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Felix Geiger

The Yield Curve and Financial Risk Premia

Implications for Monetary Policy

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Preface

This book was written during my time as research and teaching assistant at the Department of Economics at the University of Hohenheim, Germany; it was accepted as dissertation at the University of Hohenheim in November 2010. I hereby would like to address my gratitude to a number of persons.

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Stuttgart-Hohenheim, *Felix Geiger*
April 2011

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Chapter 1
Introduction

1.1 The Macro-Finance Approach to the Analysis of Monetary Policy and Financial Risk

One striking feature since the 1980s has been an observed trend decline in macroeconomic volatility for most industrialized countries. Standard deviations of output and inflation have significantly fallen with the timing of occurrence varying across countries. However, the phenomenon has been so pronounced that it has been labeled the "Great Moderation" (Blanchard and Simon 2001; Bernanke 2004c). Apart from the "good luck" hypothesis, the "good policy" approach, with an improved performance of macroeconomic policy, has been promoted as a major contributor to increased economic stability. This stylized fact has been accompanied by central banks becoming more independent and more transparent using the channel of communication and adopting some variants of the inflation targeting framework. The argument relies on the proposition that the commitment to deliver price stability in the medium term has promoted an environment of increased predictability of monetary policy thereby reducing overall macroeconomic uncertainty.

The process of enhanced central bank transparency has been spured by advances in monetary policy modeling, with its focus on the role of private expectations for the effectiveness of monetary policy. The widely adopted New-Keynesian paradigm of describing the macroeconomy with forward-looking market participants reveals that the management of expectations matters, indeed "little *else* matters" (Woodford 2005a, 3). The ability of monetary policy to affect aggregate expenditures rests on the premise to influence market expectations regarding the future path of short-term interest rates. The extent to which a central bank can alter macroeconomic dynamics depends on its impact on financial market prices, in particular on its leverage effect on the long-term interest rate that determines the level of credit demand and, hence, expenditures. A credible central bank under inflation targeting supports the anchoring of long-term inflation expectations near the target level, if it reacts more than one-by-one to inflation dynamics so that it alters ex-ante real interest rates to

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constrain aggregate demand. This "Taylor principle" delivers a nominal anchor for inflation and guarantees the uniqueness and the determinacy of the equilibrium on goods, labor and financial markets (Woodford 2003).

The arguments above rely on the assumption that the link between short-term interest rates and long-term interest rates is established through the *Expectations Hypothesis* of the term structure of interest rates. Long-term bond yields are determined by the weighted average of expected future short rates. Since monetary policy adjusts its short rate in response to macroeconomic shocks, the consistency between short- and long rates allows us to draw statements about how current and expected macroeconomic events should account for movements farther out the yield curve. The yield curve, thus, does not only represent the fulcrum between monetary policy and aggregate demand, it also provides a central bank with valuable information about private market expectations including the expected evolution of short rates, inflation and output dynamics. Monitoring expectations is essential for the conduct of monetary policy since expected changes in economic variables can have a significant impact on current market behavior. Along similar lines, monetary policy can extract information about inflation expectations from long-term bond yields for the purpose of assessing its own credibility towards maintaining price stability as perceived by market participants.

While it appears attractive to represent the main transmission mechanism of monetary impulses through this expectational channel, there is a serious shortcoming: its empirical failure. Froot (1989, 283) remarks that "if the attractiveness of an economic hypothesis is measured by the number of papers which statistically rejected it, the Expectations Hypothesis of the term structure is a knockout." Against this background, a proper understanding of monetary policy effects on the long end of the yield curve is indispensable in order to draw statements on monetary policy effectiveness. Financial factor models of the yield curve arrive at the conclusion that the long-term interest rate is mainly driven by a time-varying risk premium demanded by risk-averse agents rather than by the expected path of the short rate (Dai and Singleton 2002) – a finding not captured at all within the prototype New-Keynesian economy. These models are successful in reproducing the properties of bond yields, i.e. an upward-sloping yield curve, high volatility of long-term bond yields and a time-varying risk compensation. For monetary policy, there is an inherent interest in disentangling interest-rate expectations from required excess returns along the term structure. The economic drivers of risk premia depend on the stance and on the strategy of monetary policy as long as the latter has an effect on risk perceptions (quantity of risk) and on risk tolerance (price of risk). Thus, for any part of the transmission mechanism that works via changes in asset prices, the effects from risk premia and the effects of monetary policy on risk valuation have to be taken into account.

