research on this tradeoff extends as far back as Smith and Schreiner (1970), Fielitz (1974), and Jacob (1974). More recently, Sankaran and Patil (1999), Kellerer, Mansini, and Speranza (2000), and Baule (2010) pursue this matter. However, none of these studies take into account the fact that the tradeoff between direct and indirect equity investments depends substantially on investor preferences. In our paper *'Are Mutual Fund Fees Too High?'*, my coauthor, Marcel Marekwica, and I demonstrate that the fee and cost level that makes private investors indifferent between direct and indirect stock investments varies substantially according to risk aversion, the amount of money invested, transaction costs, correlations between asset returns, and the length of investment horizon.

Mutual fund performance and diversification are broadly discussed in the financial literature. Examples include Hendricks, Patel, and Zeckhauser (1993), Jegadeesh and Titman (1993), Goetzmann and Ibbotson (1994), Brown and Goetzmann (1995),

[6]Source: European Fund and Asset Management Association, International Statistical Release 2010, Supplementary Tables and the World Bank's DataBank.

[7]Although, these findings are already discussed in academic journals for several times, it is remarkable and new that a central bank gives in such a direct manner financial advice for retail customers. See Deutsche Bundesbank (2011).

Carhart (1997), Busse, Goyal, and Wahlal (2010), Fama and French (2010), and Blitz, Huij, and Swinkels (2010). The results they obtain are all fairly similar. None of this research indicates the existence of differential manager information or superior stock-picking skills on the part of fund managers. Consequently, investors should generally prefer funds with lower fees, in order to avoid the negative impact of fees on performance. In addition, a number of studies pioneered by Jorion (1985) show that the out-of sample performance of ex-ante optimally determined portfolios may underperform ex-post, in comparison to naïve strategies such as an equally weighted portfolio. DeMiguel, Garlappi, and Uppal (2009) confirm this outcome impressively, using 14 different models. The implications of the cost of investing are addressed empirically, for example by Carhart (1997), Bogle (2005), Fama and French (2010) or Blitz, Huij, and Swinkels (2010). They conclude that the cost effect of the fee – higher fees reduce fund performance – generally outweigh the benefit effect – increased investment company profitability and thus their ability to attract skilled managers. Pástor and Stambaugh (2010) argue, from a theoretical perspective, that a growing mutual fund industry inevitably and without exception, reduces actively managed funds' ability to outperform a passive benchmark. Khorana, Servaes, and Tufano (2009) study the fee structure and obtain average total shareholder costs of 1.53% for the USA. Recently, Cremers, Ferreira, Matos, and Starks (2011) report average costs of 1.38% for actively managed mutual funds, 0.3% for exchange traded funds, and 0.26% for passively managed mutual funds.

Throughout our research, we consider an investor who can either invest directly with up to N different equities or indirectly with an equity mutual fund. Indirect investments through equity mutual funds provide two key advantages – low-wealth investors gain access to diversified portfolios, and the portfolio rebalancing costs are lower for institutional investors than for individual investors. In our model, we consider a wealth- maximizing investor with constant relative risk aversion. We further assume that the mutual fund invests in such a way that the investor's utility is maximized and the returns are multivariate lognormally distributed. Since there is no closed-form expression known for sums of lognormals and due to the non-linearity of the utility function, we have to rely on numerical methods. We draw on a Monte Carlo simulation to approximate the distribution of total final wealth. The results are based on 50,000 simulated paths each. For our base-case parameter setting, the fee that makes the investor indifferent between investing in a mutual fund and a direct stock investment is about 0.63%. Hence, an investor prefers a mutual fund if its fee is below 0.63%. By implication, he prefers a direct stock investment if mutual funds charge fees exceeding 0.63%. However, this result must be seen in a broader context. The fee to which the investor is indifferent varies substantially according to the investor's wealth level and risk aversion, the correlations between stocks, transaction costs, and the length of investment horizon. The lower the investor's wealth level, the higher the transaction costs, the greater his risk aversion, and the shorter the length of his investment horizon, the higher the 'indifferent fee'. Our results imply that the fees of many actively managed equity mutual funds are at levels that make direct stock investments more appealing to a wide range of individual investors. The relatively low fee levels of passively managed equity mutual funds and exchange traded funds on the other hand, make these investment vehicles appealing to a wide range of investors. In further research, our results could be investigated empirically. However, the current data are inadequate for this approach at the individual investor level.

An Empirical Evaluation of Normative Commercial Real Estate Swap Pricing

The real estate derivative market is still in its infancy. Despite the fact that institutional-grade commercial real estate constitutes one third of the overall investable asset market[8], a functioning derivatives market has existed only since the mid-2000s, when swap contracts, based on private market indices, began to be traded in the UK in significant amounts. The standard commercial real estate derivative type of contract – total return swaps – are over-the-counter deals and their market liquidity remains far behind that of other established derivative markets. Market participants primarily name three concerns regarding the low acceptance. These are the lack of a secondary market and dealers, a shortage of liquidity, and concerns as to how real estate derivatives should be priced. Fabozzi, Shiller, and Tunaru (2009, 2010) argue that the imperfection of real estate markets – serial correlation and inertia in the returns – is the main obstacle to establishing liquidity in the market. Shiller (2008) shows that as long as investors do not understand the pricing process, their confidence in the market will remain low. They will thus remain unwilling to trade, preventing the critical mass that is necessary to launch a new market. In con-

[8] Estimate as of end 2009, based on data from the World Bank for stocks, from the Quarterly Review of the Bank for International Settlements for bonds and from Prudential Real Estate Investors for real estate.

trast to the close-to-zero spreads over the risk-free rate for financial market swaps, the spreads for commercial real estate total return swaps have been large and have also fluctuated considerably over the last few years. The literature on real estate pricing can be clustered into two groups: no-arbitrage models and equilibrium pricing models. Based on arbitrage analysis, Buttimer, Kau, and Slawson (1997), Björk and Clapham (2002) and Patel and Pereira (2008) theoretically examine the pricing of real estate swap contracts. Otaka and Kawaguchi (2002) model the pricing of real estate derivatives under incomplete market conditions. Baran, Buttimer, and Clark (2008) calibrate a two-factor commodity pricing model, accounting for challenges due to lags and the low frequency of index updates. By contrast, Geltner and Fisher (2007) argue against the arbitrage pricing approach with regard to the analysis of swaps based on appraisal-based indices, because the index cannot be traded and may not be valued on an ongoing basis, so as to correspond with the equilibrium expected return in the real estate market tracked by the index. The appraisal-based indices lag and smooth actual market developments and eliminate the use of no-arbitrage models. Based on equilibrium pricing considerations, Geltner and Fisher demonstrate theoretically how to price swaps fairly. Lizieri, Marcato, Ogden, and Baum (2010) simulate some of the deviations from fair swap prices by specific real estate characteristics of the direct real estate market, such as high transaction costs and long execution times.

In the paper *'An Empirical Evaluation of Normative Commercial Real Estate Swap Pricing'* my coauthor, Christian Rehring, and I empirically analyze fair commercial real estate swap pricing, using the equilibrium swap pricing considerations proposed by Geltner and Fisher. We investigate total return swaps, when the calendar year real estate index return is exchanged for a fixed rate for the US and UK markets, emphasizing how the different market dynamics affect fair swap prices. The empirical part of our investigation comprises four steps. Firstly, we develop a vector autoregressive model of expected index returns and compare these results with the actual index returns and with competing forecasts. In the second step, we estimate equilibrium risk premia for appraisal-based real estate index returns. Thirdly based on the index return forecasts and the equilibrium risk premia, we compute the normative fair swap prices, i.e., those consistent with the Geltner and Fisher model. Finally, the development of actual commercial real estate swap prices in recent years is interpreted in the light of our calculated "fair" swap prices. Qualitatively, the estimated swap prices track actual market developments quite well, indicating that the modeled swap prices enhance our understanding of the pricing of commercial real estate swaps. The deviations are particularly high for UK at the beginning of 2009. With hindsight, the large negative actual prices were not justified, because the IPD total return was positive in 2009 and 2010. In general, the differences between actual and estimated swap prices are smaller for the US. The reason could be that appraisal-based returns have a higher degree of predictability. Counterparty risk might explain part of the difference between actual and estimated swap prices. However, Lizieri, Marcato, Ogden, and Baum (2010) suggest that this is of minor importance, since no principal is exchanged, the treatment of swaps in default is favorable and the intermediary market maker offers a guarantee. In fact, Lizieri, Marcato, Ogden, and Baum (2010) explore the spreads caused by the specific characteristics of direct real estate markets. Also, our model could be extended, for example, by a rolling calibration window for the forecast and, even if we have already included time-variant smoothing parameters, by time-variant betas for the market risk premia. This may provide superior results, but would be beyond the scope of this paper. To the best of our knowledge, we are the first to empirically explain the large spreads for commercial real estate total return swaps with state-of-the-art methods.

The Rat Race of Capital Structure Research: Two Spots on Leverage

Since the seminal work of Franco Modigliani and Merton Miller in 1958, despite the large number of capital structure studies, no one generally accepted capital structure theory has emerged. Consequently my third paper *'An Empirical Evaluation of Normative Commercial Real Estate Swap Pricing'* does not aim to validate any of the capital structure theories. In fact, my coauthor, Ralf Hohenstatt, and I follow the results of Graham and Harvey (2001), who state that “financial flexibility is the single most important determinant of capital structure according to CFOs”. DeAngelo and DeAngelo (2007), who aimed at filling the gap in capital structure theory, conclude that “[f]inancial Flexibility is the critical missing link for an empirically viable [capital structure] theory.” Gamba and Triantis (2008) directly address this concept and provide the following definition: “Financial flexibility represents the ability of a firm to access and restructure its financing at a low cost. Financially flexible firms are able to avoid financial distress in the face of negative shocks, and to readily fund investment when profitable opportunities arise.”

In our paper, leverage is investigated by two spots. Spot A is defined as financial flexibility, in the sense of anticipating liquidity management. The interactions of leverage (LEV) with cash & cash equivalents (CCE) and lines of credit (LOC) are at the heart of the matter. Spot B distinguishes between real stochastic and mainly mechanical relationships of the ratio leverage and is motivated by the arguments of Chen and Zhao (2007) and Gatchev, Pulvino, and Tarhan (2010), so as to fractionalize leverage in its debt and equity component. We hypothesize that financial flexibility is a broader, but more consistent concept in explaining the dynamics of financing activities, compared to traditional capital structure theory.

By observing US REITs and REOCs from 1995 to 2010, this paper presents a dynamic multi-equation model, based on a balance sheet identity. The basic concept underlying this paper is a combination of the cash flow statement approach of Gatchev, Pulvino, and Tarhan (2010), in which we implement the cash flow statement by the intertemporal changes of CCE, and the balance-sheet view of Chen and Zhao (2007), in which we deal separately with debt and equity dynamics. More specifically, the concept that we adopt entails a system of equations, estimated by weighted least squares, where the weight is reciprocal to the number of observations per year. As both a cross and a time effect are present in our data, we follow the advice of Petersen (2009) and address the time effect parametrically, by including time dummies and then estimating the model clustered on the cross section. In addition to the balance sheet items defining the identity, we include the three instruments of liquidity management (LEV, CCE and LOC), traditional capital structure determinants and additional dummies approximating firm characteristics with two dummies unique to our research (investment opportunities and substantial cash-flow shortfalls). In order to deal with the cross-industry variation, we compare the results subject to the twelve property segments of the entire real estate market.

The six main findings are as follows. Firstly, leverage drives cash & cash equivalents positively, but lines of credit negatively. While the latter result, as well as the substitutive relationship of CCE and LOC, are backed by the existing literature, the positive LEV-CCE relationship is contrary to previous research. However, the findings from our dynamic framework are consistent with arguments of financial flexibility. Secondly, interactions of LEV, CCE and LOC are consistent with the typical funding cycle suggested by Riddiough and Wu (2009). An alternative explanation is obtained by interpreting the marginal value of a liquidity instrument as conditional on the original level of the other sources of financial flexibility. Thirdly, the discussion of mechanical dynamics is not reduced only to debt and equity for LEV, but also applies to LEV and LOC. The relationship between growth opportunities and market/book leverage demonstrate this mechanical issue very clearly. Fourthly, dummies – unique to our research – yield very robust results with respect to the observation of firms lowering LEV, i.e. preserving debt capacity after investment shocks. By contrast, FFO shocks affect balance sheet aggregates very similarly to investment shocks, but generally result in LEV increases. Fifthly, the more firms overdo debt acquisition due to cash flow improvements, the more prone they are to cash-flow-investment sensitivity. Finally, firm size seems to substitute for financial flexibility, at least to some extent.

This paper builds a bridge between emphasizing the characteristics of leverage in the function of a simplifying ratio, and classifying leverage in the class of drivers of liquidity management. However, several issues should be addressed in further research. Firstly, what are the other sources of financial flexibility? Is there a hierarchy among the sources in terms of efficiency, and under which circumstances? Can we draw inferences about managerial risk aversion in terms of preferring one or the other source? What is the relationship between the sources of liquidity and investment flexibility? And finally, what is the reason for REOCs underutilizing cash reserves and accordingly, why do REITs almost totally abandon cash as a hedging instrument?

References

Aristotle, and W.D. Ross, 1953, *Metaphysics (translated by W.D. Ross)* (Clarendon Press: Oxford) 2 edn.

Baran, L.C., R.J. Buttimer, and S.P. Clark, 2008, Calibration of a commodity price model with unobserved factors: The case of real estate index futures, *Review of Futures Markets* 16, 455–469.

Baule, R., 2010, Optimal portfolio selection for the small investor considering risk and transaction costs, *OR Spectrum* 32, 61–76.

Björk, T., and E. Clapham, 2002, On the pricing of real estate index linked swaps, *Journal of Housing Economics* 11, 418–432.

Blitz, D., J. Huij, and L.A.P. Swinkels, 2010, The performance of european index funds and exchange-traded funds, *European Financial Management, Forthcoming.*

Bogle, J.C., 2005, The mutual fund industry 60 years later: For better or worse?, *Financial Analysts Journal* 61, 15–24.

Brown, S.J., and W.N. Goetzmann, 1995, Performance persistence, *Journal of Finance* 50, 679–698.

Busse, J.A., A. Goyal, and S. Wahlal, 2010, Performance and persistence in institutional investment management, *Journal of Finance* 65, 765–790.

Buttimer, R.J., J.B. Kau, and V.C. Slawson, 1997, A model for pricing securities dependent upon a real estate index, *Journal of Housing Economics* 6, 16–30.

Carhart, M.M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57–82.

Chen, L., and X. Zhao, 2007, Mechanical mean reversion of leverage ratios, *Economics Letters* 95, 223–229.

Ciompa, P., 1910, *Grundrisse einer Ökonometrie und die auf der Nationalökonomie aufgebaute natürliche Theorie der Buchhaltung: ein auf Grund neuer ökonometrischer Gleichungen erbrachter Beweis, daß alle heutigen Bilanzen falsch dargestellt werden.* (C. E. Poeschel: Lemberg).

Cremers, M., M. Ferreira, P. Matos, and L. Starks, 2011, The mutual fund industry worldwide: Explicity and closet indexing, fees, and performance, Working Paper.

DeAngelo, H., and L. DeAngelo, 2007, Capital structure, payout policy, and financial flexibility, Working paper, Marshall School of Business.

DeMiguel, V., L. Garlappi, and R. Uppal, 2009, Optimal versus naive diversification: How inefficient is the 1/N portfolio strategy?, *Review of Financial Studies* 22, 1915–1953.

Deutsche Bundesbank, 2011, Monthly Report - January, 63 (1), 43–54.

Einstein, A., 1922, *Sidelights on relativity* (Methuen & Co.: London).

Encyclopædia Britannica, 2009, *Encyclopædia Britannica* (Encyclopædia Britannica: London) 15 edn.

Fabozzi, F.J., R.J. Shiller, and R.S. Tunaru, 2009, Hedging real estate risk, *Journal of Portfolio Management* 35, 92–103.

——— , 2010, Property derivatives for managing European real-estate risk, *European Financial Management* 16, 8–26.

Fama, E.F., and K.R. French, 2010, Luck versus skill in the cross-section of mutual fund returns, *Journal of Finance* 65, 1915–1947.

Fielitz, B.D., 1974, Indirect versus direct diversification, *Financial Management* 3, 54–62.

Frisch, R., 1926, Sur un problème d'économie pure, *Norsk Matematisk Forenings Skrifter* 1, 1–40.

——— , 1936, Note on the term "econometrics", *Econometrica* 4, 95.

Gamba, A., and A. Triantis, 2008, The value of financial flexibility, *Journal of Finance* 63, 2263–2296.

Gatchev, V.A., T. Pulvino, and V. Tarhan, 2010, The interdependent and intertemporal nature of financial decisions: An application to cash flow sensitivities, *Journal of Finance* 65, 725–763.

Geltner, D., and J.D. Fisher, 2007, Pricing and index considerations in commercial real estate derivatives, *Journal of Portfolio Management* 33, 99–118.

Goetzmann, W.N., and R.G. Ibbotson, 1994, Do winners repeat? Patterns in mutual fund performance, *Journal of Portfolio Management* 20, 9–18.

Graham, J.R., and C.R. Harvey, 2001, The theory and practice of corporate finance: evidence from the field, *Journal of Financial Economics* 60, 187–243.

Hendricks, D., J. Patel, and R. Zeckhauser, 1993, Hot hands in mutual funds: Short-run persistence of performance, 1974-88, *Journal of Finance* 48, 93–130.

Jacob, N.L., 1974, A limited-diversification portfolio selection model for the small investor, *Journal of Finance* 29, 847–856.

Jegadeesh, N., and S. Titman, 1993, Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance* 48, 65–91.

Jorion, P., 1985, International portfolio diversification with estimation risk, *Journal of Business* 58, 259–278.

Kant, I, and M. Friedman, 2004, *Metaphysical Foundations of Natural Science (translated by M. Friedman)* (Cambridge University Press: Cambridge).

Kellerer, H., R. Mansini, and M.G. Speranza, 2000, Selecting portfolios with fixed costs and minimum transaction lots, *Annals of Operations Research* 99, 287–304.

Khorana, A., H. Servaes, and P. Tufano, 2009, Mutual fund fees around the world, *Review of Financial Studies* 22, 1279–1310.

Lizieri, C., G. Marcato, P. Ogden, and A. Baum, 2010, Pricing inefficiencies in private real estate markets using total return swaps, *Journal of Real Estate Finance and Economics,* forthcoming.

Modigliani, F., and M.H. Miller, 1958, The cost of capital, corporation finance and the theory of investment, *American Economic Review* 48, 261–297.

Otaka, M., and Y. Kawaguchi, 2002, Hedging and pricing of real estate securities under market incompleteness, Working paper, MTB Investment Technology Institute.

Pástor, L., and R.F. Stambaugh, 2010, On the size of the active management industry, CRSP Working Paper.

Patel, K., and R. Pereira, 2008, Pricing property index linked swaps with counterparty default risk, *Journal of Real Estate Finance and Economics* 36, 5–21.

Petersen, M.A., 2009, Estimating standard errors in finance panel data sets: Comparing approaches, *Review of Financial Studies* 22, 435–480.

Riddiough, T.J., and Z. Wu, 2009, Financial constraints, liquidity management and investment, *Real Estate Economics* 37, 447–481.

Sankaran, J.K., and A.A. Patil, 1999, On the optimal selection of portfolios under limited diversification, *Journal of Banking and Finance* 23, 1655–1666.

Shiller, R.J., 2008, Derivatives markets for home prices, Working paper, Yale University.

Smith, K.V., and J.C. Schreiner, 1970, Direct vs. indirect diversification, *Financial Analysts Journal* 26, 33–38.

Chapter 1

Are Mutual Fund Fees too High?

This paper is the result of a joint work with Marcel Marekwica.

This is a previous previous version of the following article:
Marcel Marekwica and Bertram I. Steininger (2014): The tradeoff between mutual fund and direct stock investments: a theoretical analysis involving different types of investors, Review of Managerial Science, Vol. 8, No. 2, pp. 197-224.

which has been published in final form at:
http://link.springer.com/article/10.1007/s11846-013-0101-9

Abstract

We study the tradeoff between direct and indirect stock investments through equity mutual funds for a utility-maximizing investor. Whereas direct investments impose higher transaction costs on forming a well-diversified portfolio, mutual funds charge fees for their services. Our result shows that the fee levels that make private investors indifferent between direct and indirect stock investments vary heavily according to risk aversion, the amounts invested, correlations between assets, transaction costs and the length of investment horizon. In particular, our results suggest that for a wide range of actively managed mutual funds, the fees charged are too high for these mutual funds to appeal to a wide range of informed investors.

1.1 Introduction

The mutual fund industry has recently experienced abundant growth throughout the developed countries. By the end of 2010, the mutual fund industry had grown to 24.7 trillion dollars under management worldwide, corresponding to an increase of 38.98% over the last 5 years. Investors could choose among 69,519 different funds in 2010, an increase of 31.8% compared to the pool of funds in 1999. Although the largest markets are still located in the USA and Europe, with global market shares of 47.9% and 32.0%, respectively, the Asian and Pacific (12.4%) and African (0.6%) countries are steadily bridging the gap with an average annual growth rate of 9.6% and 16.6% over the last 5 years.[1]

Mutual funds provide investors with management services and the desirable option of gaining access to a well-diversified portfolio, even when they only invest a smaller amount. Furthermore, these investment vehicles can restructure their portfolios at substantially lower transaction costs than would be the case for private investors. However, for their services, mutual funds charge management and administration fees, which are usually expressed as a proportion of the funds under management, which reduces the portfolio return. The fees thus entail a tradeoff between direct and indirect equity investments, the latter being through mutual funds. Research on this tradeoff ranges back to Smith and Schreiner (1970), Fielitz (1974), and Jacob (1974). Other work includes Sankaran and Patil (1999), Kellerer, Mansini, and Speranza (2000), and Baule (2010). However, none of these studies take into account the fact that the tradeoff between direct and indirect equity investments depends substantially on investor preferences.

We contribute to the existing literature by studying this tradeoff for a utility-maximizing investor. This tradeoff can vary considerably between individual investors. More specifically, we show that the fee level that makes private investors indifferent between direct and indirect stock investments, varies heavily according to risk aversion, the amount invested, transaction costs, correlations between asset returns, and the length of investment horizon. In particular, our results suggest that for a wide range of mutual funds, the fees charged are too high to make those funds appealing.

[1]Source: European Fund and Asset Management Association, International Statistical Release 2010, Supplementary Tables.

Our research draws on two major groups of previous studies on mutual funds and the cost of investing. First, mutual fund performance and diversification are discussed comprehensively in the finance literature. for example, Hendricks, Patel, and Zeckhauser (1993), Goetzmann and Ibbotson (1994), and Brown and Goetzmann (1995) explain the mutual fund performance by "hot hands" or general investment strategies. However, their results seem to be driven partly by the one- to three-years momentum effect documented by Jegadeesh and Titman (1993). Carhart (1997) shows that general factors in equity returns and fund expenses explain almost all the persistence in equity mutual fund mean and risk-adjusted returns. His results do not confirm the existence of differential manager information or stock-picking skills. These results are confirmed, among others, by Busse, Goyal, and Wahlal (2010) and Blitz, Huij, and Swinkels (2010). Similarly, Fama and French (2010) find that the majority of funds do not generate αs that are statistically different from zero. As a consequence, investors should generally prefer funds with lower fees, as lower fees *ceteris paribus* have a direct positive impact on performance.

In addition, a number of studies pioneered by Jorion (1985) show that the out-of-sample performance of the ex-ante optimal determined portfolios within a sample-based mean-variance model may underperform, in comparison to naïve strategies such as an equally weighted portfolio. Recently, DeMiguel, Garlappi, and Uppal (2009) extended the sample-based mean-variance model by approaches designed to reduce estimation error, relative to the naïve 1/N portfolio. Of the 14 models which they analyze on the basis of parameters calibrated to the US equity market, none consistently outperform the 1/N rule in terms of Sharpe ratio, certainty-equivalent return or turnover. The analytical results and simulations in DeMiguel, Garlappi, and Uppal (2009) document that the estimation window needed for the sample-based mean-variance strategy and its extensions to dominate the 1/N benchmark is around 3,000 months for a portfolio with 25 assets.

Our research further draws on papers that address the cost of investing and different fee structures. For investors, fees are the price paid for professional investment management, distribution, and other services. One the one hand, higher fees reduce fund performance. Alternatively, they might increase investment company profitability through their ability to attract skilled managers. However, empirical results by Carhart (1997), Bogle (2005), Fama and French (2010) or Blitz, Huij, and Swinkels (2010) among others, suggest that the former effect generally outweighs the latter. From a theoretical perspective, Pástor and Stambaugh (2010) argue that a growing mutual fund industry reduces actively managed fund's ability to outperform a passive benchmark. Evans (2008) indeed documents that mutual funds with managerial investments perform slightly better than other mutual funds.

Khorana, Servaes, and Tufano (2009) study the fee structure charged by 46,580 mutual funds in 18 countries, representing approximately 86% of the world fund industry in 2002. They analyze the management fees, total expense ratios, and total shareholder costs including load charges. Fund expenses differ substantially by size, investment objectives and countries. Larger funds and fund complexes charge lower fees, whereas fees are higher for funds offered in different countries and those domiciled in certain tax havens. Significant differences among countries persist even after adjusting for these variables. The most robust explanatory factor for the remaining differences is that fund fees are higher in countries with weaker investor protection. The asset-weighted average total shareholder costs for equity funds worldwide were 1.80% in 2002. The cost-range varies from 0.82% in the Netherlands to 3.00% in Canada. In the United States, legal settlements and lawsuits accusing fund managers of illegal kickback commissions have led to cost reductions to 1.53 percentage points. In a recent study, Cremers, Ferreira, Matos, and Starks (2011) report average total shareholder costs of 1.38% for actively managed mutual funds, 0.3% for exchange traded funds, and 0.26% for passively managed mutual funds.

French (2008) compares the actual cost of investing – the transaction costs, fees and expenses paid for equity mutual funds in the US stock market with the modeled cost of investing, if everybody invested passively from 1980-2006. He calculates average total costs per year of 0.82% of the total value of domestic equities in 1980 and 0.75% of that in 2006. With a purely passive investment in the market portfolio, however, the cost of investing would have been 0.18% of the total value of domestic equities in 1980 and 0.09% in 2006 only. The difference between the active and passive strategy can be regarded as the cost of active investing. Consequently, the average annual cost of active investing is 0.66% in terms of total 2006 domestic equities. From an investment company perspective, this percentage expresses the cost of price discovery, based on the value of all stocks. From a private investor perspective, the interpretation is more challenging. Without net transfer between a passive market portfolio and other investors, the application of a passive strategy increases the average annual return by 66 basis points. In addition, mutual funds have front-load fees that typically vary between 1 and 8.5% (Livingston and O'Neal (1998)) and tend to have an even lower performance, following significant mutual fund outflows (Clarke, Cullen, and Gasbarro (2007)). Therefore, it may seem incomprehensible that active traders continue to play a negative sum game. According to French (2008), there are three main reasons. First, investors fail to understand the potential to increase returns by applying a passive strategy. Second, investment company promotion suggest that active trading is effortless and profitable. This impression a private investor might gain is supported by the financial press, which reports stories of undervalued stocks and prosperous deals. Third, Odean (1998), Barber and Odean (2001), and Statman, Thorley, and Vorkink (2006) report that investor overconfidence about their ability to gain superior returns overrides the knowledge that active trading may be costly.

To the best of our knowledge, we are the first to show how key parameters like risk aversion, an investor's wealth level, transaction costs, correlation, and the length of the investment horizon affect the tradeoff between direct an indirect stock investments for a utility-maximizing investor. Our results suggest that fees charged by many mutual funds are too high for them to be attractive for a wide range of private investors.

The paper proceeds as follows. Section 1.2 introduces our model. In section 1.3, we present our results and section 1.4 concludes.

1.2 The Model

Throughout our manuscript, we consider an investor who can either invest directly in up to N different stocks or indirectly via an equity mutual fund. Indirect investments via equity mutual funds provide two key advantages. First, equity mutual funds give private investors with low wealth levels access to diversified portfolios. Second, transaction costs for rebalancing portfolio weights are substantially lower for institutional investors than for individual investors.

On the other hand, mutual funds change an annual fee, which is usually a constant percentage of the fund being managed. Depending on the type of fund, the annual total shareholder costs including load charges typically vary between 0.26% for passively managed equity mutual funds and 1.6% for actively managed equity mutual funds.[2] We refer to these expenses and costs as fees in the following analysis and assume that the mutual fund's transaction costs are already included in the annual fee. We further assume that the mutual fund invests in such a way that the investor's utility is maximized. Specifically, we consider an investor with constant relative risk aversion, whose utility from total final wealth is given by

$$U(W) = \begin{cases} \frac{W^{1-\gamma}}{1-\gamma} & \text{for } \gamma \neq 1 \\ \ln(W) & \text{for } \gamma = 1 \end{cases} \tag{1.1}$$

where $\gamma \geq 0$ denotes the investor's degree of risk aversion.

Both investors holding mutual funds and those investing directly are subject to fees or transaction costs. By τ_f, we denote a fixed transaction-cost rate that the investor has to pay each time he buys and sells a fund holding. We assume that investors are not subject to variable transaction costs.[3] Initially, our investor is endowed with an amount of $W_{0\_}$ in cash which he seeks to invest. In our base-case parameter setting, we consider an investor who invests over a one-year investment horizon. First, restricting ourselves to a one-period investment horizon avoids unnecessary complications in notation. Second, the average holding period for both equity mutual funds and individual stocks listed at NYSE is only about one year (Bogle (2005) and Montier (2007)).[4]

1.2.1 Diversification

Since the pioneering work of Markowitz (1952), it is known that diversification is the key driving force for portfolio formation. For a portfolio with n assets, the portfolio's variance σ_n^2 is given by

[2]Cremers, Ferreira, Matos, and Starks (2011) report average total shareholder costs of 0.26% for passively managed mutual funds for the time period 2002-2007. Ramos (2009) computes an average total shareholder costs of 1.6% for actively managed mutual funds in 2005.

[3]We also computed results for settings with variable transaction costs. However, given that variable transaction costs affect direct and indirect stock investments in a very similar manner, our results are not affected much by introducing variable transaction costs.

