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Paper Title: Macroeconomic Influences on Government Bond Yields

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Outline

Abstract

This research paper takes into account the relation between the macroeconomic indicators and U.S. government bond yields but focuses on 10 Year US Treasury yield. The work uses BI tools like PowerBI to build a visual dashboard and data-oriented analysis. I study widely available macroeconomic variables such as the Consumer Price Index (CPI), crude oil prices, and the volume of the U.S. government securities sold to try to understand their influence on yield fluctuations.

Using BI methodologies, such as data integration, correlation modeling, time series analysis, and dashboard development method, the project shows the effects derived from the historical economic data that enable taking actionable insights. Interactive visuals illuminate trends and potential causal links in an easy-to-use manner that helps investors and policymakers make sense of volatile economic environments. This paper demonstrates how Power BI can be used as the means of increasing transparency and facilitating decision making in financial markets while further adaptive modelling approaches incorporating Python or machine learning must be explored in future research.

Chapter 1: Introduction

Government bond yields are highly important as benchmarks in the international financial markets as they will affect the decisions taking place among asset managers, corporate investment, and monetary policy. Of these, the most important is the U.S. 10-Year Treasury yield because it is frequently cited as trading yield expectations for long periods and as a benchmark for pricing so many financial instruments.

According to Bayaa and Qadan (2024), uncertainty about the future interest rates can change the yield curve's shape, hence changing the entire term structure in interest rates. Therefore, the bond market forecasting should be dependent on macroeconomic analysis. When the world is on fire, investors seek government bonds for safety which usually leads to yield compression, which is studied by Cavaleri, Ranaldo, and Rossi (2025) in their study on safe asset demand.

The purpose of this research is to examine the various macro-economic variables which are indicative of bond yields such as CPI, crude oil prices, etc. through the discipline of Business Intelligence (BI). The study would leverage Power BI for visual analysis and correlation modeling in order to make these relationships more interpretable for policymakers and market analysts. BI focuses on the fundamental purpose of gaining business performance improvement by leveraging data driven insights, especially in eroding uncertainty and economic cycle.

As part of this research, interactive Power BI dashboards were developed to visualize key macroeconomic trends and their relationship to bond yields. These visual tools are detailed in Chapter 5 to help translate complex data into actionable insights for financial decision makers.

Chapter 2: Background and Context

Over the last few decades, the U.S. Treasury market has taken shape significantly shaped by the 2008 financial crisis and the COVID-19 pandemic. Notably, these global shocks have also affected long-term interest rates. The 10-Year Treasury yield, as well as bond yields in general, is also a reaction to several macroeconomic factors such as inflation (CPI), oil prices, and turning points in economic cycles (recessionary periods).

Thus, to make things clear to those readers which don’t have a finance background, here’s an outline for a few key terms.

- **Bond Yield** - The return an investor earns from holding a bond is called Bond Yield. Specifically, it is expressed as a percentage that is affected by interest rates and bond prices.

- **10 Year Treasury Yield** - A stand indicator interest rate, that represents the thinking of the investor regarding long-term economic outlook. It serves as a mortgage and loan reference rate as well as a rate for other long-term investments.

- **Inflation (CPI) -** Inflation is the general price increase over time. The CPI is a term for a measure of the changes in prices of a market basket of goods and services, also known as the Consumer Price Index.

- **Crude Oil Prices** - The cost of crude oil feeds into production and transportation costs. As oil is such a foundational commodity, price of this particular commodity can also affect inflation expectations.

- **Recession** – The two quarters of consecutive negative GDP growth known as recession. Lower interest rates and bond yield declines are regularly associated with recessions given reduced demand.

- **Fed funds rate** - Interbank lending rate of banks. The figure is set by the Federal Reserve and is a tool for monetary policy.

This section of chapter helps to comprehend the interaction among such macroeconomic terms and these phenomena which might influence of government bond's yields. By tracing these influences using historical data and enabling this communication to a wide population (regardless of financial expertise) the study uses Power BI to visually transfer findings.

Chapter 3: Literature Review

The U.S. Treasury market is a large liquid bond market worldwide with relatively high levels of interest rate pass through to other macroeconomic factors such as interest rates, inflation as well as currency markets and interest rate dynamics. It can only be understood by investors and policymakers together. On the other end of line, predictions will be developed such that they can be used as a baseline for the evaluation of your US Treasury market trend from studies about government bond releases and interest rates together, the US dollar exchange rate movements, and crude oil market, among others.

