A Study of Relationship between Stock Market and Bond Market in the Indian Context

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Abstract

**Purpose:** The paper revisits the correlation between the stock and bond market. Theoretically, these two asset classes should have a negative correlation. However, there are times when the negative correlation does not hold, and the paper attempts to identify the macro/micro factors leading to this anomaly.

**Methodology:** The study would use secondary data from various websites (SEBI, NSE, BSE, FIMMDA) for the past two decades and employ various statistical tests - such as Pearson’s Correlation, Spearman’s Correlation and Regression Analysis to ascertain the extent of correlation between equities market and bond market in India.

**Findings:** The paper would validate the negative correlation and test the relationship during times of financial crisis - like the 2008 global melt-down and the ongoing COVID-19 pandemic.

**Implications:** The study would help develop a better understanding of equities and bond markets’ performance in different economic conditions - especially during black swan events like the present global pandemic.

**Originality:** The Study would also focus on events/situations when the traditionally accepted relationship between equity market and bond market transforms.

**Keywords**
Equities, Bonds, Correlation, Markets, Global Pandemic

1. Introduction

When it comes to investment, there are different asset classes available for worth acquiring. Some of them are Equities, Fixed Income Instruments, Commodities, Foreign Exchange, etc. There are some systematic risks associated with each asset class that cannot be avoided but can be mitigated by diversifying the portfolio. It is important to understand and quantify the correlation between these asset classes to mitigate these risks. The proportion of each asset class in the portfolio will change over time with changes in the economic factors to adhere to the investor’s risk appetite.

So, why look at the stock-bond correlation? As historical evidence suggests, the stock and bond correlation is negative. This negative correlation acts as a hedge when one market witnesses a sell-off. The other one will perform better. [1]

When it comes to financial markets, it is important to look, how fast the new information is reflected in the prices. Suppose one market is more efficient than the other. In that case, it will incorporate the information faster and would have predictive power over the other. Information incorporation also depends on the types of investors involved in each market. Institutional investors have better and faster access to information and can act quickly, making the information incorporation faster. Ancillaries to markets like research reports also have a significant role in determining the prices. The stock market’s equity research reports have a greater frequency of publishing and revision, which helps in faster information dissemination, which speeds up the incorporation. In contrast, that bond market is largely limited to the credit rating agencies, which have comparatively less frequency of revisions and publishing. These factors lead to information asymmetry in the markets, which affects the prices, which impacts the correlation between the markets.

The fair value mechanism is bringing into contact to value financial assets like equity & debt instruments. It consolidates future economic cash benefits at a given adjusted discounted factor. The adjusted discounted factor carries an identical influence on both stocks and bonds. However, there are other factors at play here.
Like the discount rate should be adjusted according to the risk profile of the instrument/market. As stocks carry more risk than bonds, they are discounted at a higher rate to justify additional market and business risk. Also, dividend streams from both instruments differ significantly. As bond yields are nominal, when an inflationary shock occurs, they are significantly impacted, while the price of a stock is less affected as dividends tend to increase because of such shock. At the same time, bonds will be impacted positively as the discount rate decreases, which increase the present value of the future inflows. Hence stocks and bonds should be negatively correlated because of the opposite impact of interest rates on both of them. [2]

The phenomenon "Flight to Quality” in the financial market validates consequences on prices of stocks and bonds. Another phenomenon is called “Flight from Quality,” during which the markets witness a shift to stock markets from the bond markets. Flight from quality generally takes place because of a crisis in the bond market. The table summarizes the “Flight to Quality” and “Flight from Quality” phenomenon:

<table>
<thead>
<tr>
<th>Phenomenon</th>
<th>Shift from</th>
<th>Indicating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock markets tumbling</td>
<td>from stocks to bonds</td>
<td>&quot;Flight to Quality.&quot;</td>
</tr>
<tr>
<td>Stock markets growing</td>
<td>from bonds to stocks</td>
<td>&quot;Flight from Quality.&quot;</td>
</tr>
<tr>
<td>Bond markets tumbling</td>
<td>from bonds to stocks</td>
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</tr>
<tr>
<td>Bond markets growing</td>
<td>from stocks to bonds</td>
<td>&quot;Flight to Quality.&quot;</td>
</tr>
</tbody>
</table>

