

Dynamic Central Bank Credibility Analysis

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Introduction

Given the growing importance of central banks and their decisions in international and domestic macroeconomic outlooks and business cycles, a more comprehensive analysis of their motives and actions is needed. That is why the economic literature has focused heavily on central banks and their actions in different circumstances. Specifically, there has been ample discussions on the central banks' (especially FED's) effect on leading to an economic crisis and their role in fighting against a crisis. Especially unconventional monetary policies such as quantitative easing have led to many debates. Due to the increasing tools at central banks' disposal and their growing importance since the start of the 1970s in international economics, a deeper analysis of how central banks operate, what they prioritize, and how successful they are gathered a lot of attention. This research is another attempt to improve our understanding of central banks and how they are seen by the market forces (investors).

While today's monetary policy is deeply complicated, the central bank's usually monthly interest rate decisions and their subsequent announcements on the state of the economy have remained massively important. This is because central banks give their inference on the state of the economy, which in itself is an important indicator for the investors but more importantly, they share their future plans and actions to limit inflation. This type of central banking is called "inflation targeting" when the central bank declares medium and long-run inflation targets and implicitly states that they will take action to achieve that target. Assessing the credibility of central banks has become increasingly important as inflation targeting requires the central bank to be credible. Central bank announces a target, and if the market believes it, they adjust accordingly, making the target easier to reach. This kind of transforms inflation into a self-fulfilling prophecy, as the inflation target influences the inflation expectations, which have great importance in setting the eventual actual inflation rate. Despite the importance of central bank credibility, the literature on it has remained vague. This is because the dynamic changing nature of credibility makes it challenging to quantify. In literature, central bank credibility has also mostly been associated with the difference between the inflation target set by the central bank and the actual inflation rate. If the target is missed, the central bank is classified as uncredible, and if it is reached, as credible. However, this system is flawed in assessing central bank credibility. This is because this analysis is a retroactive analysis where it does not take into account any anomaly events (Demiralp, Cakmakli (2015)). Especially for developing countries such as Turkey, the actual inflation rate is subject to many factors which may be out of the reach of TCMB and their

policies. Therefore, judging TCMB in such a fashion would be harsh and would not reflect reality. Not just for TCMB, but even FED naturally misses its targets in black swan events such as the pandemic. That is the reason why we propose a new method of central bank credibility. Rather than this retroactive method in long-term look, we look at the short-term interpretation of the central bank's actions and whether they are seen as helpful and effective in reaching its goals by the market or not.

Naturally, if the central banks' actions taken are seen as enough by the market, then the inflation expectations go down, and many financial instruments adjust with it. The most prominent of these financial instruments is the long-term state bond yields, as they are usually defensive investments chosen by conservative investors. This is because of their nature of being fixed-income instruments, and due to them being guaranteed by the state, they have practically no risk of default. This relationship between the long-term inflation expectations and daily yield changes in the 10-year state bonds forms the building block of our analysis. This understanding was first developed by Demiralp and Cakmakli (2015). This work is mostly an extension of their study.

This research does not have a formal hypothesis, but as speculative as it is, for the sake of the argument, we could argue against expecting that FED is more credible than TCMB. This hypothesis is a very popular one and fits the overall economic literature, as TCMB being the central bank of a developing country, faces extra problems such as currency devaluation and political pressures.

Methodology

The methodology of our research is quite simple yet solid on a basis. Decreasing state 10-year bond yields shows that investors believe that the central bank's actions are helpful in combating inflation. As the primary focus of the central bank is price stability, any action taken by the central bank that reinforces the belief that long-term inflation is under control results in a successful central bank action. Therefore, we can simply look at the daily 10-year bond yields before and after the interest rate and compare them. Due to the market's and economists' success in predicting the interest rate decision leading up to the announcement date, we have taken the bond yield averages ten days before and after the interest rate announcement. This improves the accuracy of our analysis and seeing the real effects of the interest rate decision. However, we must state that this approach may occasionally give misleading results. For example, major news unrelated to the interest rate decision some days before or after the announcement date may influence the bond yields regardless of the central bank's decision. Clearly, this would not be an accurate result, but these types of events happen so seldom that they can largely be ignored and counted as statistical errors.

If the bond yields have gone down after the interest rate announcement, then this implicitly implies the market's belief that long-term inflation has gone down, which is exactly what the central bank intends with its decisions. Naturally, this type of market reaction emerges as the market believes that the central bank is credible and will stick to its guns to lower inflation, using smart strategies. We call these types of actions "credible," as the central bank's actions are deemed effective. On the contrary, if the daily 10-year bond yields have increased after the interest rate announcement, this situation might have happened because the market assumes the central bank's actions as ineffective, not strong enough or simply does not believe the central bank can keep its future interest rate policies. We call these actions "uncredible." Let us note that the central bank's actions themselves may not necessarily be credible or uncredible, as the language definition of the word credible naturally includes plenty of events, but calling it as such serves a practical purpose. As the number of credible actions is higher, this indicates that the central bank itself is seen as more credible by the market. Again, on the other hand, higher number uncredible actions indicate the central bank is seen as uncredible. It is easy to see the practical usage of the terms.

