

## **Belief formation and its role for stability: The Case of Credit Market Sentiments\***



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*Keywords: credit cycles, expectation formation, structural threshold VARs.*

*JEL codes: C34, E32, E44, E71, G41.*

*There exists a strong linkage between credit market sentiment and investor beliefs, which also has an important role for credit cycle dynamics and their transmission to business cycle fluctuations. Using U.S. data from 1968 to 2014, we find that credit market sentiment is indeed able to detect asymmetries in a small-scale non-linear macroeconomic model. We identify an unexpected credit market sentiment shock by exploiting a distinct expectation heuristic. This shock has different impacts in an optimistic and a pessimistic credit market environment. While an unexpected movement in the optimistic regime leads to a rather muted impact on output and credit, we find a significant negative impact on these variables in the pessimistic regime. Our findings highlight the relevance of expectation formation mechanisms as a source of macroeconomic instability. Analyzing and managing expectations could therefore significantly benefit overall economic stability.*

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\*The views expressed in this paper are those of the authors and do not necessarily reflect those of the Eurosystem or the Oesterreichische Nationalbank (OeNB).

## Expectations as a source of macroeconomic instabilities

The Great Financial Crisis (GFC) of 2008-09 revealed the important role of credit expansion, investor beliefs, and expectations in financial markets as a source of recurrent financial crises. Numerous studies attribute the source of instability to an exogenous shock to the economy. In this note, based on a recent study by Boeck and Zörner (2023), we emphasize an *endogenous* explanation, highlighting the role of expectation formation as the root cause of instabilities. Our main finding reveals that credit market sentiments are strongly linked to different phases of economic activity. Moreover, sentiment shocks exhibit strong asymmetric reactions depending on the prevailing mood in the credit market. Finally, the specific expectation formation heuristics play a crucial role in determining the responses of macro-financial variables following a shock.

## The Baa spread as credit market sentiment indicator and an expectation heuristic to identify a sentiment shock

Following López-Salido et al. (2017), we gauge credit market sentiment using the Baa spread, derived from the difference between yields on long-term Baa-rated corporate bonds and 10-year government bond yields. This helps us to differentiate between optimistic and pessimistic conditions in the credit market, especially anticipating more significant effects during financial system distress. Identifying an external shock in sentiment relies on a unique belief-forming process that agents use to predict risks in financial markets. In our approach, agents forecasting the Baa spread use *diagnostic expectations* (Bordalo et al. 2018), based on the representativeness heuristic (Kahnemann and Tversky 2018). This heuristic suggests that people tend to overestimate certain characteristics in a specific population if the relative frequency of that attribute appears to be much higher than in a reference population. Hence, people assuming these characteristics are more common than they might actually be – they are therefore *diagnostic* for that population.<sup>1</sup> In the context of time series analysis, forecast revisions are crucial to understand future developments. When substantial changes occur in forecasts, it often indicates a high volume of news, leading to potential overreactions by agents. The resulting forecast error thus characterizes exogenous news from the credit market.

