The Liquidity Spread: A Parsimonious Method for Data-Scarce Emerging Markets

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Abstract: This paper develops a parsimonious method for estimating bond liquidity spreads in emerging markets where transaction data are scarce. It complements earlier work on credit spread decomposition, contributing to a unified valuation framework for data-scarce bond markets. The model was obtained analytically from a one-year holding-period return indifference condition between a liquid and an illiquid bond. It requires only two observable inputs: the bond's yield bid-ask spread and its modified duration. An extension introduces an adjustment factor to capture volatile market conditions. The central result is a closed-form approximation: the minimum annual liquidity spread equals the product of the bond's modified duration and its yield bid-ask spread. An illustrative application shows that liquidity costs can outweigh credit risk in thin markets. The framework offers a transparent and replicable alternative to arbitrary mark-ups, addressing a critical gap by providing a dedicated liquidity spread model tailored to data-scarce environments. Its primary innovation lies in its methodological parsimony, delivering a transparent valuation instrument that remains theoretically consistent even in the absence of transaction-level data.

Keywords: liquidity spread; emerging markets; bid-ask spread; bond duration; scarce data; valuation.

JEL Classification: G12; G15; G18.

Introduction

The valuation of corporate bonds in emerging markets is frequently constrained by severe data limitations, particularly with respect to liquidity-related pricing adjustments. While liquidity spreads (liquidity premia in much of the literature) are widely recognized as an integral component of bond yields, their practical estimation remains challenging in markets characterized by infrequent secondary trading and structurally wide bid-ask spreads.

Existing liquidity pricing models typically rely on high-frequency transaction data, market-wide liquidity factors, or complex econometric frameworks developed for deep and transparent markets. These approaches are difficult to implement in frontier and emerging economies, where trading activity is episodic and reporting infrastructures are limited, often leading practitioners to rely on arbitrary liquidity mark-ups that undermine valuation consistency and regulatory transparency.

This study addresses a central question: how can a transparent and replicable liquidity spread be estimated in emerging markets where transaction data are extremely scarce? It fills a clear gap in the literature by proposing a dedicated, parsimonious liquidity spread model tailored to data-scarce environments. The paper derives an accessible analytical framework that requires only two observable inputs: the bond's yield bid-ask spread and its modified duration, providing a defensible benchmark for valuation, risk management, and regulatory assessment.

1. Literature Review

While recent work has addressed credit spread decomposition in data-scarce emerging markets (Ghazaryan *et al.* 2024), the estimation of liquidity spreads remains a major challenge in such environments. Approaches to liquidity vary across contexts - developed versus emerging markets, corporate versus sovereign bonds, and theoretical versus applied pricing models. Three strands are particularly relevant for the present study: (i) theoretical foundations, (ii) empirical estimation in advanced markets, and (iii) liquidity measurement in emerging markets.

Early theoretical studies (Amihud & Mendelson, 1986, 1991; Vayanos, 1998) established the basic link between transaction costs and required returns. Roll (1984) proposed an implicit measure of effective bid-ask spreads, demonstrating how trading frictions are embedded in asset prices even in efficient markets. Subsequent work extended these insights across asset classes: Amihud (2002) documented the pricing of illiquidity in equities, while later asset-pricing frameworks incorporated liquidity more formally, whether through factor-based models such as the liquidity-adjusted CAPM (Acharya & Pedersen, 2005), interactions between market and funding liquidity (Brunnermeier & Pedersen, 2009), or evidence that liquidity shocks command systematic compensation (Pastor & Stambaugh, 2003) and affect Treasury valuations (Longstaff, 2004). Collectively, these contributions confirm that liquidity is priced in equilibrium, though often through variables that are difficult to observe in smaller or less transparent markets.

Empirical research based largely on TRACE and other transaction-level datasets shows that liquidity risk accounts for a substantial share of corporate bond yield spreads, with its effects intensifying during periods of market stress (Bao *et al.* 2011; Chen *et al.* 2007; de Jong & Driessen, 2012; Edwards *et al.* 2007; Houweling *et al.* 2005; Goyenko *et al.* 2011; Friewald *et al.* 2012). These studies typically embed bid-ask spreads among multiple liquidity proxies within regression or factor models, highlighting the multidimensional nature of liquidity costs in developed markets. By contrast, the present study isolates bid-ask spreads and duration as the sole inputs, explicitly targeting environments where such rich datasets are unavailable.

