

The Influence of Liquidity on Bond Credit Ratings: Evidence from The Indonesian Corporate Bond Market

Firly Armanda* & Buddi Wibowo^b

Faculty of Economics and Business, Universitas Indonesia, Salemba, Jakarta 10430, Indonesia

Abstract

This study examines the effectiveness of various liquidity proxies in distinguishing between Investment Grade (IG) and High Yield (HY) bonds within the Indonesian corporate bond market. Utilizing logistic regression models across a dataset of 30,738 observations for IG bonds and 176 observations for HY bonds, we evaluated the impact of six liquidity proxies: Range Measure (RG), Hui Heubel ratio (HH), Market Share (MS), Interquartile Range (IR), Imputed Roundtrip Cost (IRC), and Trading Volume (TV). The findings reveal that the Imputed Roundtrip Cost (IRC) is the most reliable indicator of liquidity, demonstrating a significant negative relationship with the likelihood of a bond being classified as IG. This suggests that higher IRC values, which represent higher transaction costs, are associated with lower liquidity. In contrast, the other proxies, including the Hui Heubel ratio, did not show consistent or significant impacts in line with the hypotheses. The study concludes that IRC is the best measure for assessing liquidity in the Indonesian corporate bond market.

Keywords: Liquidity, Corporate Bonds, Liquidity Proxies.

Received: 27 February 2024

Revised: 30 May 2024

Accepted: 22 June 2024

1. Introduction

The corporate bond market in Indonesia has experienced rapid growth (Haikal et al., 2018), becoming a vital component of the national financial market. This growth is driven by a stable economy, offering financing alternatives for companies and investment opportunities for investors. Bank Indonesia, the Ministry of Finance, and the Financial Services Authority (OJK) are striving to enhance market liquidity, crucial for investment decisions and financing strategies. High market liquidity facilitates transactions, reduces costs, and enhances efficiency (Puspaputri, 2015). However, measuring liquidity faces challenges due to decentralized bond trading and data transaction shortages. Liquidity is a crucial factor in determining the pricing of securities, referring to the ease of buying or selling assets in the market without significantly impacting prices (Amihud & Mendelson, 1991; Díaz & Escribano, 2017). A liquid bond market is attractive to investors as it provides high transaction flexibility, facilitating bond purchases or sales without being tied to specific time frames. Liquidity plays a vital role in bond pricing as an active market facilitates transactions and enhances opportunities to exploit market conditions (Dittmar & Yuan, 2008). However, liquidity is an abstract and complex concept (Díaz & Escribano, 2022), challenging to measure due to decentralized bond trading and the lack of intraday data availability.

Indonesia Corporate Bonds must have credit ratings to indicate their credit risk. There are two main categories are Investment-grade or IG Bonds (including AAA, AA, A, BBB ratings) and non-investment-grade or HY Bonds (comprising BB, B, CCC, and D ratings) are distinguished (Dick-Nielsen et al., 2012). Investment-grade bonds are considered sound investment options as the issuing companies are deemed capable of servicing interest and principal payments and have better liquidity in the bond market (Febriani, 2017; Friewald et al., 2011). Conversely, non-investment-grade bonds exhibit high liquidity costs with low credit quality (Lesmond et al., 2011). In this research, we empirically explored the relationship between liquidity and the two credit rating categories (IG and HY) to determine which liquidity proxies most effectively explain the varying degrees of liquidity between these ratings in Indonesia

* Corresponding author.

E-mail address: firly.armanda94@gmail.com

Corporate Bonds market. The capacity to differentiate between these main credit rating categories serves as a reliable indicator of liquidity measurement. Bonds with lower credit ratings typically exhibit lower liquidity. (Díaz & Escribano, 2019).

Research on securities liquidity has garnered significant attention in recent years, emphasizing the importance of effective liquidity measurement in bond markets. Notable studies include (Fleming, 2003), who analyzed the U.S. bond market using high-frequency data, and (Schestag et al., 2016), who utilized data from the Enhanced Historic Trade Reporting and Compliance Engine (TRACE) to examine liquidity and transaction costs in the U.S. corporate bond market. These studies have laid a critical foundation for understanding liquidity metrics. However, there is a notable research gap in the context of the Indonesian bond market, particularly concerning the best liquidity measurement for corporate bonds. No comprehensive study has specifically addressed which liquidity measures are most effective in distinguishing levels of liquidity in the Indonesian corporate bond market. This research aims to identify the most appropriate liquidity measurement tools, thereby aiding stakeholders in enhancing liquidity management and risk assessment strategies specific to Indonesia. This research adopts a similar approach to the study conducted by (Díaz & Escribano, 2022). This approach enables a more holistic evaluation of liquidity in the Indonesian corporate bond market, offering deeper insights into market dynamics. Identifying the most effective liquidity measurements in predicting bond ratings is the primary goal of this research. Through a comprehensive analysis of various liquidity proxies, this study aims to fill the research gap by providing fresh perspectives on how liquidity influences corporate bond ratings in Indonesia. The research findings are expected to enrich financial literature with local perspectives and support the development of a more efficient and transparent bond market in Indonesia.