[4]We consider the impact of longer investment horizons in section 1.3.5.

$$\sigma_n^2 = \sum_{i=1}^{n} \sum_{j=1}^{n} w_i w_j \sigma_i \sigma_j \rho_{i,j} \tag{1.2}$$

where σ_i denotes the standard deviation of asset i, $\rho_{i,j}$ the correlation between the return on asset i and asset j, and w_i is the portfolio weight of asset i. In order to compare the performance of a mutual fund with that of direct investments, we must take into account that the latter might optimally not invest in all assets, in an attempt to limit the transaction cost burden. In general, the submenu of assets chosen will depend on the individual characteristics of the assets considered, as well as the level of the transaction cost for trading these assets.

One of the key advantages from direct investment in stocks is that the investor can avoid paying management fees. However, for direct investments, transaction costs can be substantial. In the presence of transaction costs, investors face a tradeoff between the benefits and costs of diversifying their portfolios. This tradeoff can lead them to hold portfolios that differ from those they would have chosen in the absence of transaction costs. In particular, in the presence of fixed transaction costs, investors might choose to hold a smaller number of different assets (see e.g. Mayshar (1979), Campanale (2009)). The impact of variable transaction costs is, among others, studied in Constantinides (1986), Davis and Norman (1990), or Dumas and Luciano (1991). Liu (2004) and Lynch and Tan (2010) analyze the joint impact of both forms of transaction costs and Baule (2010) studies a portfolio choice problem with variable transaction costs and minimum fees.

The dynamic nature of the portfolio problem caused by introducing transaction costs into optimal multi-period portfolio problems makes the portfolio optimization computationally challenging. Research in this field has therefore focused on studying settings with up to two risky assets only. Given that two assets rarely constitute a well-diversified portfolio and diversification is a key factor driving the tradeoff between direct and indirect equity investments, we have to allow for more than two risky assets. As proved by Kellerer, Mansini, and Speranza (2000), finding a portfolio with the optimal number of stocks is in general an NP-hard problem.[5] To keep

[5]For an investor having access to N risky assets, there are $\frac{N!}{K!(N-K)!}$ portfolios with K different assets. Thus, finding the optimal portfolio with the optimal number of risky assets generally

the optimization problem numerically tractable, we therefore restrict our analysis to a menu of N stocks that all yield the same expected return μ, the same standard deviation σ and the same pairwise correlation ρ. This assumption potentially overestimates the desirability of mutual fund investments, in that it potentially underestimates the diversification benefits of direct stock investments. In particular, it rules out the fact that in directly invested portfolios, investors achieve substantial diversification benefits by holding those assets that correlate least.

Our assumptions imply that mutual funds are not able to generate higher expected returns by for instance, stock-picking. This corresponds with overwhelming empirical evidence that mutual funds on average do not outperform their corresponding benchmarks.[6] Therefore, investors should *ceteris paribus*, prefer mutual funds with lower fees. In particular, investors should generally prefer exchange traded funds (ETFs) to actively managed equity mutual funds and to the so-called enhanced ETFs (Chang and Krueger (2010)) that tend to charge higher fees. Exchange traded funds are traded on stock markets essentially like individual stocks. We therefore assume that the same transaction costs apply to trading individual stocks and to mutual funds.

For the portfolio problem that we study, an investor holding n stocks optimally holds an equal fraction $\frac{1}{n}$ of his wealth in each and every asset. Empirically, such an investment strategy seems to have desirable out-of-sample properties. For instance, DeMiguel, Garlappi, and Uppal (2009) report that, due to estimation risk in other portfolio choice models, they are unable to find a portfolio choice strategy that systematically outperforms the naïve equally-weighted portfolio strategy. With an equal fraction of wealth invested in each and every asset, equation (1.2) can be rewritten as

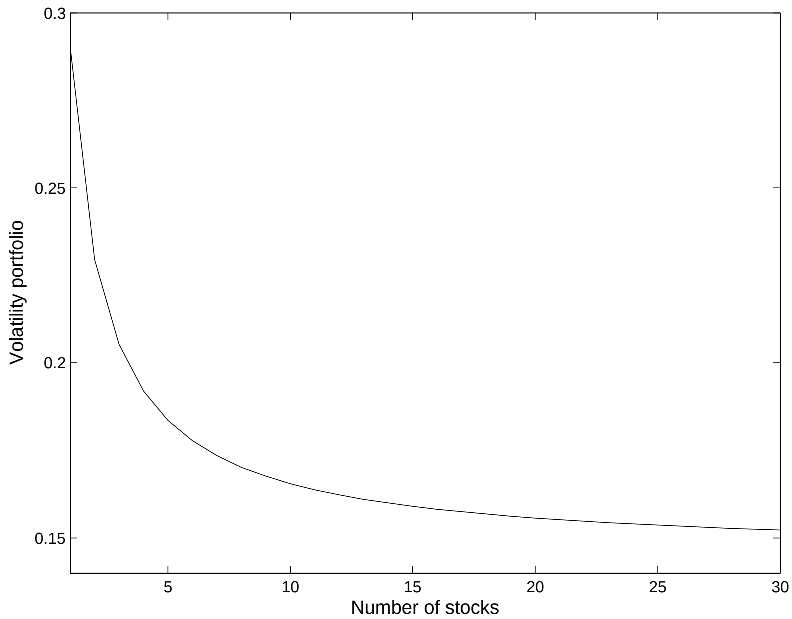
requires solving $\sum_{K=1}^{N} \frac{N!}{K!(N-K)!}$ optimization problems. Already for an N as small as 30, this results in more than 1,000,000,000 optimization problems.

[6]See, Jensen (1968), Malkiel (1995), Carhart (1997), Bogle (2005), Busse, Goyal, and Wahlal (2010), Fama and French (2010), and Blitz, Huij, and Swinkels (2010).

$$\begin{aligned}
\sigma_n^2 =& \frac{1}{n^2}\sum_{i=1}^{n}\sigma^2 + \frac{1}{n^2}\sum_{i=1}^{n}\sum_{\substack{j=1\\ j\neq i}}^{n}\sigma^2\rho \\
=& \frac{1}{n}\sigma^2 + \frac{1}{n}\left(n-1\right)\sigma^2\rho \\
=& \sigma^2\rho + \frac{1}{n}\sigma^2\left(1-\rho\right)
\end{aligned} \tag{1.3}$$

Equation (1.3) indicates that the portfolio's variance consists of two summands. The first summand $\sigma^2\rho$ describes the portfolio's systematic risk that cannot be diversified. The second summand $\frac{1}{n}\sigma^2\left(1-\rho\right)$ is the idiosyncratic risk that can be eliminated by holding a large number of different assets. If the number n of different stocks goes to infinity, the second term vanishes completely. Even for a reasonably large n, the systematic risk becomes negligible.

Figure 1.1: Portfolio Volatility



Note: This figure depicts the relationship between a portfolio's volatility and the number of stocks it contains.

Figure (1.1) depicts the relationship between a portfolio's volatility σ_n and the number n of assets held in the portfolio when $\sigma = 29.02\%$ and $\rho = 0.2503$, corresponding to the average historical standard deviation and correlation for annual returns of assets contained in the Dow Jones Industrial Average between 1980 and 2010. This confirms the finding of Statman (1987) that a portfolio consisting of 30 stocks is well-diversified. We therefore restrict ourselves to a market in which $N = 30$ stocks are traded throughout. According to the 2007 Survey of Consumer Finances, 36.4% of all families with direct stock investments held only one stock, implying a portfolio's volatility of 0.2902% in our model. 47.6% of all households hold between 2 and 9 stocks, implying portfolio volatilities between 0.2295% and 0.1676%. Only 16% of the households have more than 10 stocks and consequently, a volatility not exceeding 0.1676%. The evolution of wealth depends on whether the investor chooses a direct or an indirect stock investment.

1.2.2 Direct Investment

An investor who invests directly in n stocks has to pay transaction costs for each unit of the stock he trades. That is, the amount W_{0+} invested after purchasing stocks is given by

$$W_{0_+} = W_{0_-} - n\tau_f \tag{1.4}$$

Equation (1.4) shows how the investor's wealth before trading W_{0_-} is shrunk to wealth after trading of W_{0_+} due to the associated transaction costs. The investor's wealth W_{1_-} before trading at time $t = 1$ is given by

$$W_{1_-} = W_{0_+} \sum_{i=1}^{n} \frac{1}{n} R_i \tag{1.5}$$

where R_i denotes the gross return on asset i. At time $t = 1$, the investor liquidates his investments. Consequently,

$$W_{1_+} = W_{1_-} - n\tau_f \tag{1.6}$$

An investor holding stocks directly thus faces a tradeoff between increasing the number of stocks to improve the portfolio diversification and not increasing it to save the transaction costs. That is, the investor has to optimize the number of assets in his portfolio and solve the optimization problem

$$U^* = \max_n U\left(W_{1_+}\right) \tag{1.7}$$

subject to equations (1.4) to (1.6).

1.2.3 Mutual Fund Investment

When investing in a mutual fund, the investor has to pay fees. We assume that the fund charges a fee $f \in (0, 1)$ at the end of each period, which is a constant multiple of the funds under management at that point in time. When the investor has to pay transaction costs to purchase the mutual fund at time 0, it holds that

$$W_{0_+} = W_{0_-} - \tau_f \tag{1.8}$$

Note that in contrast to a direct stock investment, the investor only has to pay the transaction cost τ_f once – for purchasing the mutual fund. One of the key advantages of an investment in a mutual fund is the fact that the mutual fund constantly rebalances portfolio weights to the equally weighted portfolio, thereby keeping the portfolio's standard deviation as small as possible. That is, the mutual fund's annual gross return R_M prior to charging fees is given by

$$R_M = \frac{1}{N}\sum_{i=1}^{N} R_i \tag{1.9}$$

The return on the portfolio after paying of the annual fee of f is given by $R_M\,(1 - f)$. The investor's wealth W_{1_-} before selling the mutual fund at time $t = 1$

is then given by

$$W_{1_-} = W_{0_+} R_M (1 - f) = \left(W_{0_-} - \tau_f\right) R_M (1 - f)$$

After paying the transaction costs, his wealth W_{1_+} is given by

$$W_{1_+} = W_{1_-} - \tau_f = \left(W_{0_-} - \tau_f\right) R_M (1 - f) - \tau_f$$

Compared to direct investments, mutual fund investments leave the investor with a lower fixed transaction costs burden, as he only has to pay the transaction cost for trading the mutual fund, even though the fund itself is a well-diversified portfolio that invests in all N assets. However, the fund's return is negatively affected by the fee.

1.2.4 Calibration

Throughout our numerical analysis, we consider an investor with degree of risk aversion of $\gamma = 5$, which is in the range of values considered reasonable by Mehra and Prescott (1985).[7] The investor is initially endowed with $W_0 = 35,000$ dollars, roughly corresponding to the median wealth held in stocks directly or indirectly by stock owners, according to the 2007 Survey of Consumer Finances. Transaction costs are set to $\tau_f = 8$ dollars, corresponding to the flat-fee charged by in Fidelity Accounts, for example.

The risk-return characteristics of the individual assets are estimated from data from the stocks contained in the Dow Jones Industrial Average between 1980 and 2010. This leaves us with an expected return of $\mu = 8.39\%$, a standard deviation of $\sigma = 29.02\%$ and a pairwise correlation of $\rho = 0.2503$, an order of magnitude similar to that reported by Silvapulle and Granger (2001).[8] This set of parameter values,

[7] In section 1.3.1 we demonstrate how other levels of risk aversion affect the tradeoff between direct and indirect stock investments.

[8] We also estimated the stocks' characteristics, using other lengths of estimation window. Since these changes did not have a significant impact on our results, we have not reported them here in

which we refer to as our base case parameter choice throughout, is summarized in table (1.1).

Table 1.1: Parameter Values

Description	Parameter	Value
Number of assets in mutual fund	N	30
Risk aversion	γ	5
Expected return on each asset	μ	8.39%
Standard deviation of return on each asset	σ	29.02%
Pairwise correlation on return from any 2 assets	ρ	0.2503
Fixed transaction cost	τ_f	8
Initial wealth	W_0	35,000

Note: This table reports our choice of base-case parameter values.

To illustrate the quantitative impact of transaction costs and mutual fund fees, we determine the level of a mutual fund's fee that makes an investor indifferent between holding the mutual fund and a direct investment. The investor is indifferent between a mutual fund investment and a direct stock investment, if the utility U_M from investing in the mutual fund and the utility $U^* = \max_n U\left(W_{1_+}\right)$ from a direct investment with the optimal number of stocks is the same, i.e. if $U^* - U_M = 0$. We further assume the returns to be multivariate lognormally distributed. Since there is no known closed-form expression for sums of lognormals and due to the non-linearity of the utility function, we have to rely on numerical methods for finding the optimal investment strategy. Specifically, we use Monte Carlo simulation to approximate the distribution of total final wealth. The results reported throughout are each based on 50,000 simulated paths.[9]

1.3 Numerical Results

For our base-case parameter setting, the fee f_i that makes the investor indifferent between investing in a mutual fund and a direct stock investment is $f_i = 0.6254\%$, indicating that our base case investor prefers investing in a mutual fund, if the fund's annual fee is below 0.6254% and he prefers a direct stock investment if mu-

greater detail.

[9]Our results are robust to increasing the number of simulations.

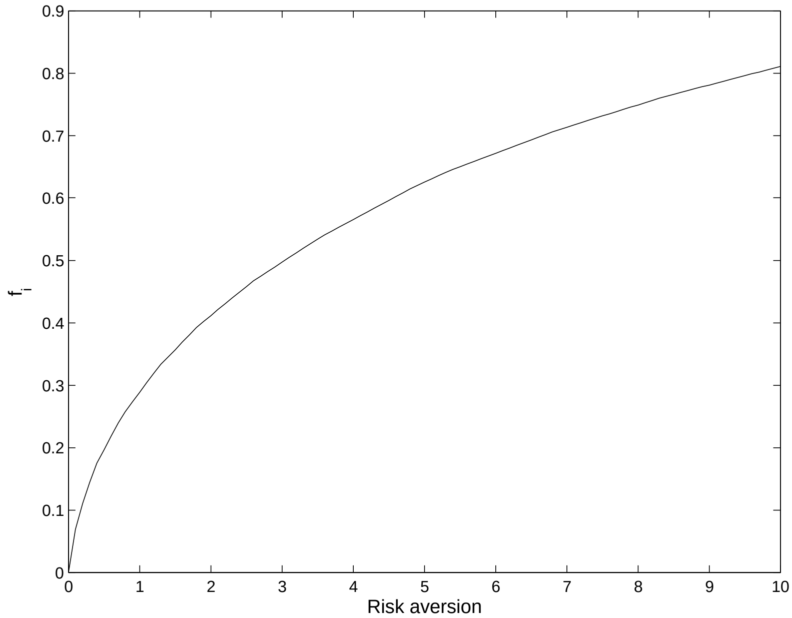
tual funds charge fees exceeding 0.6254%. This fee seems relatively small, compared those charged by many existing mutual funds. The fact that despite higher fees, there are still many investors holding these funds, can be attributed to various different reasons. First, private investors might be willing to pay an additional fee for a professional management of their money. This incentive should be particularly relevant for investors with minimal or no knowledge of the field of finance and investment. Also, given the financial innovations such as options, investment certificates or swaps, the fee such investors are willing to pay for professional management might even have increased over the last couple of decades. Second, the fee making the investor indifferent between a direct and an indirect stock investment might be heavily affected by some parameter assumptions we have made so far. In the following analysis, we seek to understand how key model parameters such as an investor's degree of risk aversion, correlations between assets' returns, the initial amount invested, the level of transaction costs, and the length of investment horizon affect the tradeoff between direct and indirect equity investments.

1.3.1 Impact of Risk Aversion

An investor's risk aversion is a key parameter defining his optimal portfolio decision. In our setting, the investor faces a tradeoff between paying transaction costs and diversifying of idiosyncratic portfolio risk. As the investor's risk aversion increases, he should assign a higher weight to diversifying his portfolio, compared to saving transaction costs. We vary the investor's degree of risk aversion between 0 and 10, the range of values considered reasonable by Mehra and Prescott (1985).

Figure (1.2) depicts the relationship between the investor's risk aversion and the level of mutual fund's fee f_i that makes our investor indifferent between investing in the equity mutual fund and a direct stock investment. Figure (1.2) indicates that the fee the investor is willing to pay to the mutual fund for its services increases with an increasing level of risk aversion. A risk-neutral investor with degree of risk aversion of $\gamma = 0$ is not prepared to pay the mutual fund for its services as he is not concerned about diversification. As the investor's risk aversion increases, he place greater emphasis on diversifying his portfolio. This affects the fee he is willing to pay to the mutual fund through two channels. First, the improved diversification potential of the mutual fund, compared to the direct investment, is considered more desirable for a more risk-averse investor. Second, the number of assets a risk-averse investor wishes to hold when investing directly in stocks increases with his risk aversion,

Figure 1.2: Impact of Risk Aversion



Note: This figure depicts the relationship between the investor's risk aversion and the mutual fund management fee f_i in percentage points that makes the investor indifferent between a direct stock investment and holding the mutual fund.

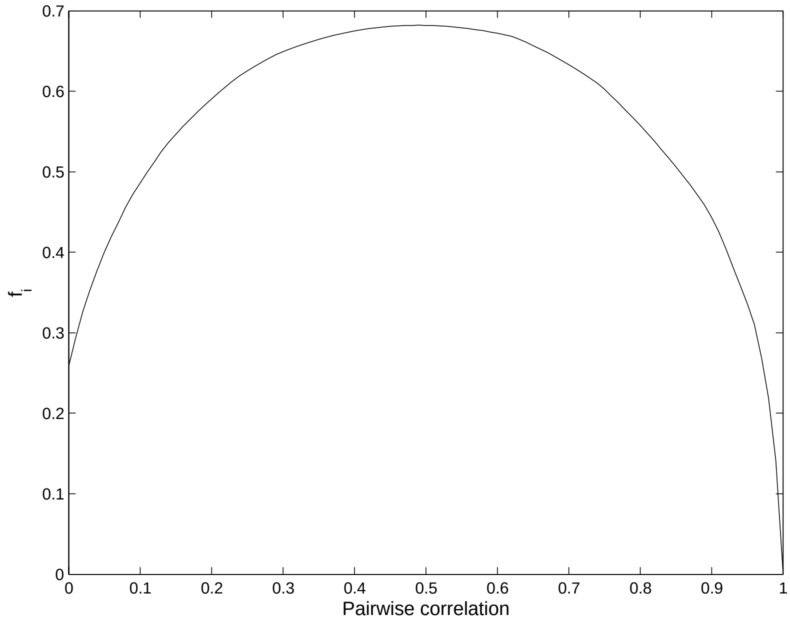
thereby causing transaction costs to increase. In order to avoid this transaction cost burden, the investor is willing to pay a higher fee to the mutual fund.

1.3.2 Impact of Correlation

Correlation is one of the most important factors driving portfolio decisions. As is well-known, the level of correlation determines the relationship between idiosyncratic and systematic risk.

Figure (1.3) depicts the relationship between the pairwise correlation ρ of the assets and the fee f_i that makes the investor indifferent between mutual fund and direct stock investments. Figure (1.3) reveals a hump-shaped relationship between correlation and the fee f_i. This hump-shaped pattern is caused by the tradeoff between transaction costs and diversification concerns. Investors who invest in stocks directly face a tradeoff between the transaction cost and diversification. Whereas a portfolio consisting of only one asset is clearly most transaction-cost efficient, it entirely neglects diversification. A portfolio investing in all available assets, on the other hand, might leave the investor with excessive transaction costs. For levels

Figure 1.3: Impact of Correlation



Note: This figure depicts the relationship between the pairwise correlation between the assets and the mutual fund management fee f_i in percentage points that makes the investor indifferent between a direct stock investment and holding the mutual fund.

of correlation close to zero, the investor can obtain a well-diversified portfolio with only a few different assets and therefore avoids further transaction costs from holding more assets. Given that transaction costs from direct investments are therefore small and so is the mutual fund's additional diversification potential, the investor is only prepared to pay a small fee to the mutual fund, so that f_i assumes a low value. As correlation increases, the number of assets required to diversify the portfolio increases. To achieve a reasonable level of diversification, the investor therefore has to pay higher transaction costs with the direct investment strategy. The mutual fund's greater diversification potential and lower transaction costs imply that the investor is prepared to accept a higher fee.

Studies of correlations between stock returns are at the heart of portfolio management and have recently received considerable attention in a wide variety of literature. Recent articles, including Bruno and Jacques (2000), Bekaert, Hodrick, and Zhang (2009), and Eun and Lee (2010) show that the risk-return characteristics and correlation of major stock market indices of developed and developing countries have increased significantly over the last few decades. By using a sample of 17 developed markets and weekly returns in three subperiods, 1974-1984, 1985-1995, and 1996-2007, Eun and Lee (2010) compute an average correlation of 0.297, 0.387, and 0.538, respectively. Our results in figure (1.3) suggest that this increase in correlation should have increased investor willingness to hold internationally diversified portfolios.

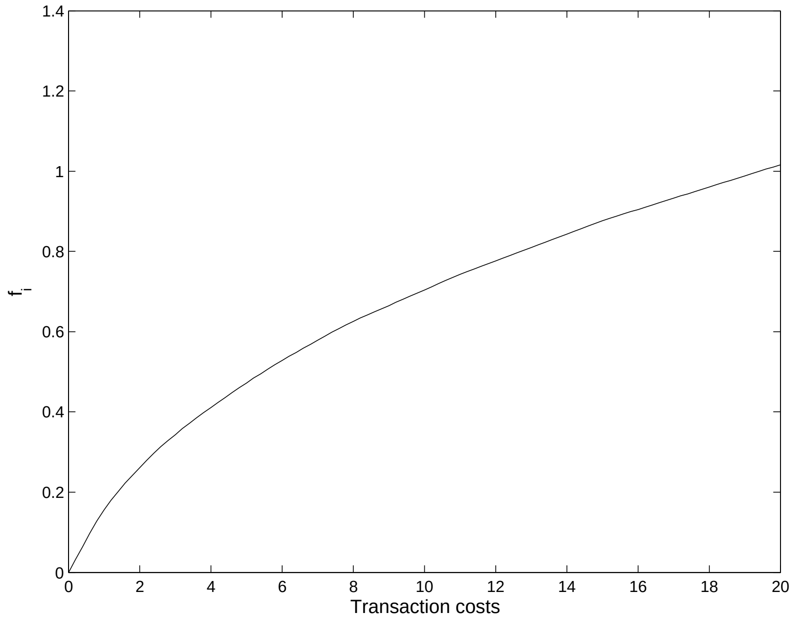
For higher levels of correlation, the diversification potential diminishes. This implies a change in the tradeoff between diversification benefits and transaction costs from holding additional assets. The higher the correlation, the lower the diversification benefits, whereas transaction costs from trading another stock remain constant. As a consequence, the investor reduces the number of assets, as the correlation increases. Therefore, direct investment strategies again become more transaction cost efficient, which is why the investor is only prepared to pay a lower fee for a mutual fund. In the extreme case where correlation is perfect ($\rho = 1$), there is no diversification benefit from holding different assets. Consequently, the optimal direct investment strategy is to invest in one asset only. Furthermore, the mutual fund cannot provide a diversification benefit to the investor, who is therefore not prepared to pay a fee for the mutual fund.

1.3.3 Impact of Transaction Costs

The level of the fixed transaction cost an investor has to pay for trading an asset is a key factor driving the tradeoff between direct and indirect stock investments. An increased transaction cost affects the investor's total wealth for both direct and indirect stock investments. However, when purchasing an equity mutual fund, the investor only has to pay the transaction cost once, whereas to construct his own diversified portfolio, he has to pay fees for every asset he purchases. Consequently, direct stock investments are affected more by increased transaction costs than indirect ones.

In figure (1.4), we allow the fixed transaction costs to be paid per trade to vary between 0 and 20 and depict its impact on the mutual fund's fee f_i that makes the investor indifferent between a direct and an indirect stock investment. This generally confirms our above intuition. With zero transaction costs ($\tau_f = 0$), the investor is not willing to pay a fee, as he is able to construct a perfectly diversified portfolio on his own at zero transaction cost. As transaction costs increase, diversifying the portfolio comes at an increasing cost, implying that the investor is willing to pay

Figure 1.4: Impact of Transaction Costs



Note: This figure depicts the relationship between the level of fixed transaction cost τ_f the investor has to pay each time he trades an asset and the mutual fund's management fee f_i in percentage points that makes the investor indifferent between a direct stock investment and holding the mutual fund.

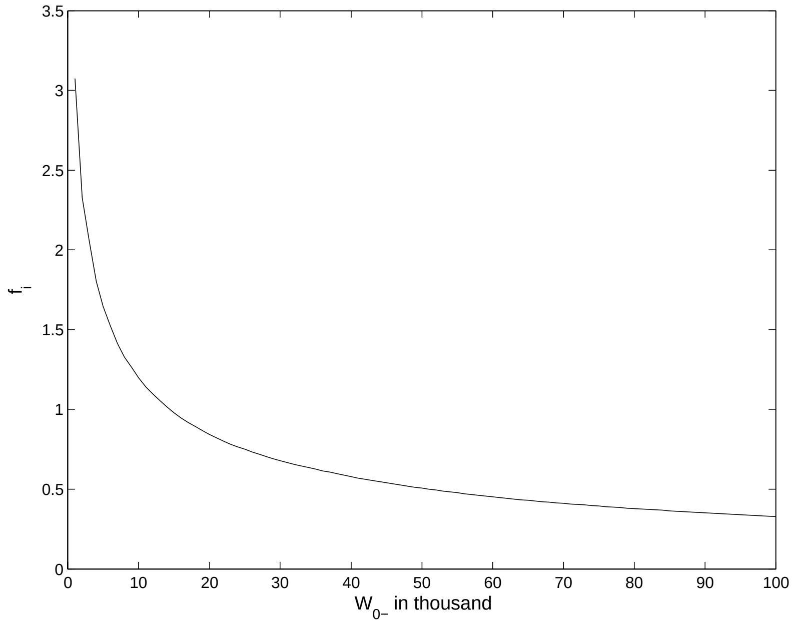
the mutual fund both to avoid these costs and simultaneously gain access to a well-diversified portfolio.

1.3.4 Impact of Wealth Level

An investor's wealth level is fundamental to determining the optimal number of assets in a portfolio. Intuitively, with a low wealth level, the investor should hold fewer assets in order to avoid transaction costs which reduce his wealth over time. As the level of fee that makes the investor indifferent between direct and indirect stock holdings increases as the transaction cost f_i does, it increase as the investor's wealth level. Consequently, especially for investors with low wealth levels, mutual fund investments should therefore be a desirable option for getting access to a well-diversified portfolio at reasonable costs.

Figure (1.5) depicts the relationship between the investor's wealth level and the fee f_i of a mutual fund that would make him indifferent between an indirect investment through that mutual fund and a direct stock investment. Figure (1.5) indicates that f_i decreases monotonically as the investor's wealth level increases. This is driven

Figure 1.5: Impact of Wealth Level



Note: This figure depicts the relationship between the investor's initial wealth level W_{0_-} and the mutual fund's management fee f_i for a mutual fund in percentage points that makes the investor indifferent between a direct stock investment and holding the mutual fund.

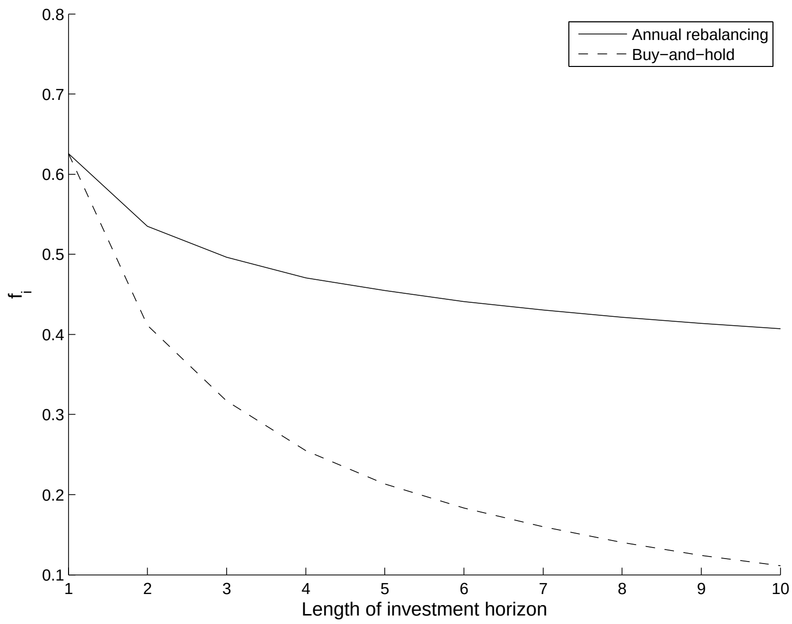
by the relative impact of transaction costs on direct investments for investors with low and high wealth levels. For investors with low wealth levels, transaction costs are high, relative to the amount they invest. However, for wealthier investors, the relative transaction cost burden is considerably smaller. Consequently, investors endowed with low initial wealth, optimally hold few assets than wealthier investors. This implies that direct investments are less well-diversified for investors with low initial wealth levels than for wealthier investors. The former are therefore prepared to pay a substantially higher fee to a mutual fund in order to obtain a well-diversified portfolio. As shown above, whether an investor should prefer a direct or an indirect stock investment depends crucially on his wealth level and the mutual fund fee.

This finding corresponds with the empirical evidence in the 2007 Survey of Consumer Finances which indicates that direct stock holdings concentrated among high-wealth families. According to Khorana, Servaes, and Tufano (2009), the average value-weighted mutual fund fee for US equity mutual funds is $f = 1.11\%$, whereas the worldwide average is $f = 1.29\%$. This implies that our investor would be indifferent between a mutual fund investment and a direct stock investment at wealth levels of 11,500 and 8,400 dollars, respectively.

1.3.5 Impact of Length of Investment Horizon

In this subsection, we study the tradeoff between the length of investment horizon and investor willingness to pay a mutual fund for its services. Given the multi-period nature of the investment problem, we distinguish between two types of trading strategies for the direct portfolio investment: 1) An investor who follows a buy-and-hold portfolio strategy and does not change portfolio weights over time and 2) an investor who rebalances his portfolio weights to the optimal equally-weighted portfolio in each and every period. The mutual fund is assumed to rebalance to the equally weighted portfolio in each and every period without.

