

Yield Theory of Recession

Introduction

The yield theory of recession is a well-known concept in economics that states a recession is imminent if the yield on short-term bonds is higher than the yield on long-term bonds. With speculation about a potential recession in the US in 2023, it is relevant to examine this theory. The US is an ideal country for study as a recession in this country can have far-reaching impacts and trigger recessions around the world. The focus of the study is the year 2022, as the third and fourth quarters of that year witnessed an inverted bond yield, making it an interesting time period to examine. The analysis of the yield theory of recession in the context of the US in 2022 provides valuable insights into the relationship between the yield curve and economic activity.

Statement of Theory or Hypothesis

An inverted yield curve, where long-term bond yields are lower than short-term bond yields, is often seen as an indicator of a coming recession. This is because investors are willing to accept lower returns for long-term bonds when they believe that the economy will slow down and that the Federal Reserve will lower interest rates to stimulate growth. However, it's important to note that an inverted yield curve is not a guarantee of a recession, and there can be other factors at play. Additionally, the relationship between an inverted yield curve and a recession can take time to develop, with the recession sometimes not occurring for several months or even years after the inversion.

The theory that an inverted yield curve is a reliable indicator of an upcoming recession was popularized by economists, including Paul Samuelson and James Tobin. This idea is based on the historical relationship between changes in the shape of the yield curve and changes in the economy. Over time, this relationship has been found to be a strong predictor of recessions in many countries, including the United States.

Specification of the Mathematical Model

In this model, the GDP is taken as the dependent variable, which represents the overall level of economic activity in a given period. The independent variable is the difference between the 10-year long-term Treasury yields and the 2-year short-term Treasury yields, which serves as a measure of the slope of the yield curve and potential changes in future economic activity. By analyzing the relationship between changes in the yield curve spread and changes in GDP, this model provides valuable insight into the impact of changes in market expectations about future interest rates and economic conditions on the overall economy. The results of this model can help inform policy decisions aimed at promoting economic growth and stability.

$$Y = \beta_1 + \beta_2 X$$

Y = Real GDP

β_1 = Intercept

β_2 = Slope of the Yield Curve

X = Yield spread i.e the difference between the 10 year long-term Treasury yield and 2 year Short-term Treasury yield

Specification of the Econometric Model

Including a disturbance term in the mathematical model for the yield theory of recession transforms it from a deterministic model to an econometric model. The disturbance term, represented by "u", accounts for all the factors that affect the GDP but are not explicitly taken into account in the model. These factors may include unanticipated events such as natural disasters, changes in government policies, and shifts in consumer behavior. By incorporating the disturbance term, the econometric model allows for a more comprehensive representation of the relationships between the dependent variable (GDP) and the independent variable (the difference

between the 10-year and 2-year Treasury yields). The inclusion of the disturbance term enables the estimation of the model parameters and the estimation of the uncertainty associated with the predictions made by the model. This is an essential step in making the model a useful tool for analyzing the relationship between the yield curve spread and economic activity, and for making more accurate predictions about future economic conditions.

$$Y = \beta_1 + \beta_2 X + u$$

Where 'u' is the disturbance term.

Obtaining Data

Estimating the econometric model requires obtaining and analyzing the relevant data. In this case, the data is gathered for the USA and includes quarterly GDP data for the year 2022 and daily data for the 10-year long-term Treasury yields and 2-year short-term Treasury yields. The risk spread, calculated as the difference between the 10-year and 2-year Treasury yields, is taken for each day and then segregated based on quarters. The average risk spread for each quarter is then compared with the corresponding GDP data. This comparison forms the basis for estimating the coefficients of Beta 1 and Beta 2, which are the parameters of the econometric model. By estimating these coefficients, it is possible to examine the relationship between the yield curve spread and economic activity and make predictions about future economic conditions. The data analysis provides valuable insights into the yield theory of recession and supports informed policy decisions aimed at promoting economic growth and stability.