2. Literature Review

Liquidity in the context of financial markets refers to the ability of an asset to be bought or sold in the market without significantly affecting the asset's price (Amihud & Mendelson, 1986). Liquidity is a key factor influencing asset value and market efficiency. The liquidity level of an asset can be influenced by various factors, including trading volume, bid-ask spreads, and market activity.

Table 1. Liquidity Proxies

Liquidity Proxies	Definition	Formula
Range Measure	Range Measure is a method that measures price variation over a specific period of time (Downing et al., 2005)	$RG_t = \frac{P_{max_t} - P_{min_t}}{P_t} \times 100$
Hui Heubel	Hui-Heubel is a metric that measures liquidity by comparing the bid-ask spread to price volatility. (Baldwin & Barbara, 1984)	$LR_t = \frac{P_{max_t} - P_{min_t}}{\frac{TV_t}{n \cdot P_t}}$
Market Share	Market Share as a measure of liquidity refers to the proportion of a specific asset's trading volume relative to the total trading volume in the market (Díaz & Escribano, 2020)	$MS_t = \frac{TV_t}{TTV_t}$
Trading Volume	Trading Volume as a liquidity proxy indicates the total amount of a particular asset traded during a specific period. (Elton & Clifton Green, 1998)	$TV_t = \sum_{k=1}^n TV_{t,k}$
Interquartile Range	The Interquartile Range assesses price variation by excluding significant price fluctuations that could be driven by a lack of fundamental information.(Helwege et al., 2014)	$IQR_t = \frac{p_t^{75th} - p_t^{25th}}{P_t}$
Imputed Roundtrip Cost	The round-trip transaction cost measure refers to the cost incurred by dealers in matching buyers and sellers in a short period and obtaining the bid-ask spread. (Dick-Nielsen et al., 2012)	$IRC_t = \frac{P_{max_t} - P_{min_t}}{P_{max_t}}$

Source:(Díaz & Escribano, 2019; Díaz & Escribano, 2022)

2.1. Previous Study

Research on liquidity dimensions in the U.S. corporate bond market, highlighted by (Díaz & Escribano, 2022), emphasizes that liquidity plays a crucial role in determining the bid-ask spread. This study indicates that metrics focusing on market tightness are particularly effective in identifying bond liquidity, distinguishing well between investment-grade and high-yield bonds. Although theoretically segmenting liquidity dimensions has empirical support, combining all dimensions only slightly enhances analytical outcomes. Further exploration by (Díaz & Escribano, 2020) offers a comprehensive review of various liquidity measures used in empirical literature. It discusses the evolution of liquidity measurement techniques, initially constrained by the availability of transaction data and later enhanced by high-frequency databases. This allows researchers to develop new metrics and refine existing ones, tailoring them to different markets. This extensive categorization describes various measures and proxies based on specific liquidity aspects, incorporating the diverse characteristics liquidity displays in financial markets. Moreover, a study by (Allaudeen Hameed et al., 2018) observes that quantity-based liquidity measures are more reliable than price-based ones in Malaysia's corporate bond market, which has not progressed in liquidity despite rapid market growth. This applies to both conventional and Islamic bonds, underlining the significance of this research for regulators and issuers, as liquidity irregularities can obstruct access to local currency debt financing. Additionally, (Dienemann, 2022) examines the significance of various liquidity proxies and constructs a superior systematic liquidity factor. By utilizing temporal variations in liquidity risk exposure, this study quantifies the risk premium over shorter periods. The asset pricing tests employ portfolios to reduce noise compared to estimating exposures at the security level, focusing on the robustness and simplicity of asset pricing factors. Credit Rating and Liquidity in the US Corporate Bond Market by (Díaz & Escribano, 2019), The purpose of the research is to examine the relationship between liquidity and credit ratings in the US corporate bond market. It aims to investigate the extent to which different dimensions of liquidity differ across credit rating categories. The study utilizes sixteen (il)liquidity proxies, encompassing both traditional and microstructure-based measures, calculated from transactions conducted with US corporate bonds between March 2012 and December 2014. The analysis focuses on various credit rating categories, ranging from AAA to "CCC or below," and examines liquidity at the bond level. The proxies are standardized to allow for homogeneous aggregation and are analyzed daily. The analysis reveals statistically significant differences in liquidity between credit rating categories. Bonds with higher credit ratings generally exhibit better liquidity. The findings support the hypothesis that better credit ratings are associated with greater liquidity.

