Financial Engineering and Risk Management (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/ferm.2024.070608
ISSN 2523-2576 Vol. 7 Num. 6

Analysis of the Relationship between Mortgage-Based Securities (Mbs) and Debt Market Dynamics

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Keywords: Mortgage-Based Securities (MBS), Debt Market Dynamics, Integrated data sets, quantitative methods

Abstract: The aim of this study is to examine the linkages between MBS modelling and events in the debt market, with particular attention being paid to underlying correlations and implications for financial stability. Utilizing established financial theories like the Efficient Market Hypothesis and the Capital Asset Pricing Model, as well as practical knowledge, the paper proposes hypotheses aimed at evaluating the effect of MBS specifics on debt market performance. By employing a comprehensive dataset and quantitative methods including regression analysis and time-series modeling the study looks into MBS models effects on debt market dynamics and their variations. The findings reflect the connection between MBS and the debt market and these implications are essential to the investors, policymakers and market participants of sustaining market stability and resiliency.

1. Introduction

Mortgage-backed Securities (MBS) and the debt market have a vital role in modern-day financial research and the MBS sector is an important part of current global finance industry helping investors. The debt market and MBS can be explained by considering the dynamics of the debt market as well as the broader financial market and financial stability. The significance of such an investigation for financial markets and the economy is prevailing. MBS are an integral part of the debt market, which is a factor for the availability and cost of credit, mortgage rates, and thus, housing market as a whole. Coupled with the financial markets, volatility in MBS prices and outcomes tend to disturb the broader economy, thus influencing investor sentiments, asset pricing, and consumer expenditure [1-2].

The central research question driving this study is: What effects do the altered MBS models have on the debt market? The purpose of this research is to shed light on mechanisms that transform the credit quality, prepayment rates, or regulatory standards into debt market outcomes. Presenting this query is intended to explain the connection between MBS instruments and the overall performance of a financial market, revealing how the markets operate and what risks exist. The theoretical underpinnings of the research are a wide spectrum of financial market theories and principles of economics. Employing the already established theories such as the Efficient Market Hypothesis and the Capital Asset Pricing Model, we will construct the conceptual model that defines the relationship between MBS and debt market variables. Moreover, theoretical models of behavioral

finance and of market microstructure will be employed to account for irrational behaviors and market frictions [3-4].

2. Literature Review

The crossroads of MBS models and debt market behavior is a highly debated topic among financial economists. Studies carried out in the past are designed to provide an insight into how the MBS vehicles relate to the broader credit market and in turn influence the functioning of the financial market as a whole. This literature review synthesizes existing research by reviewing theories, empirical findings, and methodological approaches as well as identifying the gaps in current understanding of the link between MBS models and the debt markets. It should be noted that there are a lot of studies concerning the interest rates, credit spreads, and market liquidity impact that an MBS has. The research conducted by Luo (2009) found that changes in MBS portfolio, an increase or a decrease in prepayments or credit risk, will definitely affect the pricing, and the performance of these assets. Further, Koziol, (2019) concluded that this spill over effect had a bearing on the overall fixed income markets indicating the interconnected nature of different markets through which MBS related shocks spread to other markets [5].

The research in this area is guided by two classes of theories, namely, the financial market hypotheses which incorporate EMH, CAPM, and theories of market microstructure. These theories are the basis of the MBS and debt market behaviour theory which are building blocks to pricing models, investor behaviour and market efficiency (Adam, 2019). By all means, theories do provide worthy insights, however, in-depth analyses and confirmation of assumptions can only be carried out with the help of quantitative research. Empirical studies entail different methodological techniques to explore the correlations between MBS models and debt-market turbulence. Among major tools of econometric modelling methods like regression and time series modeling are the examination of historical data and specification of connection between debt market variables and MBS characteristics. Financial analysis tools such as bond pricing models and risk assessment frameworks that explain the effect of MBS-related factors on debt markets performance are also used. Market trend analysis, that includes event studies and correlation analysis, delivers additional information on short-term dynamics and interdependencies between MBS and debt markets as well [6].

