

LIQUIDITY AND ITS MEASURES

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ABSTRACT

Liquidity is known to be the backbone of stock market which has major implications on traders, stock exchange, regulators and firms. Large number of literatures has emerged in relation with liquidity in recent years. This article gives a review and discussion on liquidity and explaining various measures of liquidity and also explores the factors influencing liquidity. It also explains the underlying assumptions with liquidity measures along with the problems with those measures cited by different authors.

INTRODUCTION

It is concluded by Baker (1996) that there is no agreement on single, unambiguous, universally accepted definition of liquidity. A liquidity market has slippery concept that includes tightness, depth and resiliency (Kyle 1985). A widely accepted definition of liquidity is given by O'Hara (1995) as immediacy to trade. Several other dimensions of liquidity is given by Black (1971) and Harris(1990) like tradable shares at bid, bid ask spread also called width and offer prices.

Concepts of Liquidity

One could think of two separate but related concepts of liquidity. The first is monetary liquidity that would depend on the availability of liquidity and quasi-liquidity by request for goods/assets. Trends in monetary liquidity would generally result in short-term interest rate short-term low rate means easy liquidity.ⁱ this idea of Liquidity is usually evoked and commented on. In the context of Markets Commodities or stocks, the depth of the market is generally related to the volume of trading frequency. In the popular language of stock markets, the volume of transactions is routine indicated to signify the ease/frequency of negotiation. However, speaking Liquidity without the reference to the price makes little sense. Market liquidity is considered to be the capacity of the markets to absorb temporary fluctuations in demand and supply without undue upheaval in the prices.ⁱⁱ these two liquidity concepts related to the increase in monetary liquidity lead to higher demand for securities and would reflect in higher security prices. As an increase in monetary liquidity would lead to lower interest rates, it is through the increase in security prices. The performance would be aligned with interest rates. However, the liquidity of the market should be considered as an important indicator of the state of the market. A

good measure of the liquidity between the different markets would facilitate the comparative analysis of the different markets/market segments.

LIQUIDITY MEASURES

Liquidity measures can be divided into four groups: a) Volume based liquidity measures b) Price Variability indices; c) Measures based on transaction cost; and d) Measures based on the balance that estimating resilience

1. Volume Based Liquidity Measures

In this section we present the liquidity indices proposed in the early stages of the market literature on microstructure. Their emphasis is on the relationship between price and quantity of an asset. These measures assess the degree of impact on the prices of a transaction of a size.

1.1 Trading Volume

An approximate measure of liquidity is represented by the trading volume. This consists of between market participants in the purchase and sale of a single active or for the market as a whole. Some researchers view the volume of transactions as an inadequate liquidity index, however. The reason lies in the question of double counting involved. A purchase-side transaction can also be registered as a transaction on the seller side. A more appropriate measure is provided by the relationship between the volume of transactions and the capitalization.

According to recent contributions, the volume of exchange of an asset is one of the main determinants of the entire price structure. Like what Blume, Easley and O'Hara (1994) show that the volume exchanged generates information that cannot be extracted from alternative statistics. Because of the high availability of data, the volume of trade represents a kind of first step towards a more complete analysis of the liquidity of the market.

1.2 The conventional liquidity ratio

The liquidity ratio, also known as the 'classic liquidity ratio', is probably one of the most frequently applied measures in the empirical analysis. This index provides a measure of how much exchanged volume is required to induce a price vary of one percent. Volumes and prices are the key ingredients. The logical equation of the liquidity ratio of asset i is:

$$LR_{it} = \frac{\sum_{t-1}^T P_{it} V_{it}}{\sum_{t-1}^T |PC_{it}|}$$

Where P_{it} is the price of the asset i day t , V_{it} refers to the volume exchanged, and $|PC_{it}|$ is the change of absolute price in percentage over a fixed time interval, given by $PC_{it} = P_{it} - P_{it-1}$.