2.2. Research Framework

A correlation exists between credit risk and liquidity risk. Distinguishing the influence of credit risk from liquidity risk is a challenge when utilizing projected yield spreads as liquidity proxies. The two primary credit rating classifications, IG and HY, clearly show varying degrees of liquidity. According to (Díaz & Escribano, 2019) there are statistically significant variations in liquidity proxies between different credit ratings. Compared to conventional techniques, this study's liquidity proxies were validated using a different process. The standard method usually takes the position that a proposed liquidity measure should be used as the standard to measure liquidity appropriately. Other liquidity proxies are then used to justify the proposed liquidity measure. The most effective liquidity proxies are those that show the strongest correlation with the benchmark.

The followings are the hypotheses to be tested further:

H1: Range Measure liquidity proxy has a negative influence in indicating the liquidity difference between IG and HY bonds.

This hypothesis suggests that the Range Measure, a proxy for liquidity that often considers the high and low prices within a given period, is effective in distinguishing liquidity levels between IG and HY bonds. A negative influence indicates that as the Range Measure increases, the perceived liquidity difference between these types of bonds also increases (Díaz & Escribano, 2022).

H2: Hui Heubel liquidity proxy has a negative influence in indicating the liquidity difference between IG and HY bonds.

The Hui Heubel ratio is a liquidity measure that examines the price impact of trading. This hypothesis posits that a higher Hui Heubel ratio is associated with a greater discernible liquidity difference between IG and HY bonds.

H3: Market Share liquidity proxy has a positive influence in indicating the liquidity difference between IG and HY bonds.

This hypothesis argues that the market share of the bonds (possibly referring to the percentage of total trading volume or total market capitalization) positively correlates with liquidity differences. A larger market share would thus imply greater liquidity compared to bonds with a smaller market share.

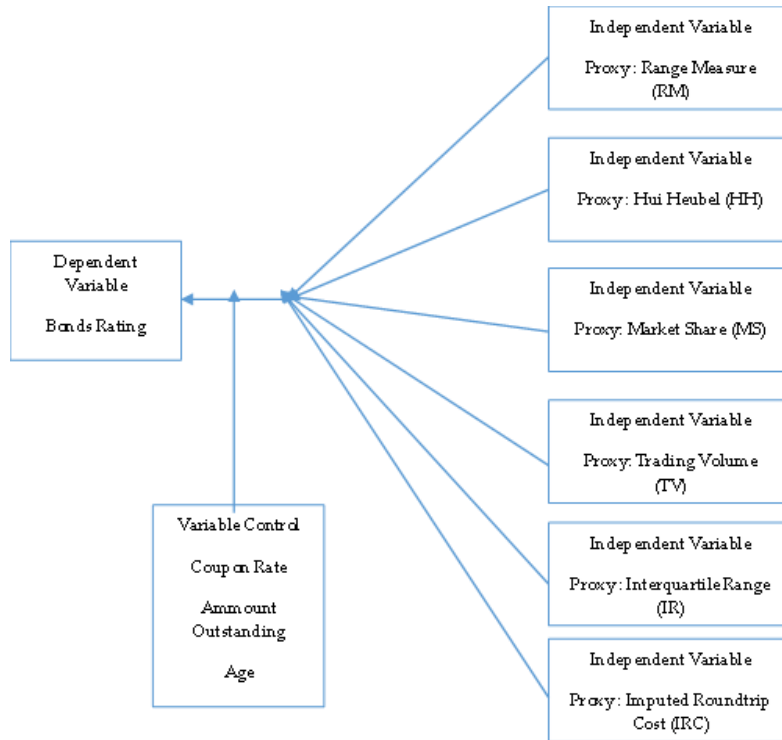


Figure 1. Research Framework

H4: Trading Volume liquidity proxy has a positive influence in indicating the liquidity difference between IG and HY bonds.

This suggests that the trading volume, while generally a straightforward measure of liquidity, inversely relates to the liquidity differences between IG and HY bonds. A positive influence implies that higher trading volumes may decrease the observable liquidity differences, possibly due to smoothing effects or increased market participation.