## Estimating a sentiment threshold and analyzing sentiment shocks

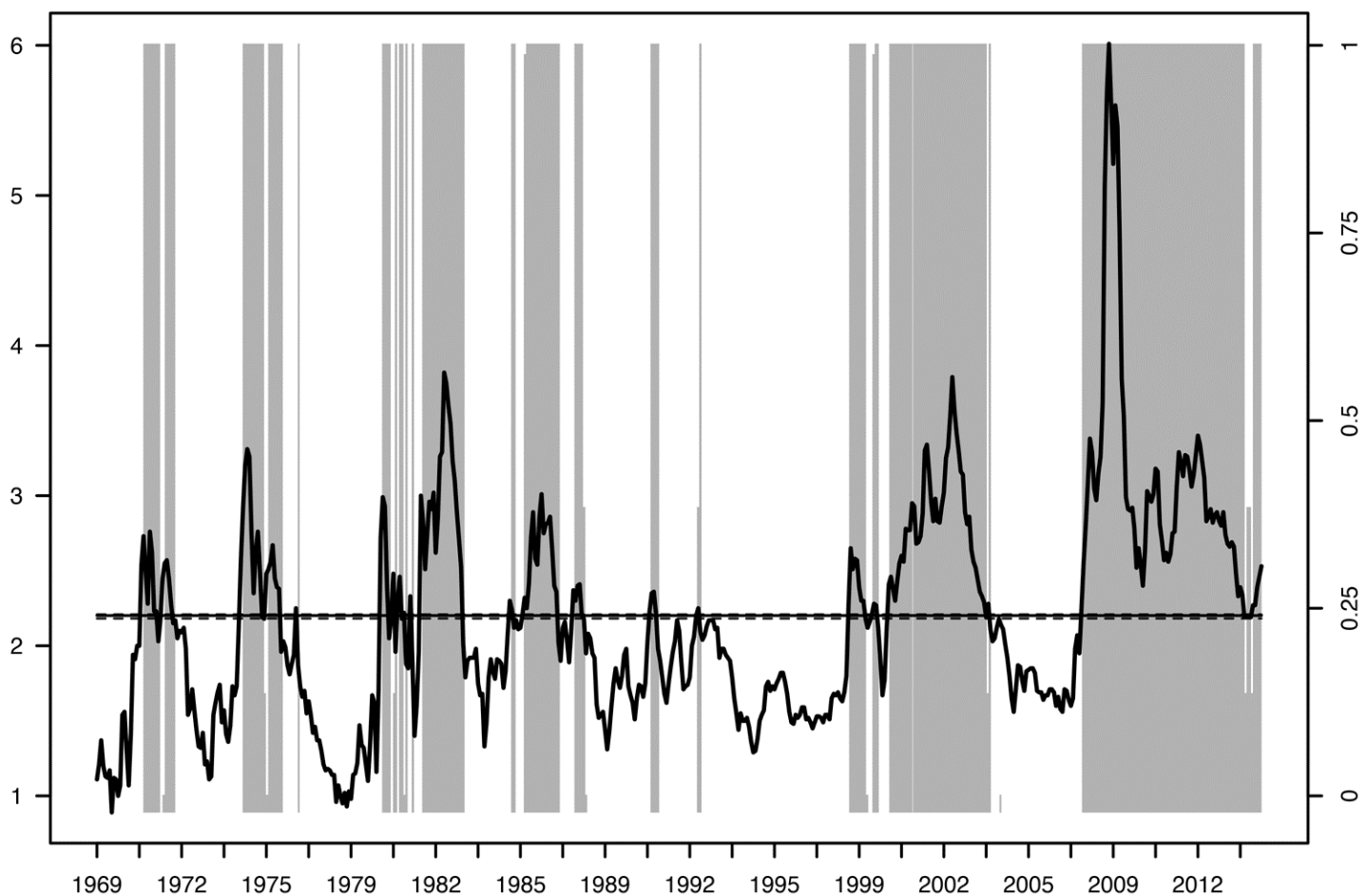
We propose a threshold structural vector autoregression (TVAR) with monthly data covering the period between January 1968 and December 2014 of the U.S. economy. Our set of variables includes the credit market sentiment (Baa spread), a measure of economic activity (industrial production), the credit volume (commercial and industrial loans), the consumer price index (CPI), and a short-term interest rate (shadow rate). This framework allows us to estimate the threshold, which separates pessimistic and optimistic regimes. This setup enables us to identify a threshold that distinguishes between pessimistic and optimistic regimes. Additionally, through an impulse response analysis, we explore the idea that shifts in credit market sentiment might significantly impact both the credit and business cycles.

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<sup>1</sup>For clarification, we refer to the example given in Bordalo et al. 2018. Suppose you are trying to predict the proportion of Irish people with red hair. Most likely, you will overestimate the proportion of redheaded Irish because this trait is diagnostic for the Irish and occurs much more frequently than in your reference population. Of course, this does not apply if your reference population is the Irish population.

If the Baa spread surpasses 2.2% within the considered sample, it signifies a shift towards a pessimistic state in current credit market sentiments. Illustrated in Figure 1 using our threshold estimation, we depict the associated probabilities of being in either of these two states. We observe that the pessimistic credit market sentiment regime roughly coincides with the US recession dates, but covers a much longer period, especially after the GFC. Consequently, despite the economy's gradual recovery, the prevailing credit market sentiment remains subdued due to lingering caution resulting from past adverse experiences. This can be explained by the fact that bad experiences are still prevalent in the agents' memory, making them too cautious to switch to an optimistic sentiment. Additionally, our observations indicate a strong resemblance between these identified regimes and the cyclical patterns within the U.S. economy.

