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Treasury Bond and Corporate Bond Spread as an Indicator of Economic Activity

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by

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Abstract

Bonds spread has been recognized as a strong indicator of future economic growth. Forecasting economic growth with spread is simpler compared to other measures. This paper focuses to study the usefulness of the spread between Treasury Bonds and High-Quality Corporate Bonds in predicting US economic growth, its accuracy between the years 1999 and 2021, and comparison with the traditional yield curve. By analyzing the relationship between different spreads and Industrial production index frequently used for observing and analyzing current economic performance, the results indicate that the traditional spreads such as 10Year–3Month and 10Year–2Year are not very accurate predictors of economic activity, while the new spread between Treasury Bonds and High-Quality Corporate Bonds can predict the economy.

Keywords: Spread, Industrial Production, Economic Growth, Yield Curve.

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Chapter 1: Introduction

The performance of bonds in the market is often viewed as how the economy is performing and how it will perform in the next six to twelve months. Investing in bonds reflects the investor's confidence on the economy ahead because when people invest in the market, they look certain period ahead to decide what to invest in. According to Knudsen and Moller (2021), it is important to make forecasts for economic activity and other leading economic variables of the country to make better decisions. These forecasts facilitate the decision making of policymakers, business owners, and the public. Despite their importance, economic forecasts are very hard to obtain, because of the unavailability of timely and accurate data, modeling errors or using too complicated models, and professional forecasters which are more expensive to hire. The above-mentioned challenges increase the demand for other techniques which are relatively easy compared to the traditional economic forecasting of economic activity.

According to Estrella and Mishkin (1998), the traditionally used indicator of economic activity which is considered as a more accurate predictor is the yield curve. The yield curve graphs the yields (interest rates) of bonds over different periods of time or the time when these bonds reach its maturities. The yield curve of Treasury bonds which plots the interest rates of the bonds issued by the government are more secured or considered risk-free than the corporate yield curves because of the possibility of default of corporations. Yield curves have different shapes Normal (upward sloping), Flat, and Inverted (downward sloping). Normal yield curve depicts that long term yields are greater than short term yields, so the curve is upward sloping. The short-term bonds have lower interest rates than long term that is because the economic situation in the long-term future is uncertain and the investors or bond buyers would be attracted by higher interest rates. Normal or upward sloping yield curves indicate better economic condition of the

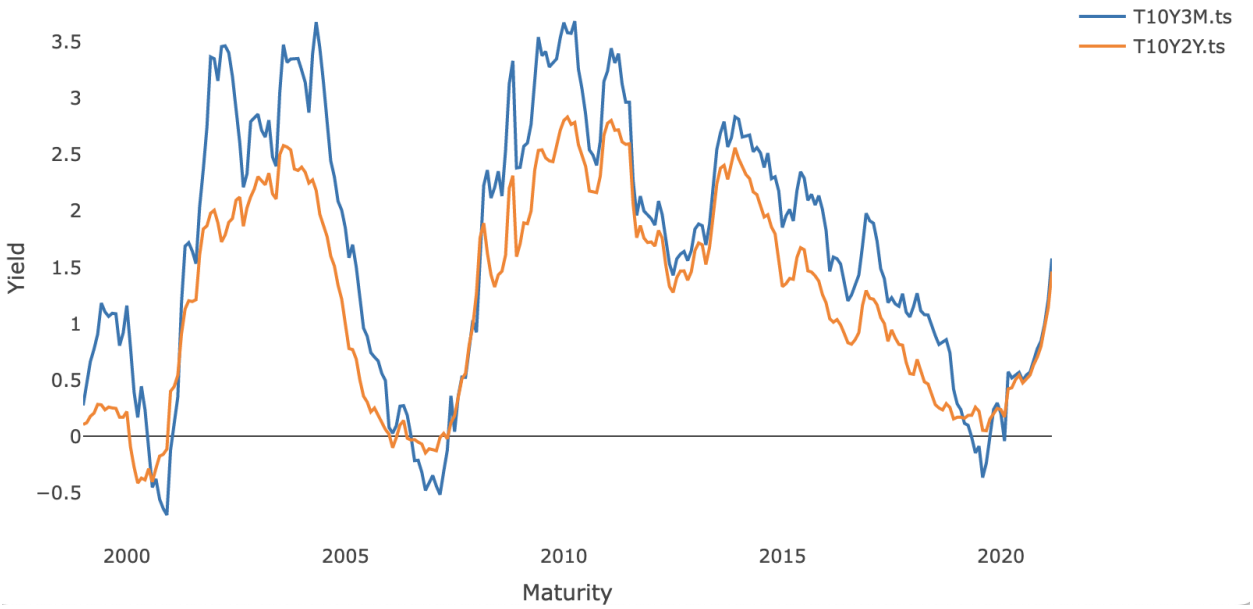
country where the economy is growing, inflation is increasing, and the interest rates are higher. Inverted yield curve indicates that the long-term interest rates are lower than short-term rates, so the curve is downward sloping. The downward sloping of the yield curve is an indicator of lower economic growth and inflation as the bond rates will result in lower interest rates. The Flat yield curve is the short period curve as it becomes flat when the curve is changing the shape from normal to inverted or vice versa.

Many studies have been conducted to measure the predictive power of the yield spread of Treasury bonds. According to Saito and Takeda (2000), the Treasury bonds are more risk free and people tend to invest in risk free assets during bad economic situation, extracting information about the future economic activity for these bonds is not enough as it does not fully reflect the economic condition. Hence, in addition to the traditional yield curve, this study examines the prediction power of difference of the yield spread of Treasury and high-quality corporate bonds in predicting economic activity.

The spread between Treasury bonds and high-quality corporate bonds is nothing more than the difference in yields – or current market interest rates of similar maturities. For example: if a 5-year Treasury bond has a 3% yield and a 5-year bond issued by a reputed corporation has a 5% yield, then “the spread” is 2%. Spreads are predictors of future economic activity. When spreads are thin, it signals investor confidence in the economy. It means investors do not foresee businesses getting into trouble or failing to pay off their loans. Investors think corporate bond is almost as safe as US Treasury bond.

Figure 1.1

Yield Spread Government Bonds



Note. Traditional spreads, January 1999 - March 2021

The 10 Year–3 Months Treasury yield spread which is the difference between the interest rates of 10 Year Treasury and the 3 Months Treasury and 10 Year–2 Year Treasury yield spread which is the difference between the interest rates of 10 Year Treasury and the 2 Year Treasury are usually used as a measure for studying yield curve. These yield spreads are conventional predictors of recession in the economy. Positive or Negative spreads signal changes the economy is experiencing.

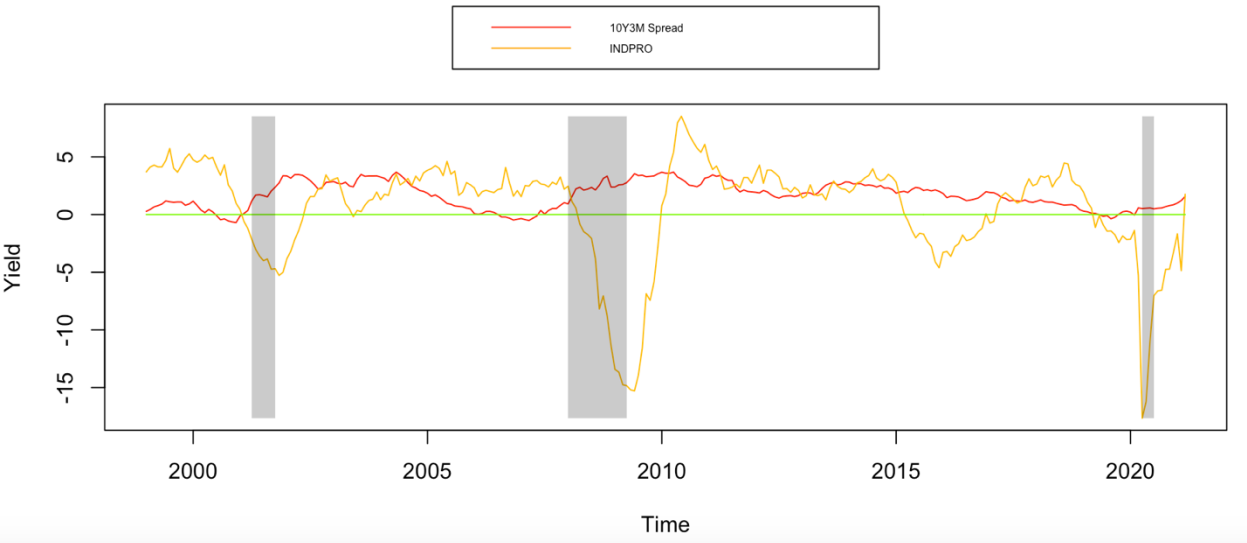
US treasuries are the safest investment as these are backed by the government. Higher investor's confidence decreases the price and demand for long term treasuries as the investors can find many other options with higher returns which results in higher yield for long term treasuries. On the other hand, low investor's confidence increases the price and demand for long term treasuries as there are no other safe options of investment with deteriorating economy and

