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Liquidity of assets and liquidity of shares: the example of the Warsaw Stock Exchange

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Abstract

The purpose of the article is to present the problem of financial liquidity and the liquidity of assets on the financial market. The integration of these two approaches should show if there will be any relationship between the liquidity of the company's assets and the liquidity of its securities listed on the capital market. The applied research methodology is similar to that described by Goplan, Kadan, and Pevzner (2012) in "Asset liquidity and stock liquidity". Studies were conducted on a group of companies listed on the Warsaw Stock Exchange in the period: 30 April 2012 – 31 December 2017. Conducting several separate studies using various measures describing liquidity on the data obtained for the Polish capital market confirms the hypothesis put forward at the beginning of the study that there is a statistically significant relationship between the liquidity of the shares and the liquidity of the company's assets.

Keywords: financial liquidity, economic condition of companies, capital market, liquidity of shares

JEL: G12, G13, G14

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1 Introduction

Companies in the capital market are understood as companies that raise capital by issuing financial instruments that are traded on the secondary market. The characteristic feature of the capital market is that the assessment of the economic condition of a comapny is made in relation to the expectations of investors, who regularly assess decisions made by the management board. The company's goal is to manage the capital to maximize its value. Maximizing the value, and hence, profitability, is related to the management of financial liquidity, a minimum level of which could lead the company to bankruptcy. Due to the purpose of the company's activity and investors' expectations, liquidity management on the capital market should not only be based on a comparison with other entities in the sector (Skoczylas 2007).

However, maximizing the value for investors and profitability is also closely related to what is happening in the capital market. It is here that investors make decisions regarding trading in securities. Investors choosing to invest their money take into account a number of different factors characterizing a given security (Bolek 2018). A significant number of these factors affect the liquidity of a given investment. Some depend on the company whose securities they want to acquire, for example, the way it is managed. There are also macroeconomic factors, independent of the company, such as the structure of the market, the current economic situation, the situation of the given industry, and the competitiveness of other forms of investing money that the financial markets offer at a given time (Shi 2015).

One of the factors that investors increasingly pay attention to is the liquidity of a share. The liquidity of shares in the financial market is usually understood as the cost and ease with which individual types of assets can be converted into cash, in other words, the simplest ones sold at the price currently available on the market. This category has not been properly analyzed within the framework of modern finance theory for a significant period of time. As a result, a number of basic models built within this theory in its classic form do not include problems related to liquidity. Subsequent research confirmed the thesis that liquidity exerts a significant influence on share prices and their rates of return (see: Shannon, Reilly, Schweihs 2000; Chordia, Roll, Subrahmanyam 2000; Dater, Naik, Radcliffe 1998; Chan, Faff 2005; Acharyal, Pedersen 2005; Cheng 2007).

The purpose of the article is to present the problem of financial liquidity and the liquidity of assets on the financial market (see: Berger, Bouwman 2008; Gopalan, Kadan, Pevzner 2012; Gopalan, Kadan, Pevzner 2009; Charoenwong, Chong, Yang 2014). The integration of these two approaches should show if there will be any relationship between the liquidity of the company's assets and the liquidity of its securities listed on the capital market.

2 The financial liquidity of a company

Financial liquidity is not homogeneous and is primarily divided into static and dynamic, the cash aspect understood as the ease of converting assets into cash, including the same level of maintained cash or the level of generated cash flow from operating activities translating into cash efficiency. Additionally, financial liquidity can be understood by the cycle of cash conversion in days, or the number of cycles in which cash is traded in a year (Myers, Rajan 1998).

The current liquidity ratio defines the ratio of current assets to the company's short-term liabilities, and therefore, it is a measure of solvency assessment and the ratio of current assets financed through short and long-term sources. Recommendations for the optimal size of this index can be found in the literature. Surmowa (1991) gives a reference range of 1.0–2.0; Waśniewski and Skoczylas (1994) give a reference value of 2; for Kralicek (1995) it is 1.5–1.8; according to both Sierpińska and Jachna (2004) and Pałczyńska-Gościniak (2001) it is 1.2–2.0; and finally, according to Nowak (2002) it is 1.5–2.0. On the capital market, the interpretation of the value of the current liquidity ratio should not be detached from the company itself and the way it operates. It should be taken into account that the company's competitive position may allow it to negotiate short payment terms with customers and extend their deadlines for suppliers and subcontractors without damaging the entire relationship system between parties that agree to do so. They consider this method of operation to be the best from the point of view of the owners, who assess the company's profitability and its risk. Taking this into account, it cannot be unambiguously determined which level of the current liquidity ratio is the best for the company without analyzing other factors, and above all, the profitability, cost of capital and the value of the company. The same applies to static liquidity ratios with more restrictive assumptions, accelerated liquidity, and cash ratios.