Thesis Statement

The constituency of this analysis discusses economic factors that can influence the incidence of issuance of bonds by the U.S. government and yield trend of bonds. Research review draws prior

findings together to bring out key predictor variables (CPI, oil prices, issuing volume), which enhance the bond market movement's forecasting model. Taken as a whole, these studies add empirical and theoretical support for the macroeconomic variables considered in this paper.

Bond Issuance and Interest Rate Trends - In particular, Bayaa and Qadan (2024) point out the role of uncertainty in interest rates for shaping U.S. Treasury yield curve and how the expectation of change in rates affects the investors behavior. They also explain how central bank interventions and equilibrium rate changes have to do with bond price changes: Favero et al. (2025). This provides evidence of the importance of monetary policy dynamics in forecasting models.

Monetary Policy and Bond Yields - Government borrowing methods and fiscal approaches are directly related to bond rates and are known as Monetary Policy and Bond Yields. Favero et al. (2025) explains how shifts in monetary policy, e.g., the change of the federal funds rate, can influence bond prices and yields. Ho et al. (2024) discuss this further by investigating the effect of central bank policy changes on bond yields in emerging markets.

Crude Oil Prices and Inflation – Crude oil prices serve as a stand in for inflation expectations. The U.S. Energy Information Administration (n.d.) indicates that when oil prices rise, it means inflationary pressures and central banks tend to raise their interest rates. As demonstrated by Shodrokova et al. (2025), the pattern just described holds, and oil price volatility plays a role in bond yield dynamics in the economy's emerging markets.

Chapter 4: Data and Methodology

Datasets were sourced from public economic datasets that were structured within Power BI. Key variables include:

- Yield (10-Year U.S. Treasury)
- Consumer Price Index (CPI)
- Crude Oil Prices
- Securities Sold Count

With Power Query Editor in Power BI's, the secondary dataset includes CPI, crude oil prices and bond yield was merged with the primary dataset using 'Add Column' and 'Merge Queries' functions. This enabled alignment of records using the common 'Date' from all data sources.

After merging, columns that were needed to fill gaps and normalize the values were transformed and extrapolated for consistency and usability for construction of dashboard. Extrapolation and data shaping were done so that a functional dashboard would be supported.

Steps:

1. Power Query (integrating and merging with date).
2. Added some calculated columns, which are needed for derived insights.
3. Creation of date hierarchies and time-based trend aggregation.
4. How the macroeconomical relationships can be visualized using scatterplots and line charts.
5. Calculation of average yield by using DAX based on changing macroeconomic conditions.
6. Building Forecast future trends using built in Power BI analytics tools.