Figure 1.6: Impact of Investment Horizon



Note: This figure depicts the relationship between the length of the investor's investment horizon T and the mutual fund's management fee f_i in percentage points that makes the investor indifferent between a direct stock investment and holding the mutual fund. The dashed line shows results for an investor who follows a buy-and-hold investment strategy for a direct stock investment, the solid one for an investor pursuing a portfolio strategy of rebalancing the portfolio annually.

Figure (1.6) depicts the relationship between the length of the investor's investment horizon and the fee f_i that makes him indifferent between a mutual fund and a direct stock investment. The dashed line shows our results for an investor with a buy-and-hold investment strategy for a direct stock investment and the solid line for an investor with a portfolio strategy that annually rebalances the portfolio.

Both lines show that with an increasing length of investment horizon, f_i declines. This is because, with a single-period investment horizon, the investor trades his entire portfolio both at time $t = 0$ and $t = 1$. That is, the investor faces the full transaction costs twice for a one-period investment horizon. For the multi-period investment horizon, however, the investor only faces the full transaction costs twice for a longer investment horizon. That is, the relative transaction costs burden declines as the length of investment horizon increases. Consequently, direct investment strategies are subject to lower relative transaction costs and the investor is therefore less willing to pay a high fee to a mutual fund. The solid line shows that investors who rebalance annually under a direct investment strategy are willing to pay a substantially higher fee to the mutual fund. This stems from the fact that the mutual fund allows them to save the annual rebalancing costs. That is, our results suggest that the costs of rebalancing outweigh the diversification advantage.

1.4 Conclusion

We have studied the tradeoff between direct equity investments and indirect investments through mutual funds. Mutual funds provide investors with diversified portfolios and rebalance the portfolio at low transaction costs. However, they charge a fee for their services. Direct investments, on the other hand, are subject to higher rebalancing costs. Furthermore, transaction costs usually prevent private investors from attaining the same level of diversification as a mutual fund. Our results show that the level of fee an informed investor is prepared to pay for a mutual fund's services varies heavily with his wealth level, his risk aversion, the correlations between assets, transaction costs, and length of investment horizon. The lower the investor's wealth level, the greater the transaction costs, the higher his risk aversion and the shorter his investment horizon, the higher the fee the investor is willing to pay a mutual fund. Specifically, our results suggest that the fees of many actively managed equity mutual funds are at levels that make direct stock investments more appealing to a wide range of individual investors. The relatively low fee levels of passively managed equity mutual funds and exchange traded funds on the other hand, makes these investment vehicles appealing to a wide range of investors.

References

Barber, B.M., and T. Odean, 2001, Boys will be boys: Gender, overconfidence, and common stock investment, *Quarterly Journal of Economics* 116, 261–292.

Baule, R., 2010, Optimal portfolio selection for the small investor considering risk and transaction costs, *OR Spectrum* 32, 61–76.

Bekaert, G., R.J. Hodrick, and X. Zhang, 2009, International stock return comovements, *Journal of Finance* 64, 2591–2626.

Blitz, D., J. Huij, and L.A.P. Swinkels, 2010, The performance of european index funds and exchange-traded funds, *European Financial Management, Forthcoming.*

Bogle, J.C., 2005, The mutual fund industry 60 years later: For better or worse?, *Financial Analysts Journal* 61, 15–24.

Brown, S.J., and W.N. Goetzmann, 1995, Performance persistence, *Journal of Finance* 50, 679–698.

Bruno, S., and R. Jacques, 2000, Dispersion as cross-sectional correlation, *Financial Analysts Journal* 56, 54–61.

Busse, J.A., A. Goyal, and S. Wahlal, 2010, Performance and persistence in institutional investment management, *Journal of Finance* 65, 765–790.

Campanale, C., 2009, Life-cycle portfolio choice: The role of heterogeneous underdiversification, *Journal of Economic Dynamics and Control* 33, 1682–1698.

Carhart, M.M., 1997, On persistence in mutual fund performance, *Journal of Finance* 52, 57–82.

Chang, C.E., and T. Krueger, 2010, Do enhanced index funds live up to their name, *Journal of Financial Services Research* 19, 145–162.

Clarke, A., G. Cullen, and D. Gasbarro, 2007, Mutual fund trades: Asymmetric liquidity preferences and fund performance, *Journal of Financial Research* 30, 515–532.

Constantinides, G.M., 1986, Capital market equilibrium with transaction costs, *Journal of Political Economy* 94, 842–862.

Cremers, M., M. Ferreira, P. Matos, and L. Starks, 2011, The mutual fund industry worldwide: Explicity and closet indexing, fees, and performance, Working Paper.

Davis, M.H.A., and A.R. Norman, 1990, Portfolio selection with transaction costs, *Mathematics of Operations Research* 15, 676–713.

DeMiguel, V., L. Garlappi, and R. Uppal, 2009, Optimal versus naive diversification: How inefficient is the 1/N portfolio strategy?, *Review of Financial Studies* 22, 1915–1953.

Dumas, B., and E. Luciano, 1991, An exact solution to a dynamic portfolio choice problem under transactionscosts, *Journal of Finance* 46, 577–595.

Eun, C.S., and J. Lee, 2010, Mean-variance convergence around the world, *Journal of Banking and Finance* 34, 856–870.

Evans, A.L., 2008, Portfolio manager ownership and mutual fund performance, *Financial Management* 37, 513–534.

Fama, E.F., and K.R. French, 2010, Luck versus skill in the cross-section of mutual fund returns, *Journal of Finance* 65, 1915–1947.

Fielitz, B.D., 1974, Indirect versus direct diversification, *Financial Management* 3, 54–62.

French, K., 2008, The cost of active investing, *Journal of Finance* 63, 1537–1573.

Goetzmann, W.N., and R.G. Ibbotson, 1994, Do winners repeat? Patterns in mutual fund performance, *Journal of Portfolio Management* 20, 9–18.

Hendricks, D., J. Patel, and R. Zeckhauser, 1993, Hot hands in mutual funds: Short-run persistence of performance, 1974-88, *Journal of Finance* 48, 93–130.

Jacob, N.L., 1974, A limited-diversification portfolio selection model for the small investor, *Journal of Finance* 29, 847–856.

Jegadeesh, N., and S. Titman, 1993, Returns to buying winners and selling losers: Implications for stock market efficiency, *Journal of Finance* 48, 65–91.

Jensen, M.C., 1968, The performance of mutual funds in the period 1945-1964, *Journal of Finance* 23, 389–416.

Jorion, P., 1985, International portfolio diversification with estimation risk, *Journal of Business* 58, 259–278.

Kellerer, H., R. Mansini, and M.G. Speranza, 2000, Selecting portfolios with fixed costs and minimum transaction lots, *Annals of Operations Research* 99, 287–304.

Khorana, A., H. Servaes, and P. Tufano, 2009, Mutual fund fees around the world, *Review of Financial Studies* 22, 1279–1310.

Liu, H., 2004, Optimal consumption and investment with transaction costs and multiple risky assets, *Journal of Finance* 59, 289–338.

Livingston, M., and E.S. O'Neal, 1998, The cost of mutual fund distribution fees, *Journal of Financial Research* 21, 205–218.

Lynch, A.W., and S. Tan, 2010, Multiple risky assets, transaction costs and return predictability: Allocationrules and implications for U.S. investors, *Journal of Financial and Quantitative Analysis* 45, 1015–1053.

Malkiel, B.G., 1995, Returns from investing in equity mutual funds 1971 to 1991, *Journal of Finance* 50, 549–572.

Markowitz, H., 1952, Portfolio selection, *Journal of Finance* 7, 77–91.

Mayshar, J., 1979, Transaction costs in a model of capital market equilibrium, *Journal of Political Economy* 87, 673–700.

Mehra, R., and E.C. Prescott, 1985, The equity premium: A puzzle, *Journal of Monetary Economics* 15, 145–162.

Montier, J., 2007, *Behavioural Investing: A Practitioners Guide to Applying Behavioural Finance* (John Wiley & Sons Ltd: West Sussex).

Odean, T., 1998, Are investors reluctant to realize their losses?, *Journal of Finance* 53, 1775–1798.

Pástor, L., and R.F. Stambaugh, 2010, On the size of the active management industry, CRSP Working Paper.

Ramos, S.B., 2009, The size and structure of the world mutual fund industry, *European Financial Management* 15, 145–180.

Sankaran, J.K., and A.A. Patil, 1999, On the optimal selection of portfolios under limited diversification, *Journal of Banking and Finance* 23, 1655–1666.

Silvapulle, P., and C.W.J. Granger, 2001, Large returns, conditional correlation and portfolio diversification: A value-at-risk approach, *Quantitative Finance* 1, 542–551.

Smith, K.V., and J.C. Schreiner, 1970, Direct vs. indirect diversification, *Financial Analysts Journal* 26, 33–38.

Statman, M., 1987, How many stocks make a diversified portfolio?, *Journal of Financial and Quantitative Analysis* 22, 353–363.

——— , S. Thorley, and K. Vorkink, 2006, Investor overconfidence and trading volume, *Review of Financial Studies* 19, 1531–1565.

Chapter 2

An Empirical Evaluation of Normative Commercial Real Estate Swap Pricing

This paper is the result of a joint work with Christian Rehring.

This is a previous previous version of the following article:
Christian Rehring and Bertram I. Steininger (2011): An Empirical Evaluation of Normative Commercial Real Estate Swap Pricing, Journal of Portfolio Management, Vol. 37, No. 5, pp. 154-169.

which has been published in final form at:
http://www.iijournals.com/doi/abs/10.3905/jpm.2011.37.5.154

Abstract

Despite the fact that commercial real estate comprises a large proportion of investable assets, a functioning derivatives market for private real estate has only existed since early 2005, when swap contracts began to be traded in the UK in significant amounts. Among other concerns about commercial real estate derivatives, the pricing issue is a major obstacle for the development of the market, due to the specific characteristics of appraisal-based indices used as the underlying of these derivatives. This article empirically evaluates a model of normative commercial real estate swap pricing, based on private real estate market indices, by estimating future appraisal-based index returns, and accounting for time-varying equilibrium risk

premia. Differences between the US and the UK markets are analyzed. Finally, the development of actual commercial real estate swap prices in recent years is interpreted in the light of calculated "fair" swap prices. Qualitatively, the estimated swap prices track actual market developments quite well, indicating that the modeled swap prices enhance our understanding of the pricing of commercial real estate swaps.

2.1 Introduction

Despite the fact that commercial real estate constitutes a large proportion of the total investment universe – estimated at roughly one third of the invested market size[1] – a functioning derivatives market has existed only since the mid 2000s, when swap contracts, based on private market indices, began to be traded in the UK in notable amounts. Since then, commercial real estate derivative markets have emerged in a number of other countries, but they are still in their infancy. The total notional outstanding of derivatives, based on the Investment Property Databank (IPD) index, reached ï¿½7.3 billion in the UK by the end of 2010. However, the other two large economies in Europe – France and Germany – have had a total outstanding of only about ï¿½0.3 billion.[2] There is no equivalent figure for the USA, but anecdotal evidence suggests that the trading volume is quite small.

Total return swaps – the standard commercial real estate derivative type of contract – are over-the-counter deals and their market liquidity is still far behind that of other established derivative markets. Market participants primarily name three concerns regarding the market: The lack of a secondary market and dealers, a shortage of liquidity, and concerns about how real estate derivatives should be priced. Fabozzi, Shiller, and Tunaru (2009, 2010) argue that the imperfection of real estate markets is the main obstacle to establishing liquidity in the market. The derivative market requires homogeneity of the underlying and is hampered by the serial correlation and inertia in the underlying's excess returns. This return predictability causes a corresponding market sentiment and this potentially exacerbates the difficulty in finding counterparties. While theoretically predictability is not a problem, since expectations could adequately be incorporated into prices, market participants may lack an understanding of the pricing mechanisms and therefore have little confidence in the market. Shiller (2008) indicates that as long as investors do not regard the pricing as accurate, they will remain unwilling to participate and thus prevent the critical mass that is necessary to get a new market underway. In contrast to the close-to-zero spreads over the risk-free rate for financial market swaps, the spreads for commercial real estate total return swaps have been large and have also fluctuated considerably over the last few years. An interesting question is whether the

[1] Estimate as of end 2009, based on data from the World Bank for stocks, from the Quarterly Review of the Bank for International Settlements for bonds and from Prudential Real Estate Investors for real estate.

[2] Source: IPD Research & Market Information.

fluctuations in prices can be reconciled with a normative pricing approach.

The literature dealing with real estate pricing models can be classified into two streams: no-arbitrage models and equilibrium pricing models. Buttimer, Kau, and Slawson (1997), Björk and Clapham (2002) and Patel and Pereira (2008) theoretically examine the pricing of real estate swap contracts based on arbitrage analysis. Otaka and Kawaguchi (2002) extend the analysis by modeling the pricing of real estate derivatives under incomplete market conditions. Baran, Buttimer, and Clark (2008) calibrate a two-factor commodity price model for the pricing of real estate derivatives, accounting for challenges due to lags and low frequency of index updates. Geltner and Fisher (2007) – hereinafter GF – argue that the arbitrage pricing approach is problematic with regard to the analysis of swaps based on appraisal-based indices, because the index cannot be traded and may not always be valued in such a manner that it reflects the equilibrium expected return in the real estate market tracked by the index. The reason is that appraisal-based indices lag and smooth actual market developments. Based on equilibrium pricing considerations, GF show theoretically how to obtain fair swap prices based on appraisal-based real estate indices. Lizieri, Marcato, Ogden, and Baum (2010) argue that some of the deviations from fair swap prices can be explained by institutional characteristics of the direct real estate market, such as high transaction costs and long execution times. These characteristics generate a rational trading window with upper and lower bounds, within which market participants – as long as the market is not fully liquid – might reasonably trade.

The contribution of this paper is to empirically investigate fair commercial real estate swap pricing, using the equilibrium swap pricing considerations put forward by GF. We analyze total return swaps, where the calendar year index return is exchanged for a fixed rate. The swap maturities range from one to five years. These swap contracts are the current market standard both in the UK and the US (Cook, Batchvarov, Dickstein, Hani, Isgro, Lehman, and Tcherkassova (2008)). We analyze the US and the UK markets, emphasizing how the different market dynamics affect fair swap prices. It is important to note that the pricing issue is related to the specific characteristics of appraisal-based indices for the direct real estate market. Swaps based on commercial real estate securities, traded on the stock exchange, would follow conventional swap pricing models.

The next section provides a review of the methodology for obtaining fair swap prices. The empirical part of the investigation comprises four steps. We develop a vector autoregressive (VAR) model of expected index returns and compare these results with the actual index returns and with competing forecasts. Subsequently, we estimate equilibrium risk premia for appraisal-based real estate index returns. Based on the index return forecasts and the equilibrium risk premia, we compute the normative fair swap prices, i.e., those consistent with the GF model. Finally, we compare the normative prices with actual swap prices in the UK and US.

2.2 Obtaining Fair Commercial Real Estate Swap Prices

The structure of the swap analyzed theoretically in GF is as follows. The long side of the swap receives a payment equal to the total return of an appraisal-based index, multiplied by the notional amount of the swap. The short side receives a fixed payment of F multiplied by the notional amount. GF assume that both parties to the swaps are covered, i.e., the short side holds a real estate portfolio, and the long side a portfolio of risk-free assets. If the index always provides an expected return commensurate to its risk, F should be the risk-free interest rate. Consider a swap of stock returns against the risk-free rate. On average, the stock return is higher than the risk-free rate, but stock returns are risky. Therefore, when stock prices are priced efficiently, the swap is fair for both sides. This reasoning can be supported by arbitrage analysis.

However, as GF emphasize, the risk and return characteristics of the real estate market differs from that of the appraisal-based index. They argue that, because the index is appraisal-based, it does not represent the dynamics of the actual real estate market. In order to obtain the fair price of a total return swap based on an appraisal-based index, F has to account for the different characteristics of the index and the actual real estate market, such that

$$F_t = E_t\left(R^{REI}\right) - RP_t^{REI} \tag{2.1}$$

Conditional on information at time t, the fair price of the swap (F) should be the expected return on the index, minus the equilibrium risk premium of the index returns. If the risky asset reflects information efficiently, the right-hand side of equation (2.1) would reduce to the risk-free rate, since the equilibrium risk premium is the difference between the expected return and the risk-free rate. However, due to the lag and smoothing effects in appraisal-based real estate index returns, expected index returns are usually different from actual market return expectations, and the equilibrium risk premium of the index differs from the risk premium of the real estate market.

Equation (2.1) is directly applicable to a one-period swap, which is a forward contract. Swaps are a portfolio of forward rate agreements. Thus, we rewrite equation (2.1) with subscript k to indicate that these are statistics for a forward contract with respect to period k:

$$F_{t,k} = E_t\left(R_k^{REI}\right) - RP_{t,k}^{REI} \tag{2.2}$$

Since the payments of the long side are risk-free, we obtain the fair price of the swap with a maturity of K years, $S_t(K)$, by solving:

$$\sum_{k=1}^{K} F_{t,k} \cdot DF_t^{(k)} = \sum_{k=1}^{K} S_t(K) \cdot DF_t^{(k)} \tag{2.3}$$

where $DF_t^{(k)} = \left(1 + R_{f,t}^{(k)}\right)^{-k}$ is the factor for discounting a risk-free cash-flow for k periods. $R_{f,t}^{(k)}$ refers to the term structure of spot rates at time t.[3]

[3]The US spot rates have been calculated from the yield curve of coupon bonds with maturities of one, two, three and five years, using the bootstrapping method. The source is the website of the Federal Reserve Board. As there are no data for a four-year coupon bond, we assume that the yield of four-year coupon bonds is the average of the yields of the three and the five-year bonds. For the UK, the spot rates were obtained from the website of the Bank of England.

2.3 Index Return Forecasts

2.3.1 VAR Model

We estimate future index returns using a vector autoregression (VAR) for each country. Let z_{t+1} be a vector that includes the appraisal-based real estate total return and additional state variables that predict these returns. We add three state variables as predictors of appraisal-based real estate returns. There is evidence that appraisal-based real estate returns are positively related to lagged returns on property shares (Giliberto (1990), Gyourko and Keim (1992), Eichholtz and Hartzell (1996)). In order to capture the cyclicality of appraisal-based indices, we include two more variables. The cap rate, i.e. the ratio of income to value, is included in the VAR model, since there is some presumption that when index values are at the peak of the cycle and the cap rate is low, future returns will be low as well, and vice versa.[4] Finally, we include the yield spread, the difference between the yield on a long-term and a short-term treasury security, as a potential asset return predictor (Campbell (1987) and Fama and French (1989) show that the yield spread does indeed forecast stock and bond returns).

Assume that a VAR(1) model captures the dynamic relationships between these variables:

$$z_{t+1} = \Phi_0 + \Phi_1 z_1 + v_{t+1} \tag{2.4}$$

where Φ_0 is a (4x1) vector of constants and Φ_1 is a (4x4) coefficient-matrix. The shocks are stacked in the (4x1) vector v_{t+1}. The k-step ($k = 1, ..., 5$) conditional forecast of the vector z_t, can be obtained recursively as

$$E_t\left(z_{t+k}\right) = \Phi_0 + \Phi_1 E_t\left(z_{t+k-1}\right) \tag{2.5}$$

[4] Fu and Ng (2001) and Plazzi, Torous, and Valkanov (2010) show that the cap rate predicts transaction-based direct commercial real estate returns.

The first element of the vector is the expected total return of the appraisal-based real estate index return.

2.3.2 Data

The forecast results are based on VAR estimates for the UK and the US market; using annual data from 1978 to 2010. The appraisal-based indices are those commonly used as the basis for commercial real estate swaps: That is, the IPD long-term annual index in the UK and the NCREIF Property Index (NPI) in the US.[5] Total returns on property companies are calculated using the UK Datastream real estate index (UK) and the FTSE/NAREIT Equity REITs Index (US). In order to construct the cap rate series, we use annual capital and income real estate returns as follows. A real estate income series (Inc_t) is obtained by multiplying the income return (IR_t) by the capital value index (CV_t) : $Inc_t = IR_t \cdot CV_{t-1}$. The cap rate series is then calculated as $CR_t = Inc_t/CV_t$. For the US, the yield spread is the ten-year Treasury bond yield minus the three-month Treasury bill yield. For the UK, the three-month treasury bills average discount rate is used as the short-term yield. These yields are obtained from Thomson Reuters Datastream. The yield on UK long-term bonds is from the Barclays 2011 Equity Gilt Study.

Table (2.1) provides an overview of the sample statistics of the data used in the VAR models. Annual appraisal-based returns have both a higher mean and a higher standard deviation in the UK. They are notably positively autocorrelated in both countries. In contrast, returns on property shares are practically uncorrelated. The cap rate and the yield spread are both persistent variables, meaning that they influence forecasts for some periods ahead.

2.3.3 VAR Results

The results of the VARs, estimated by OLS, are shown in table (2.2). In the appraisal-based real estate return equations, the signs of the regression coefficients are the same in both countries. The coefficient on the lagged own return is higher in the UK. The coefficient on the lagged return on securitized real estate is positive and highly significant in the US, but virtually zero in the UK. The coefficient on the lagged cap rate is positive in both countries, the relationship being closer in the UK. Also, the yield spread is a more important predictor of appraisal-based returns in the

[5]We thank IPD and NCREIF for providing these data.

Table 2.1: Summary of Sample Statistics

	Panel A: UK		
	Mean	St.Dv.	Auto-Corr.
Appraisal-based Index Return	10.82%	10.49%	47.60%
Return on Securitized Real Estate	13.15%	26.69%	-3.70%
Cap Rate	6.31%	1.30%	75.56%
Yield Spread	0.41%	1.79%	56.89%
	Panel B: US		
	Mean	St.Dv.	Auto-Corr.
Appraisal-based Index Return	9.22%	8.21%	54.68%
Return on Securitized Real Estate	14.41%	17.89%	4.78%
Cap Rate	7.57%	1.03%	88.95%
Yield Spread	1.65%	1.53%	46.63%

Note: The table shows statistics for the variables included in the VAR models. The sample period is from 1978 to 2010 (annual data). St.Dv. refers to standard deviation and Auto-Corr. to the first-order autocorrelation.

UK, suggesting that IPD index returns are closely related to economic activity, since the yield spread tracks the business cycle (Fama and French (1989)). With an R^2 value of 63%, US annual index returns are more predictable than in the UK, where the R^2 value is “only” 48%. For both countries, the p-value of the F-test of joint significance suggests that appraisal-based returns are indeed highly predictable. R^2 values for securitized real estate returns are lower. In both countries, the returns are positively related to the lagged cap rate and the lagged yield spread, but no coefficient is significant at the 10%-level. The dynamics of the cap rate are very well captured by the VAR models. The yield spread has a more modest degree of predictability, especially in the US.

2.3.4 Forecast Results

In order to evaluate the forecasts of our VAR model, we compare the actual appraisal-based index return outcomes with the expected one-year returns of the VAR model, to the forecasts of the best performing univariate interest rate regression model of Tsolacos (2006), and – for the UK market – to the beginning of year IPF consensus

Table 2.2: Results of VAR Model

Panel A: UK

Variable	Constant	Coefficients on Lagged Variables 1	2	3	4	$R^2(p)$
1 Appraisal-based Index Return	-0.147	0.714	0.000	2.647	2.064	48.41%
	[-1.403]	**[3.138]**	[0.005]	**[1.801]**	**[2.225]**	(0.10%)
2 Return on Property Shares	-0.401	1.163	-0.294	6.817	4.354	17.99%
	[-1.147]	[1.536]	[-1.165]	[1.395]	[1.412]	(23.57%)
3 Cap Rate	0.025	-0.034	-0.007	0.691	-0.241	78.53%
	[2.991]	**[-1.835]**	[-1.213]	**[5.856]**	**[-3.238]**	(0.00%)
4 Yield Spread	0.016	-0.114	0.011	-0.046	0.445	60.88%
	[0.992]	**[-3.293]**	[0.981]	[-0.204]	**[3.148]**	(0.00%)

Panel B: US

Variable	Constant	Coefficients on Lagged Variables 1	2	3	4	$R^2(p)$
1 Appraisal-based Index Return	-0.104	0.511	0.230	1.462	0.279	63.44%
	[-1.414]	**[3.539]**	**[4.140]**	[1.540]	[0.358]	(0.00%)
2 Return on REITs	-0.228	-0.267	-0.003	4.833	1.944	14.81%
	[-0.920]	[-0.550]	[-0.016]	[1.514]	[0.743]	(34.47%)
3 Cap Rate	0.011	-0.037	-0.008	0.927	-0.071	88.13%
	[2.047]	**[-3.539]**	**[-2.120]**	**[13.580]**	[-1.262]	(0.00%)
4 Yield Spread	0.034	-0.073	0.000	-0.189	0.237	34.03%
	[1.871]	**[-2.028]**	[-0.010]	[-0.801]	[1.227]	(2.04%)

Note: The table shows the coefficients for the UK VAR (Panel A) and the US VAR (Panel B). The results are based on annual data from 1978 to 2010. The t-statistics are in square brackets; values corresponding to p-values of 10% or below are highlighted. The rightmost column contains the R^2 values, and the p-value of the F-test of joint significance in parentheses.

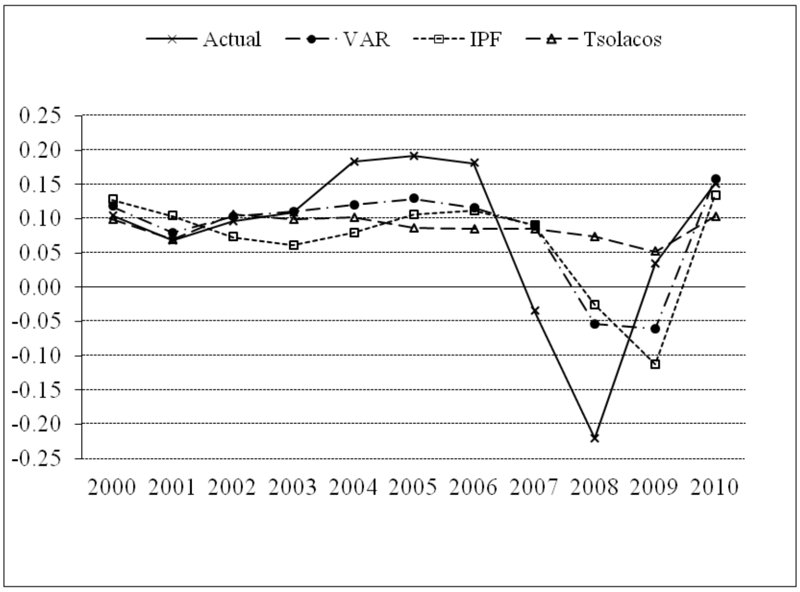
forecasts. Figure (2.1) shows the return estimates and the actual index return outcomes for the period 2000 to 2010.[6] In the UK (Panel A), actual index returns, VAR estimates and estimates from the interest rate regression model are very similar for the period 2000 to 2003. In 2004 and 2005, the VAR model forecasts the actual returns most accurately. In 2006 and 2007, all forecast estimates are very close to one another, but underestimate the return in 2006 and overestimate it in 2007. The VAR model yields the best forecast for 2008 and 2010, while the interest rate regression model yields the best estimate for 2009. The numerical evaluation supports these findings. The mean absolute forecast error of the IPF forecasts over the period 2000 to 2010 is 7.9%, compared to 7.2% for the regression model and 5.6% for the VAR model. The root mean square error of the VAR model is 7.7% as opposed to 9.7% for the IPF consensus forecasts and 10.9% for the regression model. Hence,

[6] The IPF forecasts have been conducted since November 1998. There was no survey in February 1999, so that we are bound to start our comparison in 2000.

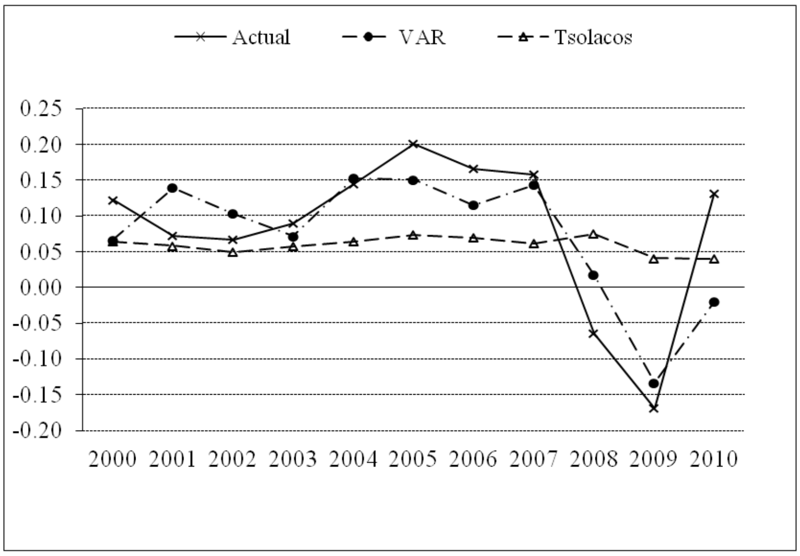
the VAR forecasts are superior to both IPF forecasts and the Tsolacos model. The relatively weak forecasting ability of the IPF forecasts conforms to the findings of Tsolacos (2006) and McAllister, Newell, and Matysiak (2008) who found evidence of inefficiencies in the IPF forecasts. The US results are shown in Panel B. While the interest rate regression model of Tsolacos yields better forecasts for 2001, 2002 and 2010, the VAR is superior in every other year and especially tracks the boom and bust periods quite good. Again, forecasts error statistics reveal that the VAR is preferable to the univariate regression model of Tsolacos.

Figure 2.1: Forecast Evaluation

Panel A: UK



Panel A: US



Note: The figure shows the actual annual index returns, the expected returns obtained from the VAR model and the forecast from the best performing univariate interest rate regression model of Tsolacos (2006) from 2000 to 2010. Additionally, the IPF consensus forecasts are included for the UK (Panel A).