There are a few issues to note here. First, from the very start, we have stated that the primary goal of the central bank is bringing inflation down and stable. Actually, the primary goal of central banks is price stability. Therefore, in a hypothetical case of a deflationary macroeconomic environment, the central bank might take action purposefully to raise long-term inflation. While this case is theoretically sound, it is ignored in our project, as deflation is not observed in the timeline we investigate. Moreover, a relatively long period of deflation has not been observed in a long time, not in the US, especially not considering the economic history of Turkey and its struggles with inflation.

Another point to note is that this analysis does not provide an in-depth analysis of why the specific actions of the central banks are seemed as ineffective or not, nor does it provide how credible or uncredible a specific action might be. We largely refrain from numerical analysis, as extensive numerical analysis require econometrical analysis and further data points. For further research, understanding why how the actions are interpreted as credible or uncredible by the market forces could be intriguing, but it is not the point of this research.

Data

The timeframe investigated for this research is between 2010-2022, with both years being included. The start date of 2010 is a conscious decision due to the 2008-9 Global Financial Crisis. During the crisis, the financial world struggled a lot with a constant stream of negative news. Many financial institutions declared bankruptcy, and the once-seen as safe instruments, such as mortgage funds, failed. During this timeline, we believe that FED's announcements were not on the front end of the

financial world and did not have the importance they had between 2010-2022. This is because the FED's interest rate announcements would often get overshadowed by other financial news, tilting the bond yields heavier than FED's decision. Therefore, including this period would include several anomalies and would not give a fair assessment of how the FED's decisions were perceived by the market. We concede the fact that our method works best when there is relatively low volatility in financial markets, where the central banks' decisions remain the crucial part of the financial cycle.

The data that we need to conduct our analysis are the dates of the interest rate announcements, the interest rate that was announced on that date, and the daily yield for 10-year state bonds. Obviously, we need this data between 2010-2022 for both US and Turkey. All of this data is available on investing.com. Moreover, extracting data from investing data from investing.com is relatively straightforward, thanks to the invest.py library. However, upon the frequent usage of the invest.py library, the investing.com firewall actively blocks attempts to get data in such a way. This is understandable, as investing.com is primarily a website that provides data and does not have a secondary purpose, unlike frequent data sources such as Twitter or LinkedIn. As I had used invest.py for another project recently, I could not use it for this one. Instead, I gathered the data from the US Treasury website (US daily bond yield data), the FED website (monetary decision dates and interest rates), and TCMB (for both sets of Turkish data). I then extracted this data to an excel format to make it tidier to interact with in python.

After I had gathered the data, I used a python code to take the averages of daily 10-year bond yields for ten days before and after the interest rate announcement dates. The 10-day margin was chosen as such because, generally, the market forces are very successful in predicting interest rate decisions. Therefore, the decision might already be priced in the bond yields several days prior to the actual announcement. In accordance with our methodology, I classified the interest rate decisions which caused bond yields to go up as uncredible and the ones that caused the bond yields to go down as credible. Note that I have done this process for both US and Turkey in separate Python sheets, as I find it easier to work in that fashion. Finally, I coloured the credible decisions in green and the uncredible decisions in red and graphed the whole picture for US and Turkey.

Results

As we have purposefully tried to avoid numerical results as they would be misleading and not give the whole picture, the best way to analyze the results of our research is to look at them analytically. To do so, in the graphs below, we have the daily 10-year bond yield as the line graph, the dates of the interest rate announcement, and the actual rate that was decided as points. Moreover, using the methodology described before, we have identified every single decision as credible or uncredible, with

the idea that we can estimate the final credibility of the FED and TCMB. Investigating the two central banks separately would be best to see the common trends and differences.