2. Literature Review

Real interest rates are identified by John Y. Campbell, inflation and future expected earnings as variables to check the correlation between stocks and bonds' prices and considering monthly returns from 1952 to 1987 concluded that there is a small positive association between the stock and the bond market. [3]

In “The lead-lag relation between the stock and the bond markets suggests that the lead-lag relation is primarily due to the time taken to incorporate the new publicly available information in the prices. The time taken decides whether the relationship would be positive or negative. The lead-lag and positive-negative relation depend on the credit rating of the bond. Better rated bonds like Aaa are more efficient in incorporating the information as they attract more erudite institutional investors who have quicker access to pertinent information, enabling them to transact fast in the marketplace. The returns for safer bonds (Aaa) and lower bonds (Ca-D) lead to the stock market returns.

In contrast, bonds with other ratings have an inverse relationship. The paper also states that bond prices are sluggish to adjust than stock prices to varying default risk, which indicates that stock returns are earlier to predict defaults. Thus, bondholders might be at an advantage to protect their capital because of early signals. The results of the study depend on the overall creditworthiness of the bond portfolio examined.

“Assimilation between Bond Market and Stock Market” is analyzed by Dr. Roopali Patodaby, which data from January 2005 to December 2010 in the Indian context. Therefore, the paper analyzes the stock and bond market correlation during three periods: Pre-Recession, Recession, and Post-Recession. “S & P CNX Nifty Index” and “NSE Bond Index” are used for analysis. The data analysis tools used were “Correlation,” “Regression,” “T-test,” and “Durbin Watson test.” Here, the stock market was taken as the dependent variable and the bond market as the independent variable. The study found that the correlation between these markets is positive and significant during the pre-recession period. During the recession, the correlation became weak positive and insignificant; the post-recession period observed a weak negative correlation between the markets. The study also analyzed the R-Square values for these periods. The R-square value was highest during pre-recession and decreased during the recession and lowest during the post-recession period. The limitation of this study is of data points. As monthly data is analyzed, only 60 data points and wholesale debt market were considered, so the study does not extend to the retail and corporate debt market. [4]

In “Co-Movements of India’s Stock Market with Bond Market and Select Global Stock Markets” examines the association of Indian equities market the bond market along with the correlation of Indian markets and US, UK, and Japan's markets. Weekly prices
have been analyzed from 2007 to 2015, amounting to 570 data points. The paper concluded that there was a negative association between the Indian equities and the bond market. The correlation with other countries’ stock markets was positive and significant. Also, the correlation among developed countries was more than that with other countries, which means that the US and UK’s stock market was more closely correlated than the US and India.

"An examination of co-movements of India’s stock and government bond markets examines Bharat Kolluri by which the cointegration of Indian equity and bond markets along with the cointegration of Indian stock markets with other countries’ equity markets. Weekly closing data for indices and Indian 10-year G-sec from January 1997 to 2014 was taken for analysis. Unconditional correlation tests were used for analyzing the correlations. In contrast, for examining the relationship and impact of other equity markets on the Indian equity market, “Johansen’s multivariate and vicariate cointegration test” was used. The paper concludes that the Indian equities and bond markets share a common cointegrating vector and are related to each other in the long run. Also, a statistically inverse significant relationship is found among the Indian equities and bond markets. [5]

Analysis of the correlation between the Philippine equities and bond markets using the dynamic correlation model (DCC) in “Forecasting Time-Varying Correlation using the Dynamic Conditional Correlation (DCC) Model” is done by Mapa. The data is analyzed in two samples viz. January 2000 to December 2008 and January 2009 to December 2010, which helps understand the correlation during crisis times and that after the crisis. The correlation was positive during the crisis and remained so until the economic state was restored. During the normal period, it was found to be negative.