Yield Spread Q1 2022

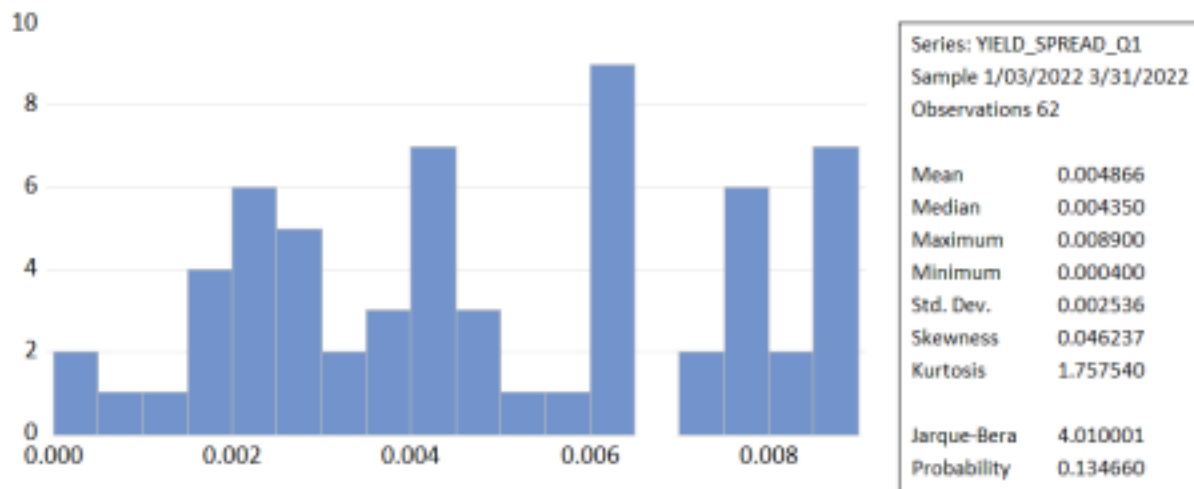


Figure 1 shows the descriptive statistics for Yield Spread Q1

Here the Mean i.e Average for Q1 is 0.49%

Yield Spread for Q2 2022

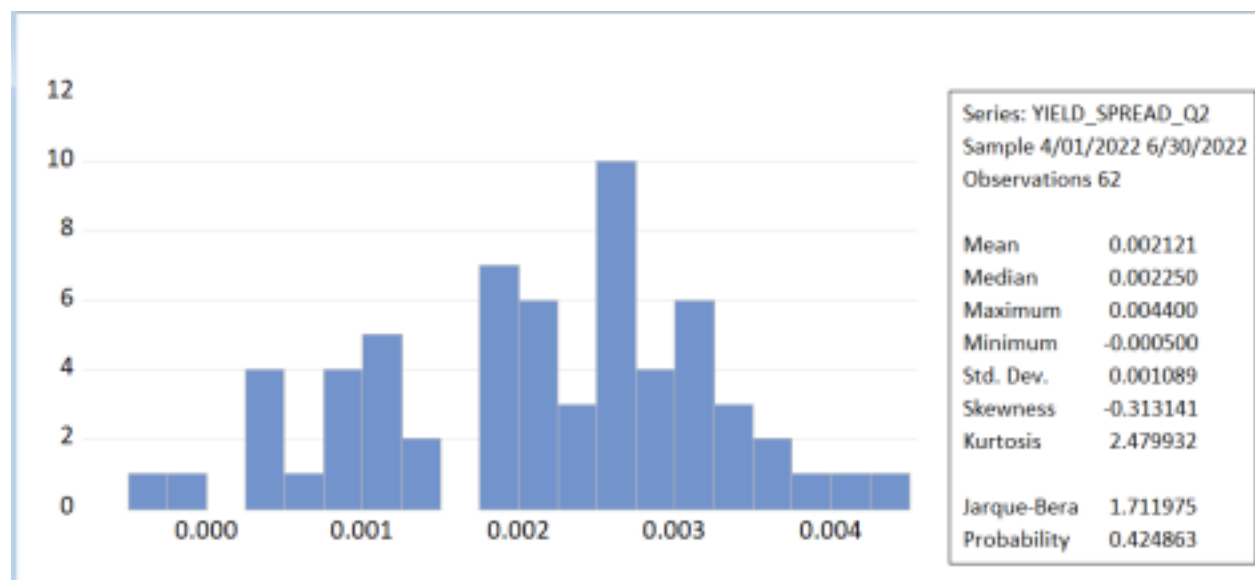


Figure 2 showing the descript statistics for Yield Spread Q2

Here the mean or Average for Q2 is 0.21%

Yield Spread Q3, 2022

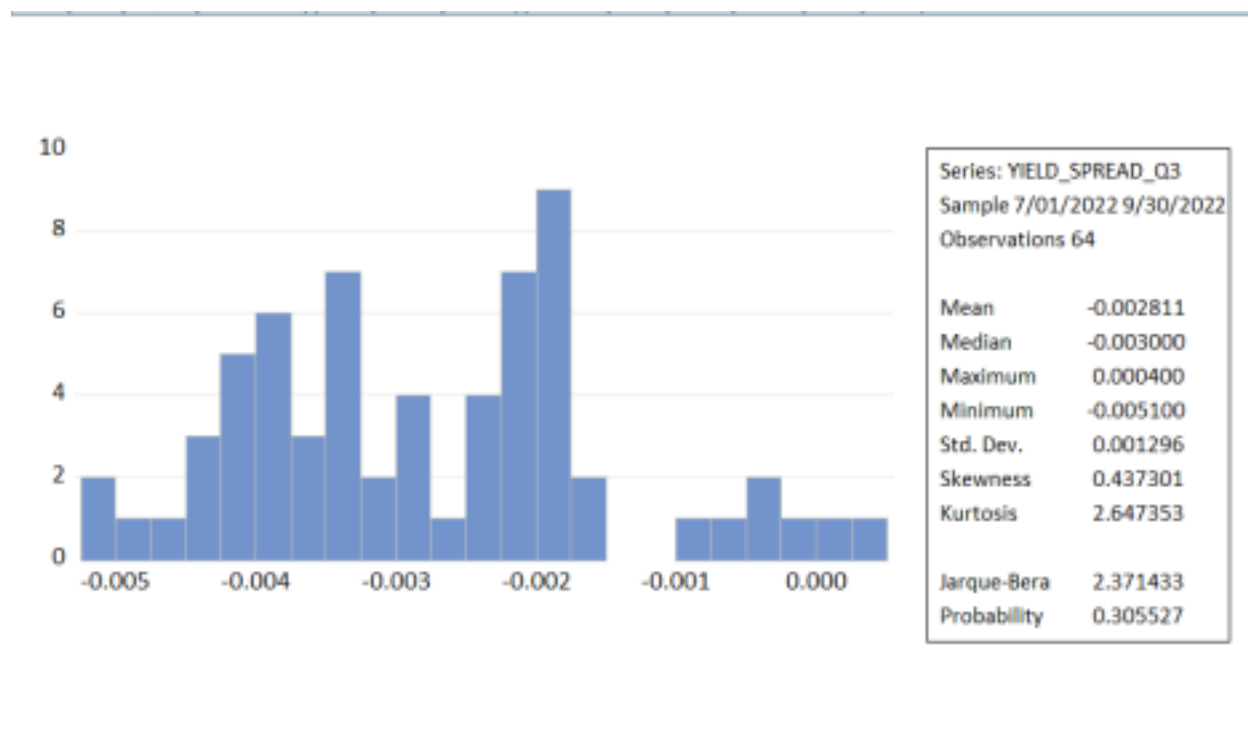


Figure 3 showing the descript statistics for Yield Spread Q3

Here the mean or average for Q3, 2022 is -0.28%

Yield Spread Q4, 2022

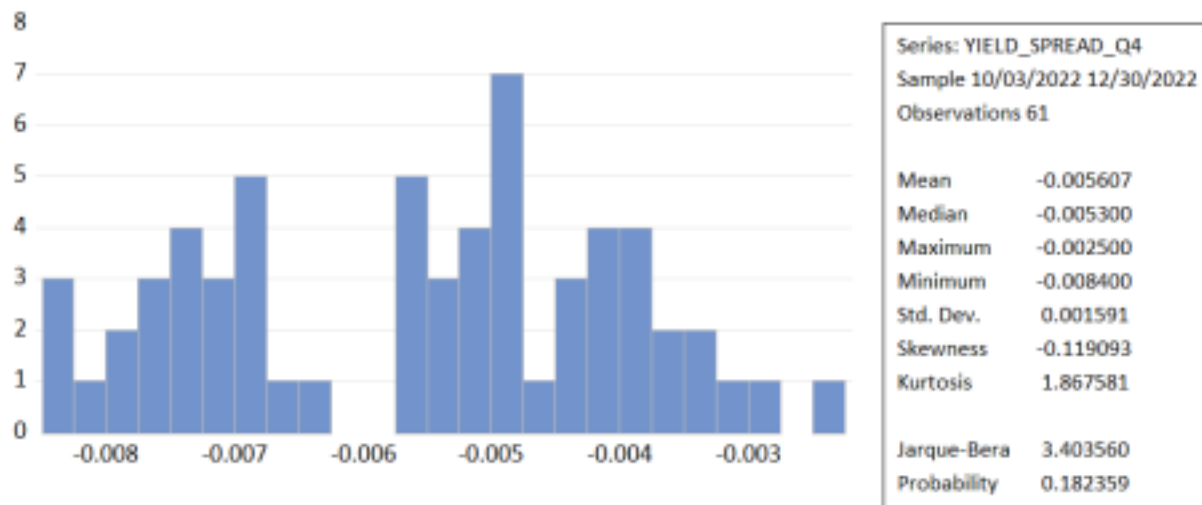


Figure 4 showing the descriptive statistics for Yield Spread Q4

Here mean or Average for Q4, 2022 is -0.56%

Real GDP for four Quarters

Year and Quarter	Real GDP (in Percentage)
2022 Q4	2.9
2022 Q3	3.2
2022 Q2	-0.6
2022 Q1	-1.6

Estimation of the Econometric model