In order to obtain a clear impression of the appraisal-based index return forecasts over the entire time span, and for both countries, figure (2.2) shows the one-, three-, and five-year index return forecasts. We omitted the two, and four-year forecasts, so as to prevent the exhibits from being too cluttered. Table (2.3) contains an overview of some key statistics of the forecasts. We see that forecasted returns fluctuate dramatically within a range of up to almost 35 percentage points. The one-year index forecasts are more volatile in the UK compared to the US. The volatility of the forecasts decreases with the forecasting horizon in both countries. The expected returns move only slowly in both countries. In both countries, the autocorrelation of one-year-ahead expected returns is slightly below 50%, and for two-year-ahead expected returns, the autocorrelation is 70%. Especially in the US, three- to five-year ahead forecasts remain highly autocorrelated. These sluggish expected returns are reflected in the figure for the US market. We see that the period from 1979 to 1992 is characterized by three to five-year expected index returns that are slightly below average, while the forecasts for the period from 1993 to 2003 are above average. In the mid 2000s, expected returns were particularly low, but rose towards the end of the decade.

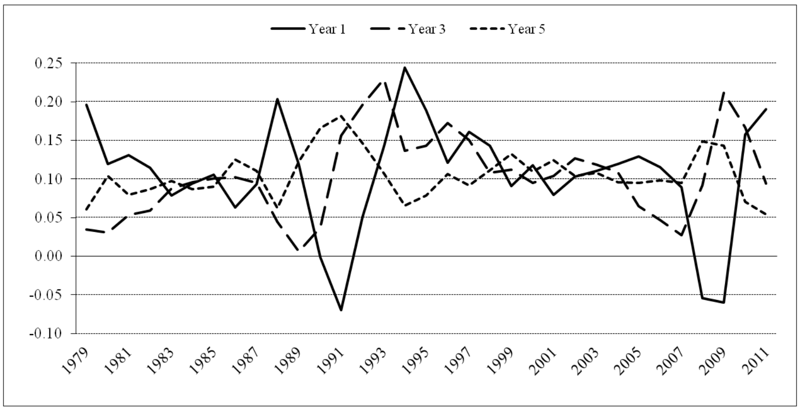
Table 2.3: Descriptive Statistics of Forecasts

Panel A: UK					
	Year 1	Year 2	Year 3	Year 4	Year 5
Mean	10.56%	10.37%	10.32%	10.39%	10.49%
Standard Deviation	7.16%	5.86%	5.49%	4.38%	2.99%
Autocorrelation	46.30%	67.68%	65.74%	51.31%	45.44%
Minimum	-6.96%	-2.69%	0.58%	2.80%	5.39%
Maximum	24.38%	23.12%	22.93%	20.54%	18.14%
Panel A: US					
	Year 1	Year 2	Year 3	Year 4	Year 5
Mean	9.16%	9.11%	9.02%	8.88%	8.74%
Standard Deviation	6.52%	4.32%	3.82%	3.48%	2.80%
Autocorrelation	48.53%	70.68%	83.44%	77.19%	69.53%
Minimum	-13.34%	-3.71%	-0.77%	0.79%	2.27%
Maximum	19.75%	15.01%	15.01%	14.60%	13.35%

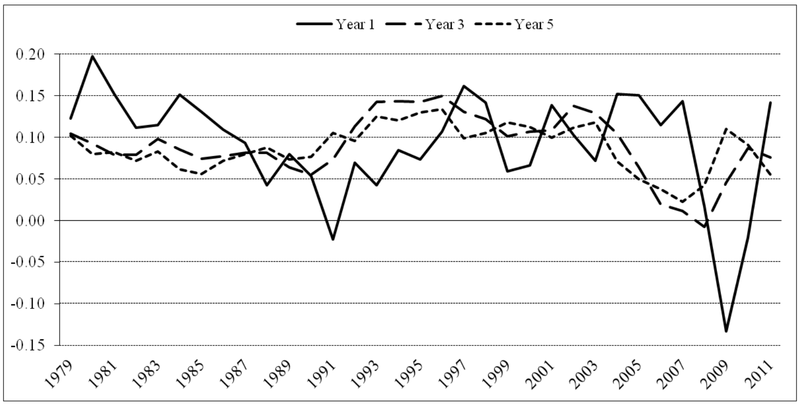
Note: This table shows statistics of expected single-period returns for the period 1979 to 2011, based on the VAR estimates.

Figure 2.2: Forecasts Obtained from VAR Approach

Panel A: UK



Panel A: US



Note: The exhibit shows forecasts for one-, three-, and five-year ahead returns obtained from the VAR model for the period 1979 to 2011.

2.4 Equilibrium Risk Premium of Appraisal-based Returns

2.4.1 Methodology

That appraisal-based indices lag and smooth actual market movements is widely accepted. As a result, appraisal-based returns are less volatile and exhibit less systematic risk than true real estate market returns (for a review see e.g. (Geltner, Miller, Clayton, and Eichholtz, 2007, Chapter 25)). Geltner (1991) shows that the equilibrium risk premium of appraisal-based real estate index returns, RP^{REI}, equals the product of ω, which is the weight of the contemporaneous transaction-price evidence reflected in the appraisal-based index value, with the risk premium of the real estate market, $RP^{REM} : RP^{REI} = \omega RP^{REM}$.[7] We account for the fact that ω should depend on the time horizon K, since smoothing is of less importance in the long-run. While annual returns are still likely to be influenced by smoothing, this distortion should be weaker for, say, (cumulative) five-year returns, because in the long-run, changes in valuations should not deviate much from the actual market development. Assuming rational behavior on the part of appraisers, placing greater weight on more recent transaction-price evidence, we formally obtain the relationship

$$\omega_K = \left(\bar{L}_K + 1\right)^{-1} \tag{2.6}$$

where $\bar{L}$ is the number of average periods of lag (see Fisher and Geltner (2000)). For example, Geltner (1993) suggests a value of $\omega = 0.40$ for annual returns ($K = 1$), which implies an average lag of 1.5 years. For five-year returns, one obtains $\omega_5 = (1.5/5 + 1)^{-1} = 0.77$.

Due to the general belief that smoothing has become less of an issue in recent years, we estimate ω for two different periods, 1978 to 2000 and 2001 to 2010. The parameter values ω_1 are calibrated so that the volatility of unsmoothed appraisal-based returns and transaction-based returns is equal. The annual appraisal-based log real capital returns g_t^* are unsmoothed using the formula

$$g_t = \frac{g_t^* - (1 - \omega_1) \cdot g_{t-1}^*}{\omega_1} \tag{2.7}$$

where g_t is the unsmoothed log real capital return (or growth), and ω_1 is the smoothing parameter corresponding to annual returns. Log real capital returns are then converted back to simple nominal returns, which are used for the calculation of the volatility. The transaction-based indices used are the TLI for the UK and the

[7] See also Geltner and Fisher (2007), Endnote 20. It should be noted that Geltner (1991) obtains the result under the assumption that true real estate market returns and the exogenous return series (i.e., the return on the market portfolio in the classical Capital Asset Pricing Model) neither predict themselves nor each other. Of course, this assumption may not reflect reality. A derivation of the equilibrium risk premium of appraisal-based real estate returns under less restrictive assumptions is beyond the scope of this paper.

TBI for the US (variable-liquidity version to be consistent with the TLI data, since the TLI is not available in a constant-liquidity version). The TBI (TLI) data from 1985 to 2000 (1989 to 2000) are used to estimate ω_1 for the period 1978 to 2000. For the period 2001 to 2010 the data from this period are used. The values for ω_K, for $K = 2, ..., 5$, are based on equation (2.6), using the implicit average lag from the annual estimate. Table (2.4) gives an overview of the dependence of ω on the time horizon and different time periods. As expected, the parameter values are higher for the more recent period. The values for ω_1 for the period 1978 to 2000 are slightly higher than those suggested by Geltner (1993) for the US (0.4) and by Barkham and Geltner (1994) for the UK (0.625). The higher value in the UK reflects the common perception that UK appraisal-based returns are less subject to smoothing. We see clearly that the longer the time horizon, the lower the disturbance due to smoothing.

Table 2.4: Time- and Maturity-Variant Parameter Values ω_K

Panel A: UK

	Maturity				
	1	2	3	4	5
1978-2000	0.69	0.81	0.87	0.90	0.92
2001-2010	0.89	0.94	0.96	0.97	0.97

Panel B: US

	Maturity				
	1	2	3	4	5
1978-2000	0.49	0.66	0.74	0.79	0.83
2001-2010	0.65	0.78	0.85	0.88	0.90

Note: The table shows the maturity-variant values of the parameter ω_K for two time periods.

In his Presidential address to the American Finance Association, Cochrane (2011) emphasizes that asset risk premia vary substantially over time. Therefore, we also allow the risk premium of appraisal-based index returns to be time-varying, so that the risk premium depends on the time of the forecast t, as well as on the maturity K:

$$RP_t^{REI}(K) = \omega_{t,K} RP_t^{REM}(K) \tag{2.8}$$

We relate the risk premium of the real estate market to the K-period time-varying risk premium of the market portfolio RP^M through beta:

$$RP_t^{REM}(K) = \beta RP_t^M(K) \tag{2.9}$$

We use national stock indices as proxies for the market portfolio (UK: FTSE Actuaries All-Share Index, US: Barclays US Equity Index) and calculate the risk premia by subtracting the returns of short-term treasury bill investments from the stock returns. Based on a regression using US data for the period 1947 to 2009, Cochrane (2011) suggests that the dividend yield multiplied by four, yields a good estimate of future annual stock market risk premia. To obtain forecasts of stock market risk premia, we use the same approach, but multiply the end of the year dividend yield not by four, but by 1.5 (UK) and 2.5 (US) respectively, so that the average of the forecasts is similar to the sample average of realized risk premia over the period 1978 to 2010. Cochrane also shows that the coefficient for five-year cumulative returns is roughly five times the coefficient for annual returns. Therefore, we assume that the cumulative risk premium increases in proportion to the time horizon.

We derive β by dividing the average annual risk premium of appraisal-based returns by the average stock market risk premium over the sample period.[8] (Note that while appraisal-based returns are conditionally biased, the mean returns of an appraisal-based index over a long period of time should not contain much bias, see Geltner (1989).) This yields a β for the real estate market of 0.457 in the UK, and 0.486 in the US.

[8]We do not estimate beta directly using regression analysis due to the measurement problems associated with direct real estate return data.

By combining equation (2.8) and (2.9), we can estimate the time-varying equilibrium risk premium of appraisal-based returns, depending on the time horizon, as:

$$RP_t^{REI}(K) = \omega_{t,K}\beta RP_t^M(K) \tag{2.10}$$

With K-year (cumulative) equilibrium risk premia of real estate index returns, single-period risk premia $RP_{t,k}^{REI}$, relevant for the estimates of the forward prices, can easily be extracted.

2.4.2 Results

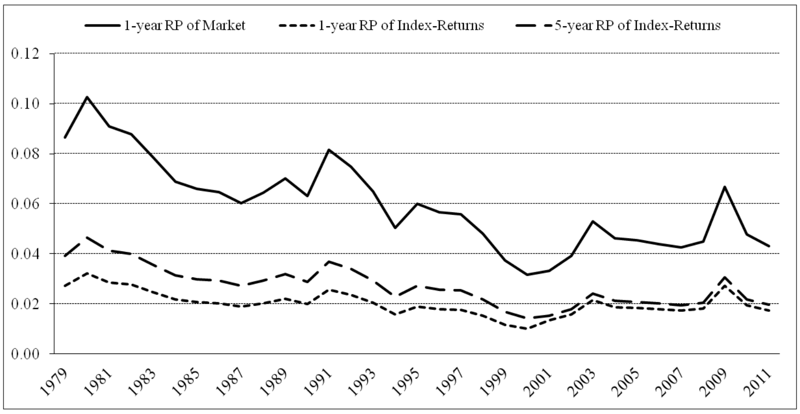
Figure (2.3) shows one-year forecasts of stock-return risk premia and the resulting forecasted risk premia of one and five-year (single-period) appraisal-based returns. The risk premia are particularly high around 1980, with a downward trend until the market crash of 2001. In both countries, we see a spike in the forecasts for the recession years of 1991 and 2009, which is intuitively appealing. Due to ω rising with the time horizon, the average risk premium of real estate index return increases from 2.02% for the one-year ahead period, to 2.71% for the five-year-ahead period in the UK. In the US, the average risk premium is 1.86% for one-year forecasts and rises to 3.45% for five-year forecasts. For comparison, Mitchell and Bond (2009) assume that the risk premium of annual UK appraisal-based returns is 1.75%.

2.5 Fair Swap Prices

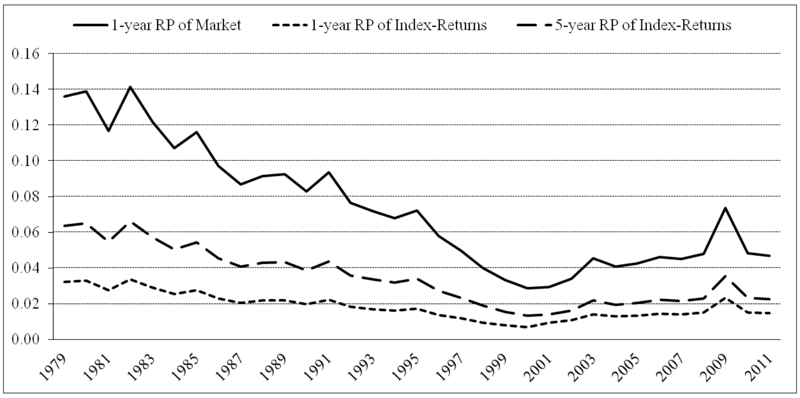
The normative commercial real estate swap prices are a weighted average of forward prices, or in other words, of future expected returns adjusted for equilibrium index risk premia. The following calculation illustrates how the fair price of a swap with a maturity of two years, at the end of 2008 / beginning of 2009, is developed using US data. The VAR model provides an expected NPI return of -13.34% for the year 2009 and -3.71% for the year 2010. The forecast of the one-year stock market risk premium for 2009 is 7.38%. Recall that we assume that the cumulative stock market risk premium increases in proportion to the time horizon, so that the forecast for the two-year risk premium is 14.75%. Hence, the equilibrium risk premium of the one-year NPI return is $RP_{2009}^{REI}(1) = \omega_{2009,1}\beta RP_{2009}^{M}(1) = 0.646 \cdot 0.486 \cdot 7.38\% = 2.32\%$. The two-year cumulative risk premium of index returns

Figure 2.3: Forecasted Risk Premia

Panel A: UK



Panel A: US



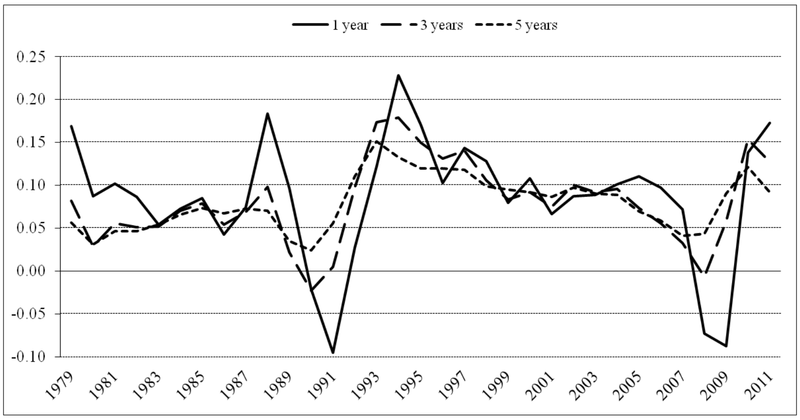
Note: The exhibit shows the one-year ahead forecasted stock market risk premium (RP) and one- and five-year-ahead real estate index return risk premia.

is $RP^{REI}_{2009}(2) = \omega_{2009,2}\beta RP^{M}_{2009}(2) = 0.785 \cdot 0.486 \cdot 14.75\% = 5.63\%$, so that we get a single-period risk premium for 2010 of $RP^{REI}_{2009}(2) = 5.63\% - 2.32\% = 3.31\%$. The forward prices are $F_{2009,1} = -13.343\% - 2.32\% = -15.66\%$ for 2009 and $F_{2009,2} = -3.71\% - 3.31\% = -7.02\%$ for 2010. With a discount factor of 0.982 (0.961) for one-year (two-year) cash-flows at the end of 2008, equation (2.3) yields the fair swap price of -11.38%.

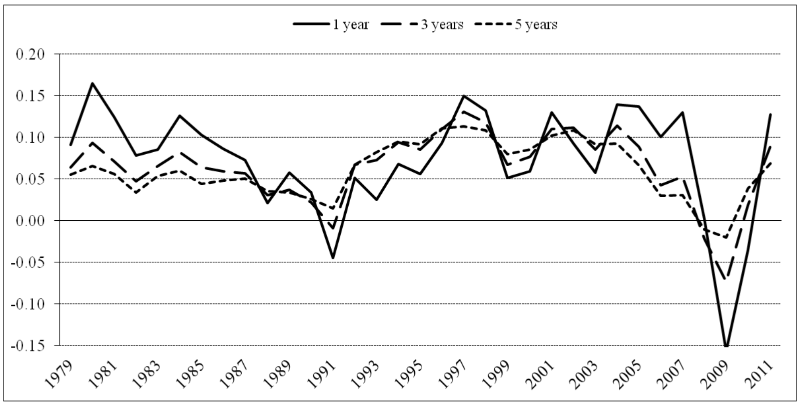
Figure (2.4) gives an impression of the different swap prices for maturities of one, three and five-years for the entire period. Again, in the interests of clarity, we do not show the two and four-year prices. Table (2.5) amends the overview, with some key statistics of the swap prices. As already observed for the index return forecast, the one-year swap prices are more volatile than the prices of swaps with a longer maturity in both the UK and the US. Corresponding to the index return forecast, the mean and standard deviation of the one-year swaps are lower in the US. The volatility of swap prices decreases successively with the maturity from 7.27% to 3.17% in the UK and from 6.52% to 3.41% in the US. Mean swap price decrease with the maturity, because annual risk premia increase with the maturity. The autocorrelation of the swap prices is particularly high in the US, with an autocorrelation coefficient of about 80% for the five-year swap prices. Negative fair swap prices (at the beginning of the year) were obtained during the crisis years around 1991 and 2009.

Figure 2.4: "Fair" Swap Prices

Panel A: UK



Panel A: US



Note: This exhibit displays beginning-of-year estimated swap prices with one-, three- and five-year maturity.

Table 2.5: Descriptive Statistics of Modeled Swap Prices

Panel A: UK					
	1 year	2 years	3 years	4 years	5 years
Mean	8.54%	8.18%	8.03%	7.96%	7.92%
Standard Deviation	7.27%	5.92%	4.87%	3.96%	3.17%
Autocorrelation	45.87%	56.17%	66.81%	73.55%	77.72%
Minimum	-9.52%	-4.48%	-2.30%	0.16%	2.39%
Maximum	22.80%	20.86%	17.89%	16.61%	15.10%

Panel A: US					
	1 year	2 years	3 years	4 years	5 years
Mean	7.30%	6.73%	6.43%	6.23%	6.08%
Standard Deviation	6.52%	5.15%	4.30%	3.77%	3.41%
Autocorrelation	46.07%	53.18%	64.12%	73.81%	79.95%
Minimum	-15.65%	-11.38%	-7.33%	-4.16%	-1.99%
Maximum	16.45%	14.03%	13.03%	12.08%	11.29%

Note: This exhibit shows statistics of fair swap prices for the period 1979 to 2011.

2.6 Comparing Actual Market Prices with Fair Swap Prices

Figure (2.5) compares the actual (indicative mid prices) and the modeled prices of swaps with one year remaining maturity at the beginning of the year.[9] The dates chosen for the actual swap prices are those when the most recent index return is published and no longer influences the swap price. In the UK, this occurs at the end of February / beginning of March and in the US, at the end of January. Because our VAR is based on end-of-the-year data, the estimated data have a slight disadvantage. Also shown is the actual IPD return outcome minus the equilibrium risk premium for that year. In the UK (Panel A), the estimated swap prices exceed the actual prices for all four observations. Especially at the beginning of 2009, the

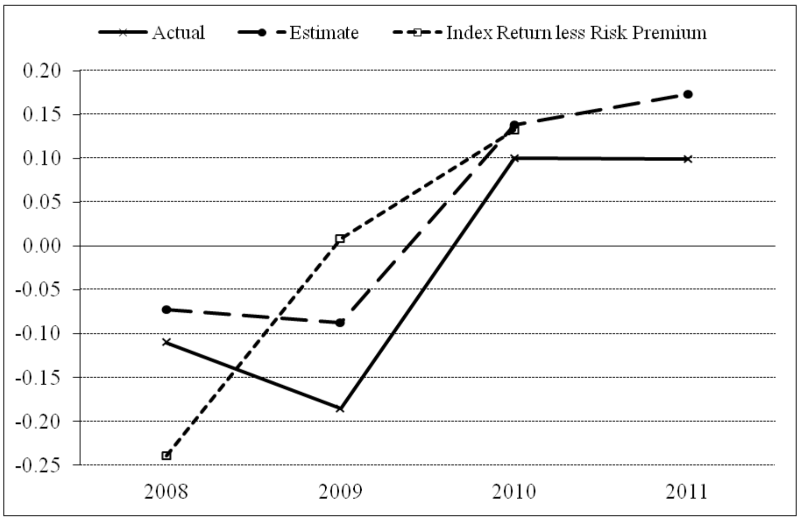
[9] All prices are quoted as a fixed rate over calendar years. The mid prices of total return swaps are obtained from Bloomberg for Merrill Lynch's data from 2008 to 2009 and from IPF for the Royal Bank of Scotland's data from 2010 to 2011 in the UK. The overlapping period reveals no relevant differences. In the US, the data are obtained from Markit, representing an average mid price of different dealers.

actual swap price is about 10 percentage points below our estimated fair swap price. Judging by the IPD return outcomes, the actual swap prices were a better indicator at the beginning of 2008, while the estimated fair swap price fared better for 2009 and 2010. In the US, the actual and estimated swap prices are relatively similar at the beginning of 2008, 2009 and 2010. With hindsight, both actual and estimated swap prices were too high at the beginning of 2008 and 2009 and too low at the beginning of 2010. The estimated swap price at the beginning of 2011 is notably higher than the actual swap price due to the high return estimate obtained from the VAR. Overall, the picture is mixed, with neither the modeled fair swap prices nor the actual swap prices being clearly superior, when judged against the actual index return outcomes. Qualitatively, the estimated fair swap prices track the market development quite well in both countries.

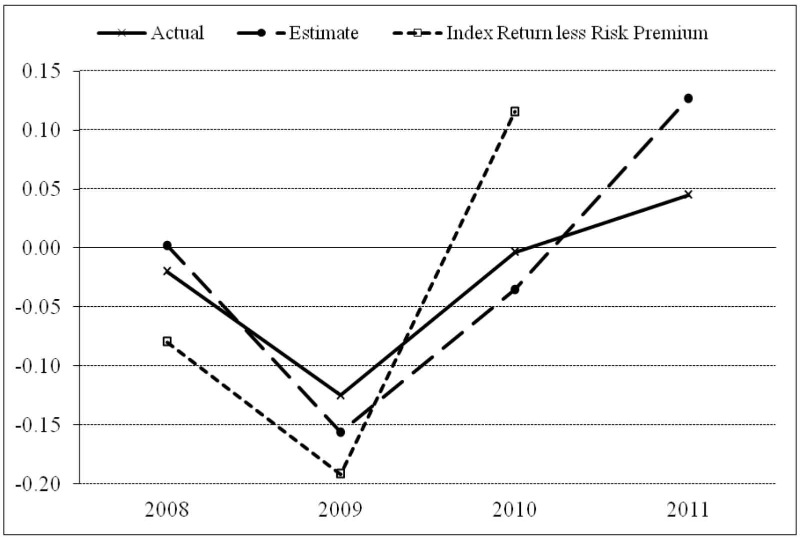
Additionally, table (2.6) provides an overview of actual and estimated swap prices with remaining maturities of up to five years, over the period from 2007 to 2011 for the UK and from 2008 to 2011 for the US (again, beginning of the year data). We also report means and standard deviations for prices with different remaining maturities. There are notable differences between actual and estimated swap prices. In both countries, the mean estimated swap prices are generally higher than the mean actual swap prices, especially in the UK. This could indicate that risk premia implicitly reflected in actual swap prices are higher than those modeled in this paper. Alternatively, the expected index returns incorporated into actual swap prices are lower, on average, than those estimated from the VAR models. However, there are some observations, where the actual swap prices are higher than the estimated swap prices. The deviations are particularly high for UK prices at the beginning of 2009. With hindsight, the large negative actual prices were not justified, because the IPD total return was positive in 2009 and 2010. In general, the differences between actual and estimated swap prices are smaller for the US. The reasons for this could be that appraisal-based returns have a higher degree of predictability; recall that in the VAR models, the R^2-statistic was higher for the US market. Standard deviations of both actual and estimated swap prices tend to decrease with maturity. The standard deviations of estimated swap prices is larger than the volatilities of actual swap prices for all maturities, expect for the one-year maturity in the UK.

Figure 2.5: Actual versus Modeled Prices of Swaps Maturing in One Year

Panel A: UK



Panel A: US



Note: This exhibit compares actual mid prices with estimated prices of swaps with one year remaining maturity from 2008 to 2011 (beginning of year). Also shown is the outcome of the index return minus the equilibrium risk premium.

Table 2.6: Actual Prices versus Modeled Swap Prices

Panel A: UK

Remaining Maturity (years)		Pricing Date						
		2007	2008	2009	2010	2011	Average	St.Dv.
	Actual	na	-11.00%	-18.50%	10.00%	9.94%	-2.39%	14.60%
1	Estimate		-7.25%	-8.74%	13.82%	17.28%	3.78%	13.68%
	Difference		-3.75%	-9.76%	-3.82%	-7.34%	-6.17%	
	Actual	6.32%	-3.12%	-9.75%	8.26%	7.94%	1.93%	8.02%
2	Estimate	4.40%	-4.31%	-0.15%	15.70%	15.27%	6.18%	9.03%
	Difference	1.92%	1.19%	-9.60%	-7.44%	-7.33%	-4.25%	
	Actual	6.32%	0.72%	-3.50%	7.69%	7.37%	3.72%	4.92%
3	Estimate	3.25%	-0.64%	5.77%	15.31%	12.71%	7.28%	6.62%
	Difference	3.07%	1.36%	-9.27%	-7.62%	-5.34%	-3.56%	
	Actual	6.42%	2.83%	-0.40%	7.40%	7.03%	4.65%	3.36%
4	Estimate	3.38%	2.40%	8.56%	13.78%	10.54%	7.73%	4.81%
	Difference	3.04%	0.43%	-8.96%	-6.38%	-3.51%	-3.08%	
	Actual	6.13%	3.87%	1.45%	7.25%	na	4.67%	2.57%
5	Estimate	4.13%	4.31%	9.06%	12.13%		7.41%	3.89%
	Difference	2.00%	-0.44%	-7.61%	-4.88%		-2.73%	

Panel A: US

Remaining Maturity (years)		Pricing Date					
		2008	2009	2010	2011	Average	St.Dv.
	Actual	-2.00%	-12.50%	-0.35%	4.50%	-2.59%	7.16%
1	Estimate	0.21%	-15.65%	-3.55%	12.71%	-1.57%	11.68%
	Difference	-2.21%	3.15%	3.20%	-8.21%	-1.02%	
	Actual	-2.00%	-9.92%	1.30%	4.30%	-1.58%	6.13%
2	Estimate	-1.74%	-11.38%	-0.37%	10.70%	-0.70%	9.04%
	Difference	-0.26%	1.46%	1.67%	-6.40%	-0.88%	
	Actual	-2.00%	-7.00%	0.45%	4.20%	-1.09%	4.69%
3	Estimate	-2.15%	-7.33%	1.84%	8.95%	0.33%	6.87%
	Difference	0.15%	0.33%	-1.39%	-4.75%	-1.42%	
	Actual	na	-4.42%	0.50%	4.10%	0.06%	4.28%
4	Estimate		-4.16%	3.14%	7.67%	2.22%	5.97%
	Difference		-0.26%	-2.64%	-3.57%	-2.16%	
	Actual	na	-2.50%	na	4.00%	0.75%	4.60%
5	Estimate		-1.99%		6.85%	2.43%	6.25%
	Difference		-0.51%		-2.85%	-1.68%	

Note: Actual mid prices are compared with estimated prices of swaps with maturities of one to five years.

Counterparty risk might explain (part of) the difference between actual and estimated swap prices, but Lizieri, Marcato, Ogden, and Baum (2010) suggest that this is of minor importance, since no principal is exchanged, the treatment of swaps in default is favorable and the intermediary market maker offers a guarantee. Lizieri, Marcato, Ogden, and Baum (2010) explore the participant's willingness to accept spreads due to the special characteristics of direct real estate markets. Focusing on the UK market, they show that the consideration of high transaction costs, execution time and (of minor importance) cash-flow timing in direct real estate markets generate a "rational" window around the spreads from the risk-free rate. This window is particularly large for swaps with short maturities. Their model can explain a spread from 900 bp to -200 bp over the risk-free rate for a one-year contract, without there being opportunities for positive net-present-value investments. Transaction costs have the most important impact on this window. Because transaction costs in the (UK) direct real estate market are higher for the buyer than for the seller, the spread window is asymmetrically distributed between buyers, who are prepared to pay a larger positive margin, than sellers, who are willing to accept a moderate negative margin to avoid using the underlying real estate market directly. In a liquid market, the midpoint buyer-seller spread, which decreases from about 350 bp for a one-year contract to 75 bp for a five-year contract, should be incorporated into prices. As long as the market is not liquid, however, prices might be set anywhere within the rational trading window. Actual prices will depend on imbalances between buyers and seller, which could be influenced by market sentiment. These considerations might explain some of the differences between estimated fair and actual swap prices.

2.7 Conclusion

In comparison to well-developed stock and bond markets, the private commercial real estate market is affected much more by market frictions, such as low liquidity, heterogeneity and high transaction costs. A result of the specific microstructure of direct real estate asset markets is that the return indices tracking commercial real estate markets are subject to a range of biases. In particular, appraisal-based returns lag behind actual market movements and are less volatile than actual market returns. This has to be accounted for in the pricing of real estate derivatives based on appraisal-based indices, making real estate swap pricing more complicated than the pricing of swaps for liquid financial assets. Despite the fact that commercial real estate derivative markets have emerged in the US and in Europe in recent years, uncertainty about fair and rational pricing remains.