H5: Interquartile Range liquidity proxy has a negative influence in indicating the liquidity difference between IG and HY bonds.

The Interquartile Range, which measures the spread in the middle 50% of data points (such as prices or yields), is hypothesized to have a negative impact on discerning liquidity differences between IG and HY bonds. This could suggest that a wider spread in values within the interquartile range correlates with reduced clarity in liquidity differences.

H6: Imputed Roundtrip Cost liquidity proxy has a negative influence in indicating the liquidity difference between IG and HY bonds.

This hypothesis indicates that the Imputed Roundtrip Cost, which estimates the total cost of executing a roundtrip transaction, negatively impacts the ability to differentiate liquidity between IG and HY bonds. A higher roundtrip cost might obscure the liquidity differences, potentially because it adds a barrier to trading that affects both types of bonds similarly.

3. Methods

This research is a quantitative descriptive study of an exploratory nature. It aims to analyze the liquidity of corporate bonds and model the relationship between liquidity and investment-grade bonds and high-yield bonds. The study also aims to demonstrate that there is a difference in liquidity between these two classes of bonds. Additionally, this research

attempts to identify the most effective liquidity proxies in predicting liquidity and considers the use of multiple selected liquidity indicators to reflect all aspects of liquidity. The research is conducted by regressing independent variables (liquidity proxies) against the dependent variable (corporate bond credit ratings) and using bond characteristic variables as control variables.

The research is conducted by examining the relationship between liquidity proxies in classifying the credit rating of corporate bonds. Below is the model used to predict the probability of an IG credit rating being equal to 1:

$$y_i = \hat{x}_i\beta + u_i = \beta_0 + \beta_1x_{i,1} + \dots + \beta_kx_{i,k} + u_i \quad (1)$$

The dichotomous variable y_i is defined as 1 if the observation falls within the IG category and 0 if it falls within the HY category. The parameters $\beta_0, \beta_1, \dots, \beta_k$ represent the estimated coefficients. The probability of an observation being classified as IG is given by:

$$\Pr(y_i = 1|\hat{x}_i\beta) = \Pr(y_i > 0) = \Pr(\hat{x}_i\beta + u_i) = F_u(-\hat{x}_i\beta) \quad (2)$$

Where $F_u(\cdot)$ is the cumulative distribution function of u , which is assumed to follow a logistic distribution, and thus:

$$\Pr(y_i = 1|\hat{x}_i\beta) = F_u(-\hat{x}_i\beta) = \frac{1}{1 + \exp[-(\beta_0 + \beta_1x_{i,1} + \dots + \beta_kx_{i,k})]} \quad (3)$$

The regression coefficients $\beta_0, \beta_1, \dots, \beta_k$ are estimated using maximum likelihood estimation method. If the coefficients β_1, \dots, β_k are statistically significant, it indicates that liquidity proxies or other external factors have predictive ability for classification.

Logistic regression will be used in this model because the credit rating value is binary where IG = 1 and HY = 0. In the individual logistic regression, the first step is to regress it with control variables such as Coupon, amount issued, bond age, and time to maturity. Then, one by one, the 6 liquidity proxies in this study will be added.

3.1. Data

The data used in this study comprises daily transaction data of Indonesian corporate bonds. The descriptive data for each bond used includes bond type (conventional, sukuk, retail), coupon rate, issuance date, maturity date, issuance amount, highest price, lowest price, transaction price, frequency, transaction volume, and bond credit rating. The data covers the period from January 1, 2018, to December 31, 2022. Only corporate bonds that are not private placements and are traded through Outright transactions are included in the analysis. The data is sourced from the Indonesia Stock Exchange. A total of 1,645 bonds are examined, and daily data over three years amounting to 50,107 transactions are processed.

For analytical purposes, the data is divided into two panels based on credit ratings: bonds with Investment Grade (IG) ratings and bonds with speculative or High Yield (HY) ratings. This classification allows for a deeper evaluation of investor behavior and market dynamics concerning risk and returns. This approach underscores the importance of credit ratings in bond market analysis, considering their influence on risk perception and investment decisions.