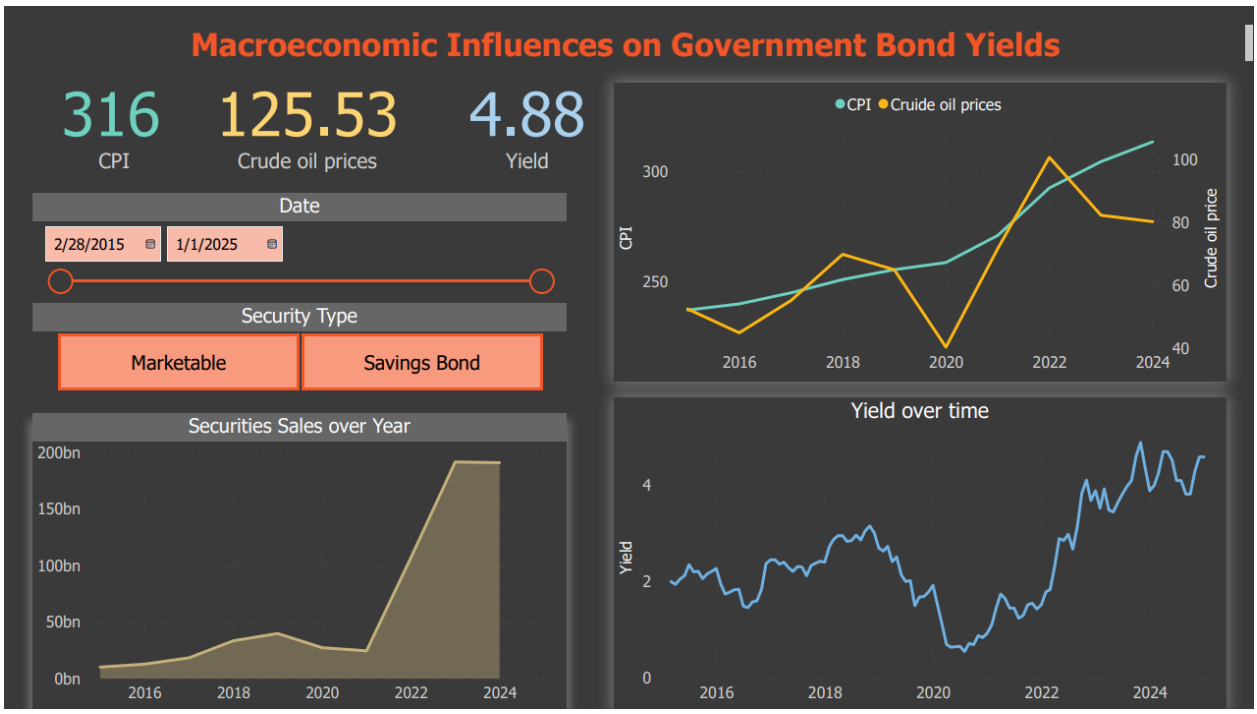
Chapter 5: Analysis and Results

I have found there are several patterns I see in Power BI dashboards.

- The trend in CPI follows a growing bond yield between 2021–2025.
- There is moderately strong correlation between crude oil prices and bond yields, a being the result of inflation linked yield movement.
- Yield bottomed out at 0.82% in 2020, in keeping with the recession that descended during the pandemic.
- So, securities sold volumes went up during periods of higher rates, implying that the issuance of debt proactively during favorable rate settings.

Visual elements include:

- Line chart - CPI, yield, and oil prices over time line charts.
- Scatterplots regarding correlations between CPI/oil and yield.
- Structured that the forecasted yield patterns can be decomposed into a tree.



Analysis 1: Macroeconomic Overview Dashboard

From image 1 the macroeconomic indicators show how they interact time wise. It mentions the key figures as of early 2025.

- CPI: 316
- Crude Oil Prices: $125.53 per barrel
- 10-Year Yield: 4.88%

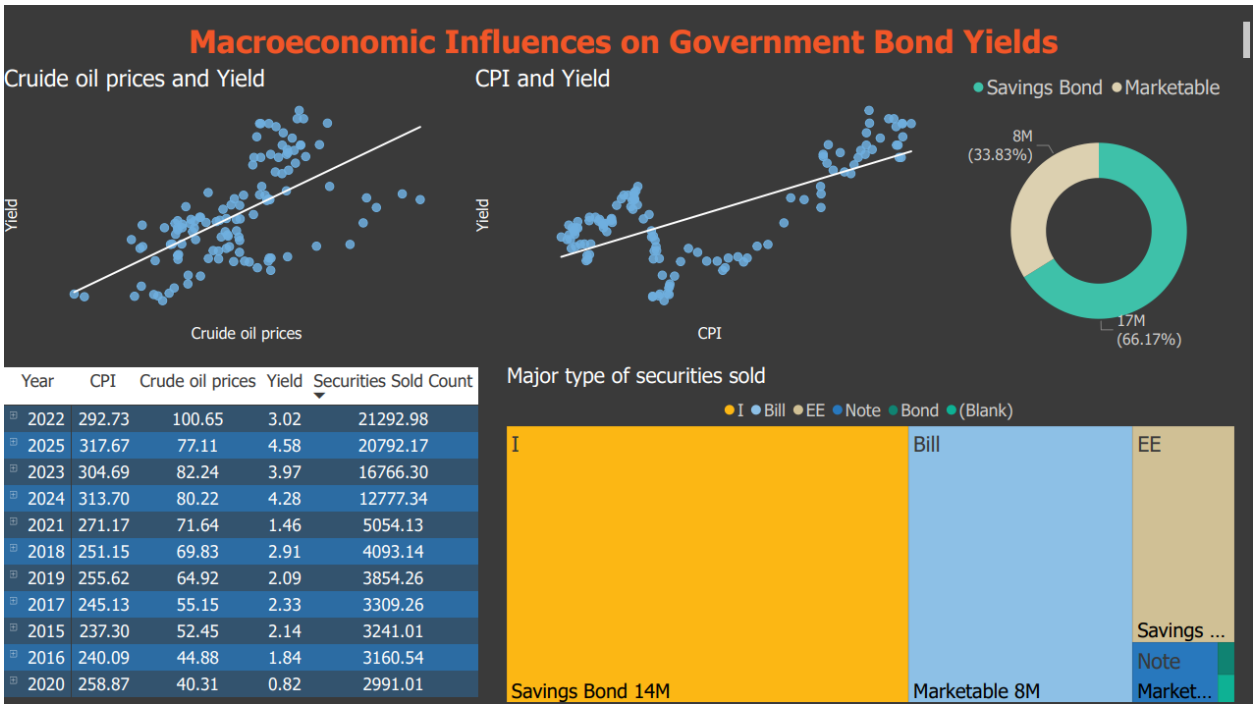
The metrics are shown along with interactive date range and security type (Marketable vs Savings Bond) filters so users can engage dynamically by what the shifts to macroeconomic conditions tell.