Once the data for the Yield theory of recession has been gathered, the next step is to estimate the

parameters of the model, Beta 1 and Beta 2. The numerical estimates of these parameters give practical meaning to the theory and allow for its empirical examination. To estimate these parameters, the ordinary least squares (OLS) method of regression analysis is used. OLS is a commonly used method in econometric analysis, as it provides reliable estimates of the parameters and allows for the examination of the relationship between the dependent and independent variables. By using OLS to estimate the parameters of the Yield theory of recession, it is possible to make informed predictions about the future economic conditions based on changes in the yield curve spread.

Using this technique and data, we obtain the following estimates of Beta1 and Beta2, namely, 0.798905 and -5.031283. Thus the given Yield Theory of recession function is given as $\hat{Y} = 0.798905 + (-5.031283)X_t$

Dependent Variable: REAL_GDP_IN_PERCENTAGE
Method: Least Squares
Date: 02/05/23 Time: 18:51
Sample: 2022Q1 2022Q4
Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIFFERENCE_BETWEEN_10_YEAR_YI...	-5.031283	0.759440	-6.624991	0.0220
C	0.798905	0.312249	2.558552	0.1248
R-squared	0.956418	Mean dependent var	0.975000	
Adjusted R-squared	0.934627	S.D. dependent var	2.433619	
S.E. of regression	0.622231	Akaike info criterion	2.195842	
Sum squared resid	0.774343	Schwarz criterion	1.888990	
Log likelihood	-2.391685	Hannan-Quinn criter.	1.522477	
F-statistic	43.89051	Durbin-Watson stat	1.810463	
Prob(F-statistic)	0.022034			

The hat on the Y indicates that it is an estimate.