The data table summarizes key descriptive statistics for Investment Grade (IG) and High Yield (HY) bonds. For IG bonds, the dataset includes 1,603 bonds issued by 158 different issuers with a total of 49,682 intraday trades over 1,221 daily observations. The mean coupon rate for these bonds is 8.5486%, with the first quartile ($Q_{0.25}$) at 7.8%, the median at 8.5%, and the third quartile ($Q_{0.75}$) at 9.4%. The average offering amount is substantial at approximately 888.8548 billion, with a median amount of 673 billion. The bonds are relatively mature, with a mean age of 4.6616 years, and a median time to maturity of 1.53 years, suggesting a moderately aged bond market. In contrast, the HY bonds data comprises 42 bonds from 25 issuers, totaling 425 intraday trades across 294 daily observations. The mean coupon rate for HY bonds is significantly lower at 5.4133%, with the median at 7.7500% and a narrower interquartile range compared to IG bonds. The mean offering amount for HY bonds is notably higher at 1,063 billion, indicative of larger issuances in this category. However, these bonds tend to be newer with a mean age of 8.7715 years and a longer time to maturity (mean of 9.8136 years), reflecting a potentially higher risk and longer investment horizon typical of high-yield bonds. The numerical rating for HY bonds also shows a tighter cluster around the median of 13, emphasizing the concentrated risk assessment in this segment.

Table 2. Descriptive Statistic of Data Observation

	Total	Mean	Q0.25	Median	Q0.75
Panel A. Investment Grade Bonds (IG)					
Bonds	1,603				
Issuer	158				
Trades (Intraday)	49,682				
Daily Observation	1,221				
Coupon Rate		8.5486	7.80	8.50	9.40
Offering Amount (in BIO)		888.8548	330.00	673.00	1,200.00
Age		4.6616	3.00	5.00	5.01
Time To Maturity		2.2017	0.46	1.53	3.00
Numerical Rating		3.1909	1.00	3.00	5.00
Panel B. High Yield Bonds (HY)					
Bonds	42				
Issuer	25				
Trades (Intraday)	425				
Daily Observation	294				
Coupon Rate		5.4133	2.00	7.75	8.80
Offering Amount (in BIO)		1,063.456	500.00	800.00	1,361.75
Age		8.7715	5.00	5.31	13.07
Time To Maturity		4.3711	0.30	1.13	9.8136
Numerical Rating		12.1294	12.00	12.00	13.00

Source: Researcher (2024)

These contrasting characteristics between IG and HY bonds highlight the diversity in the bond market in terms of risk, maturity, and investment strategies, providing investors with a wide range of options based on their risk tolerance and investment duration preferences.

Table 3. Descriptive Statistic of Liquidity Proxies

Proxy	Investment Grade					High Yield				
	Obs	Mean	SD	Q25	Q75	Obs	Mean	SD	Q25	Q75
RG	30,738	112.10	435.36	1.36	16.81	176	29.42	64.21	3.90	19.97
IRC	30,738	3.51	7.51	0.19	2.20	176	3.60	6.27	0.40	3.74
MS	30,738	0.03	0.06	0.01	0.04	176	0.02	0.04	0.01	0.02
IR	30,738	279.56	622.28	19.77	155.20	176	290.91	531.05	32.62	238.53
HH	30,738	3.64	7.87	0.20	2.25	176	3.65	6.41	0.40	3.77
TV	30,738	32.08	58.36	4.00	31.00	176	33.58	64.35	4.5	29.62

3.2. Liquidity Measurement

Based Table 3 presents descriptive statistics for various liquidity proxies covered in this study, using the full original sample. The analysis includes data on multiple liquidity proxies for 30,738 observations of Investment Grade (IG) bonds and 176 observations of High Yield (HY) bonds. For IG bonds, the mean value of the RG proxy is 112.10 with a standard deviation (SD) of 435.36, highlighting moderate variability. The lower quartile (Q25) stands at 1.36, and the upper quartile (Q75) at 16.81, indicating a skewed distribution with most values clustering near the lower end. In contrast, HY bonds exhibit a lower mean RG value of 29.42 with a smaller SD of 64.21, and tighter quartiles of 3.90 (Q25) and 19.97 (Q75), suggesting a less varied but similarly skewed distribution. For the IRC proxy, both IG and HY bonds report low mean values (3.51 and 3.60 for both), with IG bonds showing slightly higher variability (SD = 7.51) compared to HY bonds (SD = 6.27). This proxy’s quartiles further emphasize the tight clustering of data points, with values ranging from 0.19 to 2.20 for IG and 0.40 to 3.74 for HY, reflecting low recovery rates across both categories. The Market Share (MS) proxy indicates more pronounced variability in market share among IG issuers. The IR proxy presents the most considerable variability in both IG and HY bond. The HH and Trading Volume proxies also depict differing trends between the two categories.