**Figure 1: The Baa Spread along with the Estimated Sentiment Threshold and Its Associated Credit Market Sentiment Regimes in the US**



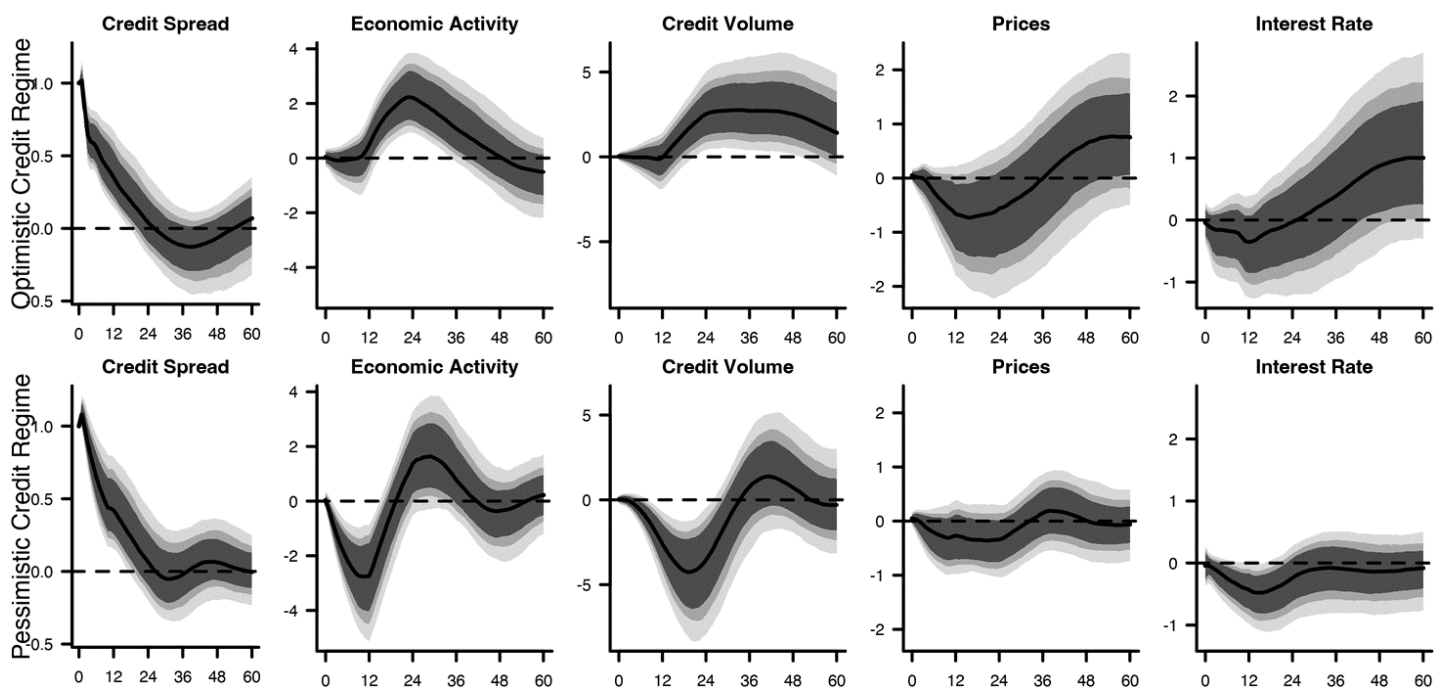
*Notes: The black solid line denotes the Baa spread in percent (left axis). The gray shaded areas represent the probability of the US being in the pessimistic credit market regime (right axis). This is defined as a state where the Baa spread exceeds the estimated critical threshold in the model (the black horizontal line with its 95% confidence interval denoted by the dashed lines). The estimated threshold equals 2.2%, with 2.18% and 2.21% being the corresponding 95% confidence interval.*

### Credit market sentiment shocks reveal strong asymmetries based on the current financial market mood

Shifting to the impulse response analysis, we utilize the Baa spread as our credit market sentiment indicator. The identified credit market sentiment shock is standardized, causing the spread to rise by 100 basis points (bps), indicating a moderate decline in sentiment. For context, during the 2007-08 financial crisis, the U.S. economy encountered a surge in the Baa spread of nearly 400 bps. We present the impulse response functions, examining the effects over a 60-month (five-year) period.

