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Liquidity on the Budapest Stock Exchange 2007-2010

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The Budapest Liquidity Measure (BLM) was created by the Budapest Stock Exchange (BSE) in 2005 to provide the market with a simple index which assists market participants in making investment decisions by showing how liquid the single securities and the entire market is at the moment. Liquidity is calculated as the sum of the *adverse price movement* created by the transaction of the investors and the *liquidity premium* to be paid for the transaction. These two factors together are also referred to as the implicit cost or indirect cost of trading. The extent of this cost depends on the current state of the order book. Trading also incurs explicit or direct costs, e.g. brokerage fees and commissions, stock exchange fees and taxes (Kutas–Végh [2005]). These costs are not included in the BLM as these can easily be identified and quantified, and the aim of the BLM is to measure the effect of implicit costs not measured earlier. Our study presents the methodology of the BLM and compares it to the other liquidity proxies used in the market.[1],[2]

1 The notion of liquidity

Prior to introducing and analyzing the Budapest Liquidity Measure it is essential to get acquainted with the notion of liquidity, and to clearly set what the measure gauges and why it is important.

Liquidity does not have a single uniform definition. This study deals with the liquidity of financial assets therefore we will use the definition perhaps most widespread in financial markets, also accepted by the Bank for International Settlements since 1999 (Csávás-Erhart [2005]):

„A liquid market is a market where a large volume of trades can be immediately or rapidly executed with minimum effects on prices."

Market liquidity is important as one of the main functions of markets is to show prices reflecting market expectations, in other words, markets are efficient. According to the efficient market hypothesis (EMH) market prices reflect the information available to investors, hence it is not worth spending time with searching for new pieces of information, that is we can rely on prices, and furthermore, price changes are caused by new information. If the theory holds true daily price returns will be independent and normally distributed. The assumption of EMH lies behind numerous financial models, and is in strongly tied to liquidity as on a market with low liquidity prices can easily be shifted by trading, "noise" may be added to the price formation process. Accordingly, a liquid market will become more efficient, as price changes stemming from low liquidity will not be present.

Furthermore, liquidity is essential, as the costs of trading are smaller on a liquid market, therefore less resource is required for the transactions. This makes it clear why it can be a key question to market participants to compare the liquidity of different assets, and to quantify the indirect costs. Measuring liquidity is a complex issue as a single measure is not capable of expressing the various dimensions of liquidity and to gauge the indirect costs of trading.

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[1] The authors work at the Department of Finance of Corvinus University of Budapest.

[2] This paper dealing with how liquid the Hungarian stock market was in recent years was written within the framework of a research at the Budapest Stock Exchange. The next study (*Budapest Liquidity Measure and its Application – Liquidity Risk in VaR measures*) focusing on a methodological innovation is also a result of this research. The authors hereby thank the Budapest Stock Exchange for the opportunity and especially Richárd Végh, Kristóf Kádár and Éva Réz for their support and numerous consultations.

2 The dimensions of liquidity

The notion of market liquidity is too complex for a single measure to grasp. Numerous indices are available for the market participants, each of these measures focusing on different aspects of the notion. Prior to the thorough analysis of market liquidity the dimensions of liquidity should be defined. The literature identifies the following dimensions:

- tightness,
- depth,
- breadth,
- resiliency and
- immediacy.

The first three refer to as the static dimensions (Kyle [1985]), while the latter two to the dynamic dimensions (Harris [1990]). Above all, part of the literature mentions the diversity of the market as a dimension of liquidity. (Kutas–Végh [2005]).

The indices measuring one dimension of liquidity are called one-dimensional measures, while the indices covering several dimensions of liquidity are referred to as multi-dimensional measures (Michaletzky [2010]). However, no index exists that comprehends all of the dimensions.

As each of the liquidity measures focus on different aspects and dimensions of liquidity they do not show the same for the liquidity of the market. (Csávás–Erhart [2005]).

2.1. Static dimensions

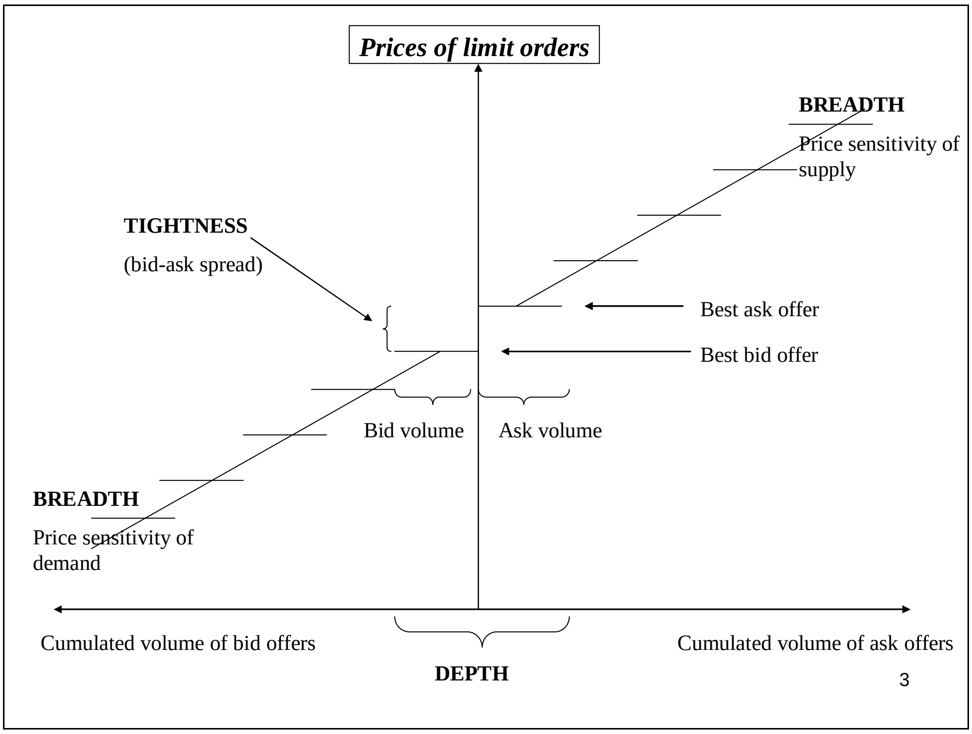
The static dimensions of liquidity can be classified into two groups: the first is measuring tightness, the second is showing depth. Tightness indicates the transaction cost of a trade that is it shows what the lowest cost of pairing supply and demand is. This is usually quantified by the bid-ask spread on the market.

The *depth* of the market is defined as the quantity of orders on the sell side and the buy side of the market, i.e. above and below the market price. In the narrow sense depth is the largest volume of order that will still not move the market price (Csávás–Erhart [2005]). Turnover is a common proxy for the depth of the market.

The *breadth* of the market is a notion strongly related to depth and it is also considered a dimension of liquidity. Breadth is an extension of depth, since market depth is determined by the quantity of limit orders available at the best price, breadth encompasses the available limit orders at the other price levels as well. Generally, breadth is expressed by price sensitivity that is the slope (gradient) of the line defined by the cumulated orders and the price range. The less steep this line is the larger breadth the market has. An increase in the quantity of orders at a given price has a beneficial effect on market liquidity, just as the decrease in the differences between the price levels. Moreover, the rise of the number of investors on the market, together with the growth of total limit orders enhances liquidity as well.

The abovementioned three dimensions of liquidity can be analyzed by looking at the data in the order book. The order book consists of the volumes to be traded by the investors at certain bid and ask prices, sorted from the best to the worst prices. Thus, as long as the order book data are available on a market the tightness, the depth and the breadth can easily be calculated as shown on Figure 1.

