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THE LIQUIDITY AND INFORMATIONAL EFFICIENCY IN STOCK AND BOND MARKET

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Abstract

This paper was taking a first step toward an integrated approach to stock and bond liquidity and informational efficiency. We drew from the literature to develop comprehensive understanding about liquidity and information event in stock and bonds market. We used variables from Chordia, et al. (2005), to explore cross-market liquidity dynamics by estimating a vector regressive model for liquidity such as bid-ask spread and depth, returns, volatility, and order flow in the stock and Treasury bond markets. We analyzed the work from Hotchkiss, et al. (2002) to find the informational efficiency of corporate bond prices. It was similar to that of the underlying stocks. The central contribution of this paper was to reveal the possibility in applying this kind of research in Indonesian market.

Key words: *liquidity, informational efficiency, stock, bond, asset's prices*

Microstructure literature recognizes two economic forces that drive trading: liquidity events and information events. The first to make this distinction was Bagehot (1971), (Also see Copeland & Galai (1983), Easley & O'Hara (1987) and Glosten & Milgrom (1985)). A liquidity event is unique to an individual investor (i.e., an individual cash flow receipt or expenditure). An information event is the advent of news that affects all investors' assessment of a security's share value. Participants do not receive news simultaneously, and the risk of transacting with a better informed trader is borne by market makers and limit order placers alike. The market maker is compensated for accepting this risk by earning the spread when transacting with liquidity motivated traders. Handa & Schwartz (1996b) show that a limit order trader is similarly compensated.

Chordia, et al. (2005) explore that innovations to stock and bond market liquidity and volatility are significantly correlated. This implies that common factors drive liquidity and volatility in these market. Volatility shocks are informative in predicting shifts in liquidity.

Hotchkiss & Ronen (2002) find that the informational efficiency of corporate bond prices is similar to that of the underlying stocks. The stocks do not lead bonds in reflecting firm-specific information. Further examination on price behaviour around earnings news shows that information is quickly incorporate into both bond and stock prices, even at short return horizons.

Using transaction data from Indonesia, Dvorak (2005) finds domestic investors have higher profits than foreign investors. While the results

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show that domestic investors do have an information advantage, they also support the argument that some foreign institutions have better information because of their experience and expertise. Clients of global brokerage have higher long-run profits than clients of either local or Asian brokerages. This is consistent with global brokerage providing superior advice to their clients. Global brokerage such as Merril Lynch or J.P Morgan can draw on years of experience and accumulated human capital. They are older and more experienced than brokerages from Indonesia, Singapore, Thailand or Malaysia.

The research described in this paper is focused on stock and bond market movement in Indonesian market based on two approaches: 1) information events and 2) liquidity events. Our position is, we will analyze both and what are variables and measurement to use, to arrive to such conclusion. Thus, we try to integrate the traders concept from Kyle (1985) and Admati & Pfleiderer (1988) in Indonesian market context.

The central premise of this position is how is liquidity and information efficiency affect the stock and bonds' prices through trading. When this kind study remain unexplored in Indonesian market, then the central contribution of this paper is how we reveal the possibility to apply this kind of research in Indonesian market. The relation between Liquidity and Information to Asset's Prices is shown in Figure 1.

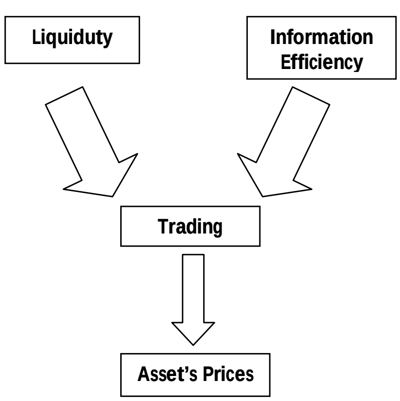

Figure 1. The Relation between Liquidity and Information to Asset's Prices (Developed by Author)

The rest of the paper is organized as follows. Section II describes liquidity on stock and bond market, section III provides informational efficiency, section IV discuss about traders, section V represents about Indonesian capital market, section VI presents the proposition of new interaction among liquidity, information and traders, section VII concludes.

Liquidity

We will use the concept of utility from Chordia, et al. (2005). As a fundamental concept in finance, liquidity can be defined as the ability to buy or sell large quantities of an asset quickly and at low cost. While as a concept this can be applied both to stock and bond market, the variable measurements are different.

There is a good reason, to believe that liquidity in the stock and bond market covaries. Liquidity shocks, caused by financial crises, which does not exist in effcient market, decline or even dries up the liquidity from the market. In each crises, starting from Great Depression on 1929, LTCM and Black October 1987, Asian crisis 1998, American crisis 2008, liquidity can decline or even disappear. Such liquidity shocks are a potential channel through which asset prices are influenced by liquidity. Amihud & Mendelson (1986) and Jacoby, et al. (2000) provide theoretical arguments to show how liquidity impacts financial market prices. Jones (2001) and Amihud (2002) show that liquidity predicts expected returns in the time series. Pastor & Stambaugh (2003) find that expected stock returns are cross-sectionally related to liquidity risk (Chordia, et al., 2005).

Liquidity can affect the pricing of bonds and stocks in two main ways. First, liquidity may affect the betas, as economic shocks may not be transmitted quickly to observed returns in illiquid markets. This called a factor exposure effect. Second, liquidity may be a priced factor, and shocks that improve liquidity should increase returns. The impact of liquidity on stock and bond return comovements then obviously depends on how liquidity shocks comove across markets (Baele, et al. 2009).