The liquidity ratio is generally calculated for a certain number of assets and is aggregated a pool with similar features. The time interval (T,t) adopted to calculate the index is usually arbitrarily chosen. However, the index is often calculated on a monthly basis the time range, so that the numerator represents the total volume of the assets exchanged on the four weeks earlier. Instead, the numerator is the fixed value of the daily percentage changes in stock prices over the previous four weeks. The high the ratio LR_{it} is, the highest the liquidity of assets i . This way those large volumes of business have little influence on the price. Of course, this intangible framework focuses more on the price aspect than on the question of the time or the costs of execution generally present in a market.

1.3 The index of Martin(1975)

Martin (1975) proposes a liquidity index where a stationary distribution of price fluctuations is assumed to remain for the duration of the transaction. The logical equation for the index takes the following form:

$$MLI_t = \sum_{i=1}^N \frac{(P_{it} - P_{it-1})^2}{V_{it}}$$

Where P_{it} is the closing price and V_{it} indicates the negotiated volume. The person who reads should note that the index is calculated on the total number of assets for the market. MLI_t is measured an appropriate index for the market as a full, even as the liquidity ratio is best suited to a single asset.

For its characteristics, Martin's Liquidity Index (1975) produces significant results if considered daily. To attain reasonable results in the longer period, it is essential to calculate a weighted average of numerous derived indices for shorter time intervals.

1.4 The liquidity ratio of Hui and Heubel(1994)

Hui and Heubel(1984) introduce an additional index that measures the liquidity of a asset. As such, it cannot be used directly for the market as a whole without using suitable aggregation techniques. In follow, this index builds a metric among the largest price change divided by the ratio of the negotiated volume to the market capitalization.

In the following, we drop the superscript I of the formula for scoring reasons convenience. The arithmetical equation of the index is:

$$LR_{HH} = \frac{P_{max} - P_{min} / P_{min}}{V / (S \cdot \bar{P})}$$

Where P_{\max} is the highest daily price over a 5 date period, P_{\min} is the lowest every day price on the similar horizon, V is the total volume of assets exchanged above a period of five days; S is the total number of outstanding assets and \bar{P} indicates the middling closing price. An higher value for the index LRHH implies lower liquidity.

1.5 The Turnover Ratio

TR_t^i , turnover ratio for i at time t is defined as follows:

$$TR_t^i = \frac{Sh_t^i}{NSh_t^i}$$

For stock i , Sh_t^i is known as the assets units traded at time t where NSh_t^i is total outstanding asset.

1.6 The market adjusted liquidity index

Hui and Heubel(1984) provides a liquidity measure that takes into account systematic sources of risk. The building of the market index has two stages. In the primary step, a market model for asset performance is estimated to control the effects of average market conditions on value changes. This step is typically by estimating the following equation for stock price:

$$R_{it} = \alpha + \beta R_{mt} + \varepsilon_{it}$$

where R_{it} is every day return for i stock and R_{mt} is daily market return on average stock market index, α , β & ε_{it} are constant, systematic risk, measure of idiosyncratic risk respectively.

1.7 An explicit illiquidity measure

The role of the negotiated volume is fundamental to the liquidity measures proposed in recent years. An eye-catching liquidity index is introduced by Amihud(2002):

$$ILLIQ_T^i = \frac{1}{D_T} \sum_{t=1}^{D_T} \frac{|R_{t,T}^i|}{V_{t,T}^i}$$

Where D_T represents number of days, $R_{t,T}^i$ is return on day t , year T and $V_{t,T}^i$ is daily volume.

This index is approximate near to the liquidity ratio. The latter provides a perceptive of the relationship between volume and price change. The liquidity index provides only an approximate measure of the price impact. In a

different way from the bid-ask spread, the main advantage of this index is the high availability of data for its Computation, particularly for markets that do not report sophisticated spread measures.