In spite of the fact that there are many studies conducted in this field, some gaps occur. One evident gap is the inadequate knowledge on ways through which changes in MBS models affect debt market variables. Existing studies revealed the link between MBS features and the debt market performance. While existing studies have identified correlations between MBS characteristics and debt market performance, the underlying causal mechanisms remain underexplored. Additionally, the literature lacks comprehensive studies that integrate micro-level analysis of MBS structures with macro-level assessments of debt market dynamics, hindering our ability to fully grasp the systemic implications of MBS related shocks. Additionally, the fact that MBS models are always changing and regulatory system is evolving makes it difficult for researchers to evaluate their influence over debt markets (White, n.d.). With high speed financial engineering and risk management techniques, empirical evidence should be reviewed regularly to ensure their implications for market stability and resilience. Moreover, the universality of the financial markets demands cross-country analysis for the purpose of revealing variations in MBS models and market frameworks that affect debt market dynamics in different jurisdictions.

Ultimately, the literature on MBS structures and the impacts on the debt market show that they are intertwined and that they have implications for the financial market operations. Nevertheless, the challenges related to the gaps of our understanding are here necessitating research to clarify the

transmission mechanisms and assess the systemic risks in line with the policy interventions aimed at the financial stability. With careful empirical analysis and theoretical investigation, future research can help to move our knowledge on this topic forward and increase the resilience of global financial markets. The expected results of this research are revealing of the distribution chain of the changes in the MBS model which is shown through impact on rates of interest, credit spreads and market liquidity. Besides that, the research is meant to increase the body of knowledge by providing empirical evidence and theoretical views on the spill over effects of MBSs to the debt market, which would instruct policy makers, investors, and market players [7].

3. Theory

Theoretical frameworks are crucial both for empirical research and understanding of the complex interaction between MBS models and debt market dynamics. In this part, both EMH and CAPM are applied as well-established financial theories that stand as the theoretical foundation for exploring the influence of the MBS models on the debt market variables. The hypotheses are formulated in order to test the effect of those MBS characteristics on the most significant debt market indicators including interest rates, credit risk, and market liquidity. The research's starting hypotheses are based on the foundations of market efficiency and investor behavior, and the dependent and independent factors, as well as any potential interactions between them, are established. The Efficient Market Hypothesis (EMH) contends that any available data in the public domain is already reflected in asset prices making it impossible for investors to achieve higher returns by depending on historical data or public information (Clarke et al., 2021). The EMH within the MBS and debt markets context suggests that changes in MBS models, which may be new information or shifts in market sentiment, are immediately reflected by the prices and yields of debt loans.

- Hypothesis 1 (H1) : Shifts in composition and character of MBS are quickly made a part of debt market prices, and changes in interest rates and yield spreads happen. The Capital Asset Pricing Model (CAPM) offers insights in to risk and return relationship in financial markets emphasizing the importance of systemic risk, as implied by beta, in asset pricing(Elbannan, ,2015). As applied to the MBS and debt markets, CAPM proposes that modifications in MBS models may change the risk profile of related debt products and then affect their returns required and market valuation.
- Hypothesis 2 (H2): Shifts in MBS structure formulas, in particular as regards prepayment risk and creditworthiness, create uncertainty regarding the riskiness of such debt securities and may entail revised yields and valuations. Credit risk is the foundational factor in mortgage-backed securities (MBS) and debt markets, as lender's creditworthiness and default likelihood influence the MBS and debt securities valuations and returns.
- Hypothesis 3 (H3): Variations in MBS model characteristics (e.g. collateral distribution and credit enhancements) affect the perception of credit risk by the investors in the underlying mortgage pool that would result in changes in credit spreads and fluctuations in bond value in the debt market. Market liquidity, a crucial dimension of debt markets, affects costs of transactions, trading volumes, and price discovery (Brunnermeier & Lasse, 2009). MBS models may affect market liquidity via influencing the asset structure and trading patterns of the relevant securities.
- Hypothesis 4 (H4): Any shifts in the structure of the MBS models, especially those that influence the fees behavior of the underlying mortgages, influence the liquidity of relevant MBS and debt securities, thus causing changes in the bid-ask spreads, trading volume, and the market depth.