Along with the "Great Moderation," there is a further stylized fact for most countries, i.e. the frequency of periods of financial distress has intensified. Accompanied by the process of reduced regulatory requirements for financial markets and for the financial intermediary sector, both industrialized and emerging-market countries have suffered from multiple financial disruptions since the 1980s

(Borio and Lowe 2002; IMF 2003). Ultimately, the most severe financial crisis since the Great Depression of the 1930s, with the first turmoil starting in 2007 in money markets, has promoted a refocus on macroeconomic implications of developments in the financial sector. In the run-up to this crisis, there has been a serious underpricing of risk characterized by a flat term structure of credit spreads, high asset price inflation across the whole range of markets, unusual low financial market volatility and immense leverage dynamics of financial institutions. In part, these low risk premia have resulted from very low policy interest rates initiated by central bankers around the world after the Tech bubble in 2001 and have started overshooting in the opposite direction with the break out of the systemic liquidity crisis in 2008 (Goodhart 2008a).

The conventional view of dealing with evolving financial imbalances from a monetary policy perspective relies on the insight that it is hard to detect ex-ante asset price bubbles and that monetary policy is likely to be ineffective in addressing the bubble component with changes in interest rates. Consequently, the most promising strategy is based on a benign neglect vis-*à*-vis financial developments with monetary policy "cleaning-up" afterwards, once the unsustainable boom has turned to bust despite the recognition "that monetary policy has an important influence on asset prices – indeed, this influence is at the heart of the transmission of policy decisions to real activity and inflation" (Kohn 2006). However, this view seems at least doubtful: "Whatever the merits of the above arguments, the fall-out in the real economy from the [recent] banking crisis seems to have made a policy of benign neglect towards potentially unsustainable credit/asset price booms untenable" (Bean et al. 2010, 19).

Considering these circumstances, the theory and practice of monetary policy must refocus on the above mentioned aspects. Closely related, Blinder (2006) posed sixteen, partly unresolved, questions and provided about twelve alleged accurate answers on these monetary policy issues. Among them, he dealt with the following questions: (1) What is the role of the term structure of interest rates in the monetary policy transmission? (2) Should monetary policy lead or follow financial markets? (3) How should central banks respond to asset price bubbles? (4) Should central banks also be bank supervisors?

The aim of this book is to address these questions within a joint *macro-finance approach*. This approach explicitly acknowledges the close feedback between the macroeconomy and financial conditions. In standard macroeconomic models, financial conditions are represented by a single interest rate with no reference to various forms of risk premia including compensation for interest-rate risk and default risk or liquidity risk. In contrast, finance models typically abstract from any macroeconomic content where latent factors drive asset prices and the primary focus lies in the consistent pricing of various assets across markets. By combining both modeling strategies, a proper understanding between macroeconomic dynamics, the conduct of monetary policy and asset price movements becomes possible. Along similar lines, financial frictions and financial intermediaries in standard policy analysis play hardly any role. Within the traditional credit view of monetary policy transmission, a case is made for financial frictions that give rise to a financial accelerator stemming from balance sheet constraints in the borrowing sector. However, as the recent financial crises demonstrated, obstacles to credit supply dynamics likewise matter and they tend to dominate propagation effects of monetary policy impulses that work through the financial sector. The insight that investors and financial intermediaries actively manage their portfolios and their balance sheets significantly alters the logic of monetary transmission. This risk-taking view allows us to take on a different perspective about the role of financial constraints and it enables policymakers to develop guidelines for the conduct of monetary policy and for financial supervision of how to cope with financial imbalances.

1.2 Plan of the Book

Part I of this book, consisting of Chaps. 2, 3 and 4, develops the theoretical and empirical basis for analyzing term structure and financial risk aspects for monetary policy analysis. Chapter 2 introduces the no-arbitrage approach of asset pricing. The absence of arbitrage opportunities focuses on the relative asset pricing model. It implies that it is not possible to invest in a risky asset and to earn an expected return higher than the risk-free return without bearing the risk of capital losses. At the same time, the absence of arbitrage opportunities guarantees that assets are consistently priced relative to each other. If the model is augmented by an individual or a representative agent who optimally allocates wealth in different states of the world and in different periods to finance expenditures, an economic interpretation is possible. The optimality condition results in an Euler equation that equals the New-Keynesian model of describing aggregate demand; it is in essence an asset-pricing equation (Woodford 2003). Thereby, the risk premium depends on the specific risk characteristic of the asset and on the risk appetite of investors.