the demand for safe investment increases which results in lower yields for the long-term treasuries.

In figure 1.1 positive yield spread or upward sloping yield curve indicate great economic conditions while negative yield spread, or downward sloping yield curve indicate deteriorating economic conditions.

Figure 1.2

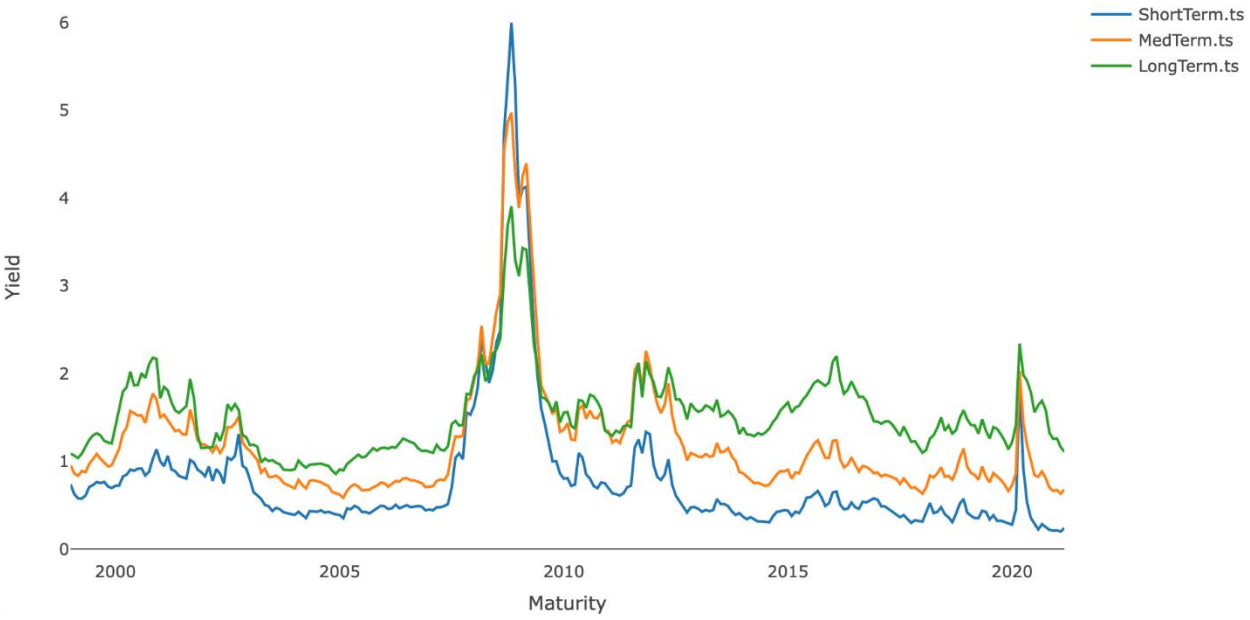
Treasury Bonds Spread Indicating Recession



Note. Another way of visualizing the predicting power of conventional 10 Year – 3 Months Treasury spread or the yield curve.

Figure 1.3

Yield Spread between Government Bonds and High-Quality Corporate Bonds



Note. Spread between the high-quality corporate bonds and Treasury bonds in the short, medium, and long terms, January 1999 - March 2021

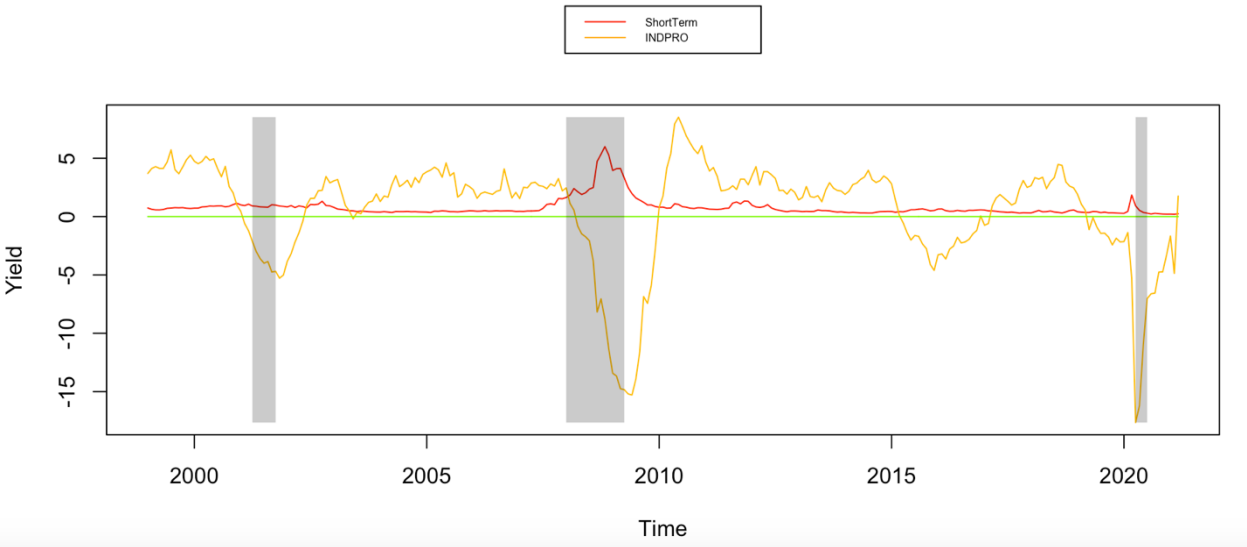
Thin spread between Treasury bonds and high-quality corporate bonds reflects higher confidence of investor in the economy. Meaning investors do not predict businesses failing to pay off their debt in the future. Small spread of Treasury bonds and corporate bonds indicate that corporate bonds are almost as safe as Treasury bonds and businesses are doing well and will continue to do so in the future. Whereas large spreads of Treasury bonds and corporate bonds indicate deteriorating economic conditions and declining investor's confidence.

In figure 1.3 each line represents spread between the high-quality corporate bonds and Treasury bonds in the short, medium, and long terms. So, for example, the spread between high-quality corporate bonds and Treasury bonds at the beginning was almost zero which indicated a

belief that the bonds issued by top US companies are as safe an investment as investing in the safest options such as Treasury bonds. During that period the economy of the US was doing great. Looking at the 2007-08 the spread reached its highest which indicated that the investors demanded higher return on high-quality corporate bonds compared to the Treasury bonds. During that period the economy was not doing well.

Figure 1.4

Spread between Treasury bonds and high-quality corporate bonds indicating recessions



Note. Another way of visualizing the predicting power of the new Short Term spread between the US Treasury and high-quality corporate bonds.