Table 4. T-test, Wilcoxon-Mann Whitney Test, Kruskal Wallis Test and Levene Test

Proxy	Mean IG	Mean HY	t-test	Median IG	Median HY	Wilcoxon-Mann Whitney test	Kruskal-Wallis test	Variance IG	Variance HY	Variance test
RG	63.04	27.10	-5.12**	6.89	8.80	10,0054**	17.54**	96,361	7,628	11.78**
MS	0.02	0.03	0.50	0.005	0.008	9,188.5	7.05**	0.02	0.0009	0.93
IR	170.43	284.52	2.67**	32.62	33.63	11,340**	41.79**	197,004	329,792	12.77**
IRC	2.18	3.46	2.59**	0.39	0.40	11,3616**	41.24**	30.60	47.33	12.56**
HH	2.26	3.52	2.49**	0.40007	0.40008	11,298**	40.83**	33.51	51.03	12.54**
TV	32.43	36.15	0.63	7.15	10.00	3,890**	6.73**	3,992,95	3,175.80	0.70

Table 4 presents the results of various statistical tests conducted to compare the liquidity proxies between Investment Grade (IG) and High Yield (HY) bonds. The proxies include RG, MS, IR, IRC, HH. The Levene’s test is done for equality of variances, t-test is done for equality of means and last the Wilcoxon-Mann-Whitney test, and the Kruskal-Wallis test was done for equality of medians, and were conducted. The null hypothesis tested was that the mean, median, and variance values of each (il)liquidity proxy are equal for both IG and HY rating classes. The analysis indicates that RG for IG bonds has a higher average compared to HY, suggesting greater price variation in the IG category. Although MS shows little statistical difference, indicating similar trade distribution between the two categories, IR and IRC reveal more pronounced differences, with HY displaying higher price variability and transaction costs, reflecting higher liquidity risk in this category. Furthermore, HH confirms that HY bonds are less capable of absorbing order flow changes without significant price alterations compared to IG. Meanwhile, TV shows insignificant differences, indicating that trading volume alone does not necessarily reflect actual liquidity. Overall, this analysis supports the conclusion that IG bonds tend to be more liquid compared to HY, with lower transaction costs, more controlled price variation, and better market ability to absorb orders without large price changes. These differences are important for investors to consider when assessing liquidity risk as part of their investment strategy.

Table 5. Correlation Liquidity Proxy

	RG	MS	IR	IRC	HH	TV
RG	1,0000	-0,0706	0,4931	0,4897	0,4895	-0,0764
MS	-0,0706	1,0000	0,0936	0,1213	0,1183	0,8597
IR	0,4931	0,0936	1,0000	0,8911	0,8893	0,0730
IRC	0,4897	0,1213	0,8911	1,0000	0,9996	0,1023
HH	0,4895	0,1183	0,8893	0,9996	1,0000	0,0996
TV	-0,0764	0,8597	0,0730	0,1023	0,0996	1,0000

Table 5 presents a correlation analysis among the liquidity proxy variables, providing in-depth insights into the interdependencies between various liquidity measures in the bond market. The significant correlation between Imputed Roundtrip Cost (IRC) and Hui-Heubel (HH) at 0.9996 indicates an almost perfect relationship, suggesting that these two proxies are nearly identical in measuring the same aspect of market liquidity. This likely reflects both metrics as measures of transaction costs and the market’s ability to absorb orders. This correlation analysis is important because it provides a deep understanding of the dynamics of bond market liquidity. The correlations among these variables can assist investors and market analysts in assessing liquidity risk and offer insights for more effective trading strategies based on the market dynamics revealed through these liquidity proxies.

4. Result and Discussions

The primary objective of this study is to investigate which liquidity proxies effectively explain the characteristics over time and across different segments of the two credit rating categories, Investment Grade (IG) and High Yield (HY). We use binary logit models to identify and select liquidity proxies, assessing their effectiveness in categorizing observations as either IG or HY bonds.

Table 6. Logistic Regression

	Coeff	Wald	Odd Ratio	Nagelkerke_R2	R_squared	Chi-Square	AUC
RG	0,0008	1,9401	1,0008	0,2065	1,2314	307,8300	0,8916
MS	-1,7333	0,9556	0,1767	0,2049	1,2291	305,4200	0,8908
HH	-0,0301**	7,7697	0,9704	0,2087	1,2345	311,1800	0,8885
IR	-0,0003**	3,8616	0,9997	0,2066	1,2315	308,0200	0,8895
IRC	-0,0333**	8,9421	0,9673	0,2093	1,2354	312,1400	0,8888
TV	-0,0001	0,0044	0,9999	0,2066	1,2283	304,5300	0,8907

Source: Researcher (2024)