Figure 1. Static dimensions based on the order book



Source: Csávás–Erhart [2005]

The three dimensions we have dealt with so far are referred to as static dimensions since they characterize the order book at the moment. Tightness depicts liquidity from the perspective of price, while depth and breadth focus on the quantity of orders. Liquidity, however, is also affected by the time development of the order book, hence it is essential to analyze liquidity's dynamic nature as well.

2.2. Dynamic dimensions

There are two kinds of dynamic dimensions: resiliency and immediacy. Resiliency refers to the speed at which price fluctuations stemming from trading smoothen, i.e. it gives the information how quickly the asset price finds its equilibrium level following a shock. This equilibrium price level might be a value determined by fundamentals, or simply a state of the market where the bid and ask orders of the order book are balanced. A possible method of assessing this sort of liquidity is measuring the time necessary for the bid-ask spread to reach its earlier equilibrium level. Another possibility is calculating price impact or market impact, which quantifies the relationship between trade volumes and the price movements caused by them. Since these indices show the price effect of trade volumes, it is likely that the financial instruments with lower price impacts have higher resiliency, i.e. their price finds its equilibrium quicker.

The dimension of immediacy indicates the time necessary for a given size of portfolio to be sold or bought at given price range, thus it incorporates the costs associated with the late execution of a trade. Common proxies for immediacy are the number of trade per unit of time, the frequency of trade, or the number of new orders in a given time period.

2.3. Diversity

Beyond the static and dynamic dimensions, there exists another one named diversity, which grasps the heterogeneity of investors based on size, information, country of origin, etc. The more heterogeneous the investor community is, the more stable the market is in tense situations.

The Budapest Liquidity Measure can be used to measure several dimensions of liquidity. The next section shows us how the BLM is constructed.

3 Constructing the BLM

3.1. Data

BLM values are to be determined from the order book. Our research was based on the BLM figures calculated from the order book data of the Budapest Stock Exchange from January 1, 2007 thru July 16, 2010. BLM data are available for every second between 9:02 am and 4:30 pm each day.

The order book contains only the limit orders, the orders that can only be executed at the given price or at a better level (at a lower price for buy orders and at a higher price for sell orders). Besides limit orders there are market orders, which are submitted by the market participants when they want their order to be executed immediately at the best available price level. The quotation system pairs these market orders with the limit orders that are in the order book. As a consequence, limit orders stay in the order book as long as they are either not paired with market orders or with limit orders submitted with the same target price or until they are withdrawn.

The market participants submitting limit orders are patient, they are able to wait for their order to be executed at the desired price level, while the investors placing market orders are impatient, as they want their order to be executed immediately. In this sense, therefore, market players placing limit orders are liquidity providers, they make the market liquid, and provide the supply of liquidity, while the investors giving market orders are liquidity takers, they create the demand for liquidity. The investors with the limit orders are interested in the time elapsed until their order is fulfilled, while the investors with the market orders are interested in the price impact of their order (Michaletzky [2010], 24. o.).

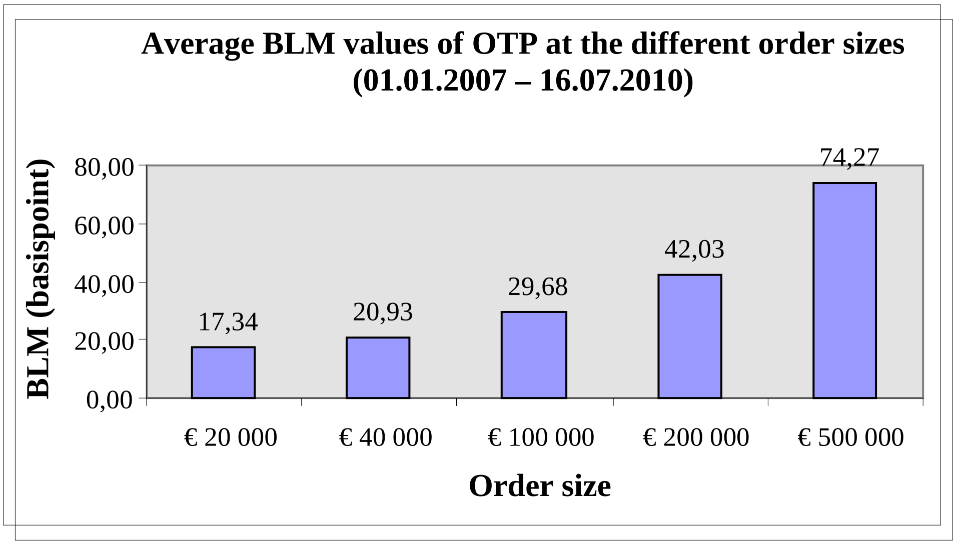
Thus, the BLM-values calculated from the order book provide a precise overview of the Hungarian stock market’s liquidity, since the limit orders provide liquidity for the liquidity takers, that is for the market orders.

3.2. Calculation

The BLM database we had access to determines the BLM-values for 5 different order sizes – therefore we have 5 different BLM figures for each of the shares listed on the BSE – i.e. for transactions worth EUR 20 thousand (BLM1), 40 thousand (BLM2), 100 thousand (BLM3), 200 thousand (BLM4), and 500 thousand (BLM5). The BLM database also includes figures for those instances when the market is not deep enough for the total order size to be fulfilled, e.g. an order of EUR 500 thousand could not be executed at the moment. In these cases, the BLM value is determined as if the order book included infinite orders at the last available price level.

Figure 2 shows the average BLM values for OTP in the given period for the different order sizes.

Figure 2.



It is easy to spot from the figure that the larger the size of the order is, the larger the BLM figure gets. Its value is affected by two factors: the liquidity premium and the adverse price movement. Therefore the calculation of the BLM can be done in two steps: determining the bid-ask spread, and the liquidity premium (LP) from that and calculating the adverse price movement (APM) caused by the transaction.

The calculation of the bid-ask spread and the liquidity premium is based on the following formula:

$$\text{bidask\_spread} = \frac{P_{ask1} - P_{bid1}}{\left(\frac{(P_{bid1} + P_{ask1})}{2}\right)}, \qquad (1)$$

where P_{bid1} = the price level of the best bid orders, P_{ask1} = the price level of the best ask orders.

$$LP = \frac{\text{bidask\_spread}}{2} \qquad (2)$$

The adverse price movement (APM) should be calculated for both the bid and the ask side of the order book, since the two sides can differ substantially from a liquidity perspective. The way the APM is measured:

$$\text{APM\_ask} = \frac{(P_{w\_avg\_ask} - P_{ask1})}{P_{mid}} \qquad (3)$$

$$\text{APM\_bid} = \frac{(P_{bid1} - P_{w\_avg\_ask})}{P_{mid}} \qquad (4)$$

The software calculating the BLM uses the following formula for $P_{w\_avg\_ask}$, the *weighted average ask price* in equation (3). The weighted average bid price is determined analogously. For the sake of simplicity let us assume that the order is fulfilled at the three best price levels:

$$P_{w\_avg\_ask} = \frac{P_{ask1} \cdot size1 + P_{ask2} \cdot size2 + P_{ask3} \cdot (transaction\ size - size1 - size2)}{transation size} \quad (5)$$

where P_{ask1} is the price level of the first best ask order, P_{ask2} is the price level of the second best ask order, P_{ask3} is the price level of the third best ask order, size1, size2 are the quantities transacted at the given price levels.

The BLM value is the sum of the liquidity premium and both sides' adverse price movement:

$$\boxed{BLM = 2 \cdot LP + APM\_bid + APM\_ask} \quad (6)$$

Based on formula (6) BLM gives the total implicit cost of turning around a position in basis points (Kutas–Végh [2005]).