Research Questions:

- Is the spread between Treasury bonds and high-quality corporate bonds an accurate predictor of economy in the US?

- Which spread ex. Traditional “10 year – 3months” Yield spread or the new “spread between Treasury bonds and high-quality corporate bonds” has significant predictive power to economic activity?
- Can it be used to predict future economic performance of the US?

This research can prove to be very beneficial for investors as an indicator of future economic activity to make decisions in the present for better future. It can also be very useful for policy makers for better monetary policy formulation. If the spread between Treasury Bonds and High-Quality Corporate Bonds has significant predictive power to economic activity, then the future economic performance of the US can be predicted for 6 to 12 months ahead.

Chapter 2: Data and Methodology

Method

To compare the predictive power of different spreads, the traditional Treasury bond spread which is the yield curve and the treasury bond and corporate bond spread are used. The yield curve can indicate economic recession or economic upswing which can be observed from the shape of the curve. To measure the slope of the yield curve the spread between widely used spread among different interest rates (3M, 6M, 1Y, 2Y, 3Y, 5Y, 7Y, 10Y, and 30Y) which is the difference between 10Y – 3M and 10Y – 2Y have been chosen. The spread between Treasury bonds and high-quality corporate bonds is the difference in yields – or current market interest rates of similar maturities. When these spreads are thin, it signals investor confidence in the economy. It means investors do not foresee businesses getting into trouble or failing to pay off their loans. Investors think corporate bond is almost as safe as US Treasury bond.

To find the effect of yield curve and the spread between treasury bonds and high-quality corporate bonds on economic activity, Industrial production is used as the dependent variable. Industrial production index is frequently used for observing and analyzing current economic performance since it captures variations in industrial production.

Data

The secondary data on Industrial production (Federal Reserve Bank of St. Louis, 2023b) and the spreads (Federal Reserve Bank of St. Louis, 2023a) have been taken from the FRED, with monthly data points available from 1999. The time-period of the study is from 1999 to 2021, as the time-period of two decade can fulfil the requirement of sample size in forming a reliable forecasting model. Since the objective of this study is to determine and compare the predictive power of different yield spreads, instead of considering many other variables which

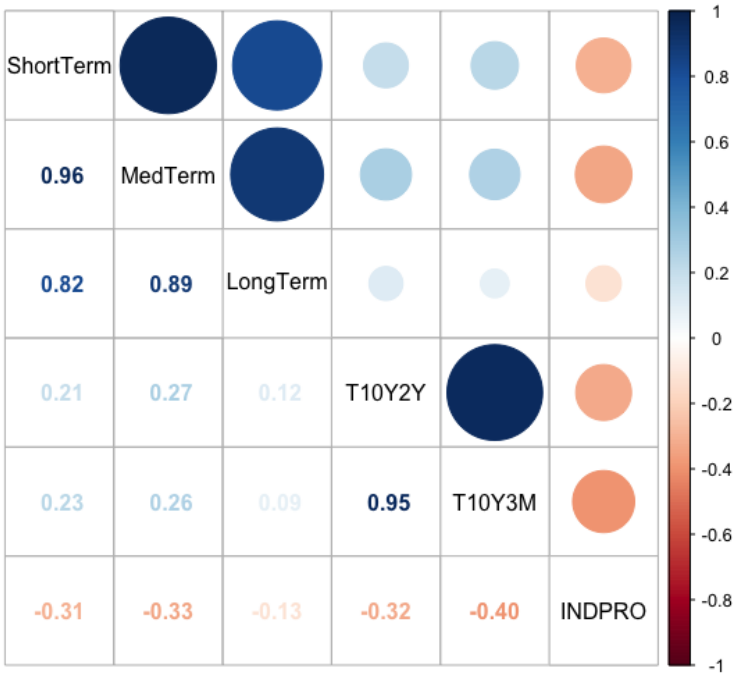
affect the economic activity, only the spread of different time periods has been considered as explanatory variables of the model.

Correlation

The figure 2.1 shows that all variables of interest are highly correlated with each other so for this study only variable or the spreads which are highly significant and mostly used in previous studies will be taken for further analysis.

Figure 2.1

Correlation Coefficients between Studied Variables



Stationarity

To check for the stationarity of the variables, augmented dicky fuller (ADF) test has been used and the results of the ADF test and the time series graphs of the variables show that the variables industrial production, 10Y-3M spread, and 10Y-2Y spread are non-stationary, while the short, medium, and long-term spread are stationary.

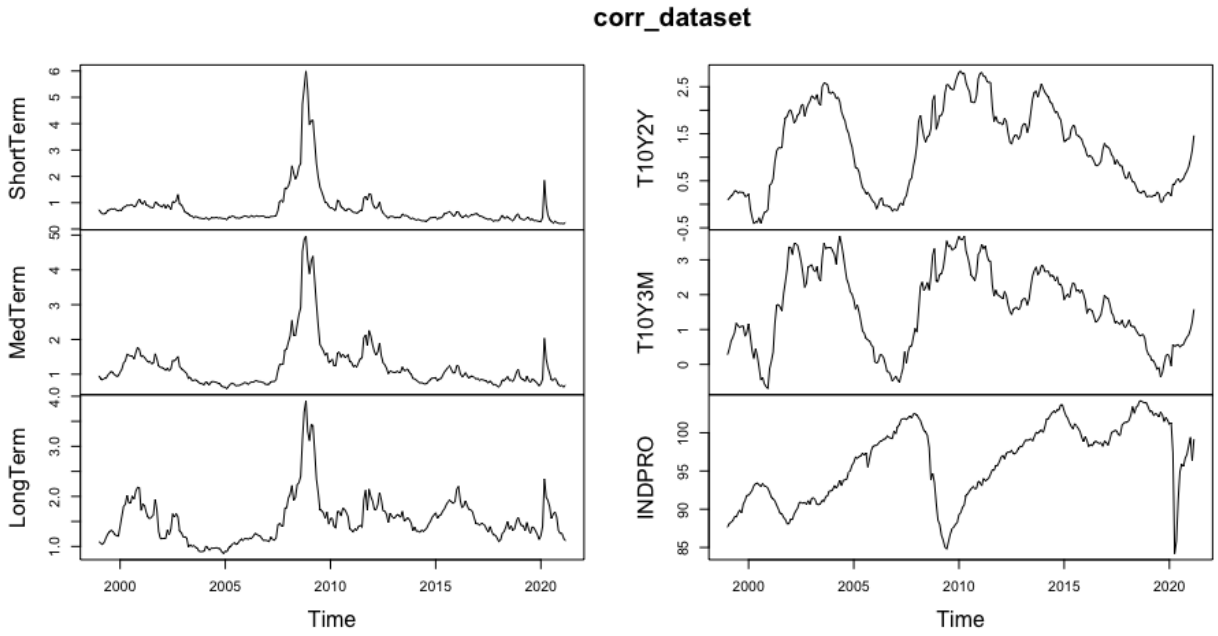
Table 2.1

ADF Test Results for Stationarity

Variables	Symbol	H_0	H_A	P-value	Conclusion
Industrial Production	INDPRO	Non-Stationary	Stationary	0.0929	Do not Reject Null Hypothesis (non-stationary)
Short Term Spread	ShortTerm	Non-Stationary	Stationary	0.03819	Reject Null Hypothesis (stationary)
Med Term Spread	MedTerm	Non-Stationary	Stationary	0.02869	Reject Null Hypothesis (stationary)
Long Term Spread	LongTerm	Non-Stationary	Stationary	0.04498	Reject Null Hypothesis (stationary)
10 Year 3 Month Treasury Bonds Spread	T10Y3M	Non-Stationary	Stationary	0.3374	Do not Reject Null Hypothesis (non-stationary)
10 Year 2 Year Treasury Bonds Spread	T10Y2Y	Non-Stationary	Stationary	0.3837	Do not Reject Null Hypothesis (non-stationary)

Figure 2.2

Time Series Graphs of the Studied Variables



To make the non-stationary variables stationary, the first difference of the variables has been taken and running the Augmented Dickey Fuller (ADF) test again shows that all the variables i.e., Industrial Production, Short Term Spread, Med Term Spread, Long Term Spread, Ten-Year Three-Month Treasury Bonds Spread, and Ten-Year Two-Year Treasury Bonds Spread have become stationary with rejecting null hypotheses for all variables and p-values less than 0.05. The results for Augmented Dickey Fuller (ADF) test are presented in the table 2.2.