Amihud (2002) introduced the liquidity index to investigate the influence of market conditions on stock returns. Selecting a sample of shares listed on the NYSE introduces a cross-sectional test by its framework. The test model takes the form

$$R_{m,T}^i = \lambda_0 + \lambda_1 ILLIQMA_{m,t-1}^i + \lambda_2 ATR_{m,T-1}^i + \lambda_3 v_{m,T-1}^i + \lambda_4 p_{m,T-1}^i + \lambda_5 c_{m,T-1}^i + \lambda_6 dy_{T-1} + \lambda_7 R_{100}^i + \lambda_8 R_{T-1}^i + \lambda_9 \sigma R_{T-1}^i + \lambda_{10} \beta_{T-1}^i + u_t^i$$

Over several variables stock return $R_{m,T}^i$ is regressed in month m for year T, with a constant λ_0 , At the end of year T-1, $ILLIQMA_{m,t-1}^i$ is the mean adjusted illiquidity measures, $ATR_{m,T-1}^i$ is the mean adjusted turnover ratio, $v_{m,T-1}^i$ is log of traded volume, $p_{m,T-1}^i$ is the log of stock price, $c_{m,T-1}^i$ is log of capitalization, the dividend yield dy_{T-1} , R_{100}^i is the total stock returns over the last 100 days and for the entire year is R_{T-1}^i .

The mean adjusted illiquidity measures –

$$ILLIQMA_{m,t-1}^i = \frac{ILLIQ_{m,T}^i}{AILLIQ_{m,T}^i}$$

$AILLIQ_{m,T}^i$ is the cross-stock average illiquidity for the stock i and it can be defined as –

$$AILLIQ_T = \frac{1}{N_T} \sum_{i=1}^{N_T} ILLIQ_T^i$$

Where N_T is the number of stock for year T.

1.8 Issues with volume-based measures

We can affirm at least three troubles related to the use of liquidity indices the volume.

First, these indices do not distinguish between the effects of transient and persistent prices fluctuations in the bargained volume. A concise effect can often be explained as a provisional lack of liquidity on the market, or come from the fresh transaction cost element. A secure price effect is a price change due to the existence of informational effects due to improved informed traders. This secure effect is linked to changes in the elementary value of assets anticipated by part of the market due to advantaged information.

The distinction between the effects of transitional and stable prices may also be considered as a problem related to the decomposition of a time series into a inactive and a random walking element, as discussed by Beveridge and Nelson(1981). The variation between stable and non-stable effects can be recognized from price errors. These are the difference between the ignored "effective" price and the actual transaction Price.

A price error can be busted down into an information-related module and a non-correlated term. The next arises from the discretion of prices, the transitory liquidity effects and inventory control. Information-based pricing errors are associated to the opposing selection. The presence of traders with high information on assets, and a belated adjustment from the market to new information.

As discussed by Hasbrouck and Schwarts (1988), this decomposition can be obtain only by studying the components of the bid-ask spread. French and Roll(1986) suggests that the role of information is critical in determining yield volatility. Price volatility may be the result of information irregularity, rather than a consequence of a lack of liquidity. These are aspects that cannot be taken into account by volume-based indices.

A next problem with the volume indices is that they do not explain how a sudden order the arrival can affect the prices. This is called the "order-induced effect". In other words, the volume the indexes only obtain into account the links between price and volume changes. The reason is that these indices are not depends on theoretical models of reseller/specialist behavior.

One more problem is discussed by Marsh and Rock (1986). They disagree that conventional liquidity indices tend to overestimate the impact of price changes transaction transactions. Undeniably, they also underestimate the effect of price changes on tiny transactions. This question arises from the lack of proportionality among prices and the volume of which characterizes all liquidity measures according to the volume.

In spite of these shortcomings, volume measurements can be used fruitfully to model liquidity for agency markets rather than for dealership markets. In fact, the problem, particularly for the volume indices calculated on a daily basis, they do not take into account the effect of large block operations, which are rather extremely common in the dealer markets. On the other hand, these measures signify a useful starting point for further analysis.

2. Price-variability indices

In this category, we can include measures that deduct liquidity from assets or markets directly of price behaviour. We consider the Marsh and rocks(1986) the liquidity ratio and the variance ratio, as well as its implications for market efficiency. A second group of the measures induce the liquidity condition using simple statistical techniques.