The studies of liquidity in the stock and bond market were done by several scholars. First, although the unconditional correlation between stock and bond returns is low (Campbell & Ammer, 1993), there are strong volatility linkages between the stock and bond market (Fleming, et al., 1998), which can affect liquidity in both markets by altering the inventory risk borne by market-making agents (Ho & Stoll, 1983 and O'Hara & Oldfield, 1986). Second, stock and bond market liquidity may interact via trading activity. In practice, a number of asset allocation strategies shift wealth between stock and bond markets. A negative information shock in stocks often causes a "flight-to-quality" as investors substitute safe assets for risky assets. The resulting outflow from stocks into Treasury bonds may cause price pressures and also impact stock and bond liquidity. In other situations, stock and bond order flows may be complementary. For example, if the Central Bank pursues an expansionary monetary policy, the increase in funds could cause higher order inflows into both stocks and government bonds and potential changes in their liquidity. Further, systematic wealth or informational shocks could induce positively correlated trading activity across equity and fixed income securities, and, in turn, cause comovements in liquidities across these markets. Overall, the preceding discussion implies that liquidity can exhibit comovement across asset classes and can also be driven by common influences such as monetary shocks (Chordia, et al., 2005).

For example, the monetary policy stance can affect liquidity in both markets by altering the terms of margin borrowing and by alleviating the borrowing constraints of dealers, or by simply encouraging trading activity. Liquidity effects may also correlate with the "flight-to-safety" phenomenon. Crisis periods may drive investors and traders from less liquid stocks into highly liquid Treasury bonds, and the resulting price-pressure effects may induce negative stock-bond return correlations. Some of these effects may persist at the quarterly frequency. Existing studies of the commonality in stock and bond liquidity (Chordia, et. al., (2005) and Goyenko (2006) are inconclusive as to which effect dominates. Table 1 suggest the summary of the studies.

The stock and bond returns in US display an average correlation of about 19% during the post-1968 period. During the mid-1990s, the stock-bond correlation was as high as 60%, to drop to levels as low as minus 60% by the early 2000s.

In particular, the negative stock-bond returns correlations observed since 1998 are mostly ascribed to a "flight-to-safety" phenomenon (see Connolly, et al., 2005), where increased stock market uncertainty induces investors to flee stocks in favor of bonds.

Table 1. Stock and Bond Covaries Model

Model	Result	Scholars
Covaries	Strong volatility between stock and bond market	Fleming, Kirby & Ostdiek (1998)
	Low unconditional correlation between stock and bond return	Campbell & Ammer (1993)
	Inventory risk borne by market making agents	Ho & Stoll (1983) and O'Hara & Oldfield (1986)
Trading Activity	Flight to Safety	
	Flight to Quality	

Bonds' Liquidity

The liquidity of a bond is systematically related to its characteristics. Over time, bonds are absorbed into investors' portfolio (e.g., pension funds or insurance). A bond's liquidity tends to decrease with its age. The bonds' age and their time-to-maturity upon issuance are correlated (Sarig & Warga, 1989).

It is natural to use a measure of liquidity in bond market. Since the direct measure is unavailable, three proxies will be used to measure bond market liquidity. The first proxy is the bond's age. The second proxy is the bid-ask spread of price quotations as suggested by Roll (1970) as well as McCulloch's (1987) findings. The bid-ask spread is used by trader which is prone to require a high margin for error. A high bid-ask spread indicates a relatively illiquid bond. Not that traders are likely to use larger spread in volatile periods because in such period uncertainty about an illiquid bonds's price is larger. This is suggested by Garbade & Silber (1976) and demonstrated empirically by Garbade & Rosey (1977). The third proxy for bond liquidity is the amount of bonds outstanding as suggested by Fisher (1959) and Garbade & Silber (1976). This proxy is based on the potential correlation between the existing inventory of a particular bond and its flow of trade.

Stock Liquidity

The stock liquidity measures may be divided into two broad categories: trade and order-based measures. Trade based measures include trading value, trading volume, the number of trades (frequency) and the turnover ratio. These measures are attractive but they are ex post rather than ex ante measures. These measures fail to indicate the ability of investors to transact immediately and the cost associated with, which is the essence of liquidity (Aitken & Comerton-Forde, 2003).

Order-based measures use the bid-ask spread as cost representative that investor must incur in or der to trade immediately. To purchase (sell) a stock, investors must cross the spread and hit the existing ask (bid) orders in the schedule. To capture the relative spread, this cost is calculated as a percentage of the stock price. Consistent with McInish & Wood (1992), time-weighted relative spread are calculated by dividing the difference between the best bid and ask by the midpoint price and weighting it by the time it existed.

The price formation in the stock and bond market is identified thorugh order flow in stock and bond market trading, that is possibly induced correlated movements in liquidity. The following section will analyze properties of variables measurement used in Chordia's, et al. (2005) model.