The Fed model is a popular model to measure the fair value of US markets. It links the stock market’s earnings yield with the yield of government bonds issued over a long term in “Fight the Fed Model: The Relationship between Stock Market Yields, Bond Market Yields, and Future Returns” discusses the problems with the fed model. One is it does not consider the effect of interest rates on the equities market. Clifford S. Asness (2002) indicated that the difference in volatility and instability among the stock and bond market, in the long run, is due to the causality and the difference between the equity and bond returns. [6]

Stock–bond correlations found that economic cycles and monetary policy changes substantially influence stock and bond prices and price trends given by Ilmanen. He observed that the equities market is likely to outperform the bond market during business-cycle expansions. The bond market tends to outperform the stock market during economic contractions. However, monetary policy easing has a constructive impact on both the markets. The stock market has a forward-looking nature, resulting in higher average returns during the end of a contraction. Hence late recession and initial expansion are better for the stock market. Bonds give maximum return during the middle of a contraction. Also, monetary policy tightening benefits the bonds, while it is detrimental for stocks. Inflation also has a major impact on the correlation. High inflation results in a positive correlation across all asset classes. Deflation results in increased equity risk premiums and decreased bond risk premiums which turn the correlation negative.

In “Equity-Bond Correlation: A Historical Perspective” analyzes the stock-bond correlation over approximately 140 years from 1870 to 2017. The correlation turned negative in the 1990s after almost 40 years of positive correlation. The author also argues that no economic theory or empirical model fully captures this correlation’s dynamic nature. [7]

“Why does the correlation between stock and bond returns vary over time?” analyzes the effect of inflation, future economic advancement expectations, and uncertainty in the stock market on the association between stock and bond markets at Magnus Andersson. The results show that a positive correlation is observed between stocks and bonds’ returns during high inflation expectations. In contrast, the correlation turns negative during low inflation expectations. The study also concluded that growth expectations had no impact on the correlation.

“Stock-bond co-movements and cross-country linkages” analyzes the stock and bond correlation for eight developed countries by Baur. The paper analyzes the correlation between equity markets, equity and bond markets, and bond markets of different nations. There is an inverse association between stock and bond correlation and correlation across different nations, i.e., during lower correlation value among the nations, the correlation between stocks and bonds is high and vice-versa. [8]

“Stock and Bond Relationships in Asia” compares the stock and bond markets of nine Asian countries by Johansson. He observes that both markets exhibit dif-
different patterns. The bond markets of all nine countries have positive means and lower returns than respective stock markets. The paper also analyzes the volatility. The observation is that the bond markets have less standard deviation and are less volatile than respective stock markets, which favors the generally held view of the stock market being riskier than the bond market. The paper concludes that the correlation between countries’ markets in the study is positive except during some small intervals. Also, correlation tends to increase during financial turmoil, which points to a probable decrease in asset diversification.

“Fiscal Deficits and Stock Prices in India: Empirical Evidence” discusses the impact of a country’s fiscal deficit and money supply on its stock market by Pooja Joshi. The study finds that fiscal deficit impacts the stock market in the long run, and short-term fluctuations in the deficit do not impact the stock markets. A budget deficit negatively impacts the stock market as investor confidence is lessened, impacting a firm’s capital-raising ability in the long run. An increased deficit comes with an increased tax burden in the future and increased interest rates leading to decreased profits for firms, decreasing the equity prices. Money supply impacts the stock market positively in the long as well as short term. The reason given behind this is that increased money supply leads to increased economic activity, which results in higher profitability for the companies. [9]

In “Active Monetary or Fiscal Policy and Stock-Bond Correlation” analyzes the impact of monetary and fiscal policy on the stock–bond correlation in the United States. The study outlines four structural shocks for an economy, namely “Permanent Neutral Technology (PT) shock,” “Marginal Efficiency of Investment (MEI) shock,” “Monetary Policy (MP) shock,” and “Fiscal Policy (FP) shock.” The correlation depends on which shocks are dominant during that period. The findings point out that PT shock drives the economy and positively during times of active monetary policy and passive fiscal policy. When the equation is reversed, MEI shock drives the economy, and the correlation turns negative. The study concludes that a positive monetary policy is seen as a driver of growth and boosts investor confidence.