Chapter 3 applies the no-arbitrage model to the term structure of interest rates. The Expectations Hypothesis of the term structure of interest rates is one approximation within this framework but it ignores the importance of time-varying excess returns along the yield curve. It can be shown that risk-neutrality, the pure form of the Expectations Hypothesis and the no-arbitrage approach are different concepts for describing movements in the cross section of bond yields. Arbitrage opportunities are excluded if the long rate equals risk-adjusted expectations of the average future short rates. One increasingly used arbitrage-free term structure model in monetary policy analysis is the affine model according to which bond yields can be described as an affine function of some state variables within a financial factor model. Chapter 3 introduces a specific form of such a model in the spirit of Ang and Piazzesi (2003).

A systematic view on the sources of risk premia is the focus of Chap. 4. Risk premia can be decomposed into three components, i.e. risk originating from the uncertain future path of interest rates, default risk and liquidity risk. This Chapter applies the affine term structure representation for Germany, USA and UK on government bond securities to extract interest-rate risk from the evolution of the yield curve. Verifying these premia to be highly time-varying, they show a secular decline starting at the beginning of the mid 1990s. Default risk is discussed with the help of a case study of government bond dynamics within the euro area. The main purpose of this case study is to disentangle the recent drivers of government bond spreads, whether they can be attributed to country-specific developments or whether global factors are the primary sources of observed bond differentials. The last part of Chap. 4 attends to the concept of liquidity risk. It deals with the difference between market liquidity and funding liquidity and how both concepts are related to each other. In this respect, a stylized model of liquidity crisis is presented in which a reinforcing loop process of falling market and funding liquidity promotes a market environment of suddenly disappearing liquidity. This endogenous nature of liquidity can be also regarded through the lens of financial intermediation and Keynes' concept of liquidity preference theory.

Part II of this book consists of Chap. 5 and 6 and it focuses on the macro-finance view of term structure transmission and monetary policy analysis. Chapter 5 introduces ways how monetary policy can use the yield curve for an assessment of its policy stance and how a joint modeling strategy of yield curve dynamics and the macroeconomy can be specified. The affine bond yield representation is applied to the New-Keynesian model economy so that statements about sources of the movements of long-term interest rates and about the shape of the yield curve becomes possible. Furthermore, this model is extended by parting with the rational expectations paradigm. Instead, with imperfect information, agents form expectations in an adaptive learning environment and the pricing of bond securities is based on subjective beliefs about the state of the economy. The learning approach, thus, allows different term structure dynamics.

Chapter 6 augments the analysis along several dimensions. Firstly, it provides a model analysis of determinacy of bond rate transmission and it sheds light on the question of whether monetary policy is advised to directly react on bond yield information in a rule-based, short-term interest rate setting. Secondly, the consistency between short- and long term interest rates allows to address the discussion whether central banks follow the gradualistic approach of setting their policy rates. Thirdly, since long-term bond yields heavily depend on market expectations, the effects of monetary policy communication on the dynamics of the yield curve are evaluated, in particular how the yield curve reacts to various communication channels and central bank announcements. Finally, Chap. 6 compares nominal and real interest rates and it provides insights to what extent the nominal term premium is related to its real counterpart and how much of nominal term premium variation is due to inflationary risk.

Part III augments the perspective by introducing financial intermediaries and financial constraints into the analysis. Chapter 7 develops the argument in favor of a broad risk-taking channel of monetary policy transmission that acknowledges active balance sheet management on part of financial market participants as a propagation effect. This Chapter analyzes how monetary policy influences risk perceptions and risk tolerance by applying different methodological tools, among them the New-Keynesian model augmented by risk premia, rules of risk management practices and insights of the theory of financial intermediation. Financial frictions originating from the lending sector emphasize the endogenous nature of financial cycles and the high procyclicality of the financial system. The simultaneous build-up of financial imbalances are high in gear when balance sheet growth, leverage and the degree of maturity transformation pick up speed. They allow the proposition that the yield spread is an effective reference point for monetary policy. The spread gives limits on how fast and how deeply the financial sector "breathes" and is engaged in liquidity transformation. Against this background, new arguments in favor of a pre-emptive tightening in the course of the financial cycle are developed. The last part of the Chapter concentrates on the different instruments a central bank is equipped with in order to cope with evolving financial imbalances. It is also discussed whether macro-prudential regulation should be the task of a central bank or of another financial supervision body and whether the objective of financial stability should be directly assigned to the central bank.

Chapter 8 summarizes the main results of the book and it provides an outlook for future research efforts.

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