METHOD

Variables Measurement of Stock and Bond Liquidity

The principal focus in this research is on analyzing the drivers of stock and bond liquidity measures that have been the focus as well as the previous literature, i.e. quoted spreads and market depth. Based on earlier literature (e.g., Benston & Hagerman, 1974; Amihud & Mendelson, 1986; and Hasbrouck, 1991), we extend these drivers to be returns, return volatility, and trading activitiy. The order imbalances is used to infer the trading activity, because order imbalances represent aggregate pressure on the inventories of market makers. That is why the order imbalances have a stronger relationship to trading costs rather than volume. In GovPX Inc., US database which covers trading activity among primary dealers in the interdealer broker market, the order imbalances data is provided. If we want to use order imbalances in Indonesian stock and bond market, we have to search appropriate sources of transaction data with GovPV Inc., or we have to infer order imbalances into other similar function with aggregate pressure on the inventories of market makers. Another development is, since Indonesian market makers do not hold inventories like market makers in US market, we have to develop another inference or implication of trading activity (i.e., order flow).

The variables of liquidity measurement is summarized in Table 2.

The bond data used is on-the-run Treasury notes with 10 years to maturity because we want to capture liquidity in relatively long-term fixed income market. In US market, this account for 71% of activity in the interdealer market (Fabozzi and Fleming, 2001). The data 30-year Treasury bond is not available. To avoid excessive variation in the sample size, we required the stock to have traded for a minimum of 100 days in a year to be included in the sample. Both stock and bond are based on data from New York trading hours (7.30 am to 5.00 pm).

RESULT

To ascertain which day-to-day liquidity are caused by returns and return volatility, both returns and return volatility are obtained as residual and the absolute value of the residual from the following regression (Schwert (1990), Jones, Kaul, and Lipson (1994) and Chan and Fong (2000):

$$R_{it} = a_1 + \sum_{j=1}^{4} a_{2j} D_j + \sum_{j=1}^{12} a_{3j} R_{it-j} + e_{it}, \qquad (1)$$

Where:

D_j is dummy variable for the day of the week,

$R_{i,t}$ represents the daily return on the Lehmann Brother's bond index or on the CRSP value-weighted index.

Vector autoregression is used to explore the intertemporal association between market liquidity, returns, and volatility. The liquidity may impact returns through a premium for greater trading costs was discussed in Amidhud & Mendelson (1986). However, returns may also influence future trading behavior, which in turn, my affect liquidity.

The impact of volatility on liquidity has been addressed in Benston & Hagerman (1974), the idea being that increased volatility implies increased inventory risk and hence a higher bid-ask spread. In the reverse direction, decreased liquidity could increase asset price fluctuations (see, e.g., Subrah-

Table 2. Variables Liquidity Measurement (Chordia, et al., 2005)

Bond	Definition	Stock	Definition
QSPRB	The daily time-weighted average quoted bid-ask spread = the best ask-the best bid per par value	QSPRS	The daily average quoted bid-ask spread = quote ask- quote bid averaged over the trading day
DEPB	The posted bid and ask depth in monetary unit, averaged over the trading day	DEPS	Average of posted bid / ask depth in monetary unit, averaged over the trading day.
OIBB	Monetary unit value of buy – monetary unit value of sells each day, divided by to total monetary value of buys and sells. (the daily order imbalace)	OIBS	The value of shares bought – shares sold each day, as a proportion of the total value of shares traded (the daily order imbalance)

manyam, 1994). Further, the predictive relationship between imbalances and liquidity has been addressed in Chordia, et al. (2002), who find that high negative imbalance and high negative return days are followed by return reversal, because of market maker inventories or investor overreaction and correction. However, if increased liquidity makes assets more attractive and induces agents to buy these assets, then in turn, may infuences order imbalances.

The cross-market effects across stocks and bonds may be significant. For example, if there are leads and lags in trading activity in response to systematic wealth or informational shocks, then trading activity in one market may predit trading activity and liquidity in another. Similarly, leads and lags in volatility and liquidity shocks may have cross-effects. If systemic (macro) shocks to liquidity and volatility get reflected in one market before another, then liquidity in one market could influence future liquidity in another market. More generally, if variables in one market forecast the corresponding variables in the other, then the influence will carry over to cross-market effects as well.

Given that there are reasons to expect cross-market effects and bidirectional causalities, the paper then adopt an eight-equation vector auto-regression that incorporates eight variables, four each (i.e., measures of liquidity, returns, volatility, and order imbalances) from stock and bond markets. The following system will be used:

$$Xt = \sum_{j=l}^{K} a_{lj} X_{t-j} + \sum_{j=l}^{K} b_{lj} Y_{t-j} + u_t, \quad (2)$$

$$Yt = \sum_{j=l}^{K} a_{2j} X_{t-j} + \sum_{j=l}^{K} b_{2j} Y_{t-j} + u_t, \quad (3)$$

X (Y) is a vector that represents liquidity, returns, order imbalance, and volatility in the bond (stock) market. K, the number of lags in Equations (2) and (3) will be based on Akaike and the Schwarz information criterion. Where these two criteria indicate different lag lengths, the lesser lag will be chosen. Typically, the slope of the information criterion (as function of lags) is quite flat for larger lag lengths, so the choice of smaller lags lengths is justified. The estimation from VAR model is to capture time-series movements in stock and bond liquidity. For further examination like the unexpected liquidity shocks (like events of crises or severe market change condition) also can be examined using VAR disturbances properties.

The daily results can be summarized as follows. There are significant cross-correlations in liquidity innovations after the effects of returns and volatility. The results of impulse response properties show evidence that volatility shocks predict liquidity movement both within and accross markets. The innovations to stock volatility forecast an increase in bond spreads. Furhtermore, shocks to volatility in a market forecast a reduction in that market's liquidity. This result is consistent with standard microstructure models such as Ho & Stoll (1983), in which volatility, by increasing inventory risk, has an adverse effect on liquidity.