Studies focusing on emerging markets emphasize structurally lower trading frequency, wider bid-ask spreads, and weaker reporting infrastructures (Sarr & Lybek, 2002; Lesmond, 2005; Dick-Nielsen *et al.* 2012; Hoyos *et al.* 2020). Methodological adaptations in this context include multidimensional indicators of tightness, depth, and resiliency (Mancini *et al.* 2013), as well as composite measures advanced by policy institutions (Committee on the Global Financial System (CGFS), 2016). Structural approaches further highlight over-the-counter trading frictions (Duffie & Singleton, 1999, 2012), market-making constraints (Biais & Green, 2019), and interactions between liquidity and credit risk (He & Milbradt, 2014). Empirical evidence from developed markets suggests that the non-default component of corporate spreads is substantial, with liquidity acting as a primary driver (Longstaff, Mithal, & Neis, 2005), underscoring the importance of disentangling these components in emerging markets as well.

Recent assessments point to growing fragilities in global bond market liquidity. Declining dealer inventories, post-crisis regulatory changes, unconventional monetary policy, and the transition to a higher interest-rate environment have reduced effective liquidity even in traditionally deep markets such as U.S. Treasuries (Bank for International Settlements (BIS), 2022; International Monetary Fund (IMF), 2023). Recent research has explored the role of different liquidity providers in corporate bond markets, suggesting that investors can act as a liquidity backstop that alleviates dealer balance-sheet constraints and influences transaction costs, particularly during stress periods (Comerton-Forde *et al.* 2025). In smaller and emerging markets, these pressures are magnified, with secondary trading often episodic or inactive, reinforcing the need for valuation approaches that rely on minimal, observable inputs.

Across the literature, there is broad consensus that illiquidity requires compensation, whether modeled as a spread in expected returns or expressed empirically as a component embedded in observed bond yields. However, most existing approaches rely on granular transaction data or complex econometric structures, limiting their applicability to frontier economies (Bongaerts *et al.* 2017). This leaves a clear practical gap: the absence of a dedicated, parsimonious framework for estimating liquidity spreads in data-scarce environments. The model proposed in this paper addresses this gap by deriving the minimum liquidity spread as the product of the bond's modified duration and its yield bid-ask spread. This approximation provides a transparent and usable benchmark in practice and can be extended with an adjustment factor to reflect volatile market conditions.

2. Method

This section presents a practical, transaction-based model for estimating the liquidity spread. The model was derived from fixed-income valuation principles to address three structural features common in emerging markets: sparse trading data, wide bid–ask spreads, and limited dealer participation (Sarr & Lybek, 2002; Hoyos *et al.* 2020; Galliani *et al.* 2014). Unlike many developed-market frameworks, the proposed approach relies on a static one-year holding period and only two observable inputs: the bond's yield bid-ask spread and its modified duration. This simplicity ensures applicability where trade-level data, depth indicators, or calibration infrastructure are unavailable.

In a perfectly liquid market, a bond can be bought and sold at the same yield, implying no loss on immediate resale. In an illiquid market, resale occurs at a less favorable yield, generating a loss proportional to duration. This loss defines the minimum required liquidity cost imposed by illiquidity and is expressed as:

$$Loss = d \times s$$

where

- d denotes modified duration, and
- s denotes yield bid-ask spread.

Table 1 illustrates the benchmark case with zero bid-ask spread, while Table 2 shows a positive spread of 20 basis points, producing a liquidity loss of 1.40 percent for a seven-year bond.

Table 1. Benchmark case with zero bid-ask spread

Buy YTM (%)	Sell YTM (%)	Duration	Liquidity Loss (%)
3.7	3.7	7	0

Table 2. Positive bid-ask spread case (20 basis points)

Buy YTM (%)	Sell YTM (%)	Duration	Liquidity Loss (%)
3.7	3.9	7	1.4

This liquidity loss represents the expected mark-to-market erosion caused by illiquidity. The liquidity spread is then defined as the additional yield required to compensate investors for this loss and to render an illiquid bond competitive with a liquid benchmark.

Consider two investment alternatives:

1. Liquid bond: yield y, bid-ask spread $s = 0$, duration d, one year holding period return $HPR = y$.
2. Illiquid bond: yield $y + l$, bid-ask spread $s > 0$, duration d, one year holding period return $HPR = y + l - d \times s$, where l denotes the liquidity spread.

The following assumptions were imposed: (i) investors are price takers, with no market impact beyond the bid-ask spread; (ii) the holding period is one year, consistent with standard fixed-income conventions; and (iii) credit spreads, yield to maturity, and modified duration remain constant over the holding period (discussed further in Section 5.3).

The one-year holding period return was defined as the yield earned minus the liquidation cost (Fabozzi, 2012; Tuckman & Serrat, 2011; Bodie *et al.* 2021). Table 3 summarizes the comparison.

Table 3. One-year holding period returns for liquid versus illiquid bonds.