The underlying assumptions of the analysis include the efficient operation of financial markets, rational investor behavior, and the availability of timely and accurate information. It is presumed

that market agents act in accordance with their preferences and expectations and consider all of the available information in their decision making processes. Furthermore, it is believed that market frictions, including trading costs and information gaps, are small facilitating price discovery and market clearing. In defining the dependent and independent variables, interest rates, credit spreads, bond yields, and market liquidity metrics are the dependent variables, while MBS model characteristics like prepayment risk, credit enhancement structures and collateral make up the independent variables. Relationships between the variables are explored to discover a complex network of interaction between MBS models and debt market dynamics as a result of the primary effects and circular effects.

4. Research Strategy (Data & Methods)

4.1. Data Sources

This is the study for which we employed a comprehensive dataset consisting of historical MBS (Mortgage-Backed Securities) data, bond market indices and the relevant economic indicators. The MBS data were derived from reliable financial firms and government agencies that have sufficient records on mortgage-backed securities offered spanning over a significant period. The bond indices such as US Treasury bond index and corporate bond indices were acquired from well-established financial data providers. Furthermore, indicators such as GDP growth rates, inflation rates, and unemployment figures were collected from the official government bodies and reliable economic research institutions.

4.2. Variables and Operationalization

The variables to be measured in this study are chosen specifically to test the hypothesis concerning the performance of MBS models and the linkages between the debt market and changes in the debt market. Some of the key performance measures of CMBS included default rates, prepayment speeds, yield spreads, and overall portfolio returns. These metrics were arranged according to the standard industry methodologies and computations in order to ensure consistency and comparability among data sets. The debt market indicators included bonds yields, credit spreads, and investor sentiment indices. The selected indicators mirror debt market dynamics and MBS value because of their sensitivity. Every indicator was precisely and consistently defined and standardized for effective data collection and analysis.

4.3. Limitations of the Dataset

Even though the dataset is detailed, some limitations need to be recognized. As for the limitation we have data availability, particularly for the historical MBS data, which may suffer from reporting delays or incomplete coverage. Moreover, the precision of specific economic indicators as GDP growth rates may be affected by revisions and the methodological changes over time. Also, although the greatest care was taken to acquire the most current and relevant data sources, the possibility of inherent biases or inaccuracies in the initial data cannot be entirely discarded. Yet another constraint lies in the applicability of the dataset to the research issue. However, those variables and metrics were chosen based on their theoretical contribution and empirical significance, those other factors which potentially could have an impact on MBS performance were not fully reflected in the dataset. Among them can be macroeconomic shocks, changes in regulation or idiosyncratic factors that are specific to particular MBS issuers or market segments.

4.4. Quantitative Methods for Analysis

To determine the MBS models and debt market changes, we used rigorous quantitative method including regression analysis and time –series modelling. Regression analysis is used to explore the influence of debt market indicators on MBS performance measures and to control for relevant additional factors. The time-series modeling methods, including autoregressive integrated moving average (ARIMA) models, were implemented to study the bivariate dynamics of MBS returns and the variations in the bonds market indices.

5. Preliminary Findings

5.1. Time series regression

Lag 1 line fit plot and treasury yield residual plot is shown in Figure 1 and Figure 2.