We empirically investigate normative swap pricing on private commercial real estate market indices using Geltner and Fisher (2007) equilibrium pricing model for the US and the UK market. Future index return estimates are based on vector autoregressive models. In deriving the swap prices, we also account for a time-varying and maturity-dependent equilibrium risk premium for appraisal-based index returns. Comparing estimated and actual swap prices with index return outcomes, neither is generally superior. Qualitatively, the estimated swap prices track actual market developments quite well, indicating that the modeled swap prices enhance our understanding of the pricing of commercial real estate swaps.

References

Baran, L.C., R.J. Buttimer, and S.P. Clark, 2008, Calibration of a commodity price model with unobserved factors: The case of real estate index futures, *Review of Futures Markets* 16, 455–469.

Barkham, R.J., and D. Geltner, 1994, Unsmoothing british valuation-based returns without assuming an efficient market, *Journal of Property Research* 11, 81–95.

Björk, T., and E. Clapham, 2002, On the pricing of real estate index linked swaps, *Journal of Housing Economics* 11, 418–432.

Buttimer, R.J., J.B. Kau, and V.C. Slawson, 1997, A model for pricing securities dependent upon a real estate index, *Journal of Housing Economics* 6, 16–30.

Campbell, J.Y., 1987, Stock returns and the term structure, *Journal of Financial Economics* 18, 373–399.

Cochrane, J.H., 2011, Discount rates, *Journal of Finance* 66, 1047–1108.

Cook, C., A. Batchvarov, A.J. Dickstein, C. Hani, T.A. Isgro, R.V. Lehman, and J. Tcherkassova, 2008, Property derivatives global guide 2008, Merrill Lynch Research, Merrill Lynch, Pierce, Fenner & Smith Incorporated.

Eichholtz, P.M.A., and D.J. Hartzell, 1996, Property shares, appraisals and the stock market: An international perspective, *Journal of Real Estate Finance and Economics* 12, 163–178.

Fabozzi, F.J., R.J. Shiller, and R.S. Tunaru, 2009, Hedging real estate risk, *Journal of Portfolio Management* 35, 92–103.

——— , 2010, Property derivatives for managing European real-estate risk, *European Financial Management* 16, 8–26.

Fama, E.F., and K.R. French, 1989, Business conditions and expected returns on stocks and bonds, *Journal of Financial Economics* 25, 23–49.

Fisher, J.D., and D. Geltner, 2000, De-lagging the NCREIF index: Transaction prices and reverse-engineering, *Real Estate Finance* 17, 7–22.

Fu, Y., and L.K. Ng, 2001, Market efficiency and return statistics: Evidence from real estate and stock markets using a present-value approach, *Real Estate Economics* 29, 227–250.

Geltner, D., 1989, Bias in appraisal-based returns, *AREUEA Journal* 17, 338–352.

———, 1991, Smoothing in appraisal-based returns, *Journal of Real Estate Finance and Economics* 4, 327–345.

———, 1993, Estimating market values from appraised values without assuming an efficient market, *Journal of Real Estate Research* 8, 325–345.

———, and J.D. Fisher, 2007, Pricing and index considerations in commercial real estate derivatives, *Journal of Portfolio Management* 33, 99–118.

Geltner, D., N.G. Miller, J. Clayton, and P. Eichholtz, 2007, *Commercial Real Estate Analysis and Investment* (Thomson South-Western: Mason, OH) 2 edn.

Giliberto, M.S., 1990, Equity real estate investment trusts and real estate returns, *Journal of Real Estate Research* 5, 259–264.

Gyourko, J., and D.B. Keim, 1992, What does the stock market tell us about real estate returns?, *AREUEA Journal* 20, 457–485.

Lizieri, C., G. Marcato, P. Ogden, and A. Baum, 2010, Pricing inefficiencies in private real estate markets using total return swaps, *Journal of Real Estate Finance and Economics,* forthcoming.

McAllister, P., G. Newell, and G. Matysiak, 2008, Agreement and accuracy in consensus forecasts of the uk commercial property market, *Journal of Property Research* 25, 1–22.

Mitchell, P., and S.A. Bond, 2009, The ipf uk consensus forecast and the returns implied by property derivative pricing: Evolution, record and influence, Discussion paper, Investment Property Forum, London.

Otaka, M., and Y. Kawaguchi, 2002, Hedging and pricing of real estate securities under market incompleteness, Working paper, MTB Investment Technology Institute.

Patel, K., and R. Pereira, 2008, Pricing property index linked swaps with counterparty default risk, *Journal of Real Estate Finance and Economics* 36, 5–21.

Plazzi, A., W. Torous, and R. Valkanov, 2010, Expected returns and the expected growth in rents of commercial real estate, *Review of Financial Studies* 23, 3469–3519.

Shiller, R.J., 2008, Derivatives markets for home prices, Working paper, Yale University.

Tsolacos, S., 2006, An assessment of property performance forecasts: Consensus versus econometric, *Journal of Property Investment & Finance* 24, 386–399.

Chapter 3

The Rat Race of Capital Structure Research: Two Spotlights on Leverage

This paper is the result of a joint work with Ralf H. Hohenstatt.

Abstract

This paper presents a dynamic multi-equation model based on a balance sheet identity, where technical aspects of capital structure are highlighted through separately observing debt and equity and their relationship to investment. Additionally, leverage dynamics are interpreted in their role for liquidity management. Interactions of leverage with lines of credit (LOC) and cash are considered in the light of financial flexibility. The major findings obtained by observing US REITs and REOCs from 1995 to 2010 are as follows. In accordance with the existing literature, cash and LOC reveal a substitute relationship. However, the calculus of financial flexibility and our findings suggest that leverage positively drives cash, which is consistent with Gamba and Triantis (2008), and also with the accepted perspective of debt minus cash being net debt (Spotlight A). Consequently, the very robust results indicate that leverage eliminates a significant amount of information. Further mechanical relationships, especially for market leverage, are suggested (Spotlight B).

3.1 Introduction

The persistently large number of capital structure studies since the seminal work of Modigliani and Miller (1958) does not yield consistent evidence for one specific capital structure theory. This study does not aim to validate any of these theories, but follows Graham and Harvey (2001), who state that “financial flexibility is the single most important determinant of capital structure according to CFOs”. Investigating firm cash holdings, Opler, Pinkowitz, Stulz, and Williamson (1999) argues: “Firms want to avoid situations where the agency costs of debt are so high that they cannot raise funds to finance their activities and invest in valuable projects. Obviously, one way to do so is to choose a low level of leverage.” A more recent example of this stream of research is the proposal of DeAngelo and DeAngelo (2007), aimed at filling the gap in capital structure theory and the associated empirical findings. They state: “Financial Flexibility is the critical missing link for an empirically viable [capital structure] theory.” Gamba and Triantis (2008) directly address this concept and provide the following definition: “Financial flexibility represents the ability of a firm to access and restructure its financing at a low cost. Financially flexible firms are able to avoid financial distress in the face of negative shocks, and to readily fund investment when profitable opportunities arise.”

In the present study, approximation leverage (LEV) is investigated by two spotlights. Financial flexibility, in the sense of anticipating liquidity management, is addressed by Spotlight A. Interactions of LEV with cash & cash equivalents (CCE) and lines of credit (LOC) form the focus. The more technical one (Spotlight B) is motivated by the arguments of Chen and Zhao (2007) and Gatchev, Pulvino, and Tarhan (2010). Spotlight B ensures robust results, distinguishing between real stochastic and mainly mechanical relationships.

The recent late-2000s financial crisis in particular, provides the motivation for investigating Spotlight A. There is consensus in the existing literature on a substitute relationship between CCE and LOC. This is due to the fact that LOC hedge against underinvestment, and CCE against cash flow (CF) shortfalls (Lins, Servaes, and Tufano (2010)). However, what was evident immediately after the peak of the crisis is that firms draw their available LOC, fearing that they will be canceled due to covenant breaks (Campello, Graham, and Harvey (2010)). Sufi (2009) also supports the view that CCE and LOC are only conditional substitutes. Therefore, this study aims to fill the gap in the literature, by including LEV in the interactions of sources of liquidity management. Furthermore, another issue of the late-2000s financial crisis is the perceived increased relevance of the real estate industry. Many studies argue that there is homogeneity in the REIT industry due to legislation, e.g. aspects such as the role of taxes or retained cash flows are of lower relevance. Hence, more consistent findings are expected when concentrating on REITs. Another interesting circumstance within this industry is the underutilization of CCE, as opposed to a similar level of importance of LOC, compared to companies outside the real estate industry. This may be due to the fact that the high dividend payout restriction prevents REITs from accumulating cash. Yet, recent research by Harrison, Panasian, and Seiler (2011) reports that REITs voluntarily choose to pay 'excess dividends' – up to 38% of their total assets.

This paper is organized traditionally. Section 2 provides an overview of the related literature. In section 3, the data are described. Section 4 introduces our model. In section 5, we present the results and section 6 concludes.

3.2 Literature Review

3.2.1 General Motivation

At first, both the general finance literature, as well as real estate studies, seem to reach no empirically robust consensus on classical capital structure theories. One could cautiously claim that recent research in this field agrees on a mixture of trade-off and market-timing theory as valid. This is justified mainly by market timing allowing equity issuances to be preferable in some states of the economy.[1] Furthermore, LEV often reveals a mean-reversion characteristic; hence, target-leverage is interpreted as a validation of the trade-off theory (Flannery and Rangan (2006)).

Hence, the second argument is motivated by Chen and Zhao (2007), who demonstrate, using the sample of Flannery and Rangan (2006), how their findings can be justified by a purely mechanical characteristic. This is due to the fact that leverage is 'just' a ratio and has insufficient implications for capital structure dynamics, thus making it an inadequate tool for distinguishing between different financing policies.

The third argument is based on the relevance of taxes to financing decisions, if one

[1] For this reason, pecking-order is often rejected, but seems to be valid for large firms with low market-to-book-ratio but high cash-flows (Leary and Roberts (2010)).

argues in favor of the trade-off theory. Blouin, Core, and Guay (2010) investigate the widespread belief in the underutilization of debt. This is supported indirectly by DeAngelo and DeAngelo (2007). They do not exclude a tax-shield, but emphasize that preserving debt capacity, in order to forego investment distortions in the near future, outweighs the “few cents on the dollar” benefit of debt. Finally, the present study observes mainly REITs, which are pass-through entities with respect to the main business activities. Hence, a tax-shield is assumed to be of no relevance for this paper.

DeAngelo and DeAngelo (2007) recognize the dilemma of capital structure research and formulate a draft aimed at filling the gap between the traditional theories and empirical findings. They argue that it is the ’equity as the last resort’ attribute of the pecking-order theory, and the ’non-occurrence of levering up after stock price increases’ of market-timing, and the ’high dividend-low leverage’ characteristic of profitable firms of trade-off theory which necessitate innovations in this field of research. Their alternative approach to explaining capital structure is based on interpreting management actions in the light of financial flexibility, e.g. preserving debt capacity for facilitating potential future financial needs.

The above mentioned arguments motivate focusing on leverage with two spotlights: from the one perspective, leverage is ’just’ a ratio, which absorbs valuable information by definition. From the other perspective, as a ratio, leverage is one source of liquidity management; hence, it competes with other sources of financial flexibility. The first spotlight can be seen as the more technical one, while the second may be interpreted rather as an alternative approach to solving the capital structure puzzle.[2] The following section briefly summarizes recent research relevant to these two spotlights.

[2]Because much is said about capital structure theories, namely trade-off, pecking-order and market-timing theory, we forego the reproduction and refer to Feng, Ghosh, and Sirmans (2007), Hardin and Wu (2010) or Harrison, Panasian, and Seiler (2011) for the real estate market or Hovakimian, Hovakimian, and Tehranian (2004) or Flannery and Rangan (2006) for the general finance literature.

3.2.2 Spotlight A: Leverage, Cash & Cash Equivalents and Lines of Credit

There is a wide range of literature on CCE versus LOC, generally agreeing that these sources may be assumed to constitute substitutes.[3] Lins, Servaes, and Tufano (2010) accord different purposes to CCE and LOC, with respect to the state of the economy. They argue that LOC serve to finance value-raising projects when they arise, while CCE hedge against CF shortfalls. Sufi (2009) investigates the dependence of firm characteristics on the use of one or the other source. High CF-generating firms maintain LOC, because of the strong link between financial covenants and credit facilities. Sufi also argues that the unavailability of LOC is a superior proxy for being financially constrained (for firms with a high degree of information asymmetry see also An, Hardin, and Wu (2010)). Accordingly, a positive CF-CCE sensitivity would only prevail for constrained firms, which do not have a LOC. Interpreting LOC as the nominal amount of debt capacity (see also Riddiough and Wu (2009)), Sufi (2009) highlights the relevance of cash flow and debt measures for credit agreements. With cash flow decreases being associated with covenant violations, CCE is only a conditional substitute for LOC. Hardin, Highfield, Hill, and Kelly (2009) confirm a substitutive relationship between CCE and LOC. Moreover, the authors state that REIT managers choose not to accumulate cash, preferring to finance externally, gaining from reduced agency conflicts of monitoring and reduced costs of financing.

While empirical evidence suggests a negative relationship between LEV and CCE (Opler, Pinkowitz, Stulz, and Williamson (1999); Ozkan and Ozkan (2004); Hardin, Highfield, Hill, and Kelly (2009)), our perspective suggests a positive, but non-linear relationship. This becomes clear when considering the insurance aspects of both instruments: low leverage preserves debt capacity, i.e. the ability to borrow in the future, high cash reserves hedge against the risk of underinvestment and cash flow shortfalls, but mainly against the latter. This view is supported by Lins, Servaes, and Tufano (2010), who find no significant (contemporaneous) relationship, but refer to argument which we have just stated. Denis and Sibilkov (2010) also favor the hedging argument of CCE for underinvestment, but predict a negative correlation of LEV and CCE. Gamba and Triantis (2008) investigate a firm's financial flexibility,

[3]For interview based studies, see Lins, Servaes, and Tufano (2010) in 2005 or Campello, Graham, and Harvey (2010) in 2008. For empirical studies based on the real estate market see Hardin, Highfield, Hill, and Kelly (2009) or Sufi (2009) for broad market evidence.

driven by levels of borrowing and lending. By controlling cash and debt, the resulting positive net debt implicates a higher firm value, although with a decreasing marginal effect with respect to the mixture of cash and debt.[4] Acharya, Almeida, and Campello (2007) also argue that CCE constitutes negative debt. Their implications are dependent on varying degrees of hedging needs, namely a lower risk of underinvestment implicating that firms pay down their outstanding debt.

Moreover, a negative relationship between LEV and LOC seems to be empirically robust, as well as consistent with the calculus of financial flexibility. Riddiough and Wu (2009) declare that REITs increased dividend payout in the 1990 to 2003 period, leaving these specific companies with lower cash reserves than non-REITs, whereas the use of LOC is comparable. Therefore, interpreting a high LEV as the inability to borrow in the future (e.g. Gamba and Triantes 2008) – and hence classified as the reciprocal of debt capacity – LEV and LOC yield reverse dynamics. Second, LEV accounts for drawing LOC and the change of other external sources of finance. Third, since the dynamics between LEV and CCE, as well as LOC, have not been comprehensively empirically investigated, the stochastic properties of the variables of interest would allow at least the following prediction. Assuming that CCE and LOC are not independent of each other, namely negative, a reverse relationship of LEV applies to each of them. Assuming positive CCE-LEV dynamics, the hypothesized sign of LEV and LOC follows technically.

Summarizing the arguments of Spotlight A, the liquidity sources have different tasks, but are dependent on firm characteristics, as well as the state of the economy. Moreover, a preference for one or the other may depend on the original level.

3.2.3 Spotlight B: Leverage is 'just' a Ratio

The second spotlight on leverage takes properties of this ratio into account. If equity and debt increase by the same percentage, a leverage ratio will simply cancel out these dynamics, but total (i.e. non-current) assets increase. The relative position of debt still plays a significant role in terms of anticipative liquidity policy, but in order to differentiate between financial actions, debt and equity must be treated separately.

[4]Hill, Kelly, and Hardin (2010) report a \$1.34 increase (\$0.30 decrease) of firm value due to a \$1 increase of CCE (one standard deviation increase of unused LOC) based on empirical investigation of REITs.

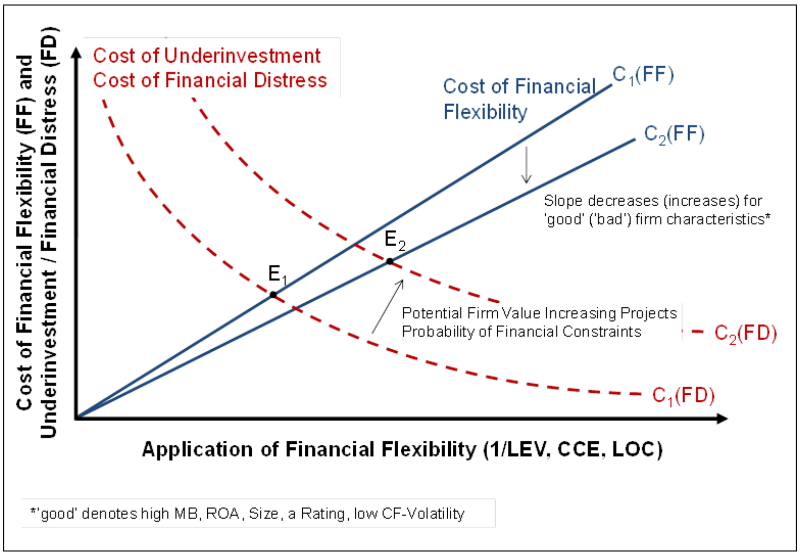
Today's decisions are determined jointly, they are dependent on what happened in the past and also influence the (unknown) future. Therefore, the first imperative, when dealing with financial flexibility is dynamic modeling. Gatchev, Pulvino, and Tarhan (2010) distinguish between debt and equity, and do so between all the main aggregates from the cash-flow statement – one example of a more cash-flow-focused mentality since the late-2000s financial crisis. The authors detect a much lower sensitivity of investment to shocks to cash flows, concluding that financing sensitivity with respect to cash flows is much more relevant than investment responses. Gatchev, Pulvino, and Tarhan (2010) define an identity where one dollar cash in-flow corresponds exactly to one dollar cash outflow. Chen and Zhao (2007) also worked with an accounting identity in which assets are defined by last year's assets plus the change in debt, equity and retained earnings. The authors suggest that firms levered below the median increase leverage by increasing debt, but highly levered firms increase equity while decreasing debt. Almeida and Campello (2007) also investigate financing-investment sensitivities with respect to the state of the market and firm characteristics. They agree that cash-flow shocks affect primarily constrained firms. However, the portion of tangible assets in particular, determines the procyclical aspect of debt capacity with respect to the business cycle.

In summary, the importance of distinguishing between the numerator and denominator of LEV is the focus of the second spotlight on LEV. In addition to research surrounding LEV, CCE and LOC, the relevance of real assets (investment) and cash flow is determined. DeAngelo and DeAngelo (2007) suggest "new testable hypothesis [...] for future research [...] [is that] firms' long-run leverage targets are inversely related in cross-section and time-series to the (investment distortion-reducing) value of financial flexibility."

3.2.4 Research Goal from a Bird's Eye

In a perfect world, there is no need to hoard cash or hedge in any other way, because firms have access to the capital market at any time without transactions costs, when investment opportunities arrive. Opler, Pinkowitz, Stulz, and Williamson (1999) define a firm as being short of liquid assets, if it has to sell assets or cut capital expenditures or dividends. By contrast, this paper considers how, dependent on the state of the economy and firm characteristics, investment funding is influenced by the drivers of financial flexibility, namely debt capacity (reciprocal LEV), CCE and LOC. However, we adjust the concept of assuming an optimum amount of 'financial flexibility'. The marginal costs of being short of money in periods when a firm would actually need funding are a decreasing function with respect to instruments of financial flexibility. On the other hand, foregoing borrowing power in terms of LEV (on balance, but not directly measurable in terms of being financially constrained), the opportunity costs of CCE (on balance and fully measurable) and fees for the availability of LOC (off balance and partly measurable in terms of efficiency) act in a contrary manner, so as to antagonize these marginal costs. Therefore, there has to be an optimum where the marginal costs of underinvestment and financial distress coincide with the costs associated with being financially flexible. Despite the fact that CCE plays a minor role for real estate companies, this is an unconditional source for hedging underinvestment, if outside investors are unwilling to provide funds. Yet, cash hedges particularly effectively in economic downturns, since a low-leverage firm would still be dependent on external capital. LOC agreements could be canceled in the event of covenant breaks. However, of the three sources, CCE is associated most strongly with costs of asymmetric information, because outsiders doubt the appropriate use by managers, while debt has the advantage of monitoring (Hardin, Highfield, Hill, and Kelly (2009)).[5]

Figure 3.1: Concept of Financial Flexibility



Note: This figure depicts the equilibrium between the costs of financial flexibility and (in-)direct costs associated with underinvestment and financial distress.

[5]For the relevance of information asymmetry for a firm's choice between CCE and LOC, see also An, Hardin, and Wu (2010).

From this perspective, the objective function describes the ability to secure sufficient financial resources and to raise sufficient financial resources to implement profitable investments with respect to uncertainty and the efficiency constraint in terms of the direct and indirect costs of financial flexibility. We hypothesize that financial flexibility is a broader, but more consistent concept in explaining the dynamics of financing activities, compared to traditional capital structure theory.

3.3 Data

The SEC statements compiled by SNL Financial are the basis of our panel data set. The initial sample contains 316 operating and acquired or defunct US Equity REITs and REOCs traded on the NYSE, NYSE Amex Equities and NASDAQ from 1996 to 2010, with 56% non-missing values. Company foundations and liquidations are responsible for 79% of the missing values, whereas 21% are due to unreported data. The broad announcements of cash flow statements in SNL from 1996 onwards, as well as the dynamic modeling, including lagged differences, restrict the sample to the 1998-2010 period and eliminate 36 firms with less than three consecutive years.[6]

Table (3.1) provides definitions and computations of the variables and approximations used in this study. All financial variables are truncated at the 5th and 95^{th} percentile. LEV (LOC) is cut at the 95^{th} percentile only, because 6% (9%) of the observations are zero. The truncation is to a lesser extent intended to reduce the influence of outliers, rather than to focus the study on firms with typical financial characteristics. Subsequently, the end-of-year financial data are deflated by the US Producer Price Index of the US Bureau of Labor Statistics. Therefore, the final sample includes 140 Equity REITs and REOCs corresponding to 558 firm-year observations.

Research on cash balances suggests the need to scale variables by non-cash assets, in order to forego mechanical relationships (see Sufi (2009)), analogous to the arguments associated with Spotlight B. However, since debt scaled by assets (leverage) would decrease after CCE scaled by non-cash assets has increased for mechanical reasons, we scale variables with the beginning of the period value of total assets, rather than divide the variables by non-cash-and-debt assets.

[6] A further reason for starting in 1996 is the beginning of a consolidation phase, after a boom of the REIT sector in the 1990s.

Table 3.1: Variable Description

Variable	Description	Definition
Balance Sheet Aggregates		
STD	Short-term debt	Debt payable within a business year
LTD	Long-term debt	Debt payable after a business year
EQU	Common equity	(shareholder equity) − (preferred equity)
DPROP	Depreciable property	PPE + accumulated depreciation
NFI	Net of financing and investment cash flow	ΔCCE − CF_Op
Instruments of Liquidity Management		
CCE	Cash & cash equivalents	Cash or assets easily convertible into cash
LEV	Market leverage	(total debt) / (market value of assets)
LOC	Lines of credit	Aggregate lines of credit and other revolving credit agreements available
CF_Op	Operating CF	Net cash provided by operating activities
Control Variables		
S&P500	Standard & Poor's 500 Index	ln(S&P500$_t$ / S&P500$_{t-1}$)
MB	Growth opportunities	(market equity) / (book equity)
ROA	Profitability	Return on assets
Size	Size of a firm	ln(total assets)
Dummies		
Rating	Access to public debt	1 if firm has investment-grade rating ...
Op_Risk	Operating risk	1 if firm has CF volatility above the median ...
Inv_Shock	Investment shock	1 if %-change is above the 55$^{\text{th}}$ percentile ...
FFO_Shock	Shock on sustainable CF	1 if %-change is below the 45$^{\text{th}}$ percentile ...
		... and 0 otherwise

Note: The table describes the variables used in the dynamic model for the two spotlights on leverage. Mean and standard deviations of the dependent variables in the multi-equation framework are reported in the respective estimation reports for the full sample, as well as for each subsample.

3.3.1 (Balance Sheet) Items Defining the Identity

The variables STD for short-term debt, and LTD for long-term debt, describe the liabilities of the company to a third party, whereas EQU for common equity, describes the claims of the shareholders. DPROP for depreciable property is calculated as the sum of property, plant and equipment (PPE) and accumulated depreciation. The differences between DPROP over time characterize the net expenditures of the company in PPE. In line with Harrison, Panasian, and Seiler (2011), real estate investment, as the source of collateral and asset tangibility, should increase the debt capacity of a firm. However, from our point of view, net property (real estate) investment foregoes the link of internal financing through depreciation.[7] Hence,

[7] Riddiough and Wu (2009) report that the 90% payout restriction transfers to 55%-70% pre-dividend payout, whereas An et al. (2010) relate this to 85% of FFO. Both figures highlight the

approximating the change in fixed assets by DPROP does not dilute the actual stock of real estate. Apart from minor aggregates, the sum of operating, investment and financing cash flow is the change in CCE and completes the identity, which is introduced in detail in the next section.

3.3.2 Instruments of Liquidity Management

The following sources are defined as the instruments of liquidity management. Cash & cash equivalents (CCE) describe the potential of the internal finance source for future projects and increase the firm's financial flexibility. By contrast, market leverage (LEV) is the ratio of total debt to the market value of assets and lowers a firm's debt capacity. While market LEV is used throughout the analysis, the results are also compared to book LEV, which is total debt to year-beginning total assets. The available lines of credit (LOC) are a revolving debt source extended by a bank. On the one hand, they offer future financial flexibility for the firm, but on the other hand, they are subject to fees for the unused lines.

3.3.3 Traditional Capital Structure Determinants

The following determinants are typical control variables used in capital structure studies. The general (stock) market cycles influence the development of real estate firms with respect to systematic risks and opportunities. This impact is incurred through the continuous returns of the S&P500. The market-to-book ratio (MB), calculated by market equity divided by book equity, characterizes the idiosyncratic growth opportunity.[8] The profitability of a firm – measured by return on assets (ROA) – may also influence the capital structure, as it is easier to issue debt and equity for more profitable firms. The size of a firm is captured by the natural logarithm of its total assets, assuming decreasing marginal economies of scale. With respect to balance sheet aggregates, a mechanical size effect on DPROP, STD, LTD and EQU is mitigated, due to scaling by total assets.

relevance of depreciation for internal funding

[8]Traditionally, MB is approximated by the deviation of market and book value of assets, rather than equity. In order to reduce the mechanical relationship to market leverage, the latter possibility is chosen.

3.3.4 Additional Dummies Approximating Firm Characteristics

The dummy Rating has a value of one, if the firm has at least an investment grade long-term issuer rating from S&P, Moody's or Fitch. It approximates access to the public debt market, due to relatively lower transaction costs and levels of asymmetric information. The dummy Op_Risk equals one, if the volatility of operating CF exceeds the conditional median of the twelve different property segments. It approximates the operational risk confronting a real estate company.

The two remaining dummies are unique to our research. As derived in the literature section, it is of interest to determine whether a firm faces strong investment opportunities or substantial CF shortfalls. Therefore, the Inv_Shock variable summarizes all observations with a percentage change of the market-to-book ratio above the 55^{th} percentile, conditional on the property segments. The computation for the FFO_Shock is similar. This determinant indicates observations with low percentage changes in funds from operations (FFO), if the changes are below the conditional 45^{th} percentile. FFO is typically calculated by adding real estate depreciation to the GAAP net income, excluding gains or losses from sales of properties or debt restructuring, and is interpreted as the sustainable cash flow. Observations with low (more negative) percentage changes in their FFOs are assumed to trigger higher leverage and lower equity.

3.3.5 Dealing with Cross-Industry Variation

It is common in real estate finance to allow for varying intercepts for different property segments. However, Ertugrul and Giambona (2011) show that the relative standing of a firm within its property focus segment ("micro industry") is essential for determining leverage. The rationale behind this approach is simply that it is not appropriate to compare profitability, leverage, or, as in this study, different forms of hedging tools of e.g. an office with a residential property company. Table (3.2) contains the t-statistics of Welch's t-test for the sources of liquidity across property segments. The results of the t-test, whether the segment means are equal to the sample mean, indicate that 10 of 21 conditional means are significantly different to the overall sample mean.

Therefore, we compare the results of the high and low subsamples. According to

Table 3.2: Cross-Industry Variance for Financial Liquidity Instruments

	LEV			CCE			LOC		
Property Focus	N	Mean	t-stat	N	Mean	t-stat	N	Mean	t-stat
All	558	0.406		558	0.015		558	0.162	
Office	103	0.411	-0.5	103	0.012	2.261*	103	0.167	-0.597
Residential	103	0.424	-1.779	103	0.011	3.337**	103	0.167	-0.737
Retail	122	0.446	-3.445***	122	0.013	1.295	122	0.164	-0.264
Industrial	40	0.407	-0.072	40	0.018	-0.87	40	0.162	-0.052
Hotel	58	0.374	1.931	58	0.022	-2.492*	58	0.146	1.448
Diversified	59	0.415	-0.549	59	0.018	-1.714	59	0.131	3.286**
Others	73	0.327	6.054***	73	0.019	-1.584	73	0.182	-2.278*

Note: This table shows the t-statistics (t-stat) of Welch's t-test. LEV refers to the market leverage. CCE refers to cash & cash equivalents, LOC to lines of credit available, both scaled by year-beginning total assets. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

the firm characteristics of the respective twelve property segments, a firm enters the low (high) subsample, if it yields a value below (above) the 45^{th} (55^{th}) percentile for a given firm characteristic. The characteristics are LEV, CCE, LOC, MB, ROA and Size. Furthermore, subsamples are constructed for the boom years (1996-1999, 2003-2007 and 2009-2010), bust years (2000-2002 and 2008) and for the sample before the late-2000s financial crisis (before 2008). Moreover, the attributes of whether a firm 'is rated as investment grade', 'has an above-median cash flow volatility' or 'experienced positive as opposed to negative cash-flow changes' are identified accordingly.