For example, if BLM5 = 60 bps, then since the order is not fulfilled at the midprice, the implicit cost of turning around a position of EUR 500 thousand is EUR 3,000 (500,000 × 0,006 = 3,000).

3.3. The BLM-measure and the dimensions of liquidity

The aim of calculating the BLM is to gain information from the current liquidity state of the market. The way the measure is constructed enables it to measure the static dimensions of liquidity. The breadth dimension of liquidity also appears in the index since not only the best bid and ask prices are used in the formula, but also the others. At the interpretation of the results the methodology of the measure must be taken into consideration, as it is calculated as if there were infinite orders at the last price levels in the order book.

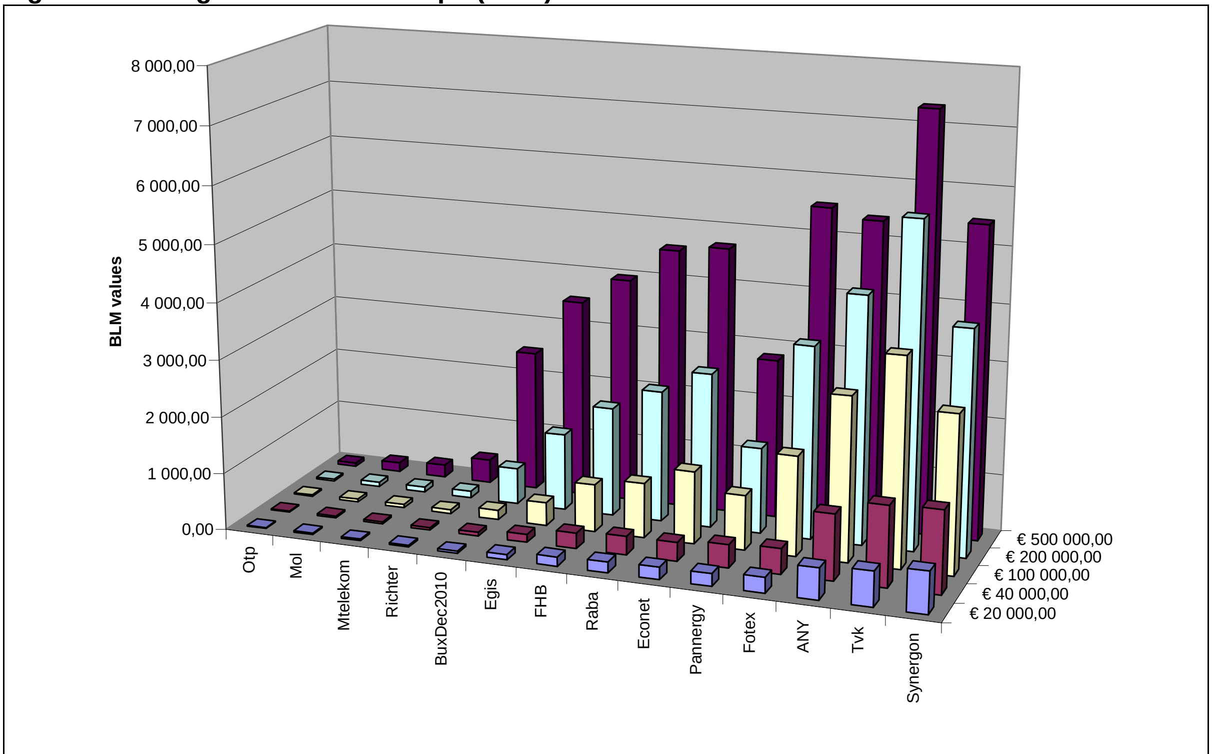
The BLM is not capable of quantifying the dynamic dimensions, resiliency and immediacy, due to the fact that only a single snapshot of the order book is utilized. Neither is diversity captured in the index.

In the following sections the study demonstrates the time evolution of certain BSE-listed stocks' BLM figures; and it also shows the extent to which the same tendencies are reflected in the BLM values as they are in other liquidity proxies of the static dimensions, such as bid-ask spread and turnover. The study focuses on the 13 shares constituting the BUX index since April 1, 2010 and on the BUX futures products. Section 5 and 6 deal with the relationships of the bid-ask spread and the BLM, and that of turnover and the BLM. Section 7 analyzes the transaction sizes on the Budapest Stock Exchange.

4 Average BLM values of the BUX shares and the BUX futures

From the perspective of the investors it is important to know which instrument has the lowest liquidity measure values, since the lower this figure is the smaller the implicit cost the investors incur when they buy the stock. The next figure shows the average BLM figures of the shares in the BUX index and the futures BUX in 2010:

Figure 3. Average BLM values in bps (2010)



The figure clearly demonstrates that BLM values are monotonically increasing for each of the stocks, i.e. BLM1 figures are the smallest ones, while BLM5 are the largest. Moreover, it is eye-striking that the order of the shares based on the BLM1 values differs from that one based on the other BLM levels. This phenomenon is attributed to the methodology of the liquidity measure, to the implicit assumption that there are infinite orders at the last available price level in the order book even if the order book is shallow.

The figure also shows that in contrast to the earlier study (Kutas-Végh [2005]) the most liquid instrument is not the BUX futures but the OTP, the stock with the largest turnover on the BSE. A possible explanation for the difference is that the turnover of the BUX futures has dropped significantly after the decimation of the contract size (from 100 to 10) by the BSE in 2006. The likely reason behind is that a notable proportion of the investors bought a fixed number of contracts prior to the change in contract size, and they sticked to the earlier contract number, instead of holding on to the same value.

When we compare the daily average turnover of the stocks with their BLM figures in 2010, we almost always experience that the larger turnover of a share is, the lower BLM1 value it has. The next table shows the turnover data of the stocks in the first seven months of 2010:

Table 1. Daily average turnover and BLM1 values

	BLM1 (bps)	Daily turnover – January-July 2010. (M HUF)
OTP	17	17 506,07
MOL	31	3 693,34
Richter	36	1 703,90
MTelekom	35	1 678,74
Egis	109	221,59
Rába	372	97,29
FHB	257	87,83
Econet	315	61,03
Fotex	244	38,84
PannErgy	607	36,15
ÁNY	630	16,28
Synergon	510	11,99
TVK	497	10,30

The heat map below can help market participants in their investment decisions since it contains BLM values at different order sizes. The larger BLM values are shown in darker shade, that way the table is easier used for making decisions.