While studying the previously published literature, it was observed that most of them did not distinguish between the stock and bond market relationship during normal times and during times of crisis. Also, most of the published literature either did not consider a longer period, or those who did, used weekly or monthly data. This paper tries to overcome some of these issues by selecting a longer period for review and considering daily data. [10]

3. Research Methodology:

Being the deductive nature of research work, we adopted various statistical analyses like correlation, the significance of various variables using regression analysis to analyze the stock and debt market’s behavior. Daily data from January 2000 is used for the analysis. The daily closing prices of BSE Sensex are taken for the stock market, and 10-year G-Sec daily average prices are taken. Sensex comprises 30 financially sound and well-established companies. It acts as a benchmark that represents the Indian stock market. Hence it is used in the study. 10-year government bonds act as a benchmark for the bond markets, and hence they are used to represent a bond market in general. [11]

The data is analyzed in different ranges to observe the relationship between the markets during normal economic conditions and during a financial crisis. The data is broken down into the following ranges:

Table 2 relationships between the markets during normal economic conditions

<table>
<thead>
<tr>
<th>Economic State</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>2000 to 2007</td>
</tr>
<tr>
<td>Crisis</td>
<td>2008 to 2009</td>
</tr>
<tr>
<td>Normal</td>
<td>2010 to Feb 2020</td>
</tr>
<tr>
<td>Crisis</td>
<td>Feb 2020 to June 2020</td>
</tr>
</tbody>
</table>

Pearson’s and Spearman’s correlation tests were performed on the data. It was found that the data for G-Sec was normally distributed. At the same time, Sensex does not follow a normal distribution. Owing to controversy over the effectiveness of the output given by Pearson’s correlation test when one variable is not normally distributed, Spearman’s test was also performed as it accepts not normally distributed variables. [12]

4. Results and Analysis

The graph shows the distribution of G-Sec interest rates. As observed, the data is normally distributed. Table 3 shows Correlations, Significance, and R-Square values.
As is evident from the above table, during normal times, the stock-bond correlation is negative. During the 2008 financial crisis, a weak positive correlation is observed among the markets under review. The strongest negative correlation was observed for the period after the financial crisis up to the period before the COVID-19 crisis affected the markets.

For regression analysis, Sensex was the independent variable, and G-sec was the dependent variable. The Adjusted R-Squared values show that both the variables are independent as the model assumed is not a good fit to predict the values of G-Sec. Table 4 shows correlations for the period under review. [13]
It was observed that as the correlation weakens, i.e., as it approaches zero, the significance or p-value starts increasing. In 2006 and 2015, the p-value saw a sharp increase as both the correlation values were near zero. In 2008, the p-value for Spearman’s correlation became 0.888, which was the highest ever recorded in the period under review. Figure 1 shows the correction pattern.

4.1. Hypothesis Testing

Null Hypothesis,

\[ H_0: \text{There is no significant correlation between the stock market and the bond market} \]

Alternate Hypothesis,

\[ H_1: \text{There is a significant correlation between the stock market and the bond market} \]

4.1.1. For the period – 2000-2008

From Table 1, it is clear that there is a very weak correlation between the markets. As the significance level (p-value) is greater than 0.05, the Null Hypothesis accepted no significant correlation between the two markets during this period.