3.4 Model

The concept underlying this paper is basically that of combining the cash flow statement approach of Gatchev, Pulvino, and Tarhan (2010) with the balance-sheet view of Chen and Zhao (2007).

More specifically, the ideas that we adopt are a system of equations, estimated by weighted least squares, where the weight is reciprocal to the number of observations per year. By also following the advice of Petersen (2009), the methodological difference, is that we decided to include year dummies in order to account for time effects.[9] An even more important difference is that we do not need to define our

[9] Gatchev, Pulvino, and Tarhan (2010) demeaned their variables by the year means, which is associated with a manual adjustment of confidence intervals (especially in smaller samples like

identity, but eliminate 48 firm-year observations which do not satisfy the conditions in equations (3.1) and (3.2).[10]

$$\begin{aligned} & Cash\ Flow\ from\ Operations_{i,t} \\ + \ & Cash\ Flow\ from\ Financing_{i,t} \\ + \ & Cash\ Flow\ from\ Investment_{i,t} \\ \hline = \ & \Delta Cash\ and\ Cash\ Equivalents\ (CCE)_{i,t} \end{aligned} \tag{3.1}$$

Through equation (3.1), we relate the operating cash flow (CF_Op) to changes in balance sheet items by modeling

$$\begin{aligned} Operating\ CF_{i,t} \overset{!}{=} & -(Financing\ CF_{i,t} + Investment\ CF_{i,t}) - ... \\ & - \Delta Depreciable\ Property_{i,t} + \Delta STD_{i,t} + \Delta LTD_{i,t} + ... \\ & + \Delta Common\ Equity_{i,t} + \Delta Resid(All)_{i,t} + error_{i,t} \end{aligned} \tag{3.2}$$

where:

$$\begin{aligned} NFI_{i,t} &= Financing\ CF_{i,t} + Investment\ CF_{i,t} \\ \Delta Resid(All)_{i,t} &= \Delta Resid(Assets)_{i,t} + \Delta Resid(Liab.\&Equi.)_{i,t} \\ \Delta Resid(Assets)_{i,t} &= \Delta Total\ Assets_{i,t} - \Delta Depreciable\ Property_{i,t} - ... \\ & \quad - \Delta(CCE)_{i,t} \\ \Delta Resid(Liab.\&Equi.)_{i,t} &= \Delta\left(Liabilities_{i,t} - Total\ Debt_{i,t}\right) + ... \\ & \quad + \Delta Total\ Mezzanine_{i,t} + \Delta Preferred\ Equity_{i,t} \\ error_{i,t} &= \ - \Delta Total\ Assets_{i,t} + \Delta STD_{i,t} + \Delta LTD_{i,t} + ... \\ & \quad + \Delta Common\ Equity_{i,t} + \Delta Resid(Liab.\&Equi.)_{i,t} \end{aligned}$$

The first two summands of equation (3.2) expresses the change in total assets, while the second row expresses the change in equity plus liabilities of the variables

ours). Accordingly, after demeaning our sample, the year dummies re-main jointly significant.

[10]Gatchev, Pulvino, and Tarhan (2010) did not capture the whole cash-flow statement and thus had to define this identity in combination with a penalty function.

in our focus. The change in Resid(All) subsumes the remaining aggregates of the balance sheet.[11]

Moreover, we allow for a maximum deviation of $100,000 in equation (3.2)

$$|error_{i,t}| \overset{!}{<} 100,000$$

Therefore, the basic model accounting for Spotlight B can be written as

$$\begin{pmatrix} \Delta Resid(All)_{i,t} \\ \Delta STD_{i,t} \\ \Delta LTD_{i,t} \\ \Delta EQU_{i,t} \\ \Delta DPROP_{i,t} \\ \Delta NFI_{i,t} \end{pmatrix} = \Gamma \cdot \begin{pmatrix} \Delta Resid(All)_{i,t-1} \\ \Delta STD_{i,t-1} \\ \Delta LTD_{i,t-1} \\ \Delta EQU_{i,t-1} \\ \Delta DPROP_{i,t-1} \\ \Delta NFI_{i,t-1} \end{pmatrix} + \Lambda \cdot CF\_Op_{i,t} + ... \tag{3.3}$$

$$+ \Pi \cdot \begin{pmatrix} S\&P500_{i,t} \\ MB_{i,t} \\ ROA_{i,t} \\ SIZE_{i,t} \end{pmatrix} + \Psi \cdot \begin{pmatrix} Rating_{i,t} \\ Op\_Risk_{i,t} \\ Inv\_Shock_{i,t} \\ FFO\_Shock_{i,t} \end{pmatrix} + \epsilon_{i,t}$$

or in compact form

$$Y = \Gamma \cdot L.Y + \Lambda \cdot CF\_Op + \Pi \cdot C + \Psi \cdot D + \epsilon_{i,t}$$

'Y' represents all the right hand side variables of equation (3.2), which are also implemented as lagged regressors.[12] Operating cash flows 'CF_Op', as well as the firm

[11] The sum of financing and investment cash flow was originally allocated to the change in Resid(All), which should only play a minor role for the system dynamics. However, the dynamics of this variable were too often significant, due to the substantial relevance of these two cash flows.

[12] Besides Gatchev, Pulvino, and Tarhan (2010), the funding cycle of Brown and Riddiough (2003) in conjunction with Riddiough and Wu (2009) would also suggest this dynamic framework.

characteristics 'C', namely S&P500, MB, ROA and Size are proposed as contemporaneous independent variables. The dummies 'D' (Rating, Op-Risk, Inv_Shock and FFO_Shock) complete equation (3.3).[13] By construction, it follows that all coefficients per row add up to zero, but the operating CF's impact on 'Y' sum to one.

[13]We also considered dummies like 'incorporated in Delaware or Maryland', 'firm is a REIT', 'firm age' etc., that are partially implemented in real estate corporate finance research. However, due to the limited useful and significant insights thus obtained, we disregard these characteristics.

Table 3.3: Basic Model (according to equation (3.3))

	(1) Resid(All)	(2) STD	(3) LTD	(4) EQU	(5) DPROP	(6) NFI	(1)+(2)+(3)+... +(4)−(5)−(6) Balance Sheet Identity
L.Resid(All)	0.133	-0.299*	-0.720*	-0.527**	-0.965**	-0.447***	0.0000033
	(0.62)	(-1.84)	(-1.90)	(-2.50)	(-2.08)	(-5.53)	
L.STD	0.168	-0.660***	-0.231	-0.409*	-0.686	-0.446***	0.0000077
	(0.82)	(-3.65)	(-0.58)	(-1.96)	(-1.42)	(-5.37)	
L.LTD	0.181	-0.260	-0.604	-0.447**	-0.681	-0.449***	0.0000061
	(0.90)	(-1.54)	(-1.60)	(-2.26)	(-1.48)	(-5.62)	
L.EQU	0.179	-0.234	-0.576	-0.460**	-0.646	-0.445***	0.0000014
	(0.91)	(-1.39)	(-1.57)	(-2.40)	(-1.50)	(-5.60)	
L.DPROP	-0.166	0.288*	0.784**	0.558***	1.009**	0.456***	-0.0000057
	(-0.80)	(1.68)	(2.01)	(2.74)	(2.14)	(5.52)	
L.NFI	-0.217	0.052	0.677**	0.518***	0.906**	0.124**	-0.0000091
	(-1.49)	(0.38)	(2.01)	(3.26)	(2.42)	(2.05)	
CF_Op	0.169	-0.006	1.192***	0.453**	1.760***	-0.952***	0.9999973
	(1.03)	(-0.05)	(3.48)	(2.48)	(4.08)	(-15.62)	
S&P500	0.021	-0.005	0.068*	0.055***	0.123***	0.016**	-0.0000002
	(1.30)	(-0.26)	(1.75)	(3.22)	(4.32)	(1.98)	
MB	-0.005**	-0.002	0.019***	-0.008***	0.004	0.001	0.0000001
	(-2.11)	(-0.72)	(3.61)	(-2.69)	(0.52)	(0.84)	
ROA	-0.003*	-0.000	-0.007***	0.006***	-0.005**	0.001**	0.0000000
	(-1.98)	(-0.54)	(-3.86)	(4.36)	(-2.17)	(1.99)	
Size	-0.001	-0.001	-0.003	-0.002	-0.008	0.000	0.0000000
	(-0.58)	(-0.87)	(-0.86)	(-0.73)	(-1.53)	(0.89)	
Rating	-0.003	-0.005	0.014	0.002	0.009	-0.001	0.0000000
	(-0.50)	(-1.32)	(1.60)	(0.43)	(0.92)	(-0.83)	
Op_Risk	-0.003	0.001	-0.001	-0.001	-0.003	-0.000	0.0000000
	(-0.61)	(0.37)	(-0.12)	(-0.27)	(-0.33)	(-0.51)	
Inv_Shock	0.011***	-0.004	-0.012	-0.016***	-0.021**	-0.001	0.0000002
	(2.68)	(-1.19)	(-1.65)	(-4.21)	(-2.38)	(-0.65)	
FFO_Shock	-0.001	0.003	-0.005	-0.013**	-0.016*	-0.000	-0.0000001
	(-0.13)	(0.65)	(-0.65)	(-2.57)	(-1.69)	(-0.00)	
N	558	558	558	558	558	558	
adj. R-sq	0.024	0.160	0.229	0.209	0.225	0.676	
N_clust	140	140	140	140	140	140	
Mean(y)	0.021	0.008	0.049	0.030	0.105	-0.062	
St.Dev(y)	0.048	0.048	0.094	0.052	0.108	0.026	

Note: This table shows results based on equation (3.3). STD refers to short-term debt, LTD to long-term debt, EQU to common equity, DPROP to depreciable property, NFI to the net of the financing and investment cash flow, Resid(All) subsumes all remaining balance sheet items as defined in equation (3.2), all measured in first differences and scaled by year-beginning total assets. CF_Op refers to operating cash flow scaled by year-beginning total assets. S&P500 refers to the continuous return of the S&P500 index, MB to the ratio of market value over book value of equity, ROA to return on assets, Size to the ln of total assets. The dummy Rating is equal to one, if a firm has an investment grade rating, Op_Risk is equal to one, if a firm's cash flows are above the median in the respective property segment, Inv_Shock is equal to one, if a firm's percentage change in MB is above the 55^{th} percentile in the respective property segment, FFO_Shock is equal to one, if a firm's percentage change of FFO is below the 45^{th} percentile in the respective property segment, and zero otherwise. Year dummies are not reported. N denotes firm-year observations of each equation, N_cluster denotes the number of observed firms, Mean(y) and St.Dev.(y) represent mean and standard deviation of the dependent variable. The last column illustrates the accounting identity defined in equation (3.2). T-stats are in parenthesis, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

This is basically the modeling aspect of emphasizing leverage. Liquidity management is essential in modeling financing decisions. Therefore, the other spotlight highlights the debt ratio from interactions with competing sources of financial flexibility, namely CCE and LOC. Therefore, the full model adds LEV, CCE and LOC to equation (3.3). The quadratic terms of these three sources are also implemented, since no previous study has so far explored potential non-linear relationships between LEV, CCE and LOC. In the manner, interactions between the three instruments of financial flexibility are dependent on the original level, which is the main reason for the quadratic terms (i.e. Sufi 2007, for LOC and CCE or Gamba and Triantis (2008), for cash and debt).

$$Y = \Gamma \cdot L.Y + \Lambda \cdot CF\_Op + \Pi \cdot C + \Psi \cdot D + \Sigma \cdot S + \Omega \cdot S^2 + \epsilon_{i,t} \tag{3.4}$$

where

$$S = \begin{pmatrix} LEV_{i,t-1} \\ CCE_{i,t-1} \\ LOC_{i,t-1} \end{pmatrix}$$

Finally, we challenge equation (3.4) with respect to three different 'sets' of conditions. The first simply splits our sample in economic up- and downturns, as well as the subsample before the recent late 2000s financial crisis. Second, rather than interpreting firm characteristics typically used in capital structure research (MB, ROA and Size), we compare subsamples with low and high levels for these variables of interest. The same is done for the sources of financial flexibility, in order to take a further look at how relationships are dependent on the original level (rankings are defined according to the respective property focus, see data section). In addition, subsamples are compared with respect to Rating, Op_Risk and the change in CF_Op.

$$Y(X|subsample) = \Gamma \cdot L.Y + \Lambda \cdot CF\_Op + \Pi \cdot C + \Psi \cdot D + \Sigma \cdot S + \Omega \cdot S^2 + \epsilon_{i,t} \tag{3.5}$$

3.5 Results

This section is also separated in Spotlight A and Spotlight B and all conditional subsamples are considered. However, only full sample and conditional estimations with respect to time and MB, ROA and Size, as well as LEV, CCE and LOC are reported.[14]

3.5.1 Spotlight A

In the literature section, it was pointed out that the negative LOC-CCE interactions seem to be empirically robust. Across the 22 subsamples, we find a robust negative (non-linear) relationship for CCE on LOC, but only six subsamples reveal reverse causality.

The literature section did not provide a robust prediction of how LEV fits into the dynamics of this discussion. Initially, LEV yields contrary interactions with LOC. If significant, the 'negative' causality runs from LEV to LOC and only for the squared terms (14/22 subsamples). Furthermore, we find four negative (four positive) impacts of LOC on LEV, most obviously for the subsamples low (high) CCE and low (high) LOC firms. This could simply be due to the chronology of the "funding cycle" of Riddiough and Wu (2009). If LEV increases due to the use of LOC, then a negative relationship follows technically. Alternatively, if debt decreases due to the repayment of outstanding debt, the next funding cycle is established by blowing up LOC. On the other hand, if LOC increases, it is not clear when the firm draws these lines. Moreover, the LOC-LEV interactions are exclusively the case for the squared terms (except for small firms).

Second, LEV-CCE interactions are much weaker. LEV positively drives CCE in 6/22 subsamples, which is also restricted to the squared terms. In contrast, CCE negatively impacts on LEV in 3/22 sub-samples. This is the case for the high LOC and high CCE firms, as well as for firms with high CF volatility. A reason for this might be that on the one hand, having a reasonable amount of one of these two sources, the marginal value of lowering debt as the third source increases. On the other hand, high CCE or LOC subsamples imply that these firms are able to afford a drop in financial flexibility by lowering CCE, accompanied by an increase in debt. In the case of firms with highly volatile cash flows, we argue that CCE will be used

[14] All estimations are, as always, available on request.

before debt increases, in the event of a CF shortfall. Accordingly, both instruments will be 'reloaded' (more CCE, less debt) after positive movements from the CF mean.

In short, in four of the six subsamples, in which LEV is significant with respect to CCE, LEV is also significant for LOC. Alternatively, the relationship of LEV on CCE (LOC) is always positive (negative). If significant, CCE on LEV is always negative and in these subsamples, LOC on LEV is always positively significant. Hence, the above stochastic argument of a reverse relationship of CCE and LOC on LEV and vice versa holds for each of the 22 subsamples. This can be observed directly in the sub-samples high CCE, high LOC and high Op_Risk.

Before discussing the remaining variables, four findings are highlighted. First, the expected strong, empirical, negative relationship of LOC and CCE is reduced to a causality from CCE to LOC. Second, causality also seems to be stronger for LEV on LOC and for LEV on CCE, compared to the reverse causalities. Third, the financial flexibility perspective provides the basis for a complementary relationship of CCE and LEV and a substitutive one of CCE and LOC. Finally, the dependence on the original level of one or the other source is strongly suggested by a dominance of significant squared terms. Also, the change in signs of significant relationships in the case of LOC on LEV, dependent on low/high CCE or LOC firms, clearly demonstrate the importance of the original level.

It was expected that CF would positively affect LOC (Sufi (2009)), whereas a CF-CCE relationship was expected for constraint subsamples. However, CF plays only a minor role within this framework. The results suggest only one positive estimate for LEV (during economic downturns), one negative estimate for CCE (low MB firms) and two positive estimates for LOC (high Size and low Op_Risk firms). S&P500 affects LEV negatively, while it affects CCE positively; LOC is negatively affected by the S&P500 continuous returns for high ROA, low LEV and high LOC firms. Differences in the market and book value of equity (MB) are negatively associated with LEV. However, MB influences LOC positively (10/22 subsamples), fully consistent with financial flexibility, where firms with growth opportunities prepare to counter underinvestment due to potential liquidity gaps. As expected, CCE plays a subordinate role as a hedging tool, but is, as with LOC, positively driven by MB in five subsamples. In accordance with the argument given for LEV-CCE interactions, two of the five subsamples are low LEV and high LOC firms, hence, the marginal value of accumulating CCE as the third source increases in response to a MB increase.

Accordingly, ROA and Size affect LEV negatively. However, the latter relationship is much weaker. Moreover, both CCE and LOC are influenced marginally by (positive) ROA dynamics. In contrast, a negative Size effect applies to both liquidity instruments, implying that firm size substitutes for financial flexibility to some extent. This is even more the case for LOC (16/22 subsamples). Accordingly, high LEV, low CCE and low LOC firms yield a negative size effect for LOC, while their counterparts do not reveal such effects with any significance. Low LEV firms even yield a positive relationship of Size on CCE.[15] This exception is illustrated by the subsample Size itself, in which large firms yield a negative relationship of Size to LOC, whereas small firms yield a positively significant relationship.

The impact of the set of dummies is less evident. Rated firms in general have lower levels of CCE, moreover they have less debt. Firms with higher Op_Risk seem to have higher levels of borrowing and lending in order to smooth out the variance.[16] Shocks primarily affect LEV, investment shocks negatively (19/22 subsamples), FFO shocks positively (8/22 subsamples).[17] There is some additional discussion with respect to the shock dummies in the section on the mechanical aspects of leverage.

3.5.2 Spotlight B

The interpretation of Spotlight B is reduced to the discussion of LTD, EQU, DPROP and LEV.[18]

[15]Since growth opportunities approximate for a need for financial flexibility, we observe a positive estimate of Size on CCE for high MB firms, whereas the counterpart yields a negative one.

[16]Despite little significant estimates, the size subsample again delivered ambiguous results. Small firms with an operating risk hold less LOC, but their counterparts just do the reverse. This is contrary to the negative Size effect for liquidity instrument stated above. A reason for this might be that small firms with volatile cash flows receive less LOC in general, while big firms additionally hedge against CF shortfalls contrary to big firms without a high operating risk.

[17]One exception is that Inv_Shock shows a positive sign to LEV before the late-2000s financial crisis.

[18]However, worth mentioning is the fact that the sum of financing and investment CF shows the most considerable significances in our system. Hence, findings of Gatchev, Pulvino, and Tarhan (2010) that these two 'activities' would balance each other so that financing-investment sensitivities are mitigated cannot be stated for the real estate market. Moreover, aspects of debt maturity as

First of all, the motivating aspects described above are addressed by investigating how often there is an impact on LTD or EQU, but LEV is unaffected and vice versa. For this reason, we employ two approaches. On the one hand, we follow the suggestion of Gatchev, Pulvino, and Tarhan (2010) by interpreting the number of significant estimators in rows of matrix Γ of equation (3.5) as impulses of the independent variable, and significances in columns as responses (recall table (3.4)). Focusing on responses, we find 18 (27) significant off-diagonal estimators for LTD (EQU), but only 22 for LEV.[19] We additionally pose the simple question of how often LTD and/or EQU are affected by capital structure variables, but LEV remains unchanged. Across the 22 subsample regressions, it is primarily MB that affects LTD and/or EQU 19 times, while LEV remains unchanged.

With respect to Size, we rarely find significant effects, since we scaled by the year-beginning total as-sets. As stated above, a negative relationship of Size is evidently the case for LEV. MB positively (negatively) impacts LTD (EQU) and hence yields a significantly negative sign to LEV, moreover, rarely it affects DPROP positively. In accordance with the arguments relating to the mechanical aspects, a negative MB-LEV relationship may be attributed to market valuation, which is in the numerator of MB, but in the denominator of LEV. Analogously, this is assumed to be valid for EQU.

Finally, ROA positively (negatively) drives EQU (LTD and LEV) – which was expected. However, a negative impact of 'profitability' on DPROP can again be attributed either to mechanics (median depreciable property accounts for 96% of total assets, which is the denominator of ROA) or is a further illustration of cash flows being a superior measure of a company's soundness.

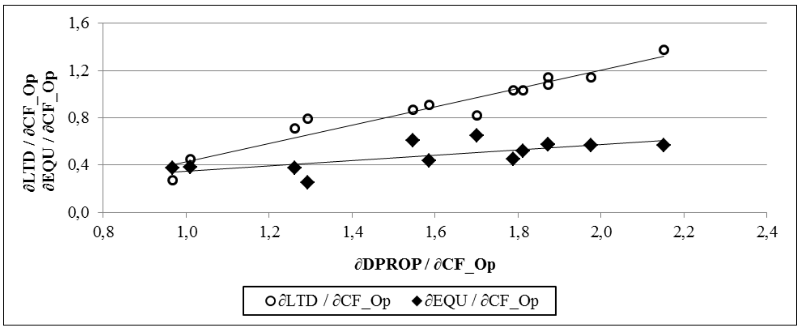
CF strictly shows positive impacts on LTD, EQU and DPROP and does not affect LEV, apart from the 'bust-subsample'. The most impressive instance is the very

suggested by Giambona, Harding, and Sirmans (2008) or Barclay, Marx, and Smith (2003) are simply modeled, though not reported, by distinguishing between short and long term debt.

[19] Assuming persistence in accounting variables, we ignore significances of lagged dependent variables. When we include lagged dependent variable, it is leverage, of course, which shows the highest persistence, since it is not measured in first differences (LTD 19, EQU 29, and LEV 42). Dependent variables with more responses are also said to be "shock absorbers" (Gatchev, Pulvino, and Tarhan (2010)).

high magnitude of estimates of CF for these three variables. While a $1 increase in operating cash flow robustly leads EQU to increase within a range of $0.35 to $0.66, estimators of LTD are between $0.27 (low Size) and a much higher $1.37 (low Op_Risk). DPROP is affected between $1.01 (low LEV) to $2.80 (during Bust) by a $1.00 increase of CF. These results suggest that firms use the improvement in cash-flow-based credit-quality ratios due to cash-flow increases and acquire more debt. Taking the full sample estimation as a benchmark, for each subsample, it can be stated that the higher the CF-LTD sensitivity the higher the CF-DPROP sensitivity.

Figure 3.2: "Liaison" of Debt and Investment via Cash Flows



Note: This figure plots the marginal impacts of operating cash flows (CF_Op) to changes in long-term debt (LTD) and changes in common equity (EQU) against the marginal impacts of CF_Op to changes in depreciable property (DPROP).

In order to understand this, recall the identity of equation (3.3). Assume also that Resid(All) and STD play a minor role, and further assume that a $1 change in operating CF transfers to a $1 change in the sum of financing and investment CF whereas EQU is very robustly affected by about $0.52 (whole sample). A strong connection between LTD and DPROP caused by operating CF then follows logically.

Accordingly, S&P500 also positively influences all variables considered, but positive market returns imply a lower LEV. The dummies Rating and Op_Risk rarely yield significant estimates. Across all estimations, INV_Shock and FFO_Shock yield a negative sign for LTD, EQU and DPROP very robustly. However, while INV_Shock results in a lower LEV, a FFO_Shock is compensated for by a higher LEV. This confirms the debt capacity argument of future investment opportunities, by investment shocks robustly resulting in a lower leverage. Therefore, if both variables are significant in the same equation, the magnitudes of the estimates are fairly equal. This also highlights the need to identify drivers of financial decisions, since an investment shock seems to affect balance sheet changes similarly to an FFO shock, but the inference for LEV yields reverse dynamics.

3.5.3 Book Leverage

While MB yields a negative relationship to market LEV, it turns into a positively significant one for book LEV. Since it was argued that the negative correlation results from a mechanical relationship, one would rely on book LEV. However, consider two identically characterized firms with different market valuations. The higher valued firm would certainly have better access to financing sources. Yet, would a firm that is not otherwise constrained be interested in this? The calculus of financial flexibility would refute such behavior. Indeed, we find no significant results for most of the 'good' subsamples (high LOC, high ROA, high Size, rated firms and low Op_Risk). Most surprisingly, the Inv_Shock dummy does not change its sign, even though it is less often significant (9 for book versus 19 for market LEV). In line with the original motivation for this approximation, it is significantly negative, especially for financially inflexible firms. On the one hand, one might see this as a further indication of the interactions of the three sources suggested in this paper being valid. On the other hand, it is evident that especially firms that are financially constrained and/or are confronted with potential underinvestment preserve debt capacity.

A further important difference is that book leverage is very sensitive to CF. Specifically, a \$1.00 increase in CF translates into about the same increase in debt. ROA remains robustly negative and Size remains understated.[20] FFO_Shock is only significant twice, suggesting that the bulk of variance in substantial FFO declines is priced by the capital market. Moreover, general causalities stated for market LEV do not change, despite a lesser appearance of linear and squared terms being significant.

With respect to Spotlight B, the approach of Gatchev, Pulvino, and Tarhan (2010), we find the opposite. That is, we obtain 12 (23) off-diagonal elements for LTD (EQU) of Γ in equation (3.3) but 54 for LEV. There is even more evidence of LEV eliminating information, since we count 5/2/3 significant estimates of MB/ROA/Size for LTD and/or EQU, whereas LEV remains unchanged across the 22 subsamples.

[20] In this sense, results based on book leverage suggest the pecking-order theory to be valid.

3.6 Conclusion

At the beginning of this paper, the position of leverage as one of the sources of financial flexibility (Spotlight A), as well as technical attributes of this ratio (Spotlight B) were outlined.

Our main findings are as follows. First, leverage (LEV) drives cash & cash equivalents (CCE) positively, but drives lines of credit (LOC) negatively. While the latter result, as well as the substitutive relationship of CCE and LOC are backed by the existing literature, the positive LEV-CCE relationship is contrary to previous studies. However, the findings from our dynamic framework are consistent with arguments of financial flexibility. Second, interactions of LEV, CCE and LOC are consistent with the typical funding cycle suggested by Riddiough and Wu (2009). An alternative explanation is obtained by interpreting the marginal value of a liquidity instrument as conditional on the original level of the other sources of financial flexibility. Third, the discussion of mechanical dynamics is not reduced only to debt and equity for LEV, but also applies to LEV and LOC. The relation between growth opportunities and market and book leverage demonstrate this mechanical issue very clearly. Four, dummies – unique to our research – yield very robust results with respect to the observation of firms lowering LEV, i.e. preserving debt capacity after investment shocks. By contrast, FFO shocks affect balance sheet aggregates very similarly to investment shocks, but generally result in LEV increases. Five, the more firms overdo debt acquisition due to cash flow improvements, the more prone they are to cash-flow-investment sensitivity. Finally, firm size seems to substitute for financial flexibility at least to some extent.

This paper can be seen as a bridge between emphasizing the characteristics of leverage in the function of a ratio on the one hand, and classifying leverage in the class of drivers of liquidity management on the other hand. While this constitutes the main contribution to the existing literature, the specific and innovative nature of our broad modeling approach arguably renders the paper far richer than may seem the paper at face value.

However, there are several issues that should be addressed in further research. First, what are the other sources of financial flexibility? One might be less debt at the operating level (mortgage/secured debt) and therefore, rather at a company level, as Hardin and Wu (2010) outline recently. Based on this observation, is there a hierarchy in terms of efficiency, and under which circumstances? Can we draw inferences about management risk aversion in preferring one or the other source? Since there is a benefit in selling and acquiring real estate assets in a more flexible manner, this example leads to the second question. What is the relationship between these sources and investment flexibility? Finally, what is the reason for non-REITs (REOCs) underutilizing cash reserves and accordingly, why do REITs almost totally abandon cash as a hedging instrument?