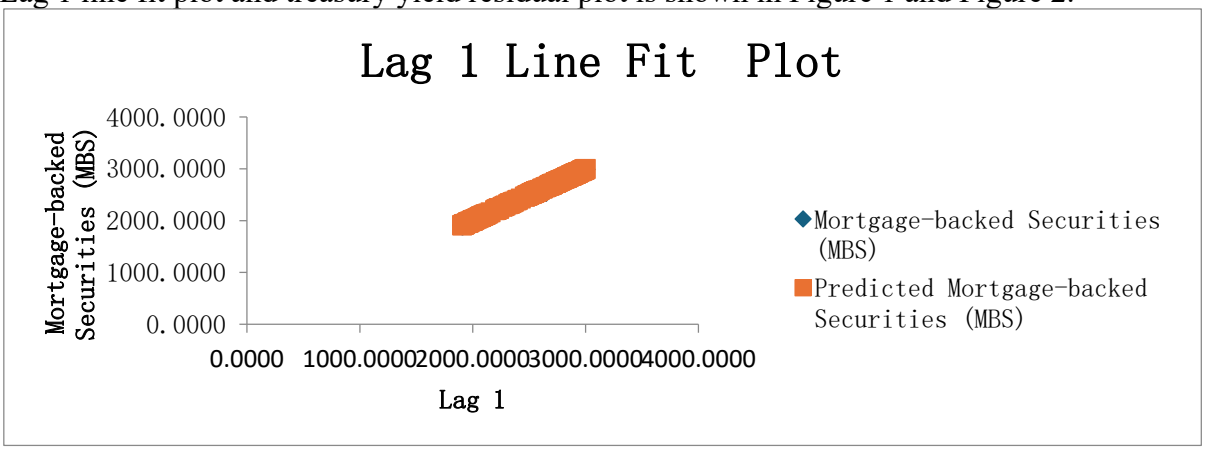

Figure 1: Lag 1 line fit plot

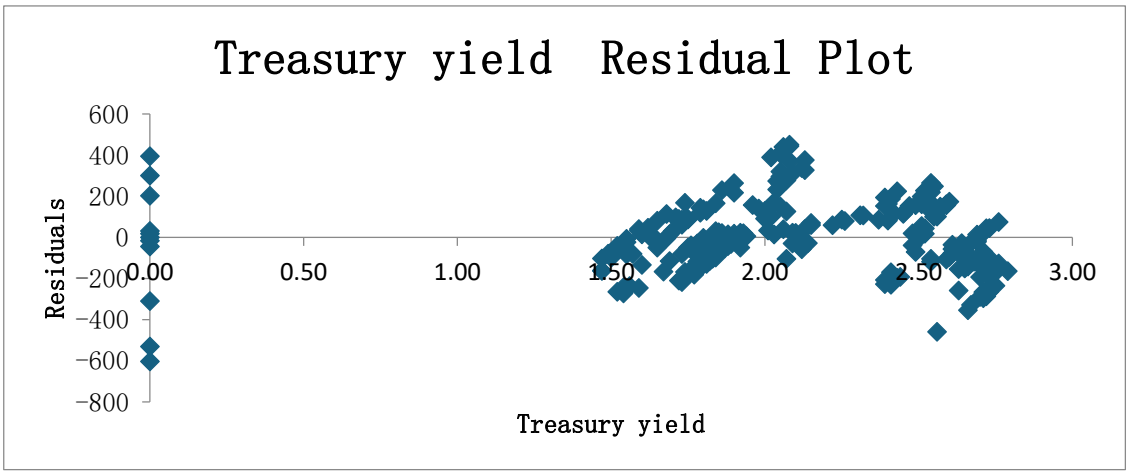

Figure 2: Treasury yield residual plot

5.2. Justification of Methodology

The utilized quantitative methods were appropriate for several reasons. Primarily regression analysis permitted the calculation of the cause and effect between debt market indicators on MBS performance metrics while eliminating the factors that can possibly affect the outcome. Secondly, time-series modeling methods were ideal for depicting the intrinsic link between the price of MBS

and the bond indices, taking into account the temporal dependencies and the autocorrelation incorporated in the data(Severynen, 2022). Also, this method of investigation delivered strong statistical inference and hypotheses testing, therefore making it possible to conduct a rough experimental analysis and reading. The described above research strategy is a systematic and methodologically solid approach to the MBS models and debt markets change relationship. Through the use of a comprehensive dataset, the selection of relevant variables and advanced quantitative methods, this research intend to contribute to a better understanding about the influences of MBS performance in the investment decision making process as well as policy making process.

