Narratives in Finance

Master's Thesis

Submitted in partial fulfillment of the requirements for the degree of
Master of Arts in Quantiative Economics and Finance

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Date of Submission: Sunday 23rd September, 2018

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Chapter 1

Introduction

Chapter 2

Monetary Policy and Interest Rates

However little understood, the relationship between monetary policy and market interest rates is undeniable. Interest rates of all maturities react to changes in monetary policy, creating opportunities and risks for traders, challenges for policy makers, and puzzling effects for academics to study (Ellingsen & Söderström, 2001, p. 1594).

Target rate changes in particular have an impact on the bond market and on interest rates (Cook & Hahn, 1989, p. 332). Yet, the understanding of yield curve movements is incomplete at best. On average, the relationship between monetary policy and interest rates appears to be positive: An increase in the central bank's target rate leads to an increase in the interest rates of all maturities. However, there are many instances where this simple rule has proven false and interest rates of long maturities fell in response to an increase in the central bank's rate (Ellingsen & Söderström, 2001, p. 1594).

Chapter 2.1 gives an account of the puzzle posed by the inconsistent response of long-term rates, Chapter 2.2 touches on previous research and possible explanations, and Chapter 2.3 outlines how an investigation of narratives might be able to shed light on this puzzle.

2.1 Excess Sensitivity Puzzle

Cook and Hahn (1989) analyzed financial data from the late 70s and found that the U.S. Federal Reserve (Fed), by setting the target for the federal funds rate, had a strong influence on interest rate movements. While short-term rates reacted particularly strongly, changes in the target rate also caused small but significant movements in long-term rates.

It is not surprising that short-term rates follow the target rate closely, after all the Fed keeps the overnight rate close to the target and thus directly influences the one-month rate (Ellingsen, Söderström, & Masseng, 2003, p. 1). The movements of the long-term rates are more ambiguous. Cook and Hahn (1989, p. 343–346) interpret the fact that, on average, 10-year and 30-year bonds co-move with the short-term rates as evidence for the expectation theory of the term structure of interest rates. According to the expectation theory, long-term rates are equal to short-term rates over the same period of time plus a term premium. Thus, an increase in the short-term rates is expected to drive up long-term rates as well, but to a lesser extent (Ellingsen & Söderström, 2001, p. 1594).

To Romer and Romer (2000), on the other hand, the response of long-term rates presents a puzzle. They argue that standard theory predicts a drop in inflation as short-term rates rise, which ought to lead to a reduction in long-term rates. The opposite can be observed, however: Interest rates for all maturities typically rise following an increase in the target rate. Romer and Romer (2000) explain this anomaly with information-asymmetry between the Fed and the general public. They find evidence that the Fed is in possession of private information, which it reveals to other market participants through its monetary policy. In response, market participants adjust their inflation expectations upwards, causing long-term rates to rise.

Dissecting the interest rate response in more detail led Skinner and Zettelmeyer (1995) to paint an even complexer picture. While the yield curve shifts upwards on average, they found a number of occasions where an adjustment to the target rate caused the yield curve to tilt: Long and short rates responded by moving in opposite directions (as cited in Ellingsen et al., 2003, p. 1). Skinner and Zettelmeyer came to the conclusion that these were not singular occurrences, but that such tilts made up a considerable portion of the yield curve responses and could be observed in all four of the big economies they studied, that is in France, Germany, the United Kingdom, and the United States (as cited in Ellingsen & Söderström, 2001, p. 1594). An example is the yield curve movement in 1994, where interest rates of long maturities fell after the Fed announced an increase in its target rate (Ellingsen & Söderström, 2001, p. 1594). So not only is the positive response of long-term rates difficult to explain, the response is not even consistent in its direction: long-term rates may move up or down when the Fed increases the target rate.