Table 2.2

ADF Test Results for Stationarity after Taking First Difference

	Symbol	H_0	H_A	P-value	Conclusion
Industrial Production	DINDPRO	Non-Stationary	Stationary	< 0.01	Reject Null Hypothesis (stationary)
Short Term Spread	ShortTerm	Non-Stationary	Stationary	0.03819	Reject Null Hypothesis (stationary)
Med Term Spread	MedTerm	Non-Stationary	Stationary	0.02869	Reject Null Hypothesis (stationary)
Long Term Spread	LongTerm	Non-Stationary	Stationary	0.04498	Reject Null Hypothesis (stationary)
10 Year 3 Month Treasury Bonds Spread	DT10Y3M	Non-Stationary	Stationary	< 0.01	Reject Null Hypothesis (stationary)
10 Year 2 Year Treasury Bonds Spread	DT10Y2Y	Non-Stationary	Stationary	< 0.01	Reject Null Hypothesis (stationary)

The stationarity of the variables can also be observed from the figure 2.3 where all variables have a mean around zero.

Figure 2.3

Time Series Graphs of the Studied Variables after Taking First Difference

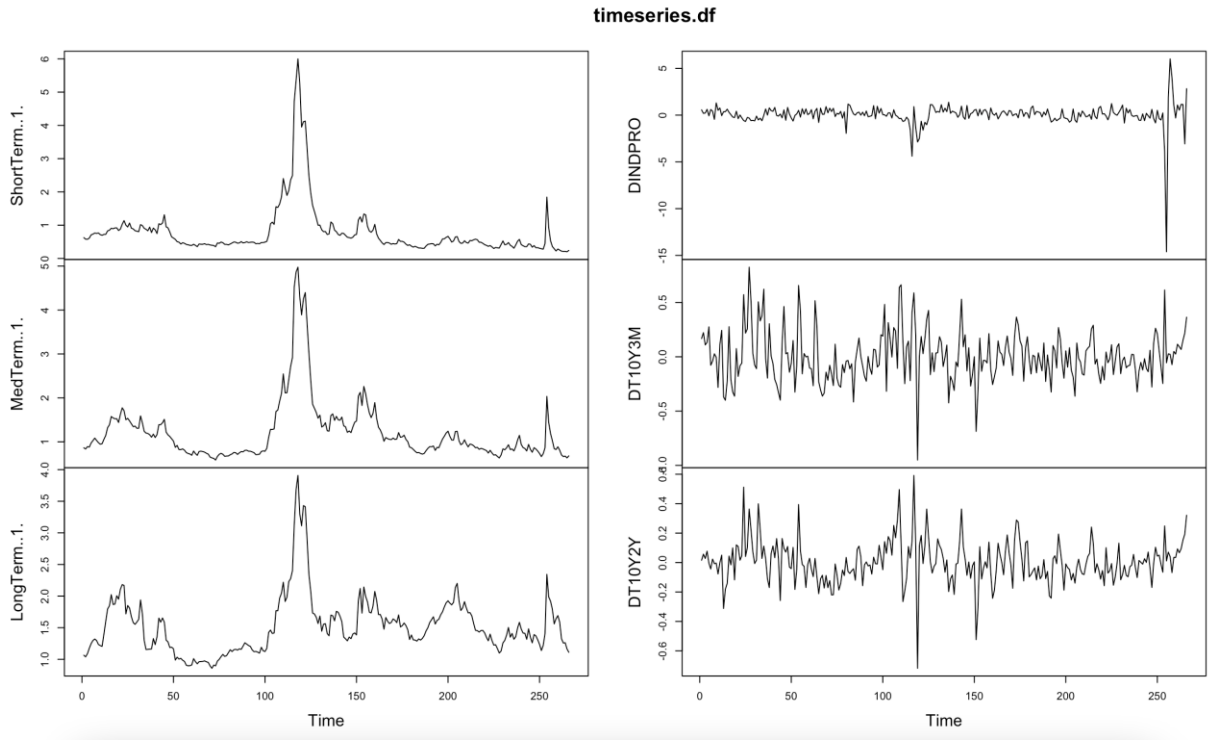


Figure 2.3. shows all the variables have mean around zero.

Chapter 3: Model Specification and Results:

The basic model used for this study is the simple linear regression model to predict the economic activity of the country. The next step is to run a series of regressions using industrial production as a dependent variable and spreads as independent variables and find out which spread has the better predictive ability to predict the economic activity.

Regression

Simple Linear Regression is used to see if one lag of the independent variable can explain the variation in the dependent variable. Given the nature of the spread, lag of the independent variables is used in the model. First, 5 separate regression models for each spread are run, and then regression models using the traditional spreads and the new spread are run.

The following equations of the simple linear regression are estimated using OLS estimates.

1. $DINDPRO_t = \beta_0 + \beta_1\ 10Y3M\ Spread_{t-1} + \varepsilon_t$
2. $DINDPRO_t = \beta_0 + \beta_1\ 10Y2YSpread_{t-1} + \varepsilon_t$
3. $DINDPRO_t = \beta_0 + \beta_1\ ShortTermSpread_{t-1} + \varepsilon_t$
4. $DINDPRO_t = \beta_0 + \beta_1\ MidTermSpread_{t-1} + \varepsilon_t$
5. $DINDPRO_t = \beta_0 + \beta_1\ LongTermSpread_{t-1} + \varepsilon_t$
6. $DINDPRO_t = \beta_0 + \beta_1\ 10Y3MSpread_{t-1} + \beta_2\ 10Y2YSpread_{t-1} + \varepsilon_t$
7. $DINDPRO_t = \beta_0 + \beta_1\ ShortTermSpread_{t-1} + \beta_2\ 10Y3MSpread_{t-1} + \beta_3\ 10Y2YSpread_{t-1} + \varepsilon_t$

Here, the dependent variable DINDPRO is used as an indicator of the economic performance as it shows month over month growth rate of industrial production, in this case economic growth.

Table 3.1

Estimates of the Models with DINIDPRO as the Response Variable and Spreads as the Control Variables

	Regression 1	Regression 2	Regression 3	Regression 4	Regression 5	Regression 6	Regression 7
10Y-3M	-0.283 (0.328)					-0.200 (0.506)	-0.245 (0.527)
10Y-2Y		-0.383 (0.524)				0.222 (0.812)	-0.077 (0.842)
Short term			-0.447 *** (0.092)			-0.446 *** (0.094)	
Med term				-0.483 *** (0.105)			
Long term					-0.747 *** (0.158)		
R Squared	0.003	0.002	0.081	0.074	0.078	0.082	0.003
Adj R Squared	-0.001	-0.002	0.078	0.071	0.075	0.071	-0.005
*** p < 0.001; ** p < 0.01; * p < 0.05							

Note. *** significant at 0.1 percent level.

From the results we can see that in simple regression lag of the explanatory variables explains the variation in our dependent variable (INDPRO). High-Quality Corporate bonds and Treasury bonds are different but have similar risk as High-Quality Corporate bonds like Treasury bonds are unlikely to default and are safe. The negative coefficient of the explanatory variables

suggests that as the independent variable (spread) increases, the dependent variable (DINDPRO) tends to decrease. As the spread becomes larger the risk is increasing and there are more chances of recession.