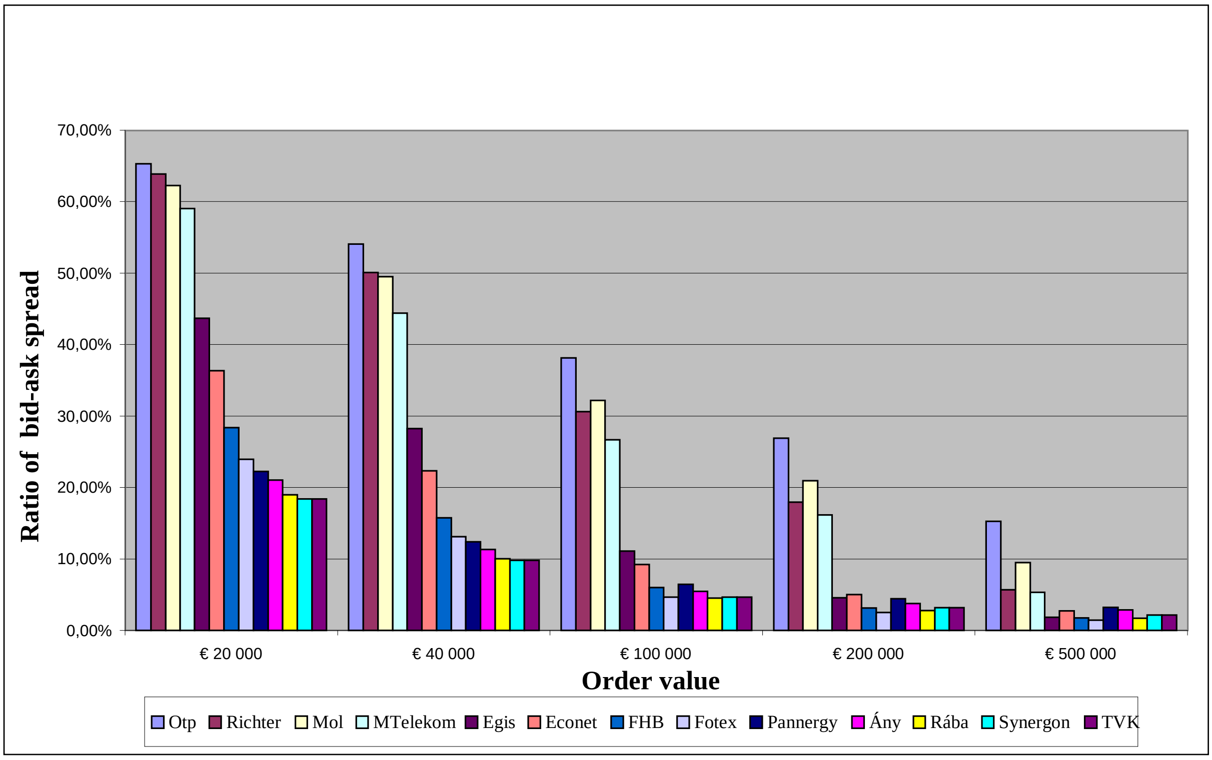
Figure 4. Heat map (basis points)

Heat map	**BLM1**	**BLM2**	**BLM3**	**BLM4**	**BLM5**
OTP	17	21	30	42	74
BUX0712	23	35	76	208	862
MOL	31	39	59	91	201
MTelekom	35	46	77	127	383
Richter	36	46	76	130	406
BUX1012	41	66	167	636	2491
BUX0812	64	112	460	1432	3170
BUX0912	96	194	827	2126	4130
Egis	109	169	431	1046	2601
Fotex	244	444	1250	2302	4058
FHB	257	464	1214	2327	4116
Econet	315	512	1237	2279	4157
Rába	372	705	1563	2535	4109
TVK	497	937	2151	3521	5107
Synergon	510	954	2015	2975	4382
PannErgy	607	1088	2096	3030	4169
ÁNY	630	1172	2421	3547	4590

5 Ratio of bid-ask spread

In this section the study examines the order of the stocks from the viewpoint of the BLM figures and the bid-ask spread. As a first step it is worth to examine the ratio of the bid-ask spread inside the BLM value on every available order level in case of those stocks, which build up the BUX index, and in case of the BUX futures. This will show us which security's adverse price movement is the most notable.

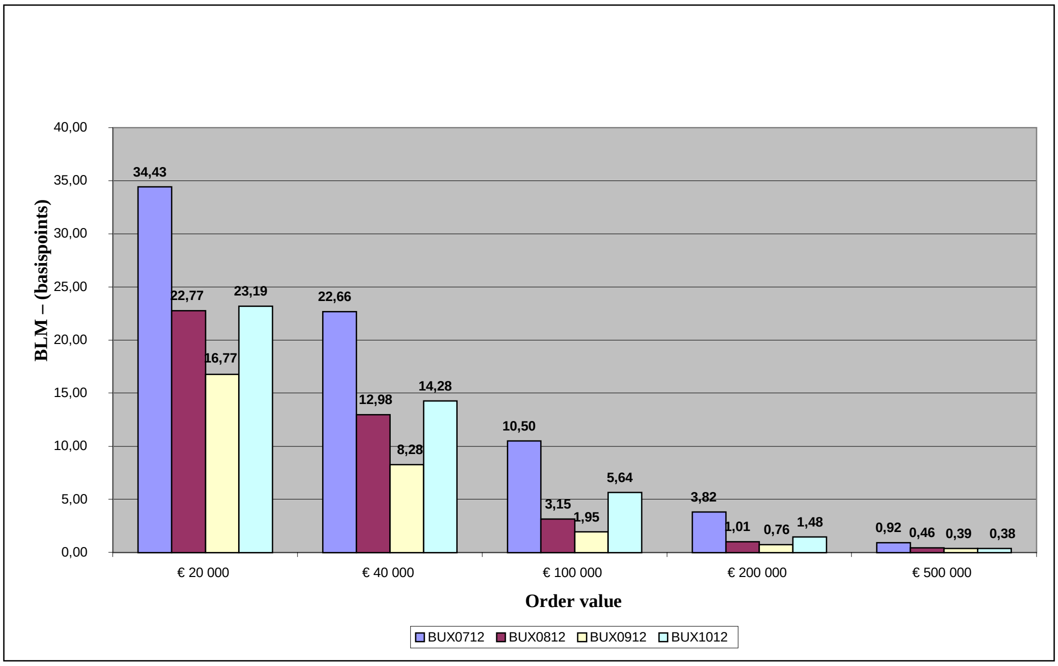
Figure 5. Ratio of bid-ask spread in the value of BLM on different order sizes (01.01.2007 – 16.07.2010)



The figure shows us that if we examine the ratio of bid-ask spread inside the BLM value, the higher order size we look at, the greater the value of adverse price movement will be. Moreover, it can be observed as well, that the stock which has a higher turnover (see Table 1.) has a higher ratio of bid-ask spread as well, namely the effect of the adverse price movement will be smaller.

The next figure shows the ratio of the bid-ask spread in case of the BUX futures. If we compare the results with the result we got at the previous figure, we see, that the ratio of the adverse price movement of the four bluechip stocks – OTP, MOL, Richter, MTelekom – is smaller than that in case of the BUX futures. This can be the consequence of the fact, that the bid-ask spread is smaller in case of the BUX futures, than that of the BUX index's stocks, as it can be seen in Table 2.

Figure 6. Ratio of bid-ask spread in the value of BLM on different order sizes for BUX futures (for each futures it was calculated for data observed in the year before maturity)



In sum, if we analyze the liquidity of the different securities according to the bid-ask spread, we find that the BUX futures is always among the best investments – from the viewpoint of liquidity – compared to the stocks of the BUX index. It can be seen in Figure 5. and 6., that the ratio of the adverse price movement takes out a bigger portion for the BUX futures than it does in case of the stocks in the index.

Table 2. The bid-ask spread[3]

Bid-ask spread (basispoints)							
2007		2008		2009		2010	
BUX0712	7.94	OTP	13.96	OTP	10.41	OTP	8.78
OTP	10.97	BUX0812	14.51	BUX0912	16.09	BUX1012	9.42
MOL	15.10	MTelekom	23.90	MOL	20.02	MOL	15.69
MTelekom	18.57	MOL	23.98	MTelekom	20.59	MTelekom	17.22
Richter	20.01	Richter	29.83	Richter	21.44	Richter	20.31
Fotex	30.46	Egis	65.99	Egis	41.46	Egis	39.16
Rába	37.02	Fotex	72.06	FHB	60.01	FHB	46.07
Egis	40.72	Rába	89.05	Fotex	69.68	Rába	48.28
Synergon	48.20	FHB	98.64	Rába	96.94	PannErgy	52.10
TVK	69.95	Econet	115.07	TVK	99.42	Fotex	62.62
Econet	73.98	Synergon	129.16	Synergon	102.64	TVK	89.49
FHB	75.28	TVK	158.41	PannErgy	108.84	Econet	93.69
ÁNY	106.51	ÁNY	199.47	ÁNY	111.02	Synergon	93.80
PannErgy	114.59	PannErgy	227.02	Econet	164.42	ÁNY	95.73

[3] BUX futures: only those futures contracts are represented in the table, which have their maturity in that certain year.