2.1 The liquidity ratio Marsh and Rock(1986)

Different from the liquidity measures considered so far, Marsh and rocks(1986) assume that price changes are independent of the size of trade, except for large negotiated blocks. This is based on the argument that the standard liquidity ratios are strongly influenced by the size of the trade. The expression of this index is given by:

$$LR_{MR}^i = \frac{1}{M^i} \sum_{m=1}^{m^t} \left| \frac{P_m^i - P_{m-1}^i}{P_{m-1}^i} \right| 100$$

where M^i is total transaction for asset i for given time.

The main problem with this index is determined by the arbitrary involved in its formulation. In exacting, during the period which the index can be calculated is not explicitly specified. It is clear, however, that an index calculated on a schedule may produce different results from those of a daily or weekly period. Due to its underlying properties, it is practical to adopt the Marsh and Rock report horizons. Different from other indices, this measure is suitable for both dealer and auction markets.

2.2 The variance ratio

The rate of variance is one of the most widely used clues in the literature. Because of its versatility, it can be applied to contexts indirectly related to market liquidity, such as the study of instability and intraday effects. This liquidity measure, also known as market efficiency ratio (MEC), measures the impact of implementation costs on the volatility of short horizons.

The idea behind the creation of this index can be summarized as follows. With high enforcement costs, asset markets are characterized by price volatility higher than theoretical volatility of equilibrium prices. As a result, a more liquid market implies a lower variance of the transaction prices around the equilibrium price. The reason is that difference between the actual price and the balance price in a liquid market is less than one should observe in a illiquid market.

The rate of variance can be calculated over arbitrary time intervals. Like what Hasbrouck and Schwarts(1988) calculate it over three separate time intervals. They consider the ratio of the variance from two days to the half hour, the ratio of one day to one hour variance, and the ratio of the return variance from two days to a day. The logic behind this the analysis is based on the informative content different from the short-and long-term

variance. In fact, a series of short-term transactions tends to affect the market price more pronounced than a set of transactions measured over a longer period of time.

The variance ratio has two additional deficiencies. The first is related to his sensitivity to the time interval chosen for its calculation. In fact, this can potentially generate contrasting results when the selected moment is chosen differently. A second drawback concerns the fact that it is a notion of unobservable equilibrium prices. The variance ratio is however measured from the actual transaction prices. This implies that it takes into account the commercial activity that has taken place within or outside the limits of spread bid-ask.

2.3 Event Studies

The methodology of the event study is to examine the behaviour of the prices of assets around a particular event of an information announcement. This method is well suited for studying active around their broadcast time. This is a time when waiting to get sustained liquidity conditions tend to generate price pressures as assets are introduced the market.

The average market conditions can provide information on liquidity. With abnormally high returns as an asset is introduced on the market, an additional supply of liquidity provides market benefits by generating higher returns. However, this observation can be interpreted in an alternative way. High yields can be considered as a means of compensating investors for the lack of effective liquidity services. This inefficiency can result from presence of transaction costs due to the existence of transaction costs. In other words, when the present value of the future transaction costs is included in the estimates, the return on assets also takes into account liquidity effects.

As this brief discussion suggests, it is difficult to provide a the interpretation of liquidity changes by considering only the observed asset profiles returns and volume exchanged. Brown and Warner(1980,1985) and Peterson(1989) suggest that there is no unique way to analyze liquidity through event studies. A general requirement is that this type of analysis should supplement the information of a set of indices generally used for technical analysis to provide a better assessment of the event under surveillance.

3. Measures based on transaction cost

Among the transaction cost measures, the bid-ask Gap and its variants are the indicators of the market liquidity that are most often used. The reason is that they provide insight into sharing of information on the market. The intuition behind the use of the bid-ask spread lies in the fact that market prices depend on the market side that initiates trade. The transactions initiated by the purchaser are concluded at the asking price, while the price of the offer. The difference between the best price (lowest) and the best price of the offer (highest) sets the bid-ask spread.