Auto Regressive Distributed Lag (ARDL) Model

It might also take effect in longer than one lag so we use ARDL which will look at many lags impact on dependent variable. Autoregressive Distributed Lag (ARDL) model allow for both interaction between short run and long run dynamics between the variables. ARDL model is a lot richer than just regressing first differences which is just short run or just regressing lags which is long run relationship.

The following equation of the ARDL model is estimated:

$$DIndPro_t = \beta_1 DIndPro_{t-1} + \alpha_1 ShortSpread_{t-1} + \alpha_2 ShortSpread_{t-3} + \alpha_3 ShortSpread_{t-6} + \alpha_4 ShortSpread_{t-9} + \alpha_5 10Y2Y_{t-1} + \alpha_6 10Y2Y_{t-3} + \alpha_7 10Y2Y_{t-6} + 810Y2Y_{t-9} + \varepsilon_t$$

Table 3.2

Results and Estimates of the Auto Regressive Distributed Lag Model

Coefficients:				
	Estimate	Std. Error	t value	Pr (> | t |)
(Intercept)	0.15568	0.12221	1.274	0.2039
L.1.INDPRO	0.12088	0.06805	1.776	0.0769 ·
L.1.10Y2Y	-0.60178	0.54014	-1.114	0.2663
L.3.10Y2Y	0.66691	0.55652	1.198	0.2319
L.6.10Y2Y	-0.67608	0.55503	-1.218	0.2243
L.9.10Y2Y	0.20604	0.55616	0.370	0.7113
L.1.ShortTerm	-0.53639	0.23386	-2.294	0.0227 *
L.3.ShortTerm	0.23589	0.28487	0.828	0.4084
L.6.ShortTerm	0.02310	0.23597	0.098	0.9221
L.9.ShortTerm	0.11955	0.17123	0.698	0.4857
Signif. Codes: 0 '***'; 0.001 '**'; 0.01 '*'; 0.05 '·'				

Note. * Significant at 1 percent level and · significant at 5 percent level

The summary show that the conventional predictor (DT10Y2Y) and its historical values (lags) cannot explain the variation in economic growth while our new explanatory variable (ShortTerm) is much significant and is much better than conventional one so it can replace the conventional spreads.

Auto Regressive Integrated Moving Average (ARIMA) Model

Next, we use Auto Regressive Integrated Moving Average (ARIMA) model to predict the impact of short term spread between Treasury bond and high-quality corporate bond on economic growth based on the past values. The table from ARDL model show that one lag is optimal so we can use one lag in ARIMA. In order to check for the order of AR and MA terms we check the Auto Correlation Function (ACF) and Partial Auto Correlation Function (PACF).

Figure 3.1

Auto Correlation Function

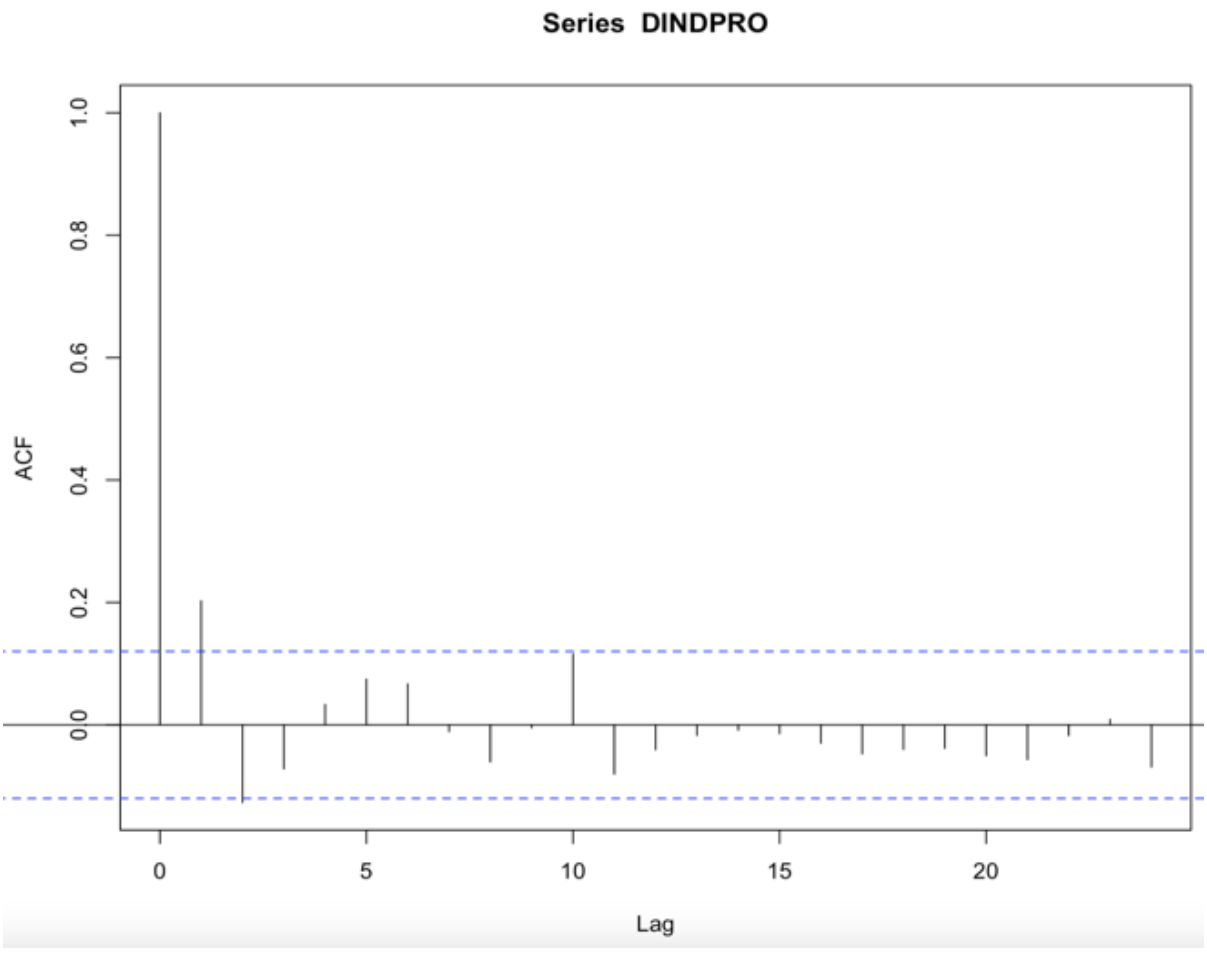
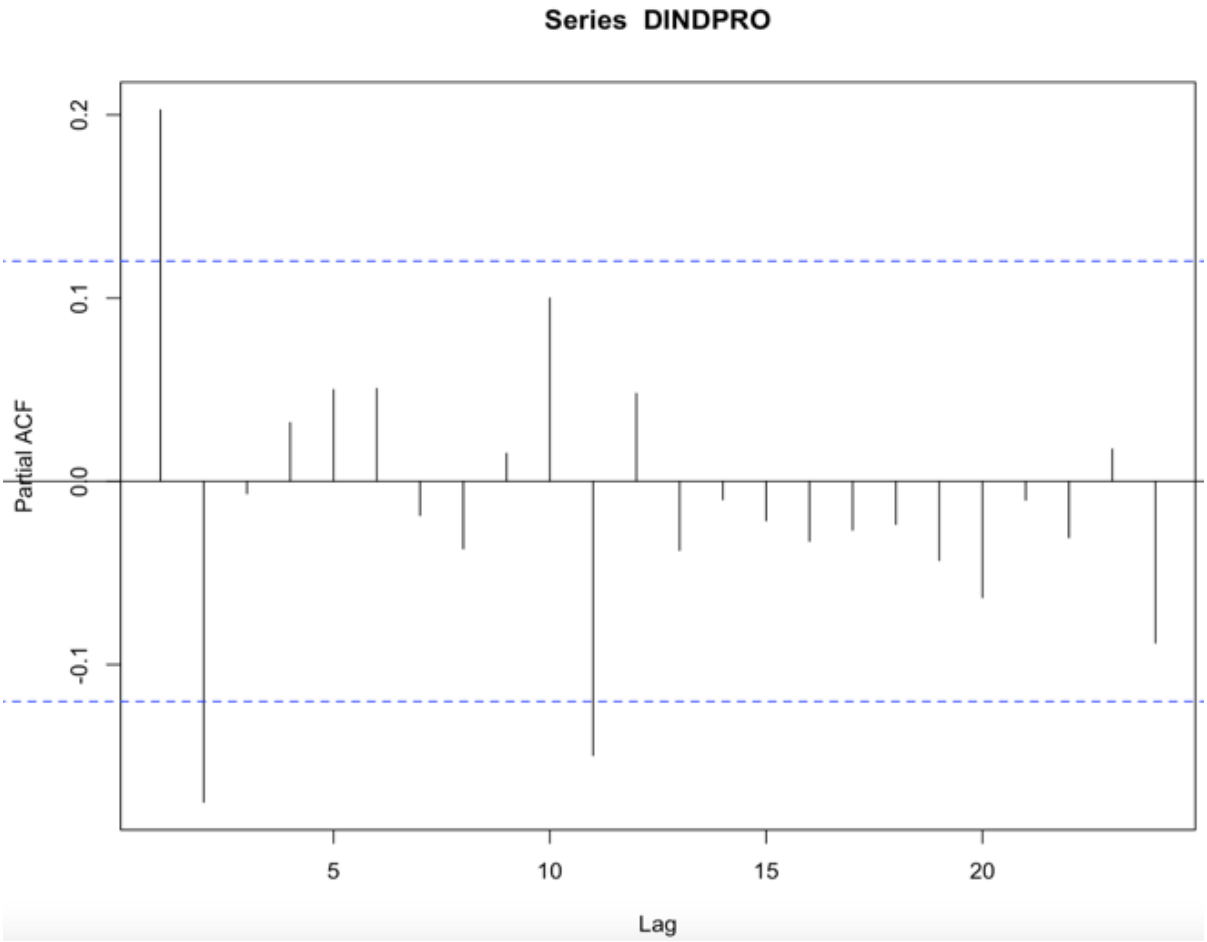