Volatility in each market is also related to lagged own market volatility as well as the volatility in the other market. There are significant cross-market effects in volatility. Volatility persistence is observed in both market, and the asymmetric volatility result that volatility decreases in upmarkets (large block traders) and increases in down-markets, obtain in both the stock and bond markets.

The impact of volatility on spreads is economically significant, for example, one standard deviation shock to stock volatility on stock spreads impacts to an annualized amount of $200,000 on a daily round-trip trade of 2 million shares in NYSElisted common stocks, whereas the bond volatility of the stock spread is about half of $200,000.

The spread innovations and return innovations are negatively correlated, suggesting that liquidity in both stock and bond markets is lower in down-markets, possibly because of strained market-making capacities during periods of bearish. Finally, the results strongly suggest the existence of a missing factor that commonly impacts bond and stock liquidity. The missing factor suspected is the systemic influences.

Informational Efficiency

Hotchkiss & Ronen (2002) examine that the informational efficiency of corporate bond prices is similar to that of the underlying stocks. The stocks do not lead bonds in reflecting firm-specific information. Further examination on price behaviour around earnings news shows that information is quickly incorporate into both bond and stock prices, even at short return horizons.

Both stock and bonds are claims on the value of the firm's assets. As such, information that affects the value of those assets will impact prices of both the firm's bonds and stock. To the extent that both markets are informationally efficient, there is contemporaneous relationship between bond and stock returns. If the bond market is less efficient, stocks will reflect information about the value of underlying assets more quicky, and then the stock returns have predictive power for future bond returns.

Table 3. Granger Causality Tests and Contemporaneous Correlation between VAR Innovations

	OIBB	OIBS	VOLB	VOLS	RETB	RETS	QSPRB	QSPRS
(a) Correlations between VAR innovations								
OIBB	1.00							
OIBS	0.03	1.00						
VOLB	-0.01	-0.05**	1.00					
VOLS	0.00	-0.08*	0.22*	1.00				
RETB	0.05*	0.25*	-0.04**	-0.02	1.00			
RETS	0.02	0.80*	-0.08*	-0.15*	0.31*	1.00		
QSPRB	-0.02	-0.06*	0.24*	0.10*	-0.12*	-0.14*	1.00	
QSPRS	-0.01	-0.16*	0.15*	0.23*	-0.08*	-0.24*	0.26*	1.00
(b) Chi-square statistics from Granger causality tests. Null hypothesis: Row variable does not Granger-cause column variable								
OIBB		0.080	1.340	7.745*	3.316	0.234	0.128	0.154
OIBS	1.966		1.217	2.860	3.360	4.047	0.919	2.617
VOLB	0.729	5.954**		1.154	3.458	8.918*	22.156*	0.498
VOLS	8.902*	1.137	2.956		0.084	1.111	4.396	34.167*
RETB	4.337	2.478	9.659*	6.036*		4.849**	3.354	5.492**
RETS	0.481	3.286	1.142	25.525*	1.733		0.014	12.342*
QSPRB	0.451	6.605	7.616*	2.364	3.301	7.333*		0.737
QSPRS	2.816	1.200	0.721	14.086*	0.380	3.086	2.723	

Several recent studies find a strong contemporaneous relationship between corporate bond returns and both government bond and stock returns using monthly or weekly quote data (Blume, et al., 1991; Cornell & Green, 1991; and Kwan, 1996). Extending this work, Kwan (1996) suggests that lagged stock returns have explanatory power for current bond yield changes. Although the positive and significant correlations between bond and stock return persist on the daily and tradaily level, the Granger causality test indicate that lagged stock returns are not significant in explaining bond returns. Any contemporaneous relationship is therefore best described as a joint reaction to common factors.

Since both bonds and stocks react to common information events, both daily and hourly high-yield bond returns are significantly related to unanticipated earnings announcement. Furthermore, this firm-specific infomation in incorporated as quickly into bond prices as into prices of the underlying stock.

The return generating process is utilized the one in Cornell & Green (1991), and measure stock and treasure returns using the S&P 500 and Lehmann Intermediate Government Bond as follows:

$$RB_t = \alpha_t + \sum_{i=1}^{nb} \beta_i^B RB_{t-i} + \sum_{i=0}^{ni} \beta_i^L RL_{t-i} + \sum_{i=0}^{ns} \beta_i^M RM_{t-i} + \varepsilon_t, \quad .....(4)$$

Where:

RBt= equally weighted FIPS bond portfolio return

RLt= Lehmann index return

RMt= S&P 500 index return

RDt= default-free return

In terms of informational efficiency, the comparison between bond returns to return on the stock of the same firm. The regression of bond returns on the corresponding default-free securities, the S&P 500 index and the underlying stocks is as follows:

$$RB_t = \alpha_t + \sum_{i=1}^{nb} \beta_i^B RB_{t-i} + \sum_{i=0}^{ni} \beta_i^D RD_{t-i} + \sum_{i=0}^{ns} \beta_i^M RM_{t-i} + \sum_{i=0}^{ns} \beta_i^S RS_{t-i} + \varepsilon_t, \quad ....(5)$$

Where:

RSt = equally weighted underlying stock portfolio return

RBt-i = inclusion of lagged bond returns (functioned as autocorrelation-adjusted bond returns).

Et = standard error adjustment to account for potentially serially correlated and heterocedastic errors using Hansen's (1982) generalized methods of moments.