3.1 The bid-ask spread

In general, the buyer-seller gap is a measure of transaction costs in the markets of NASDAQ. A market offer is the highest price at which a broker is willing to buy an action, and to which an investor intends to sell. A market demand is the lowest price at which the dealer is ready to sell the stock. We should point out that the term ' highest price ' means "the best market offer ". Since the dealer displays both offers and prices, the difference between these quantities can be interpreted as the price that the market pays for the liquidity services offered by the dealer. Huang and Stoll (1996) suggest that specialists often operate as resellers. This is due to the institutional characteristics of the specialists. Typically the specialist disseminates a quotation on the market. The market orders are then developed in relation to the limited orders previously placed on the citation posted by the specialist. The distributed quote is defined exactly as the auction spread to the dealer market.

3.2 A measure of implied spread

The measurement of Roll(1984) is one of the most well-known liquidity indices proposed literature on microstructure. The idea of Roll is to use a model to deduce the propagation carried out(actual spread) which is reflected by the time series properties of the observed market prices and/or returns.

The main disadvantage of this type of model is that it offers no insight into the possible components of the propagation. The reason for this is that this framework is based on the hypothesis of homogeneous information between traders. As a result, the opposing selection the component is missing. The magnitude of the propagation reflects only the so-called order treatment costs, considered to have a transient effect, contrary to the information effects, which have permanent effects.

3.3 The role of asymmetric information

Glosten (1987) is the first contribution that models the role of information asymmetries in market microstructure. This article introduces the distinction between the effects the processing of orders and those from adverse information. As mentioned earlier, the first type is transient, while the second is permanent. On the other hand, the unfavorable information component produces non-transient impacts as it affects the security balance value. There are many reasons why price effects last a long time. For example, this can happen when market levels engage in transactions with investors' superior information. Thus, an order passed by a trader can be correlated with the real asset value.

4. Measures based on the balance that estimating resilience

In order to assess the seasonality of stock market liquidity, we will use two liquidity measures: relative variance and turnover. Our choice is based on the availability of data, The fact that these two measures together cover three dimensions and liquidity documents Fong, Holden and Trzcinka (2014) or Sarr and Lybek (2002), who

consider these proxies as reliable measures to determine the liquidity of the financial markets. We apply the same method as Rubio and Tapia (1996) and calculate the first measure for each stock each country using the following formula:

$$\text{Relative Variance}_{it} = \frac{\text{Ask}_{it} - \text{Bid}_{it}}{(\text{Ask}_{it} + \text{Bid}_{it})/2}$$

where Ask_{it} and Bid_{it} indicate the quoted prices of the demand and the offer for the stock I on day T. In addition, the relative variance, sometimes referred to as a percentage difference, is the liquidity measures of transaction costs, implying that a particular discrepancy would be less Expensive if the price was higher. The relative distribution is appropriate for comparisons between markets (Sarr and Lybek, 2002), which is important in our study, as we intend to examine the seasonality of liquidity in various financial markets. In order to assess the seasonality of market liquidity in terms of changes in the trading activity, we will calculate the second liquidity measure Turnover_{it} based on Hong and Yu (2009) and Rubio and Tapia (1996). It is calculated for each country the following way:

$$\text{Turnover}_{it} = \frac{\text{Number of shares Traded}_{it}}{\text{Number of Shares outstanding}_{it}}$$

Where i is the index for a particular stock, while t indicates a specific period (in our day of the case). Turnover is part of the volume-based measure, and gives an idea of the number of the exceptional volume of a particular asset changes hands (Sarr and Lybek, 2002).

Conclusion

The "stock liquidity" as conceptual research was initiated by Amihud in 1986. Since then, research has been carried out in the area of the definition of liquidity, by devising measures to quantify the liquidity, by identifying the determinants of liquidity and the implications of liquidity on asset valuation, dividend policy, yields and market efficiency. This study analyzed various publications related to current research in the field of liquidity in the stock markets. This paper also discussed various literatures discussing various measures of liquidity along with the problems associated with them. In Asian stock market, the liquidity measurement is based on the system of impact cost based as it is calculated is at random time in a day and once in a six month. It is very important and best criteria to measure liquidity in Asian stock market.

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