United States

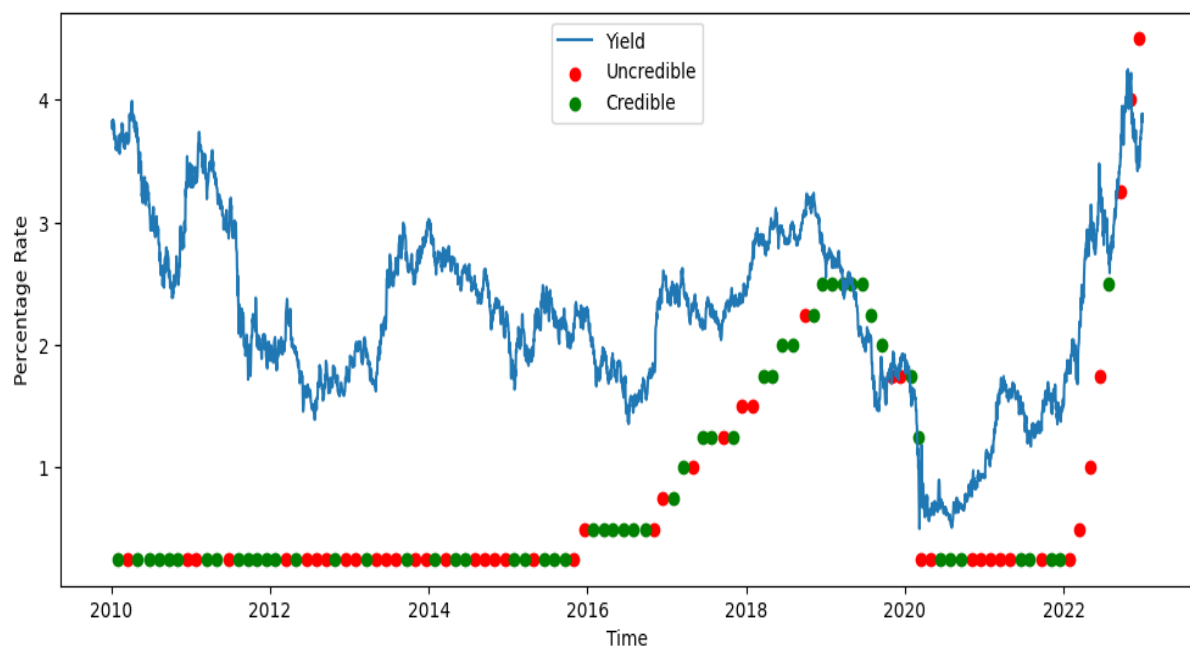


Figure 1: US Daily 10-Year Bond Yield and FED Monetary Decisions

The US 10-Year Bond Daily Yield and FED Monetary (Interest Rate) Decisions graph is presented above. In the graph, the FED's decisions are colored red when they have caused an increase in the daily 10-year US bond yields and green when they have caused a decrease in yields. US bond yields have been dramatically affected by the Coronavirus epidemic. This is because when the epidemic started, FED was in the process of steadily decreasing the interest after having raised the interest rates constantly between 2016-2019. This process can be seen in the graph. The epidemic dramatically increased the decline process of the FED interest rates, as FED hit the infamous 0 lower bound by declaring the official interest is 0.25 percent, effectively 0. Moreover, FED applied quantitative easing and several unconventional monetary methods in the hopes of avoiding a recession as the US economy closed down for weeks due to the epidemic. US bond yields first declined sharply, as again in the possibility

of a recession but then started to increase dramatically as the expansionary monetary expansion by FED and the US government raised the inflation, with the US inflation hitting 10% in 2022 for the first time since the 1980s. FED chairman first announced that the inflation levels were “transitory,” and it was mostly because the world was eager to spend coming out of the lockdowns and supply chain breakdowns. However, FED changed its sentiment in the upcoming monetary policy announcements and responded swiftly by raising the interest rates at speed never seen before since the 1970s, which explains the whole upward movement observed in 2022. Despite the rapid increases in the interest rate, the market seems to be unconvinced (possibly due to the initial misdiagnose by FED), as the 10-year bond yields have increased steadily, and only 1 of the eight monetary decisions is seen as credible according to our criteria. Our findings seem to fit perfectly with the economic narrative of recent years.

Another interesting period to point out is 2010-2016 when FED kept its interest rate decision at the 0 lower bound (numerically 0.25) to stimulate the economy and avoid a recession after the 2008-9 Global Financial Crisis. The global financial crisis emerged from the failure of subprime mortgages and financial instruments, including such mortgages but quickly spread to the rest of the financial system, causing several established institutions, such as Lehman Brothers, to collapse. FED counteracted the negative fallout of the crisis by reducing the interest rates, as it is observable above, and applying unconventional monetary policy, such as quantitative easing. While these methods have prevented a deeper crisis, many economists warned that this too-relaxed monetary environment might be the catalyst for another, this time even worse, crisis. These worries are also present in our data, as starting from 2012 until 2016, most of the FED decisions are seen as uncredible. FED finally started to raise the interest rates again in 2016, which was seen as a positive by the market, as most of the FED decisions were credible between 2016-2019.