6 Relationship of liquidity and turnover

6.1. Average value of BLM and the turnover

In the previous chapter we have found that the greater a stock's turnover is, the smaller the BLM value will be, namely it is a better investment from the viewpoint of liquidity. It is worth examining whether this phenomenon exists also within the days, namely, does a small BLM value imply a high turnover?

The examination has been done for two stocks, the MOL and the OTP, by taking the average value of turnover and liquidity for every second of the trading day. The average was calculated from the data of September 2007:

Figure 7. Average value of the MOL's BLM1 and turnover data during the workdays of September 2007

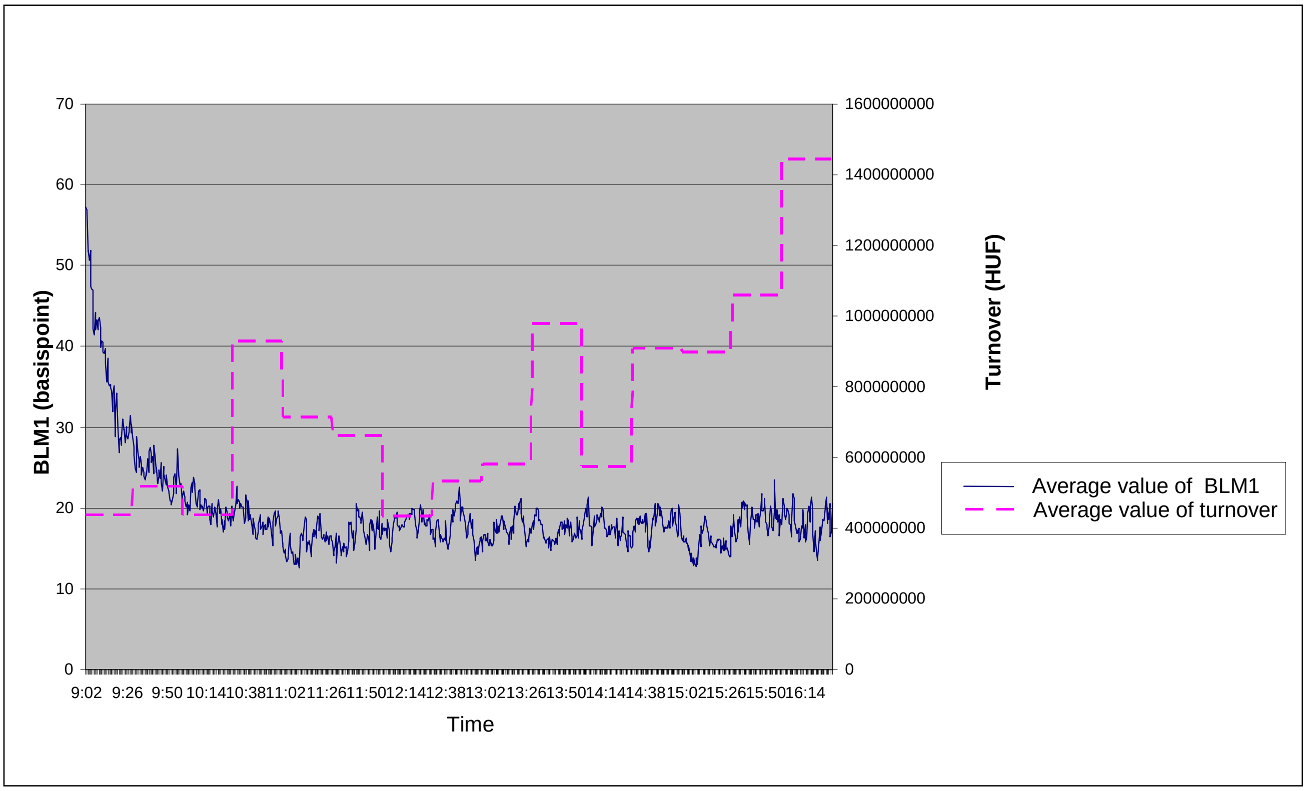
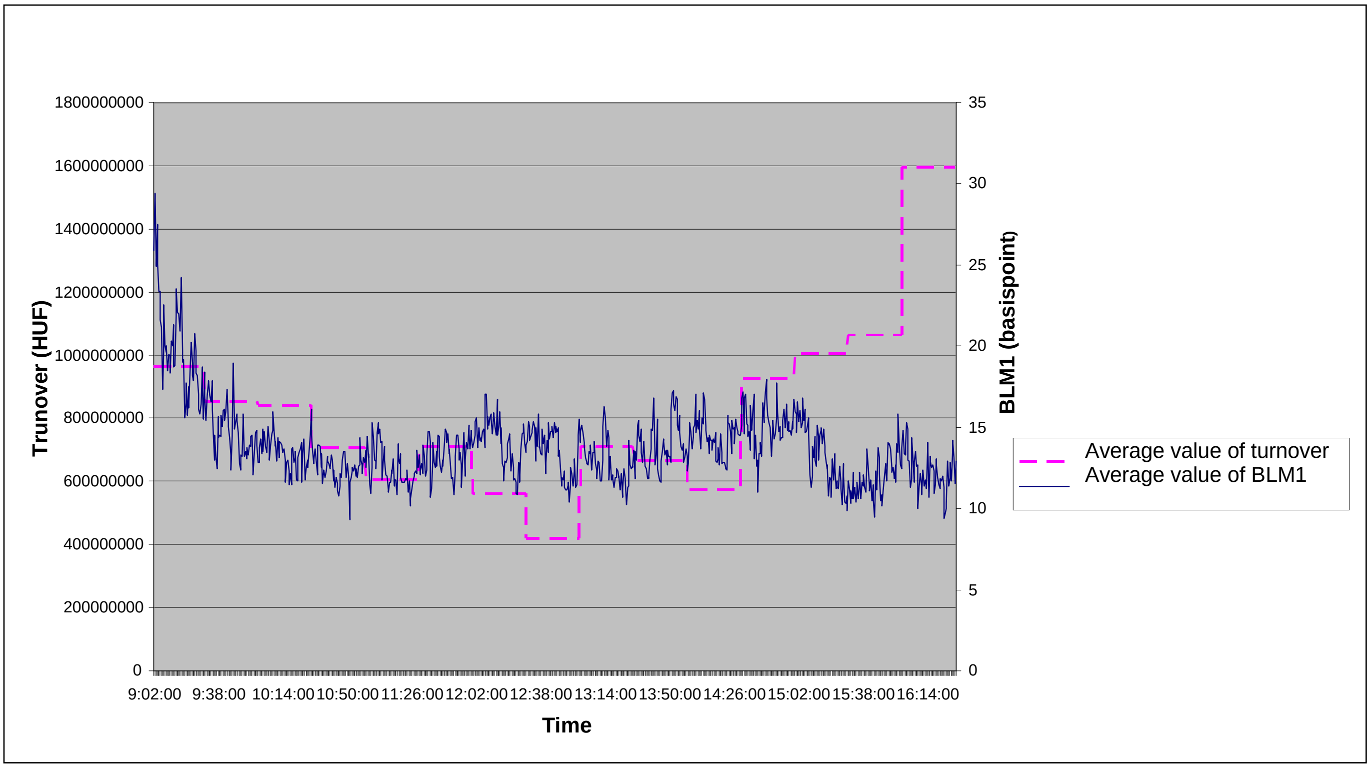


Figure 8. Average value of the OTP's BLM1 and turnover data during the workdays of September 2007



The average intraday data of September 2007 do not support the hypothesis, that the liquidity measured by BLM1 is highly correlated with the liquidity the turnover indicates. The tendency, that the high turnover entails low BLM1 values cannot be observed.