Figure 3.2

Partial Auto Correlation Function



In the above figures of ACF and PACF what we see is that we have lag one and lag two that are significant in the ACF, and we do not care about the higher order as we just consider that noise. In the PACF we also just have two significant lags so that means in this case it is difficult to say whether it is an MA, AR or ARMA but the ACF is more likely to be exponential decay and we have some kind of an oscillation and there are two lags which are significant in PACF so it is an AR(2) model.

The following tables provide output of estimating the AR(2) models:

Table 3.3

Results and Estimates of the Auto Regressive of Lag 2 for the traditional spreads

Model 1				
	Estimate	SE	t.value	p.value
AR1	0.2475	0.0634	3.9021	0.0001
AR2	-0.1890	0.0618	-3.0567	0.0025
Intercept	0.0495	0.0782	0.6332	0.5272
Lag_D10Y2Y	0.0953	0.8395	0.1135	0.9097
Lag_D10Y3M	-0.1068	0.5097	-0.2096	0.8342
RMSE	19.55245			

From the table above it is evident that the traditional spreads are not significant, therefore the second model to include the new spread of high-quality corporate bonds and treasury bonds is estimated and the output is shown in the next table.

Table 3.4

Results and Estimates of the Auto Regressive of Lag 2 for the Spreads between Treasury Bonds and High-Quality Corporate Bonds

Model 2				
	Estimate	SE	t.value	p.value
AR1	0.1825	0.0619	2.9472	0.0035
AR2	-0.2376	0.0612	-3.8838	0.0001
Intercept	0.3904	0.0954	4.0909	0.0001
Lag_Sterm	-0.4339*	0.0865	-5.0157	0.0000*
Lag_D10Y2Y	0.2469	0.7918	0.3118	0.7554
Lag_D10Y3M	-0.0762	0.4854	-0.1570	0.8754
RMSE	18.75983			

Note. * Significant at 1 percent level

We can see that the new spread is highly significant while the traditional spreads are not significant.

Analysis of Residuals

Figure 3.3

Analysis of the Residuals from Model 1

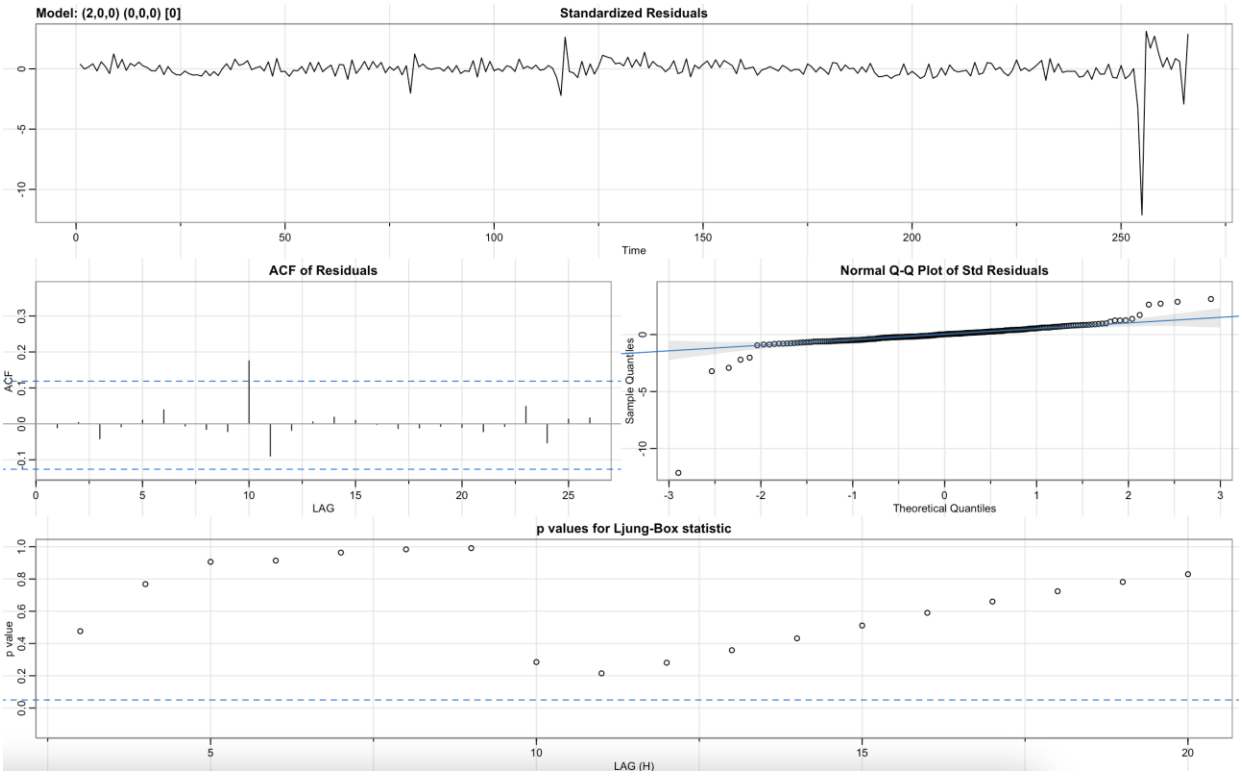
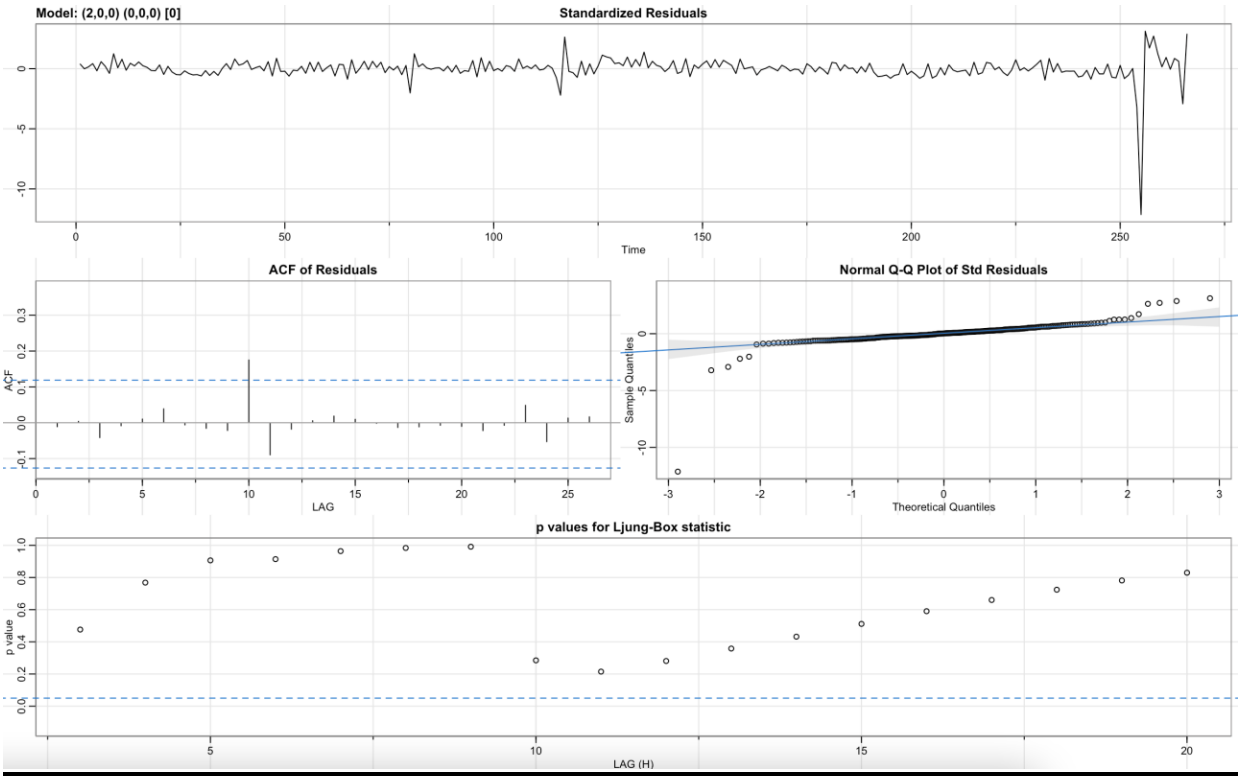