Based on the provided data from Table 6, we estimated logistic regression models for different liquidity proxies. The table lists regression coefficients, Wald statistics, odds ratios, Nagelkerke's R-squared values, B-squared values, Chi-square, and AUC for each proxy. Notably, proxies like HH, IR, and IRC show negative coefficients, indicating an inverse relationship with the bond category under consideration, possibly IG bonds. HH, with a coefficient of -0.0031 and a Wald statistic of 7.7697, suggests a statistically significant inverse relationship at a 99% confidence level (p -values < .001). Meanwhile, IRC, with a coefficient of -0.00333 and a Wald statistic of 8.9421, also suggests a significant relationship. The odds ratio of proxies like MS at 0.1767 and IRC at 0.9673 indicates the decrease in likelihood associated with an increase in these proxies. The table also indicates the fit of each model, with Nagelkerke's R-squared values ranging from 0.2065 for RG to 0.2093 for IRC, suggesting moderate explanatory power of these models. Chi-square values confirm the significance of the models, and AUC values, which measure the ability of the model to distinguish between categories, are consistently high across all proxies, reflecting good model performance.

The logistic regression showed that there is no significant evidence to support the hypothesis that an increase in Range Measure increases the perceived liquidity difference between these bonds. HH showed a negative coefficient (-0.0031) in logistic regression, indicating that higher HH values correspond to a lower likelihood of a bond being IG, supporting the hypothesis that HH can indicate greater liquidity differences in a manner that a higher HH value suggests lower liquidity for IG bonds, higher Hui Heubel ratios negatively correlate with the likelihood of being classified as IG. MS had a significantly negative coefficient (-1.7333) in the logistic regression model, which suggests that an increase in Market Share is associated with a decrease in the likelihood of a bond being IG. Higher Market Share does not indicate higher liquidity for IG bonds. The coefficient for Trading Volume was effectively zero (-0.0001), indicating no significant influence of TV on the classification between IG and HY bonds, Trading Volume does not show any substantial impact on liquidity differences. IR had a very small negative coefficient (-0.0003), suggesting minimal influence on distinguishing between IG and HY bonds. Given the negligible size of the coefficient, there's limited support for the hypothesis. The effect of IR on liquidity differentiation appears to be minor, thus not strongly supporting the hypothesis. IRC showed a negative coefficient (-0.0033), aligning with the hypothesis that higher IRC is associated with a decreased likelihood of a bond being classified as IG, higher Imputed Roundtrip Costs correspond to lower liquidity for IG bonds. The analysis provides mixed results. Hypotheses H2 and H6 are supported, showing that higher values of Hui Heubel and Imputed Roundtrip Cost indicate lower liquidity for IG bonds. Conversely, Hypotheses H1, H3, H4, and H5 are not supported by the data, indicating that Range Measure, Market Share, Trading Volume, and Interquartile Range do not significantly influence liquidity distinctions between IG and HY bonds as hypothesized. This assessment helps clarify which proxies are effective indicators of liquidity in the context of Indonesian corporate bonds.

5. Conclusions

The analysis focused on identifying the most effective liquidity proxies for classifying Indonesian corporate bonds into Investment Grade (IG) and High Yield (HY) categories. The research employed several statistical tests, including logistic regression, to assess the predictive power and significance of various liquidity proxies. Imputed Roundtrip Cost (IRC) showed a significant negative coefficient, higher IRC values correlate with lower liquidity for IG bonds. This indicates that IRC is a reliable measure of liquidity. Hui Heubel ratio (HH) Despite initially suggesting some influence, the results ultimately indicated that HH does not have a consistent or significant impact for it to be considered as effective as IRC. The best liquidity measure for Indonesian corporate bonds is the Imputed Roundtrip Cost (IRC). This proxy consistently indicates liquidity conditions, showing that higher transaction costs are associated with lower liquidity, particularly for Investment Grade bonds. It effectively captures the cost-related aspects of trading, making it a crucial tool for assessing liquidity risk. For Investors and Analysts can focus on the Imputed Roundtrip Cost (IRC) as

the primary liquidity measure when assessing the liquidity risk of Indonesian corporate bonds. IRC provides a clear and reliable indication of liquidity conditions and for future research can Investigate additional liquidity proxies or composite measures that might combine the strengths of various indicators. Further research should also test these proxies across different market conditions and bond types to validate their effectiveness.