Another indicator – the cash conversion cycle (CCC) – represents a dynamic approach to financial liquidity and is the sum of the turnover of receivables and inventories less the current trading cycle in current days. The cash conversion cycle determines the time between the outflow of cash for the repayment of liabilities and their impact in the form of receivables collected, taking into account the time of keeping stocks in a given cycle. Therefore, it can be concluded that a positive CCC level is the number of days that the company finances its operating activity from long-term capital, and a negative cash conversion cycle means the period in which the company is additionally credited by its creditors (Wędzki 2006). The value of the cash conversion cycle index varies considerably for different business profiles of companies. The inventory cycle depends on the specificity of production or sales and the cycle of receivables from the lending policy towards customers. The liabilities cycle is related to the negotiating power of the company and the possibility of extending payment deadlines for subcontractors.

When considering the problem of assessing the financial liquidity of a company, cash flows should be considered next. Liquidity in the context of financial flows according to Bernstein et al. (1981) is the ability to balance the required expenses and receipts, taking into account the possibility of interruptions in cash inflow and an increase in cash outflows. They claim that for the analysis of liquidity, cash flow from operations, which show flows at this level of activity, should be considered (Bernstein 1985). Moss and Stine (1993) presented the asset performance indicator as being the best method of analyzing the liquidity of an entity using operating cash flows.

One of the liquidity measures based on cash flows is Lambda, proposed by Emery (1984), whose value is based on projected cash flows. Lambda takes into account many factors affecting liquidity, such as the available liquid level available to the company. These resources must then be quickly converted into cash to settle the liabilities, and in addition, regulating them must not disrupt future liquidity. Short-term cash investments and short-term credit lines play a very important role in this process. The second factor affecting the liquidity of a company is the value of future cash flow. The increase in cash flow improves the company's situation in the context of liquidity; however, it cannot be predicted with 100% certainty. Therefore, an uncertainty factor should also be considered (Emery, Lyons, Grant 1991).

Deloof (2001) distinguished the motives of maintaining cash by writing about transactional motives that are related to security and investment motives. A transaction motive is related to keeping ready cash or short-term investments necessary to execute transactions resulting from operating activities. When obtaining funds on the market is easy and cheap, such reserves may be lower. The caution motive requires keeping reserves adequate to the level of accepted risk. The financial motive is the most complicated because it takes into account any conflict of interest and the asymmetry of information between the management and the owners. Consequently, as Myers and Majluf (1984) claim, companies maintain liquid reserves to finance future investments, thus giving investors signals about their plans in the future. Opler et al. (1999) found that a higher level of cash is maintained by smaller, growing companies whose fluctuations in the cash flow level are higher.

A company's overall financial condition and liquidity, which is related to matching inflows and outflows during operations, should also be taken into account. Adjusting the date of receivables and liabilities to each other may have a positive effect on the cash balance in the budget. As Siegel et al. (1999) pointed out, debt repayment dates, expected cash flows, general business risk, the likelihood of unexpected problems and profitability are conditions for a company's good financial condition.