Figure 3.4

Analysis of the Residuals from Model 2



From the output of AR(2) models we get that standardized residuals which show the mean value of residuals, is around zero and very stable across the years except for the COVID19 period. Normal Q-Q Plot of Std Residuals show approximately a linear relationship. P values of Ljung-Box statistic are significant which means residuals are independent (no correlation) and this is what we want for the model to be correct.

The following graphs show the forecast for 12 months ahead.

Figure 3.5

Forecast of the Variable 12 Periods Ahead for Model 1

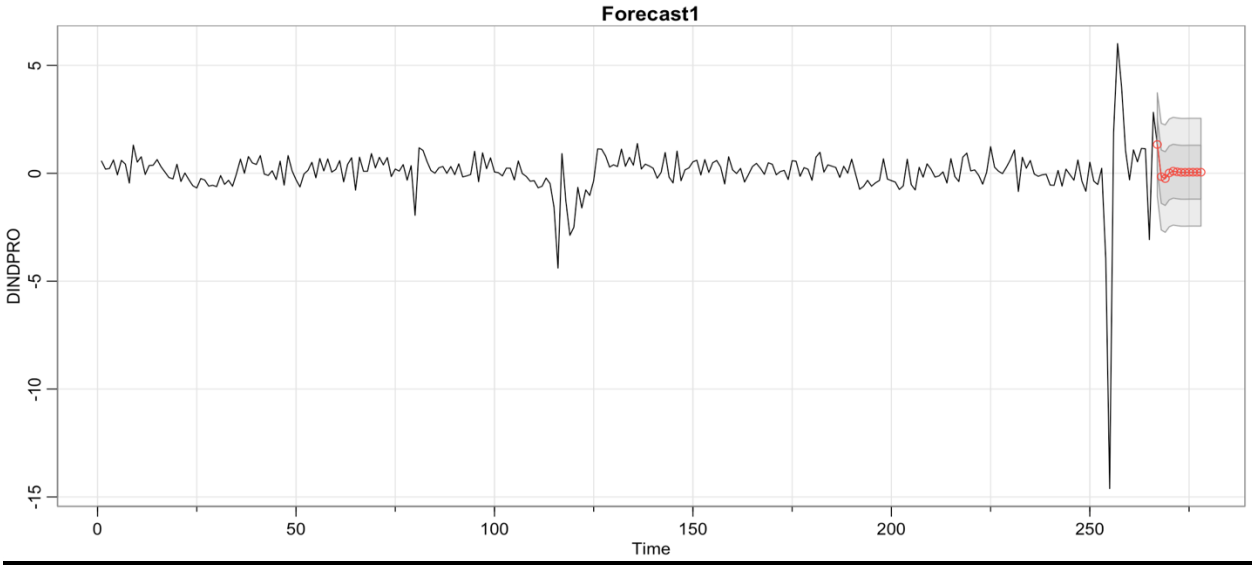
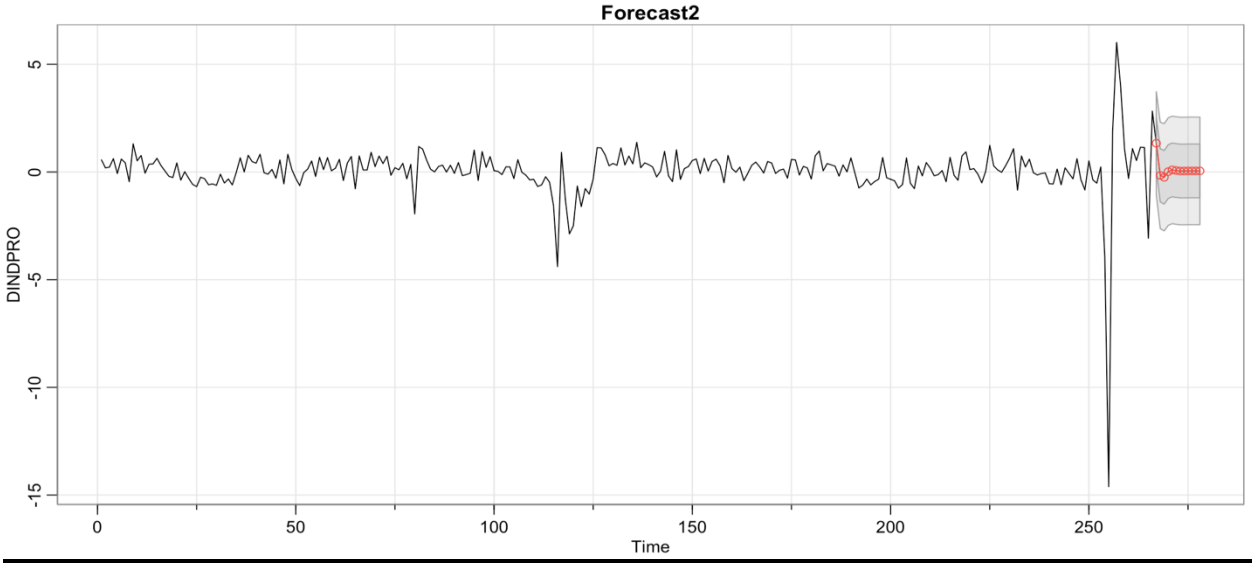


Figure 3.6

Forecast of the Variable 12 Periods Ahead for Model 2



From the plots below (Figure 3.7 and Figure 3.8) we can tell that both models do not seem too bad as predicted values and actual values are close to the diagonal line (perfect prediction where x=y).