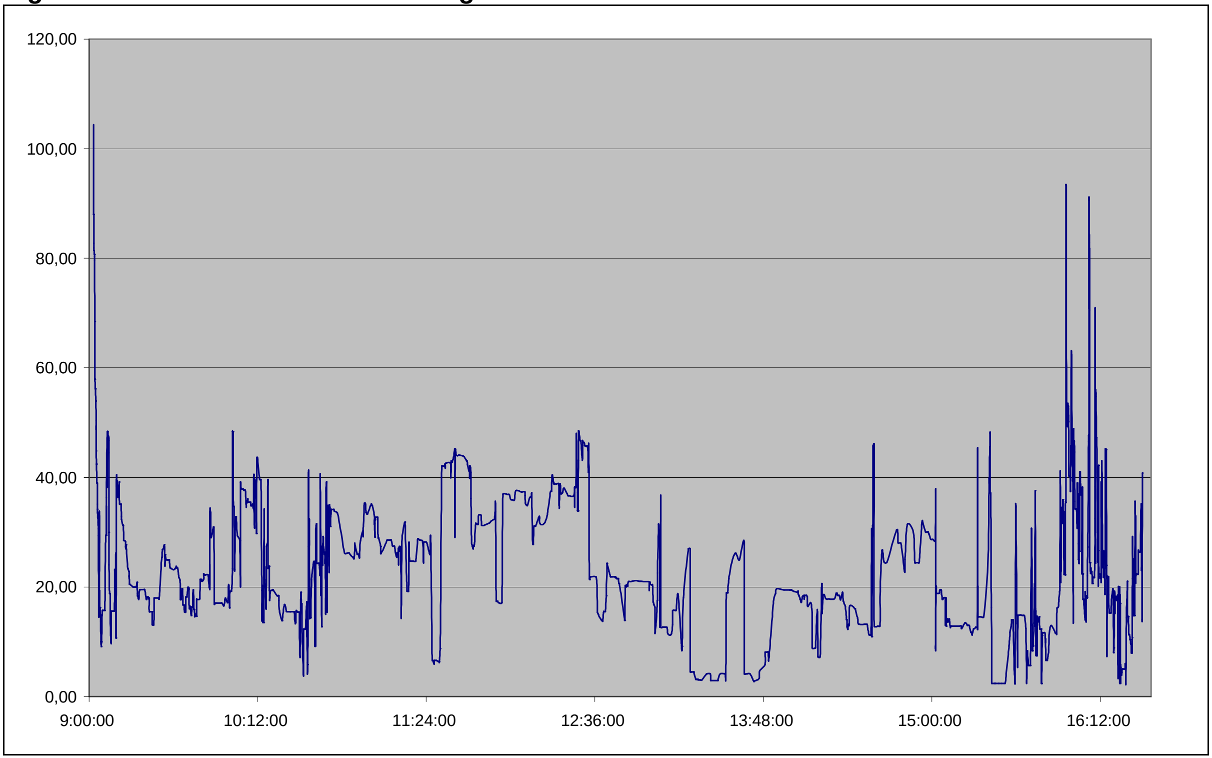
Researches have shown that the turnover forms a „U" shape during a day on average, which means that in the beginning of the day, and at the end of the day turnover is higher, than during the whole day. This „U" shape can be observed only in the case of OTP. If we look at the data of MOL we see that the turnover increases only at the end of the day, in the last hour of trading. This effect can be related to the opening of the American exchanges at 3:30 pm - Hungarian time – as this generates notable turnover. Though this effect can be seen in the turnover, it doesn't affect the value of BLM, and with the increase of turnover, the BLM does not decrease.

The figures show also, that in the first hour of trading, the activity of the stock exchange traders is very low, the trading gets notable only from 10:00 am. This means that the first hour of trading cannot be considered typical, so the BLM1 values in the first hour doesn't provide a reliable picture of liquidity. However the reason for high BLM1 values in the first hour can be the consequence of the investors building up the trading book in the beginning of the day.

6.2. The time series data of BLM

In the previous chapter we have examined the average BLM1 values during the day. But it is also worth analyzing how the BLM1 evolves during a randomly chosen day. The following figure shows the BLM1 value of MOL on the 16th of July 2010:

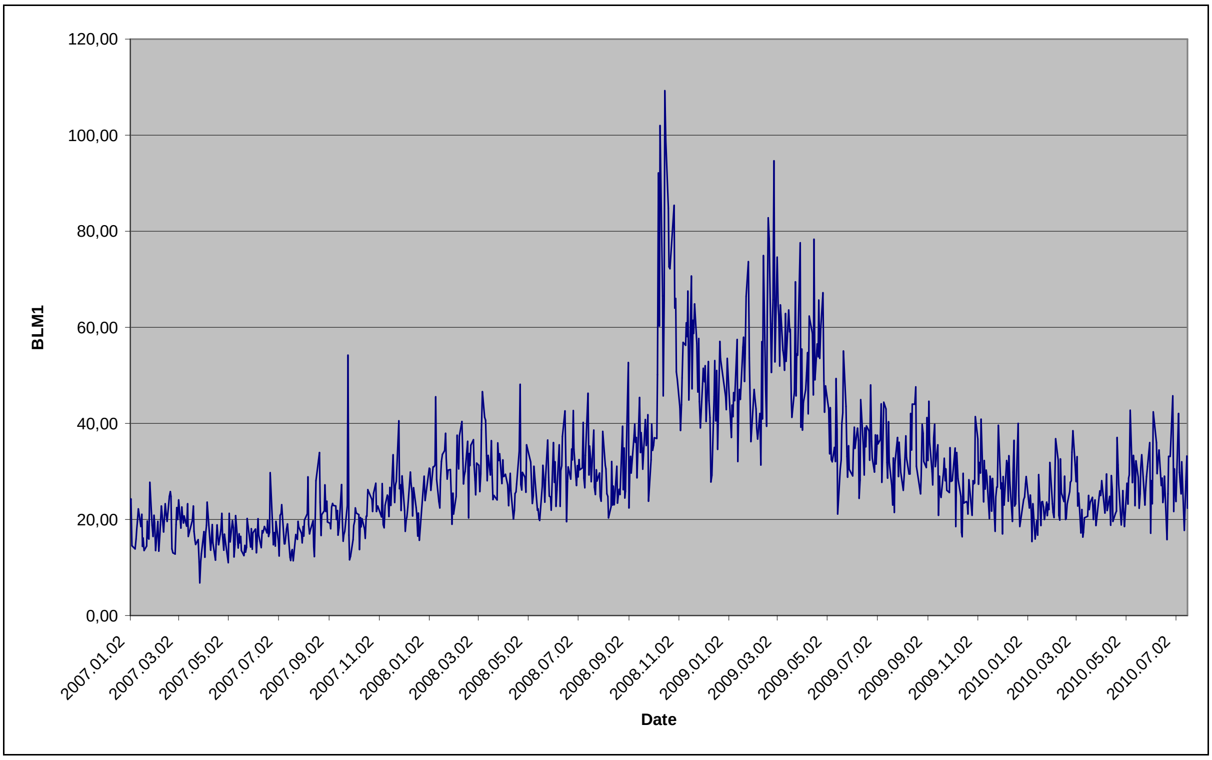
Figure 9. BLM1 values of MOL during 16. 07. 2010



This figure suggests that it would be interesting to analyze in a future research, whether the BLM process can be characterized as a mean-reversion process or not. If the process proves to be a mean-reversion process, then interest rate models, e.g. a Vasicek-model, might be applied to describe the BLM-process.