Whether positive or negative, to Gürkaynak, Sack, and Swanson (2005, p. 425) any response of long-term rates is in contradiction to standard macroeconomic models. They argue that models predict that short-term rates return quickly to their steady state and thus have only a transitory effect on the future path of interest rates. Therefore, one would expect long-term rates not to react to monetary policy changes. They refer to the fact that long-term rates move significantly in response to monetary policy decisions as *excess sensitivity* of long-term interest rates (Gürkaynak, Sack, & Swanson, 2003, p. 2).

Gürkaynak et al. (2005, p. 426–427) focus on the response of forward interest rates as a different way of expressing the yield curve. They find that long-term forward rates move in the opposite direction as the monetary policy actions. As they note, this stands in sharp contrast to the findings of Cook and Hahn (1989) and Romer and Romer (2000), who observed a movement of long-term rates in the same direction. Gürkaynak et al. put this down to their use of forward rates, which they consider a better measure for sensitivity. Additionally, they criticize previous research for the usage of raw change in the target rate, neglecting to differentiate between expected and unexpected policy moves. In their opinion, only the unexpected components of a monetary policy action can be expected to influence the term structure (Gürkaynak et al., 2005, p. 430–431).

Since Gürkaynak et al. observe a negative response of the long-term forward rates, they suggest that such a response is not an anomaly but has a very natural explanation. Standard macroeconomic models assume that long-run levels of inflations and real interest rates are relatively fixed and known by all market participants (Gürkaynak et al., 2005, p. 425). Gürkaynak et al. argue that models might be misspecified and long-run inflation expectations are not as perfectly anchored as assumed. They see the most plausible explanation for the observed term structure movements in the fact that monetary policy surprises lead market participants to adjust their expectations of the long-run level of inflation (Gürkaynak et al., 2005, p. 434–435).

Even though Gürkaynak et al. (2005) are able to account for the negative response of long-term forward rates to an increase in the target rate, Ellingsen and Söderström (2004, p. 2) maintain that their model is unable to explain the positive response of long-term yields observed by other researchers. Thus, Gürkaynak et al. (2005) fail to solve the puzzle as to why the yield curve shifts on one occasion but tilts at another when provoked by apparently identical monetary policy actions. Ellingsen et al. address this shortcoming in their own theoretical model (2001) and provide empirical support for their hypotheses (2003).

2.2 Existing Research and Explanations

Ellingsen and Söderström (2001) use a simple dynamic macroeconomic model where shocks to output and inflation exhibit some persistence and monetary policy actions have a lagged effect on output and inflation. The central bank is assumed to minimize deviations of inflation and output from their long-run averages, while market participants form rational expectations concerning the future target and short rates. On the basis of this model, Ellingsen and Söderström (2001, p. 1599–1602) make several predictions:

- *Proposition 1*: If there is symmetric information, economic shocks are observed by all market participants and affect interest rates directly. Policy actions by the central bank reveal no new information and thus will not affect the term structure of interest rates.
- *Proposition 2*: If the central bank has private information about shocks to supply or demand, market participants will infer this information from the central bank's policy actions. Thus, the yield curve of market interest rates will respond by moving in the same direction as the target rate change.
- *Proposition 3*: If the central bank has private information about changes in its own inflation preferences, market participants will infer these changes by observing the central bank's reaction to an economic shock. Consequently, they will adjust their expectations about future interest rate targets. This causes the yield curve to tilt as long rates move in the opposite direction as the target rate change.

Thus, the yield curve moves for two reasons: either the Fed reacts to new, possibly private information about the economy (what Ellingsen and Söderström call *endogenous*, outlined in proposition 2), or the Fed's policy preferences change (what Ellingsen and Söderström call *exogenous*, outlined in proposition 3). They predict that interest rates of all maturities move in the same direction after an endogenous policy action, but that short and long-rates move in opposite directions after an exogenous change (2001, p. 1594–1595).