Table 4 describes 20 bonds portfolio by credit ratings and its relation in daily regression. Based on Scholes & William (1977) and as in Cornell & Green (1991), the result shows the sum of the coefficients as opposed to individual coefficients since interpretation of the individual lagged coefficisnets is inappropriate in this context. Results are insensitive to the inclusion of additional lags (or leads) of any variables. The return on the daily bond portfolio in equation (4) is significantly positively related to the Lehmann Index Return ("âL = 0.58), as well as to the daily S&P 500 index return ("âL = 0.49). Regression (5) substitutes the default-free bond return for the Lehmann index return. Although the coefficient is somewhat lower, this variable more closely measures the interest rate risk of the specific FIPS securities. Market-wide information is reflected in the coefficient for the S&P 500 return which is slightly greater in Regression (5).

The Table 5 shows regressions equation used in Table 4. The regressions equation relating daily bond returns to interest rate and equity movements follows Hotchkiss et al., 2002.

$$RB_t = \alpha t + \sum_{i=1}^{nb} \beta_i^B RB_{t-i} + \sum_{i=0}^{ni} \beta_i^L RL_{t-i} + \sum_{i=0}^{ns} \beta_i^M RM_{t-i} + \varepsilon_t$$

$$RB_t = \alpha t + \sum_{i=1}^{nb} \beta_i^B RB_{t-i} + \sum_{i=0}^{ni} \beta_i^D RD_{t-i} + + \sum_{i=0}^{ns} \beta_i^M RM_{t-i} + \varepsilon_t$$

$$RB_t = \alpha t + \sum_{i=1}^{nb} \beta_i^B RB_{t-i} + \sum_{i=0}^{ni} \beta_i^D RD_{t-i} + \sum_{i=0}^{ns} \beta_i^M RM_{t-i} + \sum_{i=0}^{ns} \beta_i^S RS_{t-i} + \varepsilon_t$$

Where

RB_t is the FIPS bond portfolio return,

RL_t and RD_t are the Lehman Intermediate Government Bond Index nad default free bond returns,

RM_t and RS_t are the S&P and underlying stock portfolio returns.

nb, ni and ns denote the number of lags for the bond, interest rate and stock returns respectively

Table 4. Regression Models Relating Daily Bond Returns to Interest Rate and Equity Movements (Hotchkiss, et al., 2002).

	α	$\sum \beta^B$ FIPS bond	$\sum \beta^L$ Lehman Int Govt	$\sum \beta^D$ Default free	$\sum \beta^M$ S&P	$\sum \beta^S$ Stock	Adjusted R^2	N
A. All Bonds								
(1)	-0.0004	-0.1020	0.5803[a]		0.4903[a]		0.175	138
	(0.1637)	(0.5424)	(0.0001)		(0.0024)			
(2)	-0.0003	-0.1467		0.2513[a]	0.5377[a]		0.138	138
	(0.2458)	(0.3874)		(0.0098)	(0.0012)			
(3)	-0.0003	-0.1616		0.2624[b]	0.5476[a]	0.0209	0.138	137
	(0.2796)	(0.3413)		(0.0117)	(0.0015)	(0.7620)		
B. Bonds rated BB- to BB								
(4)	-0.0001	-0.3571[b]	0.7098[a]		0.4451[a]		0.204	138
	(0.6687)	(0.0381)	(0.0001)		(0.020)			
(5)	0.0000	-0.3868[b]		0.2966[a]	0.4880[a]		0.161	138
	(0.9302)	(0.0189)		(0.0028)	(0.0010)			
(6)	0.0001	-0.3024[c]		0.3203[a]	0.4130[a]	0.0847	0.221	138
	(0.7777)	(0.0921)		(0.0007)	(0.0023)	(0.1490)		
C. Bonds rated B- to B+								
(7)	-0.0003	-0.1332	0.5561[a]		0.3396[c]		0.086	138
	(0.3131)	(0.4731)	(0.0012)		(0.0565)			
(8)	-0.0003	-0.1553		0.2691[b]	0.3665[b]		0.065	138
	(0.4033)	(0.4064)		(0.02010)	(0.0445)			
(9)	-0.0001	-0.2471		0.3769[a]	0.2752[c]	0.1465[b]	0.135	138
	(0.7516)	(0.1575)		(0.0024)	(0.0731)	(0.0247)		
D. Bonds rated CCC+ or lower								
(10)	-0.0004	-0.2509	0.5713		0.9061[a]		0.059	138
	(0.5705)	(0.1332)	(0.1449)		(0.0023)			
(11)	-0.0003	-0.2689		0.1974	0.9459[a]		0.052	138
	(0.6468)	(0.1051)		(0.3563)	(0.0019)			
(12)	-0.0002	-0.2408		0.2131	0.7140[b]	0.1154[b]	0.125	138
	(0.7309)	(0.1690)		(0.3030)	(0.0387)	(0.0363)		

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Regression include three lags of the bond return (nb=3), the contemporaneous Lehman or default-free return (ni=0), the conteporaneous plus four lags of the S&P or stock returns (ns=4).

Standard errors are calculated using Hansen's (1982) generalized method of moments.