Figure 3.7

Actual and Predicted Values of the Model 1 with 45-degree line

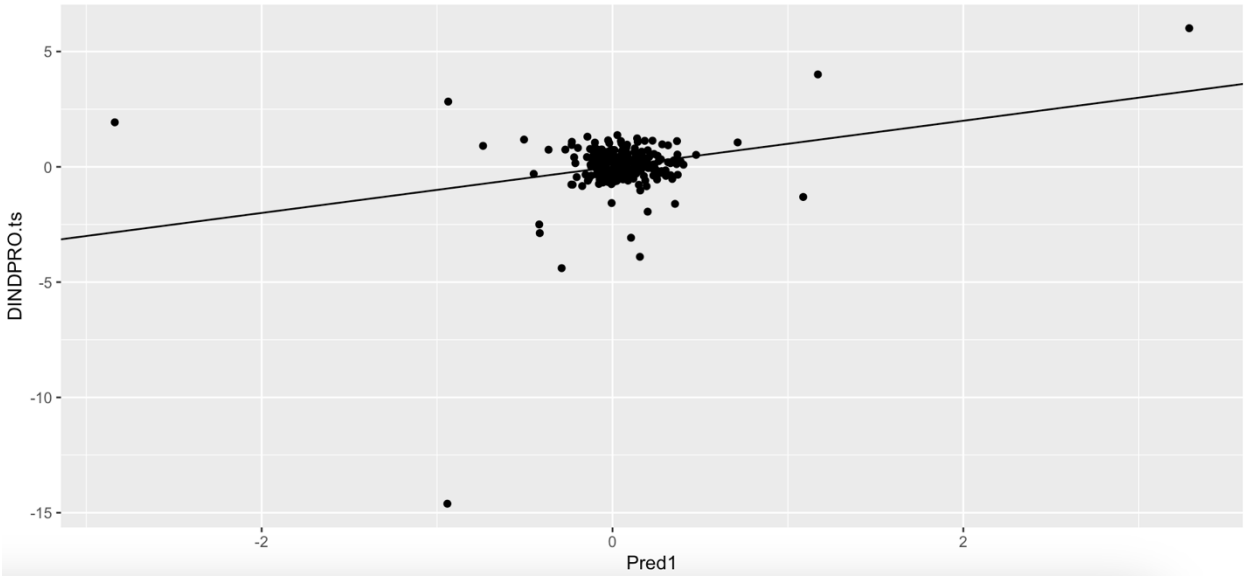
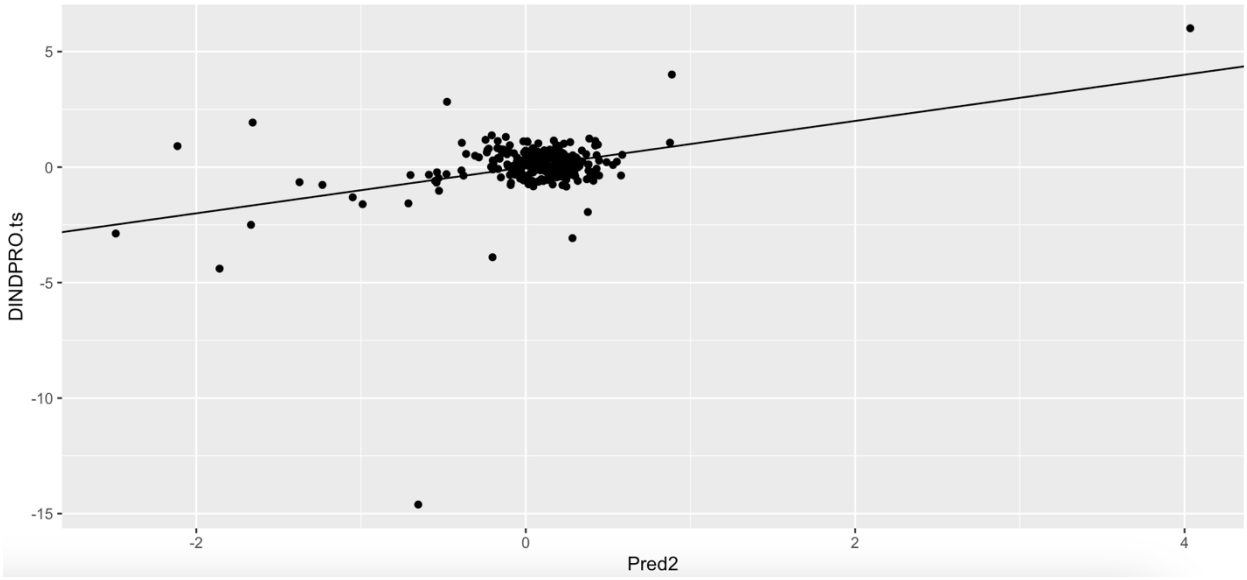


Figure 3.8

Actual and Predicted Values of the Model 2 with 45-degree line



The above results of actual values and predicted values can also be observed from the gain curves which indicate that the second model is better than the first or traditional method of yield curves indicating economic activity.

Figure 3.9

Gain Curve for Model 1

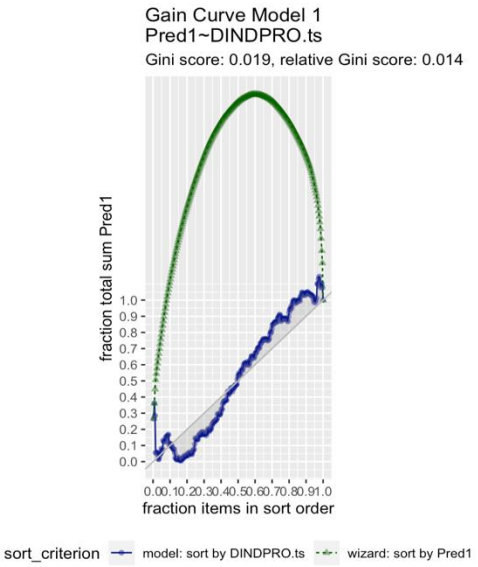
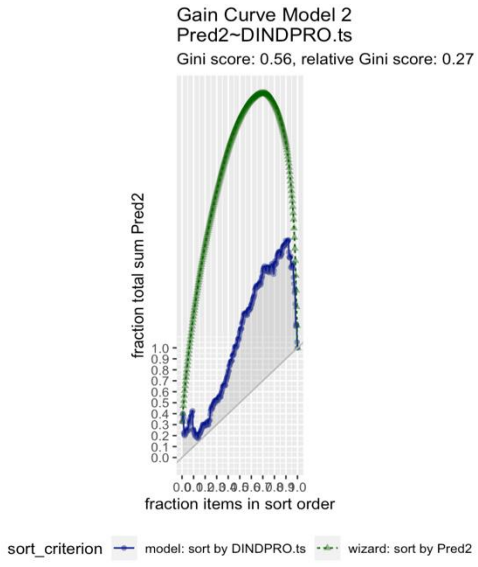


Figure 3.10

Gain Curve for Model 2



Chapter 4: Conclusion

The spread between Treasury bonds and high-quality corporate bonds is an important gauge for financial market. This spread indicate confidence in the economy especially corporate sector. Many investors use different tools to assess the economic condition of the country, they do not rely on a specific measure. By monitoring the spread between Treasury bonds and high-quality corporate bonds, investors and policymaker can obtain reliable information about the condition of the economy and the direction of the economy going forward. The spread between Treasury Bonds and High-Quality Corporate Bonds can play a role as a replacement to the traditional method of yield curve. Due to the flight to safety behavior of "spread between Treasury Bonds and High-Quality Corporate Bonds" the spread increases which better signals future economic condition or expectations for future economic conditions. This spread is not only affected by the expectations for future economic activity but also monetary policy of the government.

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