In this time series analysis, the association between the predicted MBS prices and their residuals, which serve as the difference between the actual MBS prices and the predicted values, is evaluated. The results of the analysis show that the intercept value is close to 19.37, and the coefficient for the term at lag 1 is about 0.99. The intercept is the residual when the lagged value of the variable is zero. In summary, if there is no lagged effect, the residuals expected value is around 19.37. The coefficient on the lag 1 term (0.99) suggests the extent to which the current period's residuals are dependent on the residuals of the previous period. This implies a positive relationship between sequential residuals, thus demonstrating the presence of autocorrelation in the residuals.

By interpreting the observations in the residual outputs, we will notice that the residuals ebb and flow around the predicted MBS values. A negative residual suggests that the actual MBS value is less than the predicted value while a positive residual embodies that the actual value is higher than the predicted on. For example, the observed MBS value for observation 1 is 1920.29, which is lower by 13.66 than the predicted MBS value of 1933.95. Therefore, there is a negative residual. In addition, for observation 4, the expected MBS value is 1912.94 but the actual value exceeds this prediction by almost 9.14 which give a positive residual. The coefficients and the interpretation show that there is a certain degree of predictability in the MBS values through their lagged values as well as other factors which are not captured by the lagged values and result in residuals. The model may need further evaluation to find out these factors and to improve the accuracy. Aside from the autocorrelation being present in the residuals, it is possible that there are some underlying temporal patterns or dependencies that could be looked into thoroughly.