Further examination on an alternative analysis for potential effect of interest rate moement, the F-test shows that the null hypothesis of stock (bond) returns have no explanatory power for the bond (stock) returns in a p-value of 0.27 (0.83) for the daily data. These results are critical in the interpretation of the regression in (4) and (5) regarding the links between the bond and equity markets: strong significant relationship among the bond and equity markets should not necessarily be regarded as causal relationship. Any contemporaneous (or lagged) relationships are attributed to the joint reaction to common factors.

Moreover, analysis on how both securities react to firm-specific information gives an indication that for bond returns, the forecast error is positive and significant for the one-day interval ending on the announcement date (-1,0). Return for any subsequent time interval are not significantly related to the forecast error. These results suggest that the inforamtion related to the earnings news is fully reflected in bond prices by the end of the announcement day. For stock returns, the returns past the day 0 and day 1 (0,1) interval are not related to the forecast error. Information is largely incorporated on the announcement date and to a smaller degree on the following date.

The analysis in hourly regression shows that information is fully incorporated into the high-yield bond prices by the end of the fourth hour following the announcement, though the significance levels decline substantially after the hour of the announcement. The stock returns regressions indicate that information is fully incorporated by the seventh hour following the announcement, and the significance levels decline substantially after the hour of the announcement. The greatest impact in stock prices appears in the first hour. Since most announcements occur early on the announcement date, these results show that information is quickly incorporated into both bond and stock prices within that day. Most importantly, the evidence is inconsistent with the idea that information is incorporated into bond prices only slowly over time.

Traders

The theoritical work of Kyle (1985) and Admati & Pfleiderer (1988) provides a structural link between private information, trading volume and stock-return variances. Kyle models a market with three types of traders: informed investors who trade strategically to maximize the profits from their private information, random liquidity traders whose buy and sell orders arrive randomly and exogenously through time, and a specialist who has no private information, but learns from price and volume changes.

In related work, Admati & Pfleiderer (1988) extend Kyle's analysis to include a fourth class of traders called discretionary liquidity traders. Discretionary liquidity traders have no private information. Unlike the random liquidity traders, these traders have some discretion over the timing of their trades. Admati and Pfleiderer show that, in general, trades of both discretionary liquidity traders and informed traders will cluster, with each group preferring to trade when the market is thick. This clustering of trades causes variance to be highest when trading is most active. Only random liquidity traders and informed traders for whon the intraday rate of decay for private information is high will trade during inactive periods when markets are thin.

The nature of market captures the spirit of the Walrasian auction in that the market-clearing price is determined through a sequential process and no trades occur out of equilibrium. The trading mechanism can be viewed as a type of trading game in which players meet at some venue and act according to some rules. The players may involve a wide range of market participants, although not all types of players are found in every mecahnism.

Brokers, who transmit orders for customers are one of the players. Brokers do not trade for their own account, but act merely as conduits for customer orders. These customers may be retail traders, or they may be other market participants such as dealers who simply wish to disguise their trading intentions.

If the orders are established in price at which others can trade and there is no market maker intermediation, the market is order driven. The pure order driven market set where each investor individually determines whether to place a limit order and enable another investor to buy of to sell by market order, or to submit a market order and ennable another investor's limit order to execture. Each investor's own tactial trading decision depends on the intensity of his or her desire to trade, and on the configuration of orders posted in the market. The Jakarta Stock Exchange is one example. Another is SBF Bourse de Paris's CAC market, Toronto TOREX, Tokyo's CORES and Switzerland's SWX market (Handa, et al., 2005). Further description about Jakarta Stock Exchange is the next section.

Indonesian Capital Market

We describe the structure of Indonesian Capital Market represented by JSX (Jakarta Stock Exchange) as from Aitken & Comerton-Forde (2003). The JSX operates using the Jakarta Automated Trading System (JATS). JATS an is open electronic order book which trades continuously between 9:30 to 12:00 and 13.30 to 16:00 on Monday to Thursday and between 9:30 to 11:30 and 14:00 to 16:00 on Friday. The JSX has two categories of trading boards: the regular board (main board) and the negotiated boards.

Regular boards orders must be in round lots of 500 units. The main board accounts for 98% of all trades (Dvorak, 2005). These orders are matched continuously according to price and time property. Orders may be amended or withdrawn prior to execution, but only limit orders may be entered. Short selling is prohibited.

The main board operates trading as a continuous auction. All orders are entered by member brokers as limit orders and are then matched by the computer according to price and time priorities. Each records contains the date, stock code, transaction price, and volume of shares. Most importantly, each transaction record indicates whether the investor represented by the broker is a domestic or foreign investor, and shows the identities of the brokerage firms involved in the transaction. In addition, each transaction record contains the buy and sell order numbers. Since order numbers are assigned sequentially, it is possible to identity whether the trade was buy or sell initiated.

There were five negotiated markets available to investors. These were the Crossing Board, the Foreign Board, the Block Sales Board, the Odd Lot Board and the Cash Board, Negotiated Board trades arise from negotiations between brokers and do not compete with the Regular Board trades and are not automatically matched by the trading system.

The figure 2 below is the example of order book of Bank BRI on 2003. The main board of BBRI is provided by one the provider in JATS, consists of Buy order table, sell order table, order book, price-volume rank and transaction details. Code IF stands for Foreign Investor, DX stands for Domestic Investors.

DISCUSSION

Liquidity, Information and Traders

In this section we arrive to comprehend the integration from previous chapters to better understanding among liquidity, information and traders in order to form asset's price.