References

- Allaudeen Hameed, B., Helwege, J., Li, R., Packer, F., & Bank, W. (2018). Measuring corporate bond liquidity in emerging market economies: price-vs quantity-based measures.
- Amihud, Y., & Mendelson, H. (1986). Asset pricing and the bid-ask spread. *Journal of Financial Economics*, 17(2), 223–249. [https://doi.org/10.1016/0304-405X\(86\)90065-6](https://doi.org/10.1016/0304-405X(86)90065-6)
- Amihud, Y., & Mendelson, H. (1991). Liquidity, asset prices and financial policy. *Financial Analysts Journal*, 47(6), 56–66.
- Baldwin, H., & Barbara, H. (1984). *Comparative Liquidity Advantages among Major U.S. Stock Markets*. Working Paper, DRI Financial Information Group Study Series, 84081.
- Diaz, A., & Escribano, A. (2019). Credit rating and liquidity in the US corporate bond market. In *Journal of Fixed Income* (Vol. 28, Issue 4, pp. 46–59). *Portfolio Management Research*. <https://doi.org/10.3905/jfi.2019.28.4.046>
- Díaz, A., & Escribano, A. (2017). Liquidity measures throughout the lifetime of the U.S. Treasury bond. *Journal of Financial Markets*, 33, 42–74. <https://doi.org/10.1016/j.finmar.2017.01.002>
- Díaz, A., & Escribano, A. (2020). Measuring the multi-faceted dimension of liquidity in financial markets: A literature review. *Research in International Business and Finance*, 51(August 2019), 101079. <https://doi.org/10.1016/j.ribaf.2019.101079>
- Díaz, A., & Escribano, A. (2022). Liquidity dimensions in the U.S. corporate bond market. *International Review of Economics & Finance*, 80, 1163–1179. <https://doi.org/10.1016/j.jref.2022.04.008>
- Dick-Nielsen, J., Feldhütter, P., & Lando, D. (2012). Corporate bond liquidity before and after the onset of the subprime crisis. *Journal of Financial Economics*, 103(3), 471–492. <https://doi.org/10.1016/j.jfineco.2011.10.009>
- Dienemann, F. (2022). A new perspective on the corporate bond liquidity factor.
- Dittmar, R. F., & Yuan, K. (2008). Do sovereign bonds benefit corporate bonds in emerging markets? *Review of Financial Studies*, 21(5), 1983–2014. <https://doi.org/10.1093/rfs/hhn015>
- Downing, C., Underwood, S., & Xing, Y. (2005). Is Liquidity Risk Priced in the Corporate Bond Market?
- Elton, E. J., & Clifton Green, T. (1998). Tax and Liquidity Effects in Pricing Government Bonds.
- Febriani, A. (2017). Faktor-Faktor Yang Mempengaruhi Peringkat Obligasi Pada Perusahaan Perbankan Determinants Of Bonds Rating On Banking Companies. www.bi.go.id
- Fleming, M. J. (2003). Measuring Treasury Market Liquidity.
- Friewald, N., Jankowitsch, R., & Subrahmanyam, M. G. (2011). Illiquidity or Credit Deterioration: A Study of Liquidity in the US Corporate Bond Market during Financial Crises. *SSRN Electronic Journal*, August 2011. <https://doi.org/10.2139/ssrn.1420294>
- Haikal, Y., Simatupang, M., Ni, Ariastini, W., Afif, K., Sutarto, S., Gunawan, I., Krismirinda, S., Nitria, T., Feny, Y., Rasjid, M. H., Tamba, D. R., Chandra, I., Handayani, T., Joeshar, A., Arif, B., Adi, C., Noor, S., Muktiyanto, I., ... Wasista, Y. P. (2018). *Strategi Nasional Pengembangan Dan Pendalaman Pasar Keuangan TAHUN 2018-2024*.
- Helwege, J., Huang, J.-Z., & Wang, Y. (2014). Liquidity effects in corporate bond spreads. *Journal of Banking & Finance*, 45(1), 105–116. <https://doi.org/10.1016/j.jbankfin.2013.08.018>
- Lesmond, D. A., Chen, L., & Wei, J. Z. (2011). Corporate Yield Spreads and Bond Liquidity. *SSRN Electronic Journal*, September. <https://doi.org/10.2139/ssrn.495422>

- Puspaputri, S. U. (2015). Likuiditas, Kualitas Kredit, dan Hubungan Antara Aktivitas Perdagangan Dan Volatilitas: Studi Empiris Obligasi Korporasi Indonesia.
- Schestag, R., Schuster, P., & Uhrig-Homburg, M. (2016). Measuring Liquidity in Bond Markets. *Source: The Review of Financial Studies*, 29(5), 1170–1219. <https://doi.org/10.1093/rfs/hhv132>