In both regimes, the credit market sentiment quickly begins to mean-revert, returning to its equilibrium value after approximately two years. Interestingly, in the optimistic regime we observe a further improvement in the sentiment two years after the shock. While the confidence bounds of the impulse responses are rather narrow in the optimistic sentiment regime, they are somewhat wider in the pessimistic regime reflecting the higher uncertainty associated with a pessimistic environment. However, in the optimistic regime, the responses for industrial production and credit volume react rather muted but improve significantly after one to two years. In contrast, in the pessimistic regime both variables react strongly and negatively to the sentiment shock, reaching their respective maximum between 12 and 18 months after the shock has hit. Prices fall in both regimes, but the decline is more pronounced and more persistent in the optimistic regime over a horizon of two to three years. In the pessimistic regime, prices decrease only slightly and less significantly. For the short-term interest rate, we only observe a dip in the pessimistic regimes.

**Figure 2: Impulse Responses of a Credit Market Sentiment Shock Identified with Diagnostic Expectations in the Two Regimes**



*Note: Impulse response functions to a credit market sentiment shock identified with diagnostic expectations. The black dashed line is the median response per regime, while the gray shaded areas depict the 95%, 90%, and 84% confidence intervals, respectively. The shock is normalized to a 100 bps shock to the credit spread and responses are scaled in growth rates of economic activity, credit volume, and prices, and in percentage points of credit spreads and interest rates.*

The responses suggest significant adverse impacts on economic activity and credit volume: The economic downturn is rather sudden, with a substantial decline of about 350 basis points occurring 12 months after the shock. Similarly, credit contracts in the pessimistic setting, peaking about 18 months after. However, in the optimistic scenario, the credit volume shows signs of recovery one year post-shock and continues to rise over a five-year period. Price reactions are more evident in the optimistic scenario, while in the pessimistic regime, there's no discernible price change. In the pessimistic setting, the short-term interest rate declines, reaching its lowest point after one year, then gradually normalizes. The unexpected positive movement in credit volume in the optimistic regime after two years is somewhat intriguing. This may be attributed to the specific nature of the credit volume variable (commercial and industrial loans), which primarily represents bank-based financing in the credit market, suggesting an increased demand for credit. Within the optimistic regime, the credit spread drops below its baseline value around two years after the shock, indicating a further improvement in sentiment. This trend might encourage agents to expand their investments further by seeking additional external financing.

## The role of expectations and concluding remarks

To gauge the importance of the respective belief formation heuristics, we reassess the analysis using both rational expectations and heuristics derived from learning-to-forecast experiments. These heuristics stem from experiments by Anufriev and Hommes (2012), where agents forecast asset prices or macroeconomic quantities. Notably, the experiments produced a remarkable finding: participants consistently coordinated their forecasting behavior, leading to the identification of four distinct forecasting heuristics. These comprised an adaptive heuristic, a weak and a strong trend-following heuristic, and an anchoring and adjustment heuristic with learning. Our analysis reveals heterogeneous results for some variables in the distribution of impact impulses across different expectation formation heuristics.

Hence, from a macroeconomic perspective understanding how agents form their expectations and how this translates into structural reactions to shocks is of paramount importance. In light of our overall results, policymakers should be aware of two implications. Rational expectations lead to optimal behavior in the face of financial and macroeconomic distress while diagnostic expectations (and perhaps the strong trend-following rule heuristic) show a more inert reaction. Hence, if agents use the latter approach to form forecasts policymakers should expect overshooting due to forecast errors. Ideally, they may want to take this behavior into account in their respective policy actions. Hence, the behavioral sphere of macroeconomic policy analysis seems to be promising in both academic and policymaking settings. ■

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