Investment	Buy YTM	Sell YTM	Duration	HPR
(a) Liquid	y	y	D	y
(b) Illiquid	$y + l$	$y + l + s$	D	$y + l - d \times s$

For the illiquid bond to be competitive, its holding period return must satisfy the investor indifference condition:

$$y + l - d \times s \geq y \tag{1}$$

which simplifies to:

$$l \geq d \times s \tag{2}$$

Equation (2) implied that the minimum liquidity spread must at least compensate for the duration-adjusted transaction cost. For practical applications, this condition was approximated by the closed-form expression:

$$l = d \times s \tag{3}$$

This formulation directly links observable transaction costs to a measurable liquidity spread. To account for elevated volatility or stress conditions, the model was extended with an adjustment factor:

$$l = AF \times d \times s \tag{4}$$

where AF reflects prevailing market conditions. During stress episodes, reduced turnover and funding pressures can push AF above 1, amplifying liquidity costs beyond the baseline spread-duration product. Conversely, favorable conditions or regulatory incentives may compress AF below 1.

This extension aligns with Brunnermeier and Pedersen (2009), who emphasize the interaction between funding liquidity and market liquidity, and with Acharya and Pedersen (2005), who show that liquidity spreads are time-varying and sensitive to stress. AF serves as a parsimonious scaling parameter rather than a separate pricing factor.

The model is intended for environments characterized by persistent structural illiquidity, such as emerging or thin bond markets with infrequent secondary trading. It is applicable in analytical, valuation, and supervisory contexts where transparent and replicable liquidity adjustments are required. The framework is illustrated using hypothetical bid-ask spreads and modified duration, with liquidity estimates scaled by heuristic adjustment factors under stressed market conditions.

3. Case Study

This section illustrates the practical application of the proposed model and examines the effect of explicit liquidity adjustments on yield decomposition. A hypothetical "BB+" rated corporate bond in an emerging market was evaluated against a "AAA" rated benchmark bond. Table 4 presents the required valuation inputs.

Table 4. Hypothetical valuation inputs for a "BB+" corporate bond versus a "AAA" benchmark.

	Benchmark Bond "AAA"	Corporate Bond "BB+"
Duration	5.3	5
Bid-Ask spread (bps)	5	30
Default probability (%)	-	1
Loss Given Default (%)	-	60
Yield to maturity (%)	3	To be calculated

Risk-free rate adjustment. The observed benchmark yield of 3% includes a small liquidity component associated with its own bid-ask spread.

$$l_{benchmark} = d_{benchmark} \times s_{benchmark} = 5.3 \times 0.05\% \approx 0.27\%$$

To avoid double counting, the adjusted risk-free rate was obtained as:

$$r_{benchmark}^{adjusted} = 3\% - 0.27\% \approx 2.73\%$$

***Credit risk component*.** The expected credit loss for the "BB+" bond was calculated following Ghazaryan et al. (2024).

$$CR = \frac{PD}{1 - PD} \times LGD \times (1 + r) \approx 0.62\%$$

Liquidity component. Applying the liquidity spread model derived in Section 2, the illiquidity adjustment was:

$$l_{corp} = d_{corp} \times s_{corp} = 5 \times 0.30\% = 1.50\%$$

Aggregate yield. Aggregating the risk-free, credit, and liquidity components yielded the implied corporate bond yield:

$$y_{corp} = r_{benchmark}^{adjusted} + CR + l_{corp} \approx 2.73\% + 0.62\% + 1.50\% = 4.85\%$$

This decomposition indicated that liquidity (1.50%) constitutes the dominant component of the total spread, exceeding the pure credit component (0.62%). Traditional valuation shortcuts that add a generic "BB+" spread to the benchmark yield therefore risk material mispricing in thin markets. The example illustrated the transparency and replicability of the proposed framework.

4. Research Results

The core analytical result of this study is the closed-form expression for the liquidity spread, given by Equation (3):

$$l = d \times s \tag{3}$$

Equation (3) represents the minimum compensation required by investors for illiquidity, derived from the one-year holding-period return indifference condition. The liquidity spread depends linearly on the bond's price sensitivity, measured by the modified duration, and on the observable transaction cost captured by the yield bid–ask spread.

Equation (4) extends this baseline result by introducing an adjustment factor that allows liquidity compensation to scale with prevailing market conditions while preserving the tractability of the framework.

5. Discussion

Table 5 compares the proposed model against key liquidity frameworks. While established models provide valuable insights, their data requirements limit applicability in emerging markets. The proposed method complements the literature by offering a transparent baseline that operationalizes liquidity spreads using only observable inputs.

Table 5. Comparison of the proposed model with existing liquidity spread frameworks.