Consider an investor (of bond or stock, or both) who has placed a limit order to buy. If bullish news occurs, stock and bonds value rises and the limit order does not execute. If bearish news occurs and the limit order executes, the investor loses if stock and bonds value below the purchase price of the limit order. Thus, if only information events occur, the investor is in a "heads you win, tails I loose" situation and will never place a limit order.

The arrival of liquidity motivated, market order sellers can also cause stock prices to fall and buy limit orders to execute. Unlike with an information event, after a liquidity event, price tends to revert back to its previous level, and the limit order trader profits from the execution. But the arrival of liquidity motivated, market order buyers (rather than sellers) can alternatively cause share price to increase. When this occurs, the limit order buyer either does not trade at all or may buy shares at an inflated price.

When domestic investors have inside information, they may learn about important news announcements shortly before foreigners do. This domestic brokers will quote an order and get in line. In order driver market, it achieves a balance

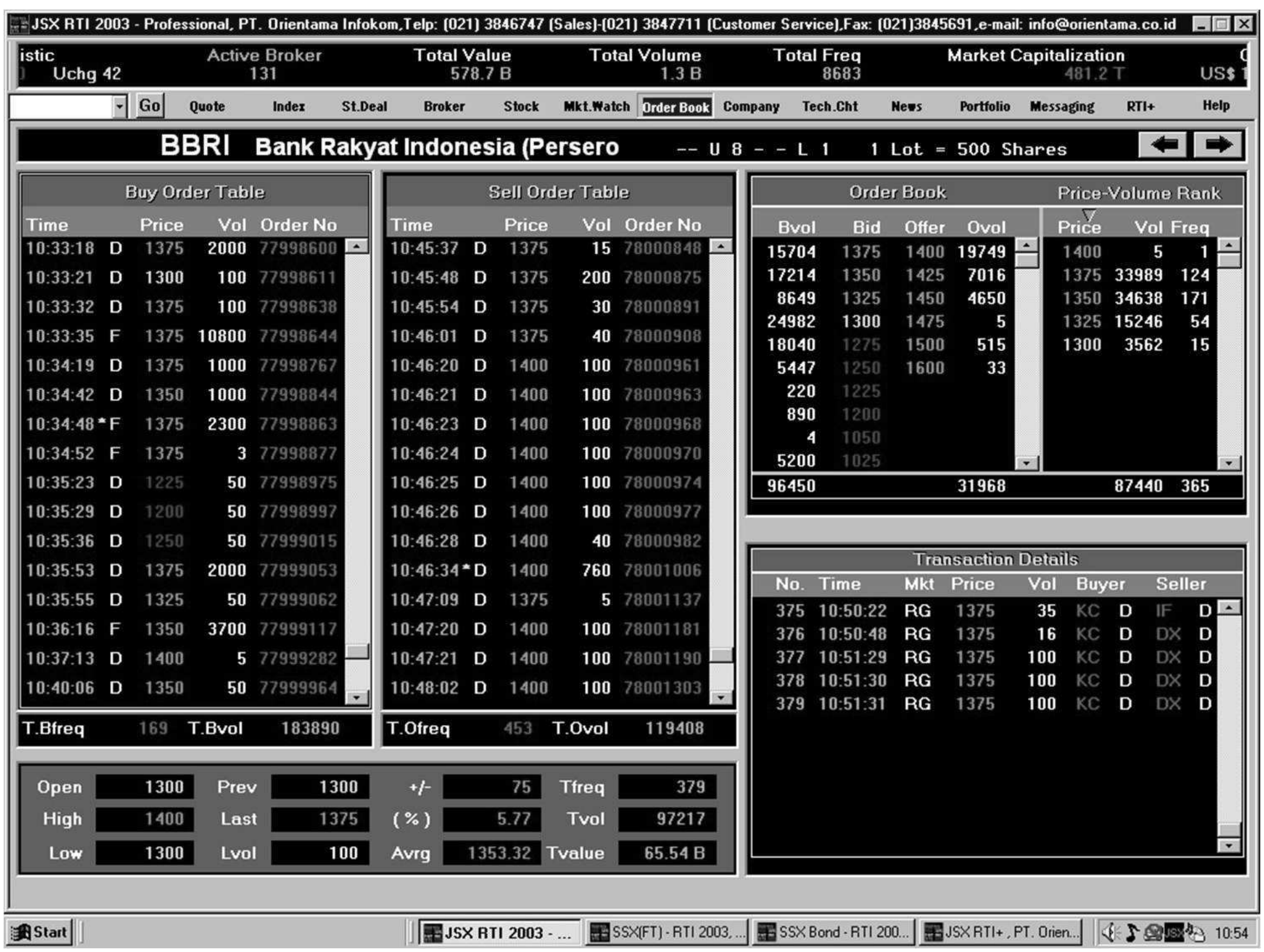

Figure 2. Example of Order Book of BBRI stock in JSX
(as courtesy of Pak Irwan Eka Adiputra, 2010)

between limit order and market order traders when the accentuated short-period volatility is just sufficient to compensate the marginal investor for placing a limit order. Assume that few investors are initially placing limit orders and consequently, that liqudiity events generate large mean reverting price swings. The compensation implied by the short-run volatility attracts more limir order placers and the book fills up. As the book fills, liqudiity events have less of an impact, the accentuated short-period price volatility is muted, and the compensation for placing a limit order falls. When volatility falls to a level that is just sufficient to compensate the marginal limit order trader, the depth of the book and the accentuated short-period price volatility are equilibrated, and the market achieves what it called "ecological" balance and trading occurs.