4.1.2. For the period – 2008-2009

From Table 1, it is clear that there is a positive association between the markets. As the significance level (p-value) is less than 0.05, the Null Hypothesis is re-

Table 4
Correlations for the Period under Review

<table>
<thead>
<tr>
<th>Year</th>
<th>Pearson Correlation</th>
<th>Spearman’s Correlation</th>
<th>Year</th>
<th>Pearson Correlation</th>
<th>Spearman’s Correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>-0.57</td>
<td>-0.576</td>
<td>2013</td>
<td>0.433</td>
<td>0.412</td>
</tr>
<tr>
<td>2001</td>
<td>0.667</td>
<td>0.792</td>
<td>2014</td>
<td>-0.739</td>
<td>-0.801</td>
</tr>
<tr>
<td>2002</td>
<td>0.273</td>
<td>0.43</td>
<td>2015</td>
<td>0.051</td>
<td>0.032</td>
</tr>
<tr>
<td>2003</td>
<td>-0.859</td>
<td>-0.879</td>
<td>2016</td>
<td>-0.541</td>
<td>-0.661</td>
</tr>
<tr>
<td>2004</td>
<td>0.26</td>
<td>0.12</td>
<td>2017</td>
<td>0.363</td>
<td>0.332</td>
</tr>
<tr>
<td>2005</td>
<td>0.535</td>
<td>0.446</td>
<td>2018</td>
<td>0.402</td>
<td>0.38</td>
</tr>
<tr>
<td>2006</td>
<td>-0.073</td>
<td>0.059</td>
<td>2019</td>
<td>-0.488</td>
<td>-0.464</td>
</tr>
<tr>
<td>2007</td>
<td>-0.331</td>
<td>-0.492</td>
<td>2020</td>
<td>0.582</td>
<td>0.522</td>
</tr>
<tr>
<td>2008</td>
<td>0.261</td>
<td>-0.009</td>
<td>2016</td>
<td>-0.541</td>
<td>-0.661</td>
</tr>
<tr>
<td>2009</td>
<td>0.792</td>
<td>0.843</td>
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</tr>
<tr>
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<td>0.607</td>
<td>0.572</td>
<td>2018</td>
<td>0.402</td>
<td>0.38</td>
</tr>
<tr>
<td>2011</td>
<td>-0.577</td>
<td>-0.62</td>
<td>2019</td>
<td>-0.488</td>
<td>-0.464</td>
</tr>
<tr>
<td>2012</td>
<td>-0.526</td>
<td>-0.575</td>
<td>2020</td>
<td>0.582</td>
<td>0.522</td>
</tr>
</tbody>
</table>

Figure 1: Correlation Pattern
jected. Hence, there was a significant positive correlation between the two markets during this period.

4.1.3. For the period – 2010-February 2020
From Table 1, it is clear that there is a negative association between the markets. As the significance level (p-value) is less than 0.05, the Null Hypothesis is rejected. Hence, there was a significant negative correlation between the two markets during this period.

4.1.4. For the period - February 2020-June 2020
Table 1 shows that there is a negative association between markets. However, as the significance level for Pearson's correlation is greater than 0.05, hence we accept the null Hypothesis. However, the significance level for Spearman's correlation is less than 0.05, which leads us to reject the null Hypothesis. Due to the limitations on the applicability of Pearson's correlation viz. variables should be normally distributed, we consider Spearman's correlation and reject the null Hypothesis. Hence, there has been a significant negative correlation between the two markets during the pandemic period of February-June 2020.

4.1.5. For the entire study period – 2000-June 2020
From Table 1, it is clear that there is a negative association between the markets. As the significance level (p-value) is < 0.05, the Null Hypothesis is rejected. Hence, it is clear that there is a substantial negative correlation between the two markets. [14]

5. Discussion
The analysis clearly shows that the correlation between the stock and bond market fluctuates noticeably over time. As postulated in theory, there is a negative correlation between the stock and bond markets. However, this theory holds when the correlation is analyzed over a long period. In the study, we found that the nature of correlation during a crisis depends on the crisis type. In 2008, when the crisis was financial, the correlation turned positive. Many investors lost confidence in the markets, and bond yields also fell along with the stock markets. While from February 2020, we face a completely different type of crisis that has not emanated from financial markets, so we can see a clear negative correlation, as investors have become more risk-averse and are shifting to less risky assets; therefore, having observed this, it is important to identify the factors due to which the variation occurs. The factors are identified from the asset pricing theory, which indicates that an asset's value is equal to the present value of all the future cash flows from the asset, which are discounted at an appropriate rate. Similarly, the value of a bond is the sum of all future coupon payments and principal repayment discounted at a rate deduced by considering the market conditions. This rate called "Yield" can be categorized into real interest rates and reimbursement for the anticipated inflation over the bond's residual life. Yield also includes the term premium, which the investors expect for longer holding periods. Hence bond yields are determined by inflation and growth expectations. As yield is the discount rate to get the real value of a bond, we can conclude that bond prices negatively correlate with inflation and growth.[15]