Study / Model	Approach	Data Needs	Comparison	Applicability
Amihud & Mendelson (1986)	Transactional cost pricing	Time-series of bid-ask spreads	Links spreads to returns, horizon-based.	Requires long history of transaction costs
Acharya & Pedersen (2005)	Liquidity-adjusted CAPM	Market-wide factors	Captures systematic liquidity, indirectly.	Data-intensive, impractical in EMs
Bao, Pan & Wang (2011)	Yield spread decomposition	Trade-level TRACE data	Separates credit and liquidity components	Limited to developed bond markets.
Chen, Lesmond & Wei (2007)	Zero-trading-day measure	Multi-period trading panels	Captures illiquidity without full quotes	Requires panel data, often absent in EMs
Proposed Model	*HPR indifference*	*Single bid-ask spread and duration*	*Transparent, replicable approximation*	*Accessible and transparent baseline for data-scarce markets*

The proposed formulation (Equation 3) can be viewed as a parsimonious compression of existing models rather than a competing alternative. Amihud and Mendelson (1986) show that higher transaction costs raise required returns; the present approach operationalizes this insight using bond duration. Acharya and Pedersen (2005) formalize liquidity as a systematic factor; in practice, bid-ask spreads widen when market liquidity deteriorates, embedding both idiosyncratic and systematic effects into a single observable metric. Similarly, Bao, Pan and Wang (2011) demonstrate time-varying liquidity frictions; bid-ask spreads respond dynamically, allowing the present rule to inherit such dynamics without requiring trade-level data. Chen, Lesmond, and Wei (2007) validate that illiquidity significantly increases yield spreads, particularly for high-yield bonds. While their measure is more data-intensive, it supports the core premise that liquidity is a critical priced factor.

The model extends this line of inquiry by offering a parsimonious solution tailored to data-scarce settings. By relying on universally available inputs, it provides a usable first-order approximation where data-intensive methods are infeasible. This parsimony reflects deliberate simplifying choices: the framework adopts a static one-year holding period, relies on linear scaling, and does not explicitly disentangle systematic liquidity risk, although bid-ask spreads may partially capture such effects. These simplifications are consistent with the model's objective of transparency and practical applicability.

The following subsection discusses the core assumptions underlying the framework and clarifies its scope and boundaries.

(i) Price-Taker Behavior and the Absence of Market Impact. The model assumed that the bid-ask spread is the sole source of transaction cost, treating investors as price takers. This abstracts from the market impact of large block trades, a significant factor in deep markets (Biais, Glosten, & Spatt, 2005). However, in thin, fragmented emerging bond markets (characterized by small ticket sizes), quoted bid-ask spreads dominate total costs, making the assumption realistic. It therefore reflects the target market structure and focuses on measurable structural illiquidity.

(ii) The One-Year Holding Period Convention. The static one-year horizon is fundamental to the closed-form result. It aligns with standard fixed-income quoting conventions (Fabozzi, 2012; Tuckman & Serrat, 2011) and interprets the liquidity spread as annual compensation for illiquidity (Acharya & Pedersen, 2005; Amihud & Mendelson, 1986). It also matches regulatory and industry norms for performance disclosure (ESMA, 2023; Morningstar, 2013). While absolute liquidity costs are horizon-dependent, the one-year benchmark provides a standardized and interpretable baseline.

(iii) Constancy of Spreads, Benchmark Yields and Duration. This assumption isolates the liquidity spread from other risk factors. Even if benchmark yields change, the liquidity spread condition $l \geq d \times s$ remains valid, as yield-change terms cancel. Although holding-period loss depends on duration at sale, the use of current modified duration as a proxy is consistent with first-order return approximations widely used in fixed-income analysis (Fabozzi, 2012).

Conclusions and Future Research

This study developed a parsimonious framework for estimating bond liquidity spreads in emerging markets characterized by limited transaction data. The analysis demonstrated that the minimum liquidity spread can be derived analytically from the liquidity loss generated by bid-ask frictions, which scales linearly with a bond's modified duration. An illustrative decomposition showed that liquidity costs may exceed expected credit losses in thin markets, underscoring the structural role of illiquidity in bond valuation.

The framework made a twofold contribution. From an academic perspective, it extended the theory of liquidity pricing to environments where conventional, data-intensive econometric approaches are infeasible. From a practical standpoint, it replaced ad hoc valuation adjustments with a transparent and replicable tool that can be readily applied in valuation, risk management, and regulatory assessment.

Although deliberately simple, the model yielded a defensible baseline for further research. Future work may focus on empirical validation across a broader set of emerging markets, integration with macro-liquidity indicators, and nonlinear extensions to better capture extreme stress conditions. Together with the credit spread decomposition framework developed in Ghazaryan et al. (2024), this study contributed to a unified and practical toolkit for decomposing bond yields in data-scarce emerging markets. The inclusion of an optional adjustment factor allows liquidity compensation to scale with prevailing market conditions while preserving the transparency and tractability of the framework.

Declarations

Credit Authorship Contribution Statement:

Vahagn Melik-Parsadanyan: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Writing - review and editing, Validation, Visualization, Project administration.
The author affirms full responsibility for all aspects of the work, including data accuracy, analysis integrity, and approval of the final manuscript.

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