In this case, the trading profit would come from domestic investors buying (selling) stocks just prior to a price increase (decrease). This would result in a comovement of initial transaction and price increases at very short horizons. On the other hand, if domestic investors are simply superior stock pickers, that is, if they buy stocks that out-perform in the long run, the profit would come from long-run comovement of initial transaction and prices changes.

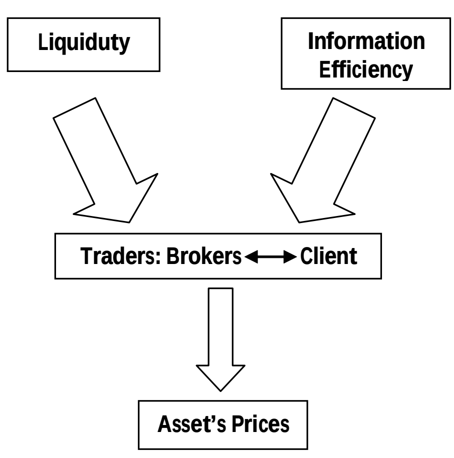

Figure 3 displays the relation among liquidity, information efficiency and traders (brokers and clients) to form assets's prices.

Unlike market makers, however, the primary objective of most investors is to implement a portfolio decision, rather, than to sell immediacy to others. An no investor, of course, is under an obligation to make a two-sided market. But, as it is true for a quote driven market, the spread remains as the price of immediacy for market order traders because it endures the presence of a large number of limit order placers.

If we consider the order driven market as an ecological system, the regulators of a securities market should pay attention. Like any ecology, the order driven market requires a reasonable balance between various types of participants. Any imposed change that turns limit order traders in an order driven market (or dealers in a quote driven market) into an endangered species could result in a market's ecological system breaking down. We think this is the most important insight from market microstructure. Not only to balance between limit order and market order traders, but also to make various types of participants in the market living in a harmony. Asset's price discovery or formation is a complex process that is itself facilitated by transparency and order flow consolidation without sacrificing one or more from various market participants. And that is, applied to both stock and bond's price discovery and formation, hence also the capital market that nursed them.

CONCLUSION AND SUGGESTIONS

The research described in this paper has focused on stock and bond liquidity and informational efficiency. We use variables from Chordia et al. (2005), to explore cross-market liquidity dynamics by estimating a vector regressive model for liquidity such as bid-ask spread and depth, returns, volatility, and order flow in the stock and Treasury bond markets. We analyze the work from Hotchkiss et al. (2002) to find the informational efficiency of corporate bond prices is similar to that of the underlying stocks. Our position is, we will analyze both and what are variables and measurement to use, to arrive to such conclusion. Thus, we try to integrate the traders concept from Kyle (1985) and Admati and Pfleiderer (1988) in Indonesian market context. The central contribution of this paper is to reveal the possibility in applying this kind of research in Indonesian market.

A number of important findings and conclusions emerge from this research. For one, weekly regularities in stock and bond market liquidity closely mimic each other. Friday is the lowest liquidity day of the week for both market. Futher, liquidity in both stock and bond markets tends to be higher during July to September. Daily innovations in volatility and liquidity explain a large fraction of the error variance in forecasting liquidity, suggesting past volatility and liquidity are the most important variables in forecasting future liquidity.

Second is the informational efficiency. Although the positive and significant correlations between bond and stock returns, even on the daily and intraday level, there are no causal relationship. The firm-specific information on corporate bond prices around earnings announcement is quickly incorporated into both bond and stock prices, even at short return horizons. This finding suggests that the market for actively traded bond issues is informationally efficient, even relative to the market for the underlying stocks. Increasing transparency in corporate bond market through centralized public source of price quotes such as FIPS in US may well reduce trading costs, most likely for less-liquid bonds.

Third, the domestic investors do have an information advantage. Clients of global brokerage have higher long-run profits than clients of either local or Asian brokerages. In the long-term, clients of Asian brokerages perform no better than clients of local brokerages. The fact that the advantage of global brokerages exists only in the long-run also supports the idea that it is related to their experience and expertise rather than to inside information, which tends to be short-lived.

The flow of information and liquidity to brokers in affecting asset price is somehow vaguely related to the expertise and experience of the brokers. While the relation between liquidity in both stock and bond market is analyzed through vector autoregression (econometrics model), the relation between information affect liquidity remained unexplored.

The work described in this paper offers several other logical extension for future research. One such extension, for instance, there is no theory on linking movements in liquidity across equity and fixed-income markets. A model of market equilibrium with endogenous trading across stock and bond market would be helpful. Other is to develop new proxy for trading activity in Indonesian capital market, since there are no constraint in inventory like market makers' driven market. As an example, the definition of trading activity itself can be viewed as a type of trading game in which players meet at some venue and act according to some rules. There are brokers who transmit orders for customers. Brokers do not trade for their own account, but act merely as conduits for customer orders. These customer may be retail traders, or they may be other market participants. Trading mechanism has properties such as trading game, trading periods (days and weeks), trading halts, trading process, and trading volume. This trading activity will lead to infer the liquidity.

Further, we need to explore the unexplored the nature of information flows between a brokerage and an investor. It would be helpful to understand to what extent brokerages provide advice as opposed to simply executing orders, and whether this varies by brokerage. Finally, is worth to analyze whether skilled domestic investors select global brokerage, while less skilled investors use local brokerages.

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