We can analyze the BLM process not only on a daily basis, but for a longer period of time. The next figure shows the daily BLM1 values of MOL from 1st January 2007 till 16th July 2010.

Figure 10. Daily BLM1 values of MOL (01.01.2007 – 16.07.2010)



In this figure we can see the mean reversion of the BLM1 process. Moreover it can be observed as well, that there can be a relationship between the daily BLM values, since if one day the BLM was small, usually it was small the next day as well. The opposite of this is true as well, if the value of BLM was large on a certain day, we can say with a high probability, that it will be large on the following day also.

It can be observed also, that the actual economic situation is reflected in the BLM values. For example during the financial crisis of 2008, the BLM values has increased notably, which shows how great the lack of liquidity was.

6.3. Relation between the return and the asymmetry of APM_bid and APM_ask

Since the BLM values reflect the actual economic situation, the research has examined the relationship between the returns of stocks, and the asymmetry of the APM_bid and APM_ask values, namely that in the value of BLM does the ask side's or does the bid's side adverse price movement is more significant. If there were a relationship between these two variables, then we could forecast whether returns would increase or decrease simply by analyzing whether the market participants rather buy or rather sell the stocks, which could be seen from the asymmetry of the APM_bid and APM_ask. The research found, that if we analyze the data of each second, then there isn't any correlation between the asymmetry of APM_bid and APM_ask and the returns.

7 Transaction sizes on the Budapest Stock Exchange

The results the research had found so far are summarized in Table 3. In case of every indicator, the average daily value of the total database – 01.01.2007 – 16.07.2010 – was the base of the calculations.

Table 3. Comparison of indicators of liquidity

	Order according the BLM1 (bp) values		Order according to the bid-ask spread (bp)		Order according to the turnover (HUF)	
OTP	17.34	1.	5.66	1.	14 049 766 185	1.
MOL	30.71	2.	19.11	2.	6 435 770 430	2.
MTelekom	34.62	3.	20.45	3.	1 604 118 269	4.
Richter	36.39	4.	23.25	4.	2 140 292 314	3.
Egis	109.46	5.	47.87	5.	287 976 841	5.
Fotex	243.87	6.	58.39	6.	156 837 943	6.
FHB	257.41	7.	73.08	8.	83 667 693	9.
Econet	314.61	8.	114.40	11.	85 468 131	8.
Rába	372.07	9.	70.57	7.	135 962 457	7.
TVK	497.14	10.	106.48	10.	39 064 987	12.
Synergon	509.62	11.	93.71	9.	83 638 330	10.
PannErgy	607.39	12.	135.29	13.	62 750 476	11.
ÁNY	629.60	13.	132.55	12.	29 148 136	13.

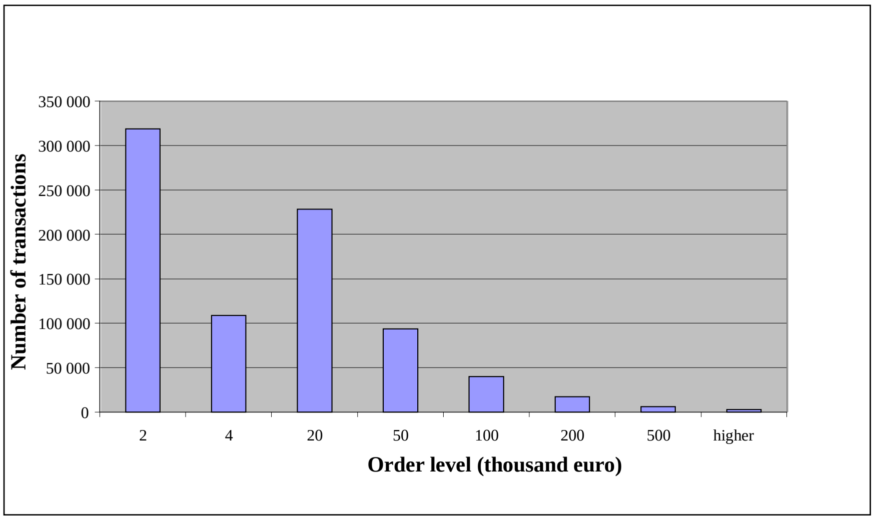
The table shows that every liquidity indicator gives a different order from the viewpoint of liquidity. This is mainly the result of the fact, that these indicator measure liquidity in different dimensions, in dimensions which we have introduced earlier.

As we have pointed out earlier the method the BLM values are calculated strongly influences the liquidity order we see. The fact that BLM is calculated for all levels even when the given order size could not be completely fulfilled immediately the BLM indicator can be used only limitedly during measuring liquidity in the breadth dimension. In our research we have tried to find out the proper order sizes for which the program should calculate the BLM.

Prior to determining the optimal order sizes, it is essential to examine the typical order values on the BSE. The analysis contains the total trade list of January-June 2007.

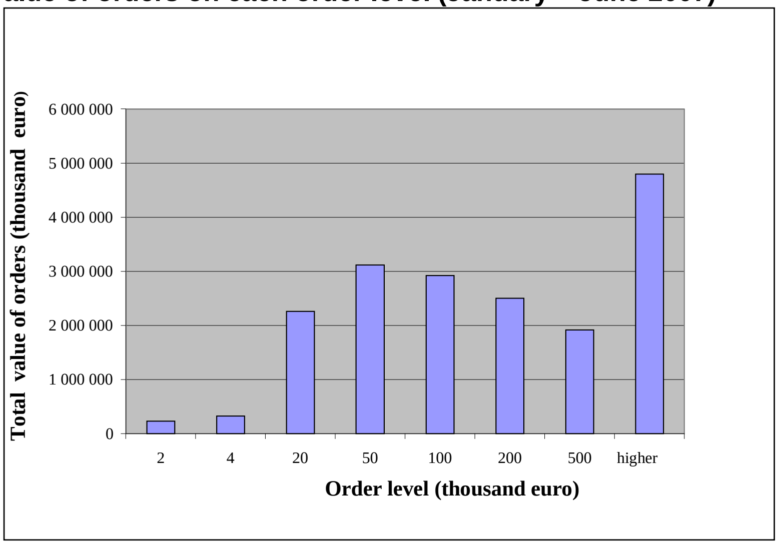
The next figure shows, that on different order levels how many orders have been fulfilled. The majority of the investors have made a transaction smaller than EUR 20 thousand, which may justify that the smallest order size to which BLM is calculated should be smaller than EUR 20 thousand, since it could be a useful information for the investors.

Figure 11. Number of orders on each order level (January-June 2007)



It is important to take into account the total value of orders on each order level. This can be seen in Figure 12.:

Figure 12. Total value of orders on each order level (January – June 2007)



As a next step we have looked at the more precise distribution of the stock market trades in order to define the proper order levels, at which the BLM values should be calculated.

The results can be seen in the following two tables; in the first one the results are in thousand HUF, while in the second one they are in EUR:

Table 4.