In a second paper, Ellingsen et al. (2003) analyze empirical data to find evidence for their model. In order to determine whether a policy action is endogenous or exogenous, they analyze reports on U.S policy in the *Credit Market* column of the *Wall Street Journal.* This text basis is supposed to capture the traders' opinions to a policy move and not the central bank's intention behind it, as it is the traders' opinions that move the bond prices (Ellingsen et al., 2003, p. 2). Ellingsen et al. used the articles on the day of the Fed move, as well as on the day before and the day after. They found publications on the days following a policy action to be the most informative (2003, p. 8).

They estimate the following regression (Ellingsen et al., 2003, p. 13):

$$\Delta i_t^n = \alpha + (\beta_n^{NP} d_t^{NP} + \beta_n^{Ex} d_t^{Ex} + \beta_n^{End} d_t^{End}) \Delta i_t^{3m} + v_t^n, \tag{2.1}$$

where Δi_t^n is the change in the interest rate of maturity n on day t; d_t^{NP}, d_t^{Ex}, and d_t^{End} are dummies for non-policy, exogenous policy, and endogenous policy days respectively; and Δi_t^{3m} is the change in the 3-month treasury bill rate on day t.

The one-day change in the 3-month T-bill rate is taken as a measure of unexpected monetary policy action (regressor in eq.2.1). Ellingsen et al. (2003, p. 13) argue that the 3-month rate is sufficiently short to be determined by policy actions, but also sufficiently long to avoid noise from expectation errors. If the target rate remains unchanged, that is on non-policy days, the change in the 3-month rate measures the adjustment of expectations about future monetary policy actions provoked by the day's new information. If the target rate changes, that is on policy days, any change in the 3-month rate is interpreted as the unexpected component of the policy action (2003, p. 12).

The main hypothesis of Ellingsen et al.'s model is that long-term interest rates respond positively to endogenous policies and negatively to exogenous policies:

$$H_0: \text{ For large } n\text{: } \beta_n^{Ex} < 0 < \beta_n^{End} \tag{2.2}$$

Using data from October 1988 to December 2001, Ellingsen et al. (2003, p. 16) find significant positive responses of the the 6-month and 1-year rate to endogenous and exogenous policy actions. For the 10-year and the 30-year rate, on the other hand, the coefficients are significant and positive for endogenous changes, and negative for exogenous changes. Ellingsen et al. conclude that their model finds strong support in U.S. data.

Yet, the author of this thesis cannot help but note that the explained variation (R^2) is rather small for long rates. While the model is able to account for up to 60% of the variation in short rates, this ratio drops to 15% for 10-year rates and 10% for 30-year rates (Ellingsen et al., 2003, p. 16). Additionally, Ellingsen et al. (2003, p. 20) admit that their results might be dependent on the classification of a few events. Since the classification was done manually, it is quite subjective. This could explain why von Krosigk (2017) was not able to replicate their results using text mining techniques. Von Krosigk analyzed data for the time period of January 2002 to June 2017 and found only positive coefficients, even highly so for exogenous events, with the only significant effect pertaining to the 6-month rate (2017, p. 36).

2.3 New Insights Through Narrative Research

The models satisfies both views, falling or rising, expectation hypothesis or inflation expectations, depending on "market participant's interpretation of the policy move". Ellingsen and Söderström (2001, p. 1603)

"financial investors perceive each policy event, since it is the investors' beliefs that determine the interest rate response." Ellingsen and Söderström (2001, p. 1604)

yet they restrict these beliefs to be characterize either a endogenous or an exogenous policy invention, it's time to open the field!

(2001) find that the yield curve response to monetary policy innovations depends crucially on the interpretation of bond market participants of the reasons behind the policy move.

Narrative analysis ad- mits studying well-defined narrow events, using daily data.

The cleanest test of our theory would be to ask bond traders in the seconds following the target change how they interpret the policy move and then link this interpretation to the very first movements of the yield curve. This test, which is unfortunately impossible to implement, would be clean for two reasons. First, in the moments following a major economic event it is indeed professional bond traders who move the yield curve, because ultimate investors haven't yet had time to react. Second, immediately after the policy change individual bond traders haven't yet observed the bond price movement caused by the trading of others, and so will have to report their own interpretations rather than a rationalization of the observed yield curve change.