Table 3.4: Estimation Results for Spotlight A (according to equation (3.5))

	Full Model			State of Economy						Late-2000s Financial Crisis		
				Boom			Bust			Before the Crisis		
	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC
L.LEV	0.851***	-0.007	-0.001	0.846***	-0.007	-0.003	0.831***	-0.009	0.020	0.828***	-0.009	0.009
	(32.62)	(-1.03)	(-0.06)	(23.99)	(-0.79)	(-0.16)	(16.34)	(-0.90)	(0.63)	(23.17)	(-0.92)	(0.35)
L.CCE	0.027	0.578***	-0.376***	-0.136	0.598***	-0.341***	0.376	0.486***	-0.361*	-0.038	0.602***	-0.495***
	(0.17)	(9.14)	(-3.80)	(-0.81)	(8.89)	(-3.06)	(0.82)	(3.55)	(-1.82)	(-0.17)	(8.07)	(-3.00)
L.LOC	-0.013	-0.012	0.815***	0.011	-0.017	0.813***	-0.077	0.004	0.805***	-0.013	-0.013	0.801***
	(-0.45)	(-1.41)	(34.65)	(0.31)	(-1.48)	(36.77)	(-1.57)	(0.31)	(13.90)	(-0.45)	(-1.38)	(25.59)
$L.LEV^2$	0.002	0.001***	-0.004***	0.005	0.002	-0.007**	0.008	0.002	-0.008*	0.003	0.001**	-0.005***
	(1.09)	(3.05)	(-2.66)	(1.19)	(1.34)	(-2.26)	(1.25)	(1.36)	(-1.85)	(1.25)	(2.58)	(-2.63)
$L.CCE^2$	-0.034	-0.002	0.024**	-0.018	-0.004	0.020*	-0.175	-0.001	0.103	-0.038	-0.004	0.030**
	(-1.42)	(-0.46)	(2.46)	(-0.94)	(-0.66)	(1.70)	(-1.48)	(-0.05)	(1.38)	(-1.45)	(-0.79)	(2.45)
$L.LOC^2$	-0.001	-0.000	0.000	-0.001	-0.000	0.000	0.006	0.000	-0.003	-0.001	-0.000	0.000
	(-0.80)	(-0.76)	(0.29)	(-0.91)	(-0.94)	(0.86)	(1.22)	(0.15)	(-0.57)	(-0.70)	(-0.78)	(0.71)
CF_Op	0.070	0.035	0.178	-0.119	0.065	0.149	0.614*	-0.014	0.226	-0.146	0.025	0.288
	(0.36)	(0.59)	(1.13)	(-0.54)	(0.78)	(0.79)	(1.88)	(-0.21)	(0.79)	(-0.70)	(0.33)	(1.50)
S&P500	-0.093***	0.015**	-0.013	-0.117***	0.018**	-0.001	-0.058	0.012	-0.057	-0.086	0.005	-0.000
	(-3.72)	(2.18)	(-1.02)	(-5.16)	(2.25)	(-0.11)	(-1.09)	(0.67)	(-0.94)	(-1.63)	(0.50)	(-0.00)
MB	-0.003	0.001	0.005**	0.000	0.001	0.006**	-0.012**	0.003*	0.003	0.001	0.001	0.006*
	(-1.01)	(1.26)	(2.11)	(0.01)	(0.90)	(2.19)	(-2.54)	(1.76)	(0.76)	(0.38)	(1.22)	(1.81)
ROA	-0.006***	0.000	0.001	-0.004***	0.001	0.001	-0.010***	-0.001	-0.000	-0.007***	0.000	0.000
	(-4.67)	(1.21)	(0.86)	(-3.36)	(1.66)	(1.17)	(-4.02)	(-0.77)	(-0.06)	(-4.38)	(0.82)	(0.28)
Size	-0.004	0.001	-0.005***	-0.003	0.001	-0.006***	0.001	0.002	-0.009**	-0.005**	0.000	-0.006**
	(-1.52)	(0.92)	(-2.73)	(-0.95)	(0.51)	(-2.67)	(0.37)	(1.45)	(-2.30)	(-2.01)	(0.15)	(-2.52)
Rating	0.003	-0.002**	0.005	0.006	-0.003*	0.006	-0.005	-0.001	0.003	0.005	-0.001	0.008
	(0.60)	(-2.04)	(1.15)	(0.96)	(-1.84)	(1.18)	(-0.59)	(-0.48)	(0.57)	(1.04)	(-1.16)	(1.55)
Op_Risk	-0.000	0.001	0.001	-0.000	0.000	-0.004	-0.006	0.002	0.008	-0.001	0.002	0.004
	(-0.00)	(0.72)	(0.17)	(-0.03)	(0.25)	(-0.90)	(-0.73)	(1.24)	(1.42)	(-0.22)	(1.31)	(0.95)
Inv_Shock	-0.031***	-0.001	-0.003	-0.027***	-0.001	-0.005	-0.033***	-0.000	0.001	0.013***	-0.001	-0.003
	(-6.39)	(-0.60)	(-0.94)	(-4.95)	(-0.75)	(-1.32)	(-3.97)	(-0.23)	(0.12)	(2.78)	(-0.52)	(-0.62)
FFO_Shock	0.008*	-0.001	-0.001	-0.001	-0.001	-0.000	0.019***	-0.002	-0.005	0.300***	0.008	0.152***
	(1.76)	(-1.11)	(-0.15)	(-0.13)	(-0.61)	(-0.11)	(2.69)	(-1.03)	(-0.81)	(5.70)	(0.42)	(2.76)
N	558	558	558	373	373	373	185	185	185	395	395	395
adj. R-sq	0.868	0.325	0.808	0.866	0.321	0.804	0.866	0.240	0.807	0.875	0.331	0.791
N_clust	140	140	140	122	122	122	100	100	100	116	116	116
Mean(y)	0.407	0.015	0.162	0.388	0.017	0.163	0.443	0.011	0.158	0.402	0.013	0.162
St.Dev(y)	0.127	0.017	0.083	0.124	0.019	0.083	0.123	0.012	0.084	0.120	0.016	0.086

Note: This table shows results based on equation (3.5). LEV refers to market leverage, CCE to cash & cash equivalents, LOC to lines of credit, CF_Op refers to operating cash flow, all scaled by year-beginning total assets. S&P500 refers to the continuous return of the S&P500 index, MB to the ratio of market value over book value of equity, ROA to return on assets, Size to the ln of total assets. The dummy Rating is equal to one, if a firm has an investment grade rating, Op_Risk is equal to one, if a firm's cash flows are above the median in the respective property segment, Inv_Shock is equal to one, if a firm's percentage change in MB is above the 55^{th} percentile in the respective property segment, FFO_Shock is equal to one, if a firm's percentage change of FFO is below the 45^{th} percentile in the respective property segment, and zero otherwise. Estimates for the matrix Γ and year dummies are not reported. N denotes firm-year observations of each equation, N_cluster denotes the number of observed firms, Mean(y) and St.Dev.(y) represent mean and standard deviation of the dependent variable. T-stats are in parenthesis, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

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	LEV						LOC					
	Low			High			Low			High		
	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC
L.LEV	0.832***	-0.012	0.021	0.697***	-0.004	-0.032	0.852***	0.008	-0.027	0.809***	-0.018	0.048
	(22.11)	(-0.91)	(0.85)	(13.83)	(-0.32)	(-1.00)	(22.35)	(0.85)	(-1.38)	(17.81)	(-1.42)	(1.38)
L.CCE	0.136	0.599***	-0.279**	0.002	0.515***	-0.481**	-0.012	0.561***	-0.261**	-0.010	0.605***	-0.393**
	(0.76)	(7.62)	(-2.25)	(0.01)	(6.43)	(-2.52)	(-0.06)	(8.81)	(-1.99)	(-0.04)	(4.56)	(-2.26)
L.LOC	-0.059	-0.010	0.792***	0.034	-0.021*	0.820***	-0.009	-0.043**	0.642***	-0.043	0.006	0.725***
	(-1.65)	(-0.81)	(21.01)	(0.85)	(-1.69)	(24.17)	(-0.18)	(-2.46)	(10.57)	(-1.00)	(0.41)	(20.10)
$L.LEV^2$	-0.001	0.019**	-0.003	0.007	-0.000	-0.005*	0.003	0.000	-0.005**	0.019**	0.003	-0.006
	(-0.05)	(2.60)	(-0.25)	(1.52)	(-0.06)	(-1.91)	(0.86)	(0.33)	(-2.36)	(2.36)	(0.99)	(-0.68)
$L.CCE^2$	0.014	-0.000	0.019	-0.098	0.015	0.055	-0.043	0.012	0.059*	-0.051**	0.003	0.015
	(0.64)	(-0.03)	(1.41)	(-1.23)	(0.90)	(1.38)	(-0.76)	(0.70)	(1.81)	(-2.33)	(0.29)	(0.85)
$L.LOC^2$	-0.001	-0.002**	-0.001	-0.001	-0.000	0.001	-0.003***	-0.000	0.000	0.003**	-0.001	-0.000
	(-0.36)	(-2.08)	(-0.33)	(-0.80)	(-0.55)	(1.55)	(-4.61)	(-1.11)	(0.90)	(2.22)	(-0.85)	(-0.26)
CF_Op	0.108	0.055	0.183	-0.138	0.032	0.248	-0.040	-0.053	0.251	-0.067	0.130	-0.012
	(0.51)	(0.63)	(0.90)	(-0.51)	(0.45)	(1.04)	(-0.15)	(-0.65)	(1.38)	(-0.26)	(1.57)	(-0.05)
S&P500	-0.105**	0.006	-0.070*	-0.089***	0.022**	0.005	-0.098***	0.016	-0.007	-0.134***	0.018***	-0.050**
	(-2.53)	(0.51)	(-1.71)	(-3.54)	(2.42)	(0.36)	(-2.72)	(1.44)	(-0.60)	(-4.87)	(2.69)	(-2.28)
MB	-0.003	0.003**	0.006*	-0.001	-0.001	0.004	-0.001	0.001	0.004	-0.004	0.002*	0.003
	(-0.91)	(2.38)	(1.86)	(-0.27)	(-0.64)	(1.07)	(-0.19)	(0.40)	(1.52)	(-1.00)	(1.72)	(0.79)
ROA	-0.004***	0.001*	0.001	-0.007***	0.000	0.001	-0.006***	0.001	0.002*	-0.005***	0.001	0.000
	(-3.21)	(1.71)	(1.31)	(-3.04)	(0.38)	(0.55)	(-3.39)	(1.35)	(1.76)	(-3.22)	(1.11)	(0.33)
Size	0.000	0.003**	-0.005	0.000	-0.001	-0.006*	-0.001	0.001	-0.003**	-0.003	0.001	-0.006
	(0.03)	(2.52)	(-1.58)	(0.13)	(-0.69)	(-1.96)	(-0.52)	(0.53)	(-2.25)	(-0.60)	(0.60)	(-1.20)
Rating	0.006	-0.005***	0.001	-0.007	-0.002	0.009	-0.003	-0.002	0.004	0.006	-0.002	0.004
	(1.14)	(-2.79)	(0.17)	(-0.99)	(-0.96)	(1.44)	(-0.74)	(-1.34)	(1.06)	(0.85)	(-0.94)	(0.57)
Op_Risk	0.004	0.000	0.004	-0.002	0.002	0.002	-0.005	0.002	0.003	0.005	-0.001	0.001
	(0.77)	(0.06)	(0.93)	(-0.34)	(1.58)	(0.33)	(-0.80)	(1.59)	(0.67)	(1.02)	(-0.71)	(0.20)
Inv_Shock	-0.018***	-0.002	-0.000	-0.033***	0.001	-0.003	-0.034***	0.002	0.001	-0.030***	-0.002	-0.004
	(-3.61)	(-1.23)	(-0.06)	(-4.57)	(0.52)	(-0.67)	(-4.76)	(1.37)	(0.37)	(-4.99)	(-1.00)	(-0.81)
FFO_Shock	0.010*	-0.000	0.001	0.002	-0.001	-0.003	0.014**	-0.002	0.003	0.000	-0.000	-0.002
	(1.70)	(-0.16)	(0.13)	(0.26)	(-0.77)	(-0.56)	(2.30)	(-0.83)	(0.75)	(0.07)	(-0.10)	(-0.37)
N	303	303	303	292	292	292	296	296	296	299	299	299
adj. R-sq	0.833	0.346	0.785	0.800	0.327	0.807	0.880	0.383	0.752	0.849	0.282	0.692
N_clust	90	90	90	111	111	111	100	100	100	95	95	95
Mean(y)	0.333	0.015	0.168	0.480	0.014	0.153	0.418	0.017	0.111	0.392	0.013	0.210
St.Dev(y)	0.097	0.018	0.074	0.106	0.016	0.088	0.129	0.018	0.058	0.122	0.017	0.071

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	CCE						MB					
	Low			High			Low			High		
	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC
L.LEV	0.833***	0.003	0.022	0.848***	-0.011	-0.005	0.849***	0.007	0.003	0.849***	-0.017*	-0.015
	(20.07)	(0.53)	(0.85)	(26.45)	(-0.99)	(-0.21)	(19.34)	(0.94)	(0.14)	(28.28)	(-1.67)	(-0.68)
L.CCE	-0.311	0.170**	-0.678***	0.146	0.435***	-0.309**	-0.155	0.411***	-0.387**	0.034	0.614***	-0.398***
	(-0.95)	(2.11)	(-2.98)	(0.73)	(6.11)	(-2.54)	(-0.53)	(5.05)	(-2.60)	(0.16)	(7.39)	(-3.13)
L.LOC	-0.007	-0.015**	0.786***	-0.039	-0.013	0.837***	-0.059	-0.035***	0.822***	0.023	0.000	0.801***
	(-0.18)	(-2.22)	(21.58)	(-0.83)	(-0.91)	(23.24)	(-1.36)	(-3.02)	(25.14)	(0.72)	(0.02)	(26.29)
$L.LEV^2$	0.012*	-0.000	-0.006	0.003*	0.001	-0.003*	0.002	0.000	-0.002*	0.004	0.002	-0.009***
	(1.70)	(-0.17)	(-0.98)	(1.67)	(1.64)	(-1.88)	(0.67)	(0.29)	(-1.83)	(1.14)	(1.37)	(-3.09)
$L.CCE^2$	0.171	0.177***	0.253***	-0.056**	0.004	0.030**	-0.032	0.003	0.029**	-0.049	0.018	0.049*
	(1.60)	(8.99)	(3.26)	(-2.51)	(0.54)	(2.07)	(-1.25)	(0.51)	(2.16)	(-1.22)	(0.81)	(1.84)
$L.LOC^2$	-0.003**	-0.001**	-0.000	0.004***	-0.000	-0.001	0.004**	-0.001	-0.002	-0.002	-0.000	0.001
	(-2.58)	(-1.99)	(-0.11)	(3.14)	(-0.60)	(-0.60)	(1.99)	(-1.00)	(-0.81)	(-1.33)	(-0.59)	(1.30)
CF_Op	0.016	0.002	0.160	0.048	0.134	0.249	-0.014	-0.097*	0.237	0.210	0.106	0.075
	(0.06)	(0.09)	(0.83)	(0.19)	(1.16)	(1.04)	(-0.05)	(-1.68)	(0.97)	(0.84)	(1.11)	(0.35)
S&P500	-0.128***	-0.004	-0.025	-0.081***	0.026***	0.009	-0.105**	0.011	-0.027	-0.107***	0.007	-0.001
	(-3.84)	(-0.40)	(-1.11)	(-2.73)	(2.92)	(0.64)	(-2.10)	(1.58)	(-1.06)	(-4.75)	(0.77)	(-0.08)
MB	-0.005	0.000	0.003	-0.001	0.002	0.006*	-0.006	0.001	0.007	-0.001	0.001	0.002
	(-1.28)	(0.34)	(0.79)	(-0.18)	(1.10)	(1.72)	(-0.80)	(0.56)	(1.36)	(-0.34)	(0.51)	(0.47)
ROA	-0.005***	0.000	0.001	-0.006***	-0.000	0.001	-0.005***	0.001	0.002	-0.006***	0.001	-0.000
	(-2.88)	(1.53)	(1.29)	(-4.23)	(-0.04)	(0.47)	(-2.87)	(1.37)	(1.26)	(-3.78)	(1.02)	(-0.22)
Size	-0.001	-0.001*	-0.006**	-0.003	0.001	-0.003	-0.001	-0.002*	-0.007***	-0.004	0.002*	-0.006**
	(-0.31)	(-1.77)	(-2.27)	(-1.04)	(1.42)	(-1.23)	(-0.29)	(-1.86)	(-2.88)	(-1.27)	(1.80)	(-2.02)
Rating	0.004	-0.001	0.006	-0.001	-0.006**	0.004	-0.002	-0.002	-0.000	0.006	-0.002	0.008
	(0.67)	(-1.56)	(1.26)	(-0.15)	(-2.32)	(0.71)	(-0.33)	(-1.57)	(-0.01)	(1.05)	(-1.26)	(1.28)
Op_Risk	-0.002	-0.000	0.005	0.005	0.001	-0.003	-0.002	0.001	-0.005	0.004	0.001	0.006
	(-0.33)	(-0.20)	(1.09)	(0.85)	(0.57)	(-0.57	(-0.36)	(0.72)	(-1.00)	(0.92)	(0.36)	(1.30)
Inv_Shock	-0.032***	0.001*	-0.002	-0.031***	-0.004*	-0.002	-0.037***	-0.001	-0.007	-0.023***	0.000	0.000
	(-5.02)	(1.77)	(-0.45)	(-4.74)	(-1.73)	(-0.39)	(-5.64)	(-0.71)	(-1.49)	(-3.33)	(0.16)	(0.09)
FFO_Shock	0.011	-0.001	0.003	0.002	0.002	-0.004	-0.003	-0.003	-0.001	0.013**	-0.000	-0.000
	(1.61)	(-1.12)	(0.71)	(0.29)	(0.73)	(-0.77)	(-0.43)	(-1.63)	(-0.22)	(2.15)	(-0.03)	(-0.04)
N	308	308	308	288	288	288	279	279	279	318	318	318
adj. R-sq	0.847	0.370	0.821	0.883	0.290	0.782	0.860	0.381	0.815	0.868	0.308	0.788
N_clust	112	112	112	103	103	103	101	101	101	102	102	102
Mean(y)	0.402	0.007	0.173	0.408	0.024	0.147	0.425	0.014	0.153	0.385	0.016	0.167
St.Dev(y)	0.116	0.008	0.077	0.135	0.020	0.085	0.130	0.015	0.082	0.123	0.019	0.081

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	ROA						Size					
	Low			High			Low			High		
	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC	LEV	CCE	LOC
L.LEV	0.859***	-0.011	-0.012	0.823***	-0.005	0.004	0.826***	-0.002	-0.055**	0.815***	-0.011	0.004
	(21.40)	(-0.87)	(-0.44)	(19.86)	(-0.46)	(0.16)	(22.48)	(-0.22)	(-2.24)	(22.23)	(-1.04)	(0.15)
L.CCE	-0.151	0.535***	-0.365**	0.015	0.629***	-0.375***	-0.131	0.500***	-0.426**	-0.131	0.568***	-0.299**
	(-0.64)	(5.57)	(-2.36)	(0.08)	(8.51)	(-3.06)	(-0.58)	(4.75)	(-2.10)	(-0.62)	(7.68)	(-2.32)
L.LOC	-0.025	-0.021	0.829***	0.012	-0.006	0.799***	-0.003	-0.018	0.834***	-0.032	-0.005	0.757***
	(-0.63)	(-1.62)	(26.91)	(0.32)	(-0.47)	(21.11)	(-0.08)	(-1.64)	(27.28)	(-0.76)	(-0.50)	(23.16)
$L.LEV^2$	0.001	0.000	-0.006*	0.002	0.001***	-0.003*	0.001	0.001	0.000	0.042**	-0.000	-0.016
	(0.21)	(0.13)	(-1.96)	(0.98)	(2.82)	(-1.79)	(0.46)	(1.24)	(0.27)	(2.52)	(-0.02)	(-1.61)
$L.CCE^2$	-0.040	0.021	0.029	-0.011	-0.008	0.021	-0.037	0.002	0.027**	-0.054	0.234***	0.406***
	(-0.86)	(0.89)	(1.01)	(-0.42)	(-1.20)	(1.42)	(-1.38)	(0.24)	(2.02)	(-0.61)	(10.74)	(5.48)
$L.LOC^2$	-0.001	0.000	0.001	-0.001	-0.000	-0.001	-0.001	-0.000	0.000	0.003	-0.012***	-0.024***
	(-0.78)	(0.27)	(0.96)	(-1.11)	(-1.03)	(-0.80)	(-0.65)	(-0.99)	(0.23)	(0.77)	(-7.47)	(-5.58)
CF_Op	0.033	-0.035	0.049	-0.058	0.093	0.231	-0.135	-0.032	-0.181	0.116	0.101	0.382*
	(0.11)	(-0.39)	(0.24)	(-0.22)	(1.20)	(0.95)	(-0.47)	(-0.46)	(-0.87)	(0.49)	(1.00)	(1.85)
S&P500	-0.073***	0.013	-0.010	-0.113***	0.015	-0.043*	-0.089***	0.021***	-0.021	-0.123***	0.014	0.015
	(-3.46)	(1.19)	(-0.89)	(-4.31)	(1.44)	(-1.75)	(-3.05)	(3.48)	(-1.17)	(-5.00)	(1.47)	(0.99)
MB	0.001	0.001	0.007*	-0.006*	0.002	0.004	0.004	-0.002**	0.006*	-0.010***	0.005***	0.006**
	(0.28)	(0.89)	(1.84)	(-1.67)	(1.14)	(1.18)	(1.19)	(-2.54)	(1.77)	(-2.64)	(3.48)	(2.02)
ROA	-0.005***	-0.000	0.004***	-0.005***	0.001*	-0.001	-0.007***	0.001**	0.000	-0.005***	-0.000	0.001
	(-2.74)	(-0.32)	(2.74)	(-3.27)	(1.91)	(-0.50)	(-4.13)	(2.30)	(0.01)	(-3.16)	(-0.09)	(1.02)
Size	-0.007	0.001	-0.006**	0.000	0.000	-0.006*	-0.006*	-0.001	0.005*	0.001	0.001	-0.011***
	(-1.63)	(0.52)	(-2.53)	(0.06)	(0.05)	(-1.82)	(-1.82)	(-1.10)	(1.90)	(0.27)	(0.86)	(-3.42)
Rating	0.004	-0.002	0.001	0.001	-0.001	0.003	-0.438*	-0.211**	0.131	-0.002	-0.001	0.008*
	(0.44)	(-1.08)	(0.22)	(0.10)	(-0.68)	(0.52)	(-1.67)	(-1.99)	(0.58)	(-0.31)	(-0.80)	(1.67)
Op_Risk	-0.003	0.001	-0.001	0.009	-0.000	0.006	-0.006	0.001	-0.009**	0.011*	-0.001	0.008*
	(-0.49)	(0.65)	(-0.29)	(1.65)	(-0.30)	(1.09)	(-1.04)	(0.69)	(-2.31)	(1.82)	(-0.59)	(1.68)
Inv_Shock	-0.037***	0.001	-0.005	-0.027***	-0.002	0.001	-0.043***	0.000	-0.004	-0.021***	-0.000	-0.003
	(-4.92)	(0.35)	(-1.05)	(-4.48)	(-0.96)	(0.17)	(-5.79)	(0.05)	(-0.68)	(-3.45)	(-0.19)	(-0.83)
FFO_Shock	0.007	-0.003	0.001	0.010	-0.000	-0.002	0.002	-0.001	-0.003	0.013**	-0.002	0.003
	(0.99)	(-1.32)	(0.28)	(1.63)	(-0.04)	(-0.35)	(0.23)	(-0.51)	(-0.46)	(2.02)	(-1.03)	(0.54)
N	289	289	289	314	314	314	301	301	301	295	295	295
adj. R-sq	0.830	0.316	0.847	0.846	0.335	0.745	0.882	0.298	0.818	0.852	0.414	0.790
N_clust	111	111	111	98	98	98	98	98	98	86	86	86
Mean(y)	0.454	0.015	0.152	0.357	0.015	0.174	0.423	0.015	0.171	0.396	0.015	0.150
St.Dev(y)	0.119	0.017	0.088	0.112	0.018	0.078	0.139	0.016	0.091	0.112	0.018	0.071

Table 3.5: Estimation Results for Spotlight B (according to equation (3.5))

	Full Model				State of Economy							
					Boom				Bust			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	1	1	1	1	0	2	0	0	3	0	1	0
CF_Op	1.034***	0.517***	1.811***	0.070	0.537	0.560**	1.286***	-0.119	2.092***	0.279	2.799***	0.614*
	(2.80)	(2.72)	(3.86)	(0.36)	(1.40)	(2.17)	(2.75)	(-0.54)	(2.88)	(1.11)	(2.81)	(1.88)
S&P500	0.061*	0.058***	0.120***	-0.093***	-0.003	0.058***	0.053	-0.117***	0.319***	0.134**	0.452***	-0.058
	(1.71)	(5.08)	(4.17)	(-3.72)	(-0.12)	(2.80)	(1.04)	(-5.16)	(2.87)	(2.28)	(3.51)	(-1.09)
MB	0.020***	-0.008***	0.005	-0.003	0.023***	-0.009***	0.006	0.000	0.013	-0.004	0.001	-0.012**
	(3.60)	(-2.79)	(0.70)	(-1.01)	(3.29)	(-2.64)	(0.74)	(0.01)	(1.26)	(-0.89)	(0.06)	(-2.54)
ROA	-0.008***	0.006***	-0.005**	-0.006***	-0.008***	0.005***	-0.006**	-0.004***	-0.008	0.008***	-0.004	-0.010***
	(-3.91)	(4.49)	(-2.11)	(-4.67)	(-3.53)	(3.18)	(-2.10)	(-3.36)	(-1.61)	(4.70)	(-0.86)	(-4.02)
Size	-0.003	0.002	-0.009	-0.004	-0.005	-0.002	-0.014**	-0.003	0.002	0.002	-0.012	0.001
	(-0.56)	(0.54)	(-1.42)	(-1.52)	(-0.98)	(-0.51)	(-2.19)	(-0.95)	(0.21)	(0.47)	(-1.13)	(0.37)
Rating	0.009	0.000	0.009	0.003	0.018	0.003	0.016	0.006	-0.016	-0.005	-0.007	-0.005
	(0.89)	(0.08)	(0.80)	(0.60)	(1.53)	(0.49)	(1.23)	(0.96)	(-1.05)	(-0.79)	(-0.43)	(-0.59)
Op_Risk	0.000	0.002	-0.000	-0.000	0.001	-0.003	-0.005	-0.000	-0.010	0.012**	-0.001	-0.006
	(0.04)	(0.34)	(-0.00)	(-0.00)	(0.15)	(-0.52)	(-0.40)	(-0.03)	(-0.73)	(2.08)	(-0.06)	(-0.73)
Inv_Shock	-0.011	-0.016***	-0.022**	-0.031***	-0.018*	-0.021***	-0.034***	-0.027***	0.012	-0.008	0.000	-0.033***
	(-1.52)	(-4.39)	(-2.53)	(-6.39)	(-1.80)	(-3.89)	(-2.97)	(-4.95)	(0.83)	(-1.17)	(0.01)	(-3.97)
FFO_Shock	-0.007	-0.017***	-0.020**	0.008*	-0.018*	-0.018**	-0.035***	-0.001	0.015	-0.019***	-0.001	0.019***
	(-0.88)	(-3.20)	(-2.14)	(1.76)	(-1.81)	(-2.41)	(-2.70)	(-0.13)	(1.20)	(-4.00)	(-0.09)	(2.69)
N	558	558	558	558	373	373	373	373	185	185	185	185 5
adj. R-sq	0.243	0.235	0.229	0.868	0.275	0.186	0.248	0.866	0.146	0.273	0.149	0.866
N_clust	140	140	140	140	122	122	122	122	100	100	100	100
Mean(y)	0.049	0.030	0.105	0.407	0.052	0.037	0.111	0.388	0.039	0.015	0.089	0.443
St.Dev(y)	0.094	0.052	0.108	0.127	0.097	0.055	0.110	0.124	0.087	0.041	0.100	0.123

Note: This table shows results based on equation (3.5). LTD to long-term debt, EQU to common equity, DPROP to depreciable property, all measured in first differences and scaled by year-beginning total assets. LEV refers to market leverage, CF_Op refers to operating cash flow, all scaled by year-beginning total assets. S&P500 refers to the continuous return of the S&P500 index, MB to the ratio of market value over book value of equity, ROA to return on assets, Size to the ln of total assets. The dummy Rating is equal to one, if a firm has an investment grade rating, Op_Risk is equal to one, if a firm's cash flows are above the median in the respective property segment, Inv_Shock is equal to one, if a firm's percentage change in MB is above the 55^{th} percentile in the respective property segment, FFO_Shock is equal to one, if a firm's percentage change of FFO is below the 45^{th} percentile in the respective property segment, and zero otherwise. Estimates for the matrix Γ and year dummies are not reported. N denotes firm-year observations of each equation, N_cluster denotes the number of observed firms, Mean(y) and St.Dev.(y) represent mean and standard deviation of the dependent variable. T-stats are in parenthesis, ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.