Distribution of the order sizes in the first half of 2007. (Thousand HUF)							
Percentile	**January**	**February**	**March**	**April**	**May**	**June**	**Total**
5%	38.50	36.30	41.25	41.75	38.14	43.98	**39.42**
10%	67.90	63.00	74.23	74.00	68.10	79.22	**71.10**
15%	99.90	88.20	106.10	105.69	97.01	107.47	**100.80**
20%	136.00	117.00	154.77	152.50	129.33	154.70	**141.60**
25%	203.00	163.20	211.55	215.60	188.27	218.50	**200.00**
30%	294.00	217.91	306.66	304.00	248.00	297.00	**279.20**
35%	403.90	307.13	404.80	411.91	352.50	410.40	**385.70**
40%	525.00	405.28	537.50	517.88	467.50	517.05	**494.00**
45%	720.50	516.66	730.09	728.62	616.50	717.60	**673.79**
50%	952.80	710.49	914.12	917.88	852.50	940.50	**875.35**
55%	1 200.00	871.89	1 130.78	1 110.75	1 027.61	1 146.14	**1 065.00**
60%	1 697.20	1 078.55	1 586.00	1 560.00	1 369.80	1 548.40	**1 477.50**
65%	2 065.00	1 543.03	2 014.67	1 992.34	1 895.25	2 024.00	**1 950.00**
70%	2 973.48	2 005.00	2 699.99	2 580.40	2 319.50	2 801.56	**2 518.52**
75%	4 090.50	2 712.60	3 737.81	3 774.38	3 491.81	3 892.93	**3 697.00**
80%	5 319.64	4 009.20	4 750.00	4 830.72	4 644.00	5 278.00	**4 812.50**
85%	8 265.00	5 760.75	7 420.00	7 732.87	6 780.55	8 580.00	**7 520.00**
90%	10 414.92	8 770.00	10 142.50	10 800.00	9 854.68	12 200.00	**10 320.00**
95%	19 398.21	16 828.90	18 408.27	20 081.46	18 920.00	24 155.00	**19 404.01**
100%	10 276 500.00	39 413 370.00	3 850 959.04	2 215 000.00	25 740 000.00	60 000 000.00	**60 000 000.00**

The interpretation of the data is the following: for example, in the first cell of the column „January" shows that in January 5% of the transactions were under HUF 38.5 thousand.

Table 5.

Distribution of the order sizes in the first half of 2007. (EUR)							
Percentile	**January**	**February**	**March**	**April**	**May**	**June**	**Total**
5%	151.16	143.05	165.32	169.51	153.29	175.35	**156.58**
10%	267.09	248.46	296.37	300.88	274.87	317.28	**284.26**
15%	393.11	348.43	425.33	429.52	390.28	428.38	**401.29**
20%	535.84	461.79	621.36	619.28	520.21	618.98	**565.72**
25%	798.65	643.83	845.34	875.63	757.86	871.64	**796.96**
30%	1 159.02	859.84	1 230.19	1 235.91	997.85	1 190.67	**1 116.03**
35%	1 589.36	1 212.14	1 620.25	1 675.36	1 417.66	1 643.82	**1 540.71**
40%	2 070.49	1 601.32	2 150.81	2 105.78	1 878.54	2 069.31	**1 970.31**
45%	2 835.85	2 038.26	2 917.86	2 961.52	2 483.61	2 864.20	**2 691.18**
50%	3 758.69	2 804.33	3 655.52	3 731.93	3 435.18	3 752.74	**3 497.84**
55%	4 724.81	3 440.95	4 519.67	4 518.15	4 137.36	4 586.68	**4 263.73**
60%	6 665.99	4 255.19	6 325.62	6 337.17	5 509.60	6 202.92	**5 906.03**
65%	8 119.12	6 092.40	8 031.05	8 108.75	7 606.45	8 144.00	**7 784.66**
70%	11 708.46	7 913.47	10 779.14	10 499.09	9 318.00	11 264.74	**10 026.73**
75%	16 094.13	10 685.92	14 900.59	15 354.64	14 046.59	15 571.31	**14 772.16**
80%	21 024.36	15 835.31	19 033.74	19 654.93	18 656.75	21 190.89	**19 269.03**
85%	32 571.35	22 696.78	29 489.20	31 453.78	27 355.29	34 343.62	**30 052.84**
90%	41 182.31	34 609.33	40 655.52	43 874.51	39 862.40	48 643.22	**41 229.99**
95%	76 307.41	66 488.48	73 380.63	81 666.10	76 122.61	96 119.19	**77 641.11**
100%	40 320 555.58	156 607 342.95	15 223 588.85	9 017 261.03	103 290 529.70	242 169 841.78	**242 169 841.78**

It can be seen that the order sizes are not stable in time; there are differences between the months. In the future it would be useful to look at the same analysis for the data before, during and after the 2008 financial crisis.

It can be observed as well, that the 95% of the orders on average are under EUR 80 thousand, and 90% of the orders on average are do not exceed EUR 40 thousand. According to this it can be stated, that the order sizes of the BLM categories should be modified from the current EUR 20 thousand, 40 thousand, 100 thousand, 200 thousand, and 500 thousand. As a consequence it can be said, that the BLM3, BLM4 and BLM5 do not give a reliable picture of liquidity, since orders on that level are very rare. Moreover, large-value orders are usually fix transaction, so they do not have an effect on the price.

There are similar liquidity measures internationally, for example the Xetra Liquidity Measure (XLM) (Gomber–Schweikert [2002]), which was the basis of constructing the BLM. This measure was created by the Deutsche Börse Group in 2002. In case of the XLM the order sizes at which the XLM is calculated differ from stock to stock. It depends on the turnover of a certain stock. (Gomber–Schweikert [2002]). Besides the stock-varying levels, the XLM is also being calculated for the following order sizes in every case: EUR 10 thousand, 25 thousand, 50 thousand. In case of stocks with a higher turnover, the measure is calculated also for the following order sizes: EUR 75 thousand, 100 thousand, 150 thousand, 250 thousand. In a few cases also for much greater sizes, like: EUR 500 thousand, 750 thousand, 1000 thousand, 2000 thousand, 4000 thousand, 5000 thousand. According to this, probably the BSE should differentiate between the stocks. The next table shows the order sizes of the blue chip and non-blue chip stocks, and show the notable difference between them:

Table 6.

Average distribution of order sizes (01.-06.2007)		
EUR	**Non blue chip**	**blue chip**
5%	72.35	156.74
10%	154.23	284.48
15%	223.69	401.46
20%	287.61	566.20
25%	368.00	797.33
50%	1 076.68	3 500.61
75%	3 206.60	14 815.83
80%	4 003.09	19 305.34
85%	5 349.43	30 184.15
90%	7 550.97	41 309.31
95%	12 788.76	77 750.01
100%	31 298 414.38	242 169 841.78

The table shows, that in case of non-blue chip stocks, it would be necessary to calculate the BLM for smaller order sizes then in case of the blue chip stocks, since the 95% of the orders were under EUR 13 thousand. While in the case of the blue chip stocks, the BLM value at an order size of EUR 80 thousand would provide a lot of information for the investors. In sum, the BSE should differentiate also as it happens in case of the XLM.

It is worth mentioning another international example, the CGT, which is the same liquidity measure as the XLM or the BLM. The Ljubljana Stock Exchange uses this indicator, and it is measured only at one order size, at EUR 7,500.[4]

8 Conclusion and possible application

The possible application of BLM could be on one hand, to help brokers in order splitting, on the other hand it could help the dealers to define the stop limits. Moreover it could be used as a reference point for market makers in setting prices, or it could be the basic of building a derivative product which could be used for hedging liquidity risk.

It could also support the technical analysis in two respects, one is that a model could be developed for the BLM process, based on the time series data, the other is to find the relationship between the returns and the asymmetry of the APM_bid and APM_ask.

In sum we can conclude, that the BLM is such a liquidity measure, which measures liquidity in several dimensions, and gives a reliable picture of the actual liquidity of certain securities. Moreover, it is an important advantage of this indicator that it can be used and interpreted easily, and could help market players in making decisions easily from the viewpoint of liquidity.

[4] http://www.ljse.si/cgi-bin/jve.cgi?doc=2498&sid= (letöltés: 2010. július 27.)

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