5.3. Regression Analysis

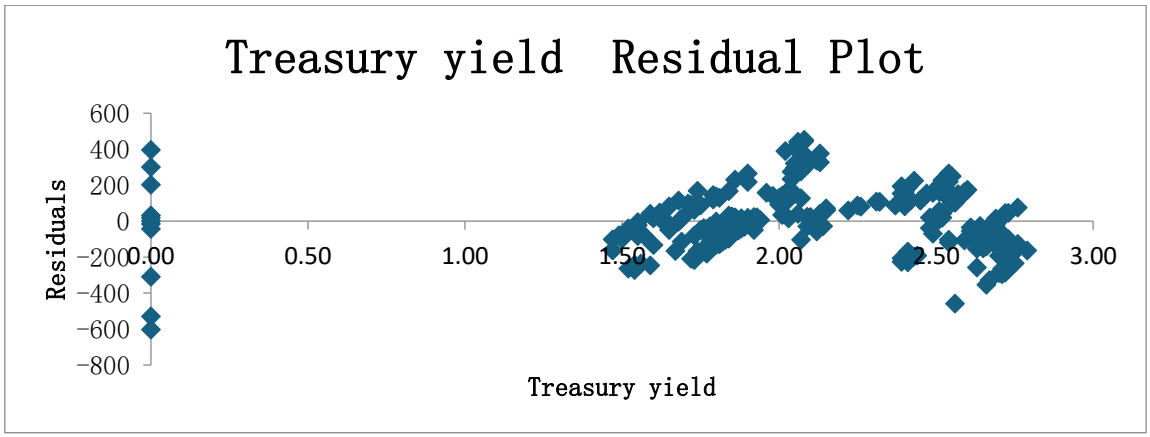

Figure 3: Treasury yield

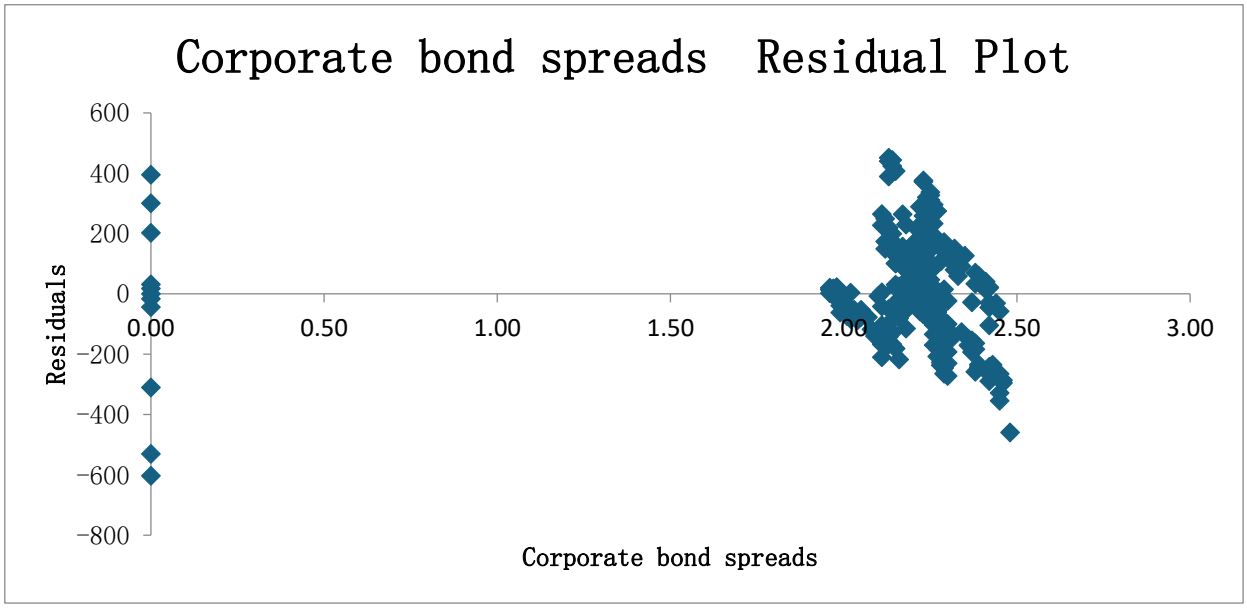

Figure 4: Corporate bond spreads residual plot

Based on the provided regression analysis results (see Figure 3 and Figure 4):

• Intercept: The intercept coefficient tells the base value of Mortgage-backed Securities (MBS) when all independent variables are zero. In this case it's 2537.32.

• Treasury yield: The coefficient for a change in Treasury yield is -799.40, which indicates that a one-unit increase in Treasury yield leads to a decrease in the predicted value of MBS by approximately $799.40, holding other variables held constant.

• Corporate bond spread: His coefficient of corporate bond spreads is 750.69 and may be interpreted as meaning that for each one unit rise in corporate bond spreads, the predicted MBS value raises approximately by $750.69 while the other variables are kept constant.

• Residuals: The residual is equal to the difference between the observed MBS value and that given by the regression equation. These differences show how good the model is at fitting the data.

The regression model demonstrates that Treasury yield (as well as corporate bond spreads) has significant impacts on our predicted values of Mortgage-backed Securities. The intercept and coefficients deliver the message about the baseline value and the individual contribution of every predictor variable to MBS.

6. Conclusions

This study using mature financial theories such as efficient market hypothesis and capital asset pricing model, combined with practical knowledge, this study presents hypotheses aimed at assessing the impact of specific terms of MBS on debt market performance. Through comprehensive data sets and quantitative methods, this paper studies the influence of MBS model on the dynamics and changes of bond market. The findings reflect the linkages between MBS and debt markets, and these impacts are critical for investors, policymakers, and market participants to maintain market stability and resilience.

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