The estimated Yield Recession function (i.e, regression line) is shown as below

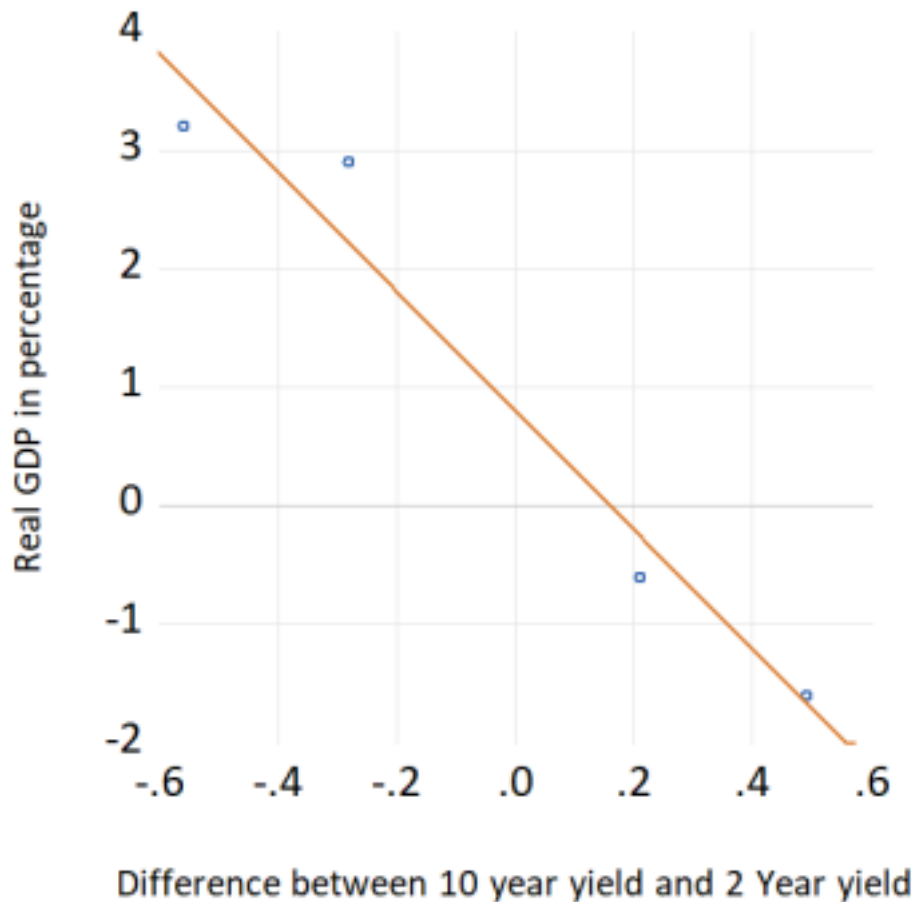


Figure 5 showing the linear regression.

The regression analysis of the Yield theory of recession provides a visual representation of the relationship between the yield spread and GDP. As the figure shows, the regression line fits the data well, with the data points being very close to the line. The slope coefficient of -5 for the period of 2022 suggests that, on average, a one unit change in the yield spread will cause a change of -5 units in the GDP. The downward sloping regression line further supports this relationship. It's important to note that the relationship between the yield spread and GDP is not exact, as not all the data points lie precisely on the regression line. This highlights the existence of other factors that influence the economy and that are not accounted for in the model. Nevertheless, the results of the regression analysis provide a useful understanding of the relationship between the yield spread and GDP and support informed policy decisions aimed at promoting economic growth and stability.

Conclusion

In conclusion, the examination of the yield theory of recession in the context of the US in 2022 provides valuable insights into the relationship between the yield spread and economic activity. The regression analysis of the yield spread and GDP supports the yield theory of recession, with a slope coefficient of -5 suggesting that, on average, a one unit change in the yield spread leads to a change of -5 units in the GDP. The results of the analysis provide a useful understanding of the relationship between the yield spread and GDP and inform policy decisions aimed at promoting economic growth and stability. Despite the fact that the relationship between the yield spread and GDP is not exact, with other factors affecting the economy, the yield theory of recession remains a useful tool for predicting potential recessions and informing economic policy.