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	Late-2000s Financial Crisis Before the Crisis				LEV Low				High			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	1	2	1	0	0	1	0	0	1	1	1	1
CF_Op	1.355***	0.611**	2.113***	-0.146	0.451	0.381*	1.010**	0.108	1.530**	0.635**	2.487***	-0.138
	(2.63)	(2.57)	(3.21)	(-0.70)	(1.40)	(1.72)	(2.50)	(0.51)	(2.48)	(2.18)	(3.01)	(-0.51)
S&P500	0.091	0.033	0.190*	-0.086	0.024	0.028	0.066	-0.105**	0.092***	0.067***	0.155***	-0.089***
	(1.64)	(0.91)	(1.95)	(-1.63)	(0.27)	(0.69)	(1.20)	(-2.53)	(2.73)	(3.98)	(4.10)	(-3.54)
MB	0.023***	-0.007**	0.005	0.001	0.020***	-0.007*	0.005	-0.003	0.022**	-0.010**	0.005	-0.001
	(2.96)	(-1.98)	(0.59)	(0.38)	(3.37)	(-1.83)	(0.54)	(-0.91)	(2.37)	(-2.51)	(0.47)	(-0.27)
ROA	-0.010***	0.006***	-0.004	-0.007***	-0.010***	0.004**	-0.006**	-0.004***	-0.003	0.008***	-0.002	-0.007***
	(-4.53)	(3.77)	(-1.52)	(-4.38)	(-5.06)	(2.38)	(-2.35)	(-3.21)	(-0.97)	(4.28)	(-0.52)	(-3.04)
Size	-0.005	-0.001	-0.010	-0.005**	0.001	0.002	-0.008	0.000	-0.001	-0.000	-0.004	0.000
	(-0.81)	(-0.35)	(-1.38)	(-2.01)	(0.18)	(0.56)	(-1.08)	(0.03)	(-0.09)	(-0.02)	(-0.51)	(0.13)
Rating	0.012	0.002	0.013	0.005	0.024**	0.001	0.019	0.006	-0.003	0.001	0.002	-0.007
	(1.02)	(0.42)	(0.97)	(1.04)	(2.33)	(0.17)	(1.53)	(1.14)	(-0.21)	(0.11)	(0.12)	(-0.99)
Op_Risk	0.002	0.002	-0.000	-0.001	0.002	0.001	-0.000	0.004	-0.003	0.004	-0.006	-0.002
	(0.23)	(0.31)	(-0.03)	(-0.22)	(0.18)	(0.19)	(-0.01)	(0.77)	(-0.29)	(0.70)	(-0.47)	(-0.34)
Inv_Shock	-0.018*	-0.021***	-0.027**	-0.025***	0.005	-0.016***	-0.005	-0.018***	-0.009	-0.008*	-0.017	-0.033***
	(-1.75)	(-4.37)	(-2.13)	(-4.65)	(0.56)	(-2.74)	(-0.39)	(-3.61)	(-0.77)	(-1.66)	(-1.19)	(-4.57)
FFO_Shock	-0.003	-0.021***	-0.024**	0.013***	-0.000	-0.014**	-0.005	0.010*	-0.016	-0.017*	-0.042**	0.002
	(-0.37)	(-3.49)	(-2.09)	(2.78)	(-0.02)	(-2.13)	(-0.45)	(1.70)	(-1.29)	(-1.93)	(-2.59)	(0.26)
N	395	395	395	395	303	303	303	303	292	292	292	292
adj. R-sq	0.225	0.249	0.212	0.875	0.244	0.148	0.169	0.833	0.285	0.267	0.278	0.800
N_clust	116	116	116	116	90	90	90	90	111	111	111	111
Mean(y)	0.056	0.028	0.109	0.402	0.037	0.034	0.094	0.333	0.061	0.028	0.119	0.480
St.Dev(y)	0.097	0.053	0.114	0.120	0.083	0.050	0.093	0.097	0.102	0.056	0.121	0.106

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	LOC							
	Low				High			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	1	1	1	0	0	0	0	1
CF_Op	0.713	0.345	1.262**	-0.040	1.081*	0.574**	1.872***	-0.067
	(1.47)	(1.48)	(2.38)	(-0.15)	(1.87)	(2.15)	(2.71)	(-0.26)
S&P500	0.069	0.048***	0.115***	-0.098***	-0.012	0.050**	0.046	-0.134***
	(1.64)	(4.03)	(3.37)	(-2.72)	(-0.41)	(2.46)	(1.56)	(-4.87)
MB	0.025***	-0.004	0.018**	-0.001	0.014	-0.015***	-0.010	-0.004
	(2.91)	(-1.37)	(2.05)	(-0.19)	(1.60)	(-3.04)	(-0.96)	(-1.00)
ROA	-0.005	0.008***	-0.000	-0.006***	-0.010***	0.004**	-0.009**	-0.005***
	(-1.60)	(5.44)	(-0.06)	(-3.39)	(-3.89)	(2.15)	(-2.61)	(-3.22)
Size	-0.007	-0.001	-0.013	-0.001	0.002	0.006	-0.002	-0.003
	(-1.31)	(-0.30)	(-1.62)	(-0.52)	(0.23)	(1.30)	(-0.17)	(-0.60)
Rating	0.012	-0.001	0.011	-0.003	0.018	0.005	0.017	0.006
	(0.96)	(-0.14)	(0.82)	(-0.74)	(1.18)	(0.71)	(1.04)	(0.85)
Op_Risk	-0.009	0.004	-0.017	-0.005	0.007	-0.002	0.009	0.005
	(-0.87)	(0.63)	(-1.25)	(-0.80)	(0.67)	(-0.21)	(0.62)	(1.02)
Inv_Shock	-0.012	-0.013***	-0.018	-0.034***	-0.004	-0.014**	-0.016	-0.030***
	(-1.19)	(-2.98)	(-1.61)	(-4.76)	(-0.34)	(-2.15)	(-1.21)	(-4.99)
FFO_Shock	0.003	-0.019***	-0.006	0.014**	-0.009	-0.012	-0.026*	0.000
	(0.26)	(-3.78)	(-0.53)	(2.30)	(-0.85)	(-1.32)	(-1.88)	(0.07)
N	296	296	296	296	299	299	299	299
adj. R-sq	0.229	0.266	0.190	0.880	0.201	0.205	0.222	0.849
N_clust	100	100	100	100	95	95	95	95
Mean(y)	0.047	0.024	0.096	0.418	0.049	0.035	0.113	0.392
St.Dev(y)	0.089	0.046	0.103	0.129	0.098	0.057	0.111	0.122

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	CCE							
	Low				High			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	0	0	0	0	0	0	0	1
CF_Op	1.143**	0.564***	1.975***	0.016	0.870*	0.609**	1.546***	0.048
	(2.11)	(2.92)	(3.05)	(0.06)	(1.90)	(2.07)	(2.69)	(0.19)
S&P500 -0.015	0.043	0.044	-0.128***	0.071*	0.064***	0.124***	-0.081***	
	(-0.33)	(0.93)	(0.90)	(-3.84)	(1.96)	(3.65)	(2.91)	(-2.73)
MB	0.024***	-0.006*	0.008	-0.005	0.019**	-0.014***	-0.003	-0.001
	(3.14)	(-1.67)	(1.17)	(-1.28)	(2.60)	(-3.70)	(-0.38)	(-0.18)
ROA	-0.007**	0.007***	-0.002	-0.005***	-0.009***	0.005**	-0.006	-0.006***
	(-2.13)	(3.58)	(-0.64)	(-2.88)	(-3.42)	(2.51)	(-1.46)	(-4.23))
Size	0.003	0.003	-0.000	-0.001	-0.003	0.001	-0.009	-0.003
	(0.36)	(0.71)	(-0.03)	(-0.31)	(-0.48)	(0.45)	(-1.12)	(-1.04)
Rating	0.023*	0.005	0.021	0.004	-0.005	-0.005	-0.004	-0.001
	(1.92)	(0.71)	(1.59)	(0.67)	(-0.38)	(-0.66)	(-0.24)	(-0.15)
Op_Risk	0.001	0.002	0.012	-0.002	-0.004	-0.004	-0.020	0.005
	(0.07)	(0.41)	(1.03)	(-0.33)	(-0.41)	(-0.63)	(-1.49)	(0.85)
Inv_Shock	-0.009	-0.017***	-0.024**	-0.032***	-0.005	-0.011*	-0.003	-0.031***
	(-0.83)	(-3.27)	(-2.03)	(-5.02)	(-0.50)	(-1.95)	(-0.21)	(-4.74)
FFO_Shock	-0.002	-0.015**	-0.017	0.011	-0.011	-0.012	-0.018	0.002
	(-0.19)	(-2.12)	(-1.41)	(1.61)	(-1.15)	(-1.58)	(-1.32)	(0.29)
N	308	308	308	308	288	288	288	288
adj. R-sq	0.222	0.307	0.286	0.847	0.246	0.235	0.184	0.883
N_clust	112	112	112	112	103	103	103	103
Mean(y)	0.046	0.027	0.106	0.402	0.049	0.037	0.106	0.408
St.Dev(y)	0.093	0.050	0.104	0.116	0.094	0.057	0.112	0.135

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	MB							
	Low				High			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	1	5	5	4	0	0	0	1
CF_Op	1.032*	0.451*	1.789**	-0.014	0.907**	0.440*	1.585***	0.210
	(1.93)	(1.71)	(2.53)	(-0.05)	(1.99)	(1.80)	(2.89)	(0.84)
S&P500	0.035	0.034	0.123*	-0.105**	0.052	0.074***	0.093**	-0.107***
	(0.60)	(0.89)	(1.92)	(-2.10)	(1.53)	(3.81)	(2.44)	(-4.75)
MB	0.043***	-0.002	0.042***	-0.006	0.019***	-0.015***	-0.004	-0.001
	(3.01)	(-0.49)	(2.67)	(-0.80)	(3.00)	(-3.45)	(-0.45)	(-0.34)
ROA	-0.007**	0.006***	-0.006*	-0.005***	-0.010***	0.006***	-0.007**	-0.006***
	(-2.26)	(3.24)	(-1.82)	(-2.87)	(-4.06)	(3.26)	(-2.54)	(-3.78)
Size	-0.002	-0.004	-0.009	-0.001	-0.001	0.004	-0.007	-0.004
	(-0.25)	(-1.21)	(-1.14)	(-0.29)	(-0.21)	(1.01)	(-0.98)	(-1.27)
Rating	0.011	0.008	0.011	0.011	0.008	-0.006	0.000	0.006
	(0.69)	(1.06)	(0.62)	(0.69)	(0.62)	(-0.93)	(0.04)	(1.05)
Op_Risk	-0.012	-0.006	-0.013	-0.012	0.012	0.003	0.005	0.004
	(-0.98)	(-0.95)	(-0.98)	(-0.98)	(1.37)	(0.56)	(0.46)	(0.92)
Inv_Shock	-0.019	-0.007	-0.017	-0.037***	-0.006	-0.026***	-0.029***	-0.023***
	(-1.57)	(-1.45)	(-1.23)	(-5.64)	(-0.60)	(-4.75)	(-2.77)	(-3.33)
FFO_Shock	-0.014	-0.012	-0.034**	-0.003	-0.008	-0.019***	-0.016	0.013**
	(-1.05)	(-1.64)	(-2.19)	(-0.43)	(-0.77)	(-2.80)	(-1.26)	(2.15)
N	279	279	279	279	318	318	318	318
adj. R-sq	0.202	0.208	0.219	0.860	0.227	0.240	0.232	0.868
N_clust	101	101	101	101	102	102	102	102
Mean(y)	0.041	0.029	0.101	0.425	0.054	0.032	0.109	0.385
St.Dev(y)	0.093	0.051	0.109	0.130	0.093	0.054	0.105	0.123

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	ROA							
	Low				High			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	1	1	1	0	0	1	0	0
CF_Op	0.792	0.253	1.293**	0.033	0.824	0.649**	1.701***	-0.058
	(1.61)	(1.03)	(2.20)	(0.11)	(1.59)	(2.50)	(2.78)	(-0.22)
S&P500	0.082**	0.054***	0.127***	-0.073***	0.069	0.046	0.149**	-0.113***
	(2.04)	(3.01)	(3.27)	(-3.46)	(1.17)	(1.65)	(2.02)	(-4.31)
MB	0.038***	-0.006	0.023**	0.001	0.012	-0.009***	-0.008	-0.006*
	(4.32)	(-1.29)	(2.12)	(0.28)	(1.60)	(-2.79)	(-1.13)	(-1.67)
ROA	-0.004	0.010***	0.002	-0.005***	-0.013***	0.004**	-0.011***	-0.005***
	(-1.22)	(5.72)	(0.38)	(-2.74)	(-4.84)	(2.09)	(-3.77)	(-3.27)
Size	-0.010	-0.000	-0.020**	-0.007	-0.003	-0.003	-0.007	0.000
	(-1.40)	(-0.07)	(-2.09)	(-1.63)	(-0.49)	(-0.93)	(-1.04)	(0.06)
Rating	0.017	0.003	0.017	0.004	0.012	0.001	0.009	0.001
	(1.29)	(0.33)	(1.15)	(0.44)	(0.83)	(0.22)	(0.60)	(0.10)
Op_Risk	-0.002	0.009	-0.002	-0.003	0.003	-0.007	0.002	0.009
	(-0.15)	(1.47)	(-0.12)	(-0.49)	(0.30)	(-1.12)	(0.12)	(1.65)
Inv_Shock	-0.028***	-0.019***	-0.037***	-0.037***	0.011	-0.009	-0.000	-0.027***
	(-2.68)	(-3.49)	(-2.86)	(-4.92)	(1.10)	(-1.63)	(-0.01)	(-4.48)
FFO_Shock	-0.017	-0.019**	-0.032**	0.007	0.005	-0.014**	-0.010	0.010
	(-1.44)	(-2.24)	(-2.22)	(0.99)	(0.44)	(-2.16)	(-0.78)	(1.63)
N	289	289	289	289	314	314	314	314
adj. R-sq	0.284	0.207	0.242	0.682	0.202	0.203	0.222	0.846
N_clust	111	111	111	111	98	98	98	98
Mean(y)	0.053	0.023	0.106	-0.056	0.046	0.038	0.104	0.357
St.Dev(y)	0.096	0.053	0.110	0.025	0.092	0.050	0.103	0.112

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	Size							
	Low				High			
	ΔLTD	ΔEQU	DPROP	LEV	ΔLTD	ΔEQU	DPROP	LEV
Response	1	1	1	2	0	1	0	0
CF_Op	0.270	0.374	0.966**	-0.135	1.377**	0.564*	2.151**	0.116
	(0.60)	(1.56)	(2.13)	(-0.47)	(2.09)	(1.94)	(2.54)	(0.49)
S&P500	0.073	0.062***	0.109**	-0.089***	0.024	0.073***	0.042	-0.123***
	(1.33)	(3.96)	(2.16)	(-3.05)	(0.77)	(4.38)	(0.89)	(-5.00)
MB	0.034***	-0.011***	0.013	0.004	0.009	-0.005	-0.009	-0.010***
	(4.40)	(-2.99)	(1.49)	(1.19)	(1.23)	(-1.36)	(-0.96)	(-2.64)
ROA	-0.005*	0.008***	-0.003	-0.007***	-0.010***	0.005***	-0.007**	-0.005***
	(-1.79)	(3.98)	(-1.00)	(-4.13)	(-3.95)	(2.74)	(-2.05)	(-3.16)
Size	0.003	0.007**	0.001	0.005*	-0.008	-0.005	-0.016	0.001
	(0.41)	(2.01)	(0.11)	(1.90)	(-0.87)	(-0.81)	(-1.35)	(0.27)
Rating	-0.005	-0.001	0.001	-0.011	0.015	0.004	0.005	-0.002
	(-0.42)	(-0.10)	(0.05)	(-0.69)	(1.25)	(0.59)	(0.33)	(-0.31)
Op_Risk	-0.013	-0.003	-0.023*	-0.032*	0.012	-0.000	0.013	0.011*
	(-1.28)	(-0.44)	(-1.85)	(-1.69)	(1.06)	(-0.06)	(0.93)	(1.82)
Inv_Shock	-0.018	-0.010	-0.010	-0.043***	-0.003	-0.017***	-0.022*	-0.021***
	(-1.61)	(-1.54)	(-0.71)	(-5.79)	(-0.32)	(-3.58)	(-1.80)	(-3.45)
FFO_Shock	-0.009	-0.010	-0.017	0.002	-0.009	-0.023***	-0.027*	0.013**
	(-0.78)	(-1.35)	(-1.37)	(0.23)	(-0.82)	(-3.30)	(-1.83)	(2.02)
N	301	301	301	301	295	295	295	295
adj. R-sq	0.222	0.223	0.188	0.882	0.229	0.207	0.240	0.852
N_clust	98	98	98	98	86	86	86	86
Mean(y)	0.046	0.030	0.105	0.423	0.051	0.029	0.105	0.396
St.Dev(y)	0.098	0.052	0.101	0.139	0.091	0.051	0.112	0.112

References

Acharya, V.V., H. Almeida, and M. Campello, 2007, Is cash negative debt? a hedging perspective on corporate financial policies, *Journal of Financial Intermediation* 16, 515–554.

Almeida, H., and M. Campello, 2007, Financial constraints, asset tangibility, and corporate investment, *Review of Financial Studies* 20, 1429–1460.

An, H., W.G. Hardin, and Z. Wu, 2010, Information asymmetry and corporate liquidity management: Evidence from real estate investment trusts, *Journal of Real Estate Finance and Economics,* forthcoming.

Barclay, M.J., L.M. Marx, and Jr. C.W. Smith, 2003, The joint determination of leverage and maturity, *Journal of Corporate Finance* 9, 149–167.

Blouin, J., J.E. Core, and W. Guay, 2010, Have the tax benefits of debt been overestimated?, *Journal of Financial Economics* 98, 195–213.

Brown, D.T., and T.J. Riddiough, 2003, Financing choice and liability structure of real estate investment trusts, *Real Estate Economics* 31, 313–346.

Campello, M., J.R. Graham, and C.R. Harvey, 2010, The real effects of financial constraints: Evidence from a financial crisis, *Journal of Financial Economics* 97, 470–487.

Chen, L., and X. Zhao, 2007, Mechanical mean reversion of leverage ratios, *Economics Letters* 95, 223–229.

DeAngelo, H., and L. DeAngelo, 2007, Capital structure, payout policy, and financial flexibility, Working paper, Marshall School of Business.

Denis, D.J., and V. Sibilkov, 2010, Financial constraints, investment, and the value of cash holdings, *Review of Financial Studies* 23, 247–269.

Ertugrul, M., and E. Giambona, 2011, Property segment and REIT capital structure, *Journal of Real Estate Finance and Economics,* forthcoming.

Feng, Z., C. Ghosh, and C.F. Sirmans, 2007, On the capital structure of real estate investment trusts (REITs), *Journal of Real Estate Finance and Economics* 34, 81–105.

Flannery, M.J., and K.P. Rangan, 2006, Partial adjustment toward target capital structures, *Journal of Financial Economics* 79, 469–506.

Gamba, A., and A. Triantis, 2008, The value of financial flexibility, *Journal of Finance* 63, 2263–2296.

Gatchev, V.A., T. Pulvino, and V. Tarhan, 2010, The interdependent and intertemporal nature of financial decisions: An application to cash flow sensitivities, *Journal of Finance* 65, 725–763.

Giambona, E., J.P. Harding, and C. Sirmans, 2008, Explaining the variation in REIT capital structure: The role of asset liquidation value, *Real Estate Economics* 36, 111–137.

Graham, J.R., and C.R. Harvey, 2001, The theory and practice of corporate finance: evidence from the field, *Journal of Financial Economics* 60, 187–243.

Hardin, W.G., M.J. Highfield, M.D. Hill, and G.W. Kelly, 2009, The determinants of REIT cash holdings, *Journal of Real Estate Finance and Economics* 39, 39–57.

Hardin, W.G., and Z. Wu, 2010, Banking relationships and REIT capital structure, *Real Estate Economics* 38, 257–284.

Harrison, D.M., C.A. Panasian, and M.J. Seiler, 2011, Further evidence on the capital structure of REITs, *Real Estate Economics,* forthcoming.

Hill, M.D., G.W. Kelly, and W.G. Hardin, 2010, Market value of REIT liquidity, *Journal of Real Estate Finance and Economics,* forthcoming.

Hovakimian, A., G. Hovakimian, and H. Tehranian, 2004, Determinants of target capital structure: The case of dual debt and equity issues, *Journal of Financial Economics* 71, 517–540.

Leary, M.T., and M.R. Roberts, 2010, The pecking order, debt capacity, and information asymmetry, *Journal of Financial Economic* 95, 332–355.

Lins, K.V., H. Servaes, and P. Tufano, 2010, What drives corporate liquidity? an international survey of cash holdings and lines of credit, *Journal of Financial Economics* 98, 160–176.

Modigliani, F., and M.H. Miller, 1958, The cost of capital, corporation finance and the theory of investment, *American Economic Review* 48, 261–297.

Opler, T., L. Pinkowitz, R. Stulz, and R. Williamson, 1999, The determinants and implications of corporate cash holdings, *Journal of Financial Economics* 52, 3–46.

Ozkan, A., and N. Ozkan, 2004, Corporate cash holdings: An empirical investigation of UK companies, *Journal of Banking & Finance* 28, 2103–2134.

Petersen, M.A., 2009, Estimating standard errors in finance panel data sets: Comparing approaches, *Review of Financial Studies* 22, 435–480.

Riddiough, T.J., and Z. Wu, 2009, Financial constraints, liquidity management and investment, *Real Estate Economics* 37, 447–481.

Sufi, A., 2009, Bank lines of credit in corporate finance: An empirical analysis, *Review of Financial Studies* 22, 1057–1088.

Schriften zu Immobilienökonomie und Immobilienrecht
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Gohs, Andreas: Wertentwicklungen von Immobilienanlagen und ihre Risiken: Ein Vorschlag zur Evaluierung von Korrekturverfahren für bewertungsbasierte Immobilienindices / IREBS International Real Estate Business School (Hrsg.). Regensburg: Universitätsbibliothek Regensburg, 2014 (Schriften zu Immobilienökonomie und Immobilienrecht 70)

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Schriften zur Immobilienökonomie

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Kusiluka, Moses M.: Agency conflicts in real estate investment in Sub-Saharan Africa: exploration of selected investors in Tanzania and the effectiveness of institutional remedies / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.); Schäfers, Wolfgang (Hrsg.). Köln: Immobilienmanager-Verlag, 2012 (Schriften zur Immobilienökonomie 63)

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Forster-Kraus, Stefanie: Der Einfluss der Demographie auf die Erschwinglichkeit von Wohnraum in Deutschland: Eine theoretische und empirische Analyse / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.); Schäfers, Wolfgang (Hrsg.). Köln: Immobilienmanager-Verlag, 2011 (Schriften zur Immobilienökonomie 60)

Trübestein, Michael: Real Estate Asset Management für institutionelle Investoren: eine theoretische Konzeption und empirische Untersuchung aus Sicht institutioneller Investoren in Deutschland / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.); Schäfers, Wolfgang (Hrsg.). Köln: Immobilienmanager-Verlag, 2011 (Schriften zur Immobilienökonomie 59)

Rothenberger, Steen: Foreign Real Estate Investment in Sub-Saharan Africa: A Behavioural Approach in Countervailing the Investment Stigma by Image Analysis and Exploration of the Tanzanian Real Estate Market / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.); Schäfers, Wolfgang (Hrsg.). Köln: Immobilienmanager-Verlag, 2010 (Schriften zur Immobilienökonomie 58)

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Kohl, Nicolas: Corporate Governance and Market Valuation of Publicly Traded Real Estate Companies: A Theoretical and Empirical Analysis / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.). Köln: Immobilienmanager-Verlag, 2009 (Schriften zur Immobilienökonomie 50)

Pfeffer, Tobias: Performance of REITs: A Sector- and Company-based Analysis of Links and Time Lags between Real Estate Market Cycles, Earnings, and Pricing of REITs / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.). Köln: Müller, 2009 (Schriften zur Immobilienökonomie 49)

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Matzen, Frank J.: Unternehmensbewertung von Wohnungsbauunternehmen unter besonderer Berücksichtigung der Besteuerung und Finanzierung / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.). Köln: Müller, 2005 (Schriften zur Immobilienökonomie 32)

Wernecke, Martin: Büroimmobilienzyklen - Eine Analyse der Ursachen, der Ausprägungen in Deutschland und der Bedeutung für Investitionsentscheidungen / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.). Köln: Müller, 2004 (Schriften zur Immobilienökonomie 31)

Pitschke, Christoph: Die Finanzierung gewerblicher Immobilien-Projektentwicklungen unter besonderer Berücksichtigung der Neuen Baseler Eigenkapitalvereinbarung / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.). Köln: Müller, 2004 (Schriften zur Immobilienökonomie 30). - Umschlagtitel: Die Finanzierung gewerblicher Immobilien-Projektentwicklungen unter Basel II

Rottke, Nico: Investitionen mit Real Estate Private Equity – Herleitung eines anreizkompatiblen Beteiligungsmodells unter Berücksichtigung der Transaktionskosten- und Agency-Theorie / Schulte, Karl-Werner (Hrsg.); Bone-Winkel, Stephan (Hrsg.). Köln: Müller, 2004 (Schriften zur Immobilienökonomie 29)

Blumenthal, Ira: Anforderungen an ein Marketingkonzept für Facilities-Management-Dienstleistungsunternehmen – Ein Vergleich zwischen Theorie und Empirie / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2004 (Schriften zur Immobilienökonomie 28)

Ecke, Christian: Strategisches Immobilienmanagement der öffentlichen Hand – empirische Untersuchungen und Handlungsempfehlungen / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2004 (Schriften zur Immobilienökonomie 27)

Fischer, Carsten: Projektentwicklung: Leistungsbild und Honorarstruktur / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2004 (Schriften zur Immobilienökonomie 26)

Busz, Pamela: Seniorenimmobilien als Investitionsobjekte - Entwicklung und empirische Analyse eines Beurteilungsmodells / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2003 (Schriften zur Immobilienökonomie 25)

Gerhard, Jan: Immobilienportfoliomanagement mit Immobilienindex-Derivaten: Eine kritische Analyse und Bewertung der Einsatzmöglichkeiten immobilienindexbasierter Finanzinstrumente auf dem deutschen Markt / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2003 (Schriften zur Immobilienökonomie 24)

Iblher, Felix: Internetbasierte Immobilienfinanzierung: Auswirkungen des Electronic Business auf die Finanzierung privater Wohnimmobilien / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2003 (Schriften zur Immobilienökonomie 23)

Vogel, Ludwig: Projektentwicklung von Factory Outlet Centern - eine akzeptanztheoretische Untersuchung / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2003 (Schriften zur Immobilienökonomie 22)

Hagemeier, Irene M.: Der Einsatz staatlicher Instrumente in der Wohnungs- und Bodenpolitik des 20. Jahrhunderts: Deutschland, Spanien, Schweden und die USA im Vergleich / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2003 (Schriften zur Immobilienökonomie 21)

Werner, Jeannette: Die Besteuerung von Gewerbeimmobilien in Europa: effektive Steuerbelastung und Steuerbeständigkeit in einem Fünf-Länder-Vergleich / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2002 (Schriften zur Immobilienökonomie 20)

Schulz-Eickhorst, Antje: Die Bauherren-Architekten-Beziehung: eine institutionenökonomische Problemanalyse mit Lösungsansätzen / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2002 (Schriften zur Immobilienökonomie 19)

Cieleback, Marcus: Optionsaspekte der Zinssicherung durch Bauspardarlehen und ihre Implikationen für die Wohneigentumsfinanzierung / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2001 (Schriften zur Immobilienökonomie 18). - Umschlagtitel: Bausparen und Optionstheorie

Crommen, Marcel: Finanzierung von Unternehmensimmobilien: Eine Shareholder Value-orientierte Analyse / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2001 (Schriften zur Immobilienökonomie 17)

Sotelo, Ramon: Ökonomische Grundlagen der Wohnungspolitik / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2001 (Schriften zur Immobilienökonomie 16)

Walbröhl, Victoria: Die Immobilienanlageentscheidung im Rahmen des Kapitalanlagemanagements institutioneller Anleger – eine Untersuchung am Beispiel deutscher Lebensversicherungsunternehmen und Pensionskassen / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2001 (Schriften zur Immobilienökonomie 15)

Pierschke, Barbara: Die organisatorische Gestaltung des betrieblichen Immobilienmanagements / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 2001 (Schriften zur Immobilienökonomie 14)

Hens, Markus: Marktwertorientiertes Management von Unternehmensimmobilien / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1999 (Schriften zur Immobilienökonomie 13)

Straßheimer, Petra: Internationales Corporate Real Estate Management: Implikationen der Internationalisierung von Unternehmen auf das betriebliche Immobilienmanagement / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1999 (Schriften zur Immobilienökonomie 12)

Väth, Arno: Die Grundstücks-Investmentaktiengesellschaft als Pendant zum REIT: Entwicklung einer Konzeption auf Basis der KAGG-Novelle ’98 / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1999 (Schriften zur Immobilienökonomie 11)

Vaaßen, Nicole: Gewerbliches Immobilienleasing: eine quantitative und qualitative Analyse aus Sicht des Leasingnehmers / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1999 (Schriften zur Immobilienökonomie 10)

Buse, Christoph: Strategisches Management von industrieverbundenen Wohnungsunternehmen / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1999 (Schriften zur Immobilienökonomie 9)

Isenhöfer, Björn: Strategisches Management von Projektentwicklungsunternehmen / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1999 (Schriften zur Immobilienökonomie 8)

Brade, Kerstin H.: Strategischer Marketingplanungsprozeß für Büroimmobilien: Anwendung der Kausalanalyse zur Erforschung des Mieterverhaltens / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1998 (Schriften zur Immobilienökonomie 7)

Leopoldsberger, Gerrit: Kontinuierliche Wertermittlung von Immobilien / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1998 (Schriften zur Immobilienökonomie 6)

Ropeter, Sven-Eric: Investitionsanalyse für Gewerbeimmobilien / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1998 (Schriften zur Immobilienökonomie 5)

Kirsch, Daniela: Public Private Partnership: Eine empirische Untersuchung der kooperativen Handlungsstrategien in Projekten der Flächenerschließung und Immobilienentwicklung / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1997 (Schriften zur Immobilienökonomie 4)

Schäfers, Wolfgang: Strategisches Management von Unternehmensimmobilien: Bausteine einer theoretischen Konzeption und Ergebnisse einer empirischen Untersuchung / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1997 (Schriften zur Immobilienökonomie 3)

Thomas, Matthias: Die Entwicklung eines Performanceindexes für den deutschen Immobilienmarkt / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1997 (Schriften zur Immobilienökonomie 2)

Bone-Winkel, Stephan: Das strategische Management von offenen Immobilienfonds unter besonderer Berücksichtigung der Projektentwicklung von Gewerbeimmobilien / Schulte, Karl-Werner (Hrsg.). Köln: Müller, 1994 (Schriften zur Immobilienökonomie 1)

Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht

Kühling, Jürgen (Hrsg.): Grünes Baurecht und Energiewende (Tagungsband des 6. Regensburger Immobilienrechtstags am 12. Juli 2013), Köln, München: Heymann, 2014 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 10)

Kühling, Jürgen (Hrsg.): Die Einzelhandelsimmobilie - Wirtschaftliche Rationalität und rechtliche Steuerung (Tagungsband des 5. Regensburger Immobilienrechtstags am 13. Juli 2012), Köln, München: Heymann, 2012 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 9)

Müller, Kathrin: Das bauordnungsrechtliche Verunstaltungsverbot (Verfahrensoptimierung zur Bewältigung bauästhetischer Konflikte im öffentlichen Raum), Köln, München: Heymann, 2012 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 8)

Kühling, Jürgen (Hrsg.): Die Einzelhandelsimmobilie - Bau(recht)liche Todsünden und vernünftige Problemlösungen (Tagungsband des 4. Regensburger Immobilienrechtstags am 15. Juli 2011), Köln, München: Heymann, 2012 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 7)

Kühling, Jürgen (Hrsg.): Kooperation im Öffentlichen Immobilien- und Infrastrukturrecht (Tagungsband des 3. Regensburger Immobilienrechtstags am 16. Juli 2010), Köln, München: Heymann, 2011 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 6)

Kühling, Jürgen (Hrsg.): Mehrebenenkonflikte im Öffentlichen Immobilien-und Infrastrukturrecht (Tagungsband des 2. Regensburger Immobilienrechtstags am 2. Juli 2009), Köln, München: Heymann, 2010 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 5)

Pfeifle, Florian: UNESCO-Weltkulturerbe - Vom globalen Völkerrecht zur lokalen Infrastrukturplanung, Köln, München: Heymann, 2010 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 4)

Tigges, Damian: Die Regulierung des Zugangs zum Markt für Hafendienste - Ein Vergleich der horizontalen und vertikalen Regulierungsansätze, Köln, München: Heymann, 2009 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 3)

Müller, Friederike: Kommunalrechtliche Grenzen beim Sale-and-lease-back - Ein Beitrag zum Privatisierungsfolgerecht am Beispiel der Privatisierung und öffentlich genutzter Immobilien, Köln, München: Heymann, 2009 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 2)

Kühling, Jürgen (Hrsg.): Öffentliches Recht und Investitionssicherheit in der Immobilienwirtschaft (Tagungsband des 1. Regensburger Immobilienrechtstags am 20. Juni 2008), Köln, München: Heymann, 2009 (Schriften zum Öffentlichen Immobilienrecht und Infrastrukturrecht 1)