The effect of inflation and growth expectations on stock prices is not quite clear. There may be no impact of rising inflation and growth expectations if the discount rates are equal to the expectations. However, studies have shown that increased inflation expectations harm stock prices. Apart from these factors, the association between the stock and bond markets is affected by changes in the equity risk premium and term premium of bonds.

Investors are likely to take lesser risks during financial turmoil, leading to a reallocation of funds from equities to safer asset classes like investment-grade bonds. This “Flight to Quality” can be construed as a decrease in the bond term premium and an increase in the equity risk premium.

Another factor affecting the correlation is the volatility inherent in each market. The stock market volatility is measured by an indicator called Volatility Index (VIX). It was observed that correlations have a predictive power to forecast VIX. As the correlation increases, the VIX also spread increases. Correlations can also predict potentially unstable swings in values of VIX.

As the bond under consideration is a government bond, we also have to consider its fiscal deficit. They are an important factor while issuing credit ratings that affect the bond yields and hence the stock-bond correlation. The fiscal deficit also affects the real interest rates, which directly impacts the correlation. Though fiscal deficit is not under the purview of this paper, previous studies show that lower fiscal deficits lead to positive correlations. It improves bond yields
and boosts investor confidence in the stock market because of a better economic outlook.

6. Conclusion

The previous literature either did not take a longer period under consideration or did not categorize the analysis based on the state of markets/economy. This paper attempts to overcome both these shortcomings by analyzing the data over two decades and categorizing it according to the economy/markets.

The analysis concludes that against the theoretical understanding of stock and bond, correlation is always negative. It is quite volatile and largely depends on the market sentiment. In theory, it is assumed that investors tend to shift funds to bonds from equities during market turmoil, as bonds carry lesser risk than equity, leading to a “Flight to Quality” phenomenon. However, during the 2008 financial crisis, the observation was that the investors did not shift funds from equities to the bond market. Even if they did, the volume/value was not sufficiently high to render the correlation negative, which could be the loss of confidence in the financial system as investment grade instruments were defaulting during that period. Hence, investors were fleeing from the stock market and the bond market simultaneously, due to which the stock indices and the bond yields also crashed, and a positive correlation was observed.

Compared to the 2008 crisis, the recent crisis is quite different when it comes to financial markets. As the ongoing crisis is due to factors external to financial markets, there is no confidence loss regarding the ability of markets. In India, the general assembly elections also have a deep impact on the financial markets. The elections were held in 2014 and 2019, during which there was a strong negative correlation. It can be attributed to the election decision being in line with market expectations. The market expected the economy to perform better under the NDA regime, leading to a shift from government securities investment to equities.

Overall, from 2000 to June 2020, the correlation was negative, which resonates with theoretical considerations. However, large swings were also observed in the correlation. The correlation was significant during some periods and insignificant during other periods.

We believe that this paper will help provide a better understanding of financial markets’ response to a crisis - depending on its type and help investors make an informed decision regarding their investments as they try to mitigate the risks.

7. Limitations:

While this paper tries to overcome some of the earlier studies’ gaps by selecting a longer period for review and considering daily data, it still has some limitations/gaps. As stated earlier, “Pearson’s correlation” has been used. However, due to the controversy around the distribution of variables used in the correlation test and the stock market not exhibiting normal distribution, the model is considered a limitation. Also, some advanced statistical tests can be used along with the tests used in this paper. Lastly, volatility is always inherent in all financial instruments. However, this study has not considered the effect of volatility on the correlation.

References:

sition for Long-Term Asset Returns. The Journal of Finance.