After our brief period analysis of the FED and their actions, the reasoning for those actions, and the reaction from the market, it would be appropriate to look at the era as a whole. During 2010-2022 FED held 105 monetary policy meetings and therefore announced 105 interest rate decisions. Out of those decisions, 58 of them have caused an immediate decline in the daily 10-year bond yields and, thus, can be qualified as credible actions. On the other hand, 47 of them have raised the daily 10-year bond yields and can be qualified as uncredible. This means that FED is credible 58.5% of the time or has a credibility score of 0.585. This score is lower than what I anticipated, but it should be noted that this score only investigates the immediate reaction by the market and does not look into the long-term results of such actions. In other words, the reputation of the FED is not investigated in this project.

Turkey



Figure 2: Turkish Daily 10-Year Bond Yield and TCMB Monetary Decisions

The story of Turkish daily 10-year bond yields and TCMB monetary decisions is a different story than the US case entirely. There are two distinct periods where the bond yields have increased dramatically, and therefore inflation expectations have skyrocketed. The first of these periods is the 2018 -2019 period. In the summer of 2018, Turkey faced a currency crisis, where the Turkish lira lost over 60 percent of its value in several months. The intriguing point is that this period coincides with FED increasing its interest rate. As FED increased its rate dollar has appreciated and put pressure on developing countries' currencies, with the Turkish lira being of them. During 2018, plenty of Turkish firms declared moratoriums as they were unable to pay back their loans in foreign currencies due to the sudden depreciation of the Turkish lira. Turkey, being a natural importer of petroleum, natural gas, and consumer technology products, is affected negatively by the depreciation of its currency. As the purchasing power of the Turkish lira decreases, the prices of imported goods increase, which

eventually leads to price increases in even non-imported goods. This situation naturally results in uncontrollable inflation. High inflation may cause even further currency depreciations, resulting in a negative feedback loop. To break this vicious cycle, Turkey resorted to conventional monetary policies. TCMB increased the interest rates to 24 percent, a figure that was not seen since the infamous 2001 crisis. After confirming the 24 percent figure for seven monthly decisions, TCMB finally started to decrease the interest rates back again, and the normalization period started. According to our data, TCMB has handled this period relatively well, despite being late. Between late 2017 and the 24 percent interest rate announcement in September 2018, only 1 TCMB decision was seen as credible, but after the 24 percent figure was announced, 8 of the 19 decisions were seen as credible and effective by the market. Therefore, it could be said that the drastic measures had worked as intended in this case.

The other exciting period is the summer of 2020 until the end of 2022, the pandemic era. At the start of this period, along with all the world's economies, Turkey implemented loose monetary policies to avoid a recession. While this policy has worked, it has caused uncontrollable inflation and another rapid currency devaluation. High inflation and currency depreciation are not problems that Turkey is unfamiliar with; as we have talked about in the previous paragraph, a similar situation occurred in 2018. But this time, Turkey did not resort to conventional monetary policies such as increasing interest rates. Instead, in December 2021, Turkey implemented several unconventional methods, such as exchange rate-protected deposits and increasing restrictions on financial transactions involving foreign currencies. Turkey combined these policies with interest rate decreases, despite the common economic literature wisdom. When we look at the practical results in our model, out of 12 decisions in 2022, 11 of them are categorized as credible, while only one is uncredible. However, this outcome might be misleading as one of the unconventional policies adopted by Turkey was increasing the mandatory holding limit of long-term state bonds for banks. By doing so, Turkey hoped that the banks and financial institutions would convert their foreign currencies back to the Turkish lira. This decision of mandatory holding of state bonds increased the prices of bonds, decreasing the yield. Recall that decreasing yields are our benchmark for classifying the decisions of a central bank as credible. Therefore, we can't say whether the decisions of TCMB have been as credible as our model suggests.

Overall, between 2010-2022, TCMB made 147 monetary decision announcements. Eighty-six of them are classified as credible, while 61 are uncredible, according to our model. This means that 58.5 percent of TCMB decisions have been technically credible. Note that this figure is higher than FED's, which was a real surprise. However, if we exclude 2022 due to the previously mentioned potentially misleading results, the credibility falls to 55.5 percent, practically the same as FED. It must be stated that despite this credibility percentage, TCMB is not seen as an effective central bank in combating

inflation, mostly due to the complex economic problems and political pressures on them. Our clear distinction between credible and reputable comes in handy in this part of the analysis.

Our hypothesis of FED being more credible than TCMB has been proved incorrect. Our work creates a new way to look into the credibility of central banks and offers intriguing results. It requires further work and research, mostly including other country fundamentals and econometric analysis. Only then can we determine how markets react to central bank decisions and how single actions help build or destroy credibility. Our work lays a decent framework for further research in this relatively obscure area.

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