Key visual insights include:

The CPI and crude oil prices are represented as a line chart with a positive trend over 2016-2022, and slight decoupling with CPI having continued to rise and oil prices also begin to fall (possibly indicating inflation persistence beyond the energy market).

This follows through on the "Yield Over time" chart which confirms yields were sharply upward from 2021 through 2023 mirroring the rise of inflation.

The thesis is that inflation (CPI) and crude oil prices are strong indicators of yield movement; also that, in the context of supply and demand for government borrowing, government borrowing volumes reflect macro economic shifts. The dashboard serves to combine key variables in to an interactive BI environment to present its users in real time decision-relevant insights to the investors and the policymakers.



Analysis 2: Variable Correlation and Issuance Structure

- Scatterplots, a data table and visual breakdowns of bond issuance types are the second page of the provided dashboard.
- The crude oil prices vs. yield scatterplot shows the positive relationship between crude oil prices and inflation expectations, increasing the bond yield.
- CPI vs. yield plot also shows the same patterns, that is, there are periods of rising inflation that correspond to higher yields.
- On the one hand, the data matrix gives a year by year summary of macro indicators but on the other hand the highest yields (4.58% in 2025) is aligned with very high CPI and issuance volumes.
- Marketable securities are 66.17% of total issuance while Savings Bonds are 33.83%.
- Treemap explains I-Bills and EE Bond are the most common issued instrument, which pointed at the preference for flexible as well as the inflation protected instruments when the period is volatile.

The literature linking inflation and commodity prices to yield dynamics is validated by these findings and the results show that issuance strategy varies depending upon economic indicators.

Visual elements include:

- CPI line charts, yield line chart, and oil price line chart over time.
- There are scatterplots with correlations between CPI/oil and yield.
- Treemap to showcase the majority for types of bonds sold.

Using data in dashboards is a form of a business intelligence solution as it helps boost performance with visualization and real time analysis.

Chapter 6: Discussion

Discussion of Dashboard findings confirms that U.S. bond yields are highly driven by inflation (CPI), crude oil prices, and Treasury issuance. CPI and yield increased both upward in 2021 to 2025 as was predicted by the Fisher Effect, and oil prices show the inflationary nature of energy markets. The ‘flight to safety’ theory in recessions is supported by 2020 yield suppression.

The data also indicate strategic government borrowing, rising when issue occurs during high-yield periods. Global factors and policy lags not captured by the model are areas for future research, while the model is effective at capture of domestic trends. And the study validated that Power BI is a business intelligence tool that has the ability to visualize and interpret these macroeconomic phenomena.

Chapter 7: Conclusion and Recommendations

This study shows that CPI, oil prices, and securities issuance are useful in explaining patterns of 10-Year Treasury yield. These trends had predictive value and power BI allowed for them to be clearly communicated as such.

Key takeaways are that inflation and commodity trends follow yields and issuances of new bonds coincide with interest rate shifts. The insights were delivered through the power BI dashboards to the decision makers.

The model can be improved in future research with:

- Regression using Python based forecasting
- International economic indicators
- Cyclical patterns of longer timeframes can be captured.

This analysis could be extended into a tool of predictive public finance and investment planning.

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Appendix

PowerBI Dashboard link-
https://drive.google.com/file/d/1Q59y1flKacHhVu5ldHYKCWCPGmSKRsx/view?usp=sharing