Narratives / interpretation plays a big role in how people react to financial facts.

> In joint work with Goetzmann and Kim (2016), using data from a questionnaire survey I have been conducting with institutional investors and high-income Americans since 1989, we found that these people generally have exaggerated assessments of the risk of a stock market crash, and that these assessments are influenced by the news stories, especially front page stories, that they read. One intriguing finding was that an event such as an earthquake could influence estimations of the likelihood of a stock market crash. (Shiller, 2017, S. 974)

also kann Textauswertung etwas dazu beitragen, es geht um das Verständnis zu Narrativen - aber jetzt die Frage der Zeitdimension: die Kurse sind innerhalb einer halben Stunden verändert - question: is the narrative really driving the change still or is this rather a case of already observing the result -¿ we can't explain y by knowing y!

So, use NLP techniques and then model like thus: aber jeder regressor erh;ht nat[rlich das R2]

$\Delta i_t^n = \alpha + (\beta_n^{NP} d_t^{NP} + \beta_n^{N1} d_t^{N1} + \beta_n^{N2} d_t^{N2} + +\beta_n^{N3} d_t^{N3} + ...)\Delta i_t^{3m} + v_t^n$

Cook and Hahn (1989) use Wall Street Journal articles, even though they mention the speculative wording of the journals, they try their best ot isolate the facts in the articles, completely ignoring the manner in which the facts are presented¿ giving example of wording Even when the facts are not clearly stated, they try to find the facts and approximate them, instead of analyzing what kind of information the public had at its disposal

Gürkaynak, Sack, and Swanson (2004) - here they analyze statements, should I involve that in any way?

E2001 is a narrative approach

Chapter 3

Narratives and Decision Making

3.1 What Narratives Are

3.1.1 McAdams Research on Narratives

3.1.2 Social Psychology Background

3.2 How Narratives can help

3.2.1 Bayesian Brain and Predictive Coding

Here, there could be a direct link to the algorithms that are used in Machine Learning, AI, and NLP.

3.2.2 Influence and Change on Human Beings

Akerlof and Shiller understand narratives as a convention, but it is more than that, it changes how people think and perceive the world. Akerlof and Snower (2016)

3.3 Narrative Research

Chapter 4

Natural Language Processing

4.1 Methods in Natural Language Processing

4.1.1 Sensitivity Analysis

4.1.2 Topic Modeling

Chapter 5

Data and Methodology

Chapter 6

Results

Chapter 7

Conclusion

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Appendix A

Whatever may come...

A.1 For Example...

Appendix B

Whatever may come...

B.1 For Example...

Declaration of Authorship

"I hereby declare

- that I have written this thesis without any help from others and without the use of documents and aids other than those stated above;
- that I have mentioned all the sources used and that I have cited them correctly according to established academic citation rules;
- that I have acquired any immaterial rights to materials I may have used such as images or graphs, or that I have produced such materials myself;
- that the topic or parts of it are not already the object of any work or examination of another course unless this has been explicitly agreed on with the faculty member in advance and is referred to in the thesis;
- that I will not pass on copies of this work to third parties or publish them without the University's written consent if a direct connection can be established with the University of St.Gallen or its faculty members;
- that I am aware that my work can be electronically checked for plagiarism and that I hereby grant the University of St.Gallen copyright in accordance with the Examination Regulations in so far as this is required for administrative action;
- that I am aware that the University will prosecute any infringement of this declaration of authorship and, in particular, the employment of a ghostwriter, and that any such

infringement may result in disciplinary and criminal consequences which may result in my expulsion from the University or my being stripped of my degree."

....	....
Location, Date	Signature

By submitting this academic term paper, I confirm through my conclusive action that I am submitting the Declaration of Authorship, that I have read and understood it, and that it is true.