The liquidity of a company can also be perceived as structured liquidity (related to the structure of assets) and potential liquidity (related to the structure of liabilities). Analysis of the balance sheet structure (vertical analysis) also provides a lot of valuable information about the financial situation in which the company is located and is a supplement to the dynamics analysis (Olzacka, Pałczyńska-Gościniak 2007). The structure of assets informs about capital involvement, and the structure of liabilities shows their sources of origin. It involves determining the share of assets and liabilities in the balance sheet total and enables the assessment of the balance sheet structure as well as the trend and the reasons for changes occurring in this structure. It also enables the analysis of the degree of liquidity of assets and the level of maturity of liabilities, and thus indirectly the risk associated with it (Sierpińska, Jachna 2007). Assets are arranged in the balance sheet according to their degree of liquidity and sources of financing according to maturity, and by analyzing their structure it can be determined whether in the event of problems with liquidity a given entity will have difficulty selling assets and to what extent equity covers fixed assets, as well other relationships between the left and right side of the balance sheet (Gołaszewski, Urbanek, Walińska 2007). The structure of assets is partly due to the nature of the business entity under study. A higher share of non-current assets will be found in production, construction or mining units (they need buildings, machinery, etc. for their operations), while trading companies are dominated by inventories and receivables (to increase sales, they offer favourable trade credits), so they may have a higher share of current assets (Gołaszewski, Urbanek, Walińska 2007).

Most often, both the balance sheet total and the structure of assets and liabilities change as a result of different dynamics of changes in a given period.

The most important indicators include:

– the share of fixed or current assets in the total assets (the total of these two ratios is equal to 1),
– the share of intangible assets in the balance sheet total,
– the share of property, plant and equipment in the balance sheet total,
– the share of balance sheet total inventories.

In the research presented later in this work, it is liquidity in structural terms that will be taken into account.

3 Liquidity of shares

The liquidity of shares on the capital market is understood by investors as the ease with which a given type of asset can be converted into cash, that is, the easiest way to sell it (Bodie, Kane, Marcus 2002). High liquidity of trading is a very desirable feature of the market. Low liquidity means that investors will demand a liquidity risk premium because they count on the potential for there being no possibility of reselling large blocks of shares at the price the market offers for small packages. Investment portfolio managers earn a living by diversifying investments included in a given portfolio in terms of liquidity preferences and the client's time horizon. However, despite the obvious importance of liquidity in making investment decisions, it has not found the right place in financial theory. Even the Capital Asset Pricing Model (CAPM) does not pay attention to the liquidity effects of assets or the time for which investments are made. This situation has changed since the mid-eighties, when it was adapted to formally analyze the liquidity issue in the financial market. The forerunners in this topic were Amihud and Mendelson (1986), who in theoretical and empirical studies demonstrated the existence of a relationship between the rate of return on shares and the liquidity measured by the spread on the US market. Subsequent research confirmed their thesis that liquidity exerts a significant influence on share prices and their rates of return (see: Shannon, Reilly, Schweihs 2000; Chordia, Roll, Subrahmanyam 2000; Dater, Naik, Radcliffe 1998; Chan, Faff 2005; Acharyal, Pedersen 2005; Cheng 2007).

There are many measures and definitions of the liquidity of shares. The commonly accepted definition of liquidity is the ability to trade shares in large quantities without affecting prices. Hence, the natural measure of liquidity is the volume of turnover. Volume-based research was presented by, among others, Brennan and Subrahmanyan (1996), Bertsimas and Lo (1998), Amihud (2002), Pastor and Stambaugh (2003), Acharya and Pedersen (2005), and Sadka (2006).

Another measure of liquidity is spread, which was used in the first studies, starting with the research presented by Amihuda and Mendelson (2012). Spread is understood as the difference between the best purchase offer, after which the investor can sell the share and the best sale offer, after which the investor can acquire the share before each transaction. In stock exchange statistics, it is usually given in basis points.

In addition to spread, other liquidity measures are also used in the research:

– turnover ratio – simply the average number of shares traded in a given period divided by the number of shares occurring in that period;

– the number of transactions – understood as an indicator of investor activity in the buying or selling of a given financial instrument; the number of transactions is the number of purchase and sale contracts of a given financial instrument made in the audited period (counted individually);

– value (volume) of turnover – in terms of value, calculated as the product of the exchange rate and the number of instruments bought and sold (counted in duplicate), while in terms of quantity, it is the number of instruments sold (counted individually);

– liquidity ratio (ILLIQ) – this indicator shows the daily impact of the volume of orders on prices (Amihud 2002).

There is much evidence that liquidity affects profits from shares. One line of scientific thinking regards liquidity as a feature that affects profits beyond trading costs. Investing in illiquid shares is compensated by a higher rate of return (see Amihud, Mendelson 1986b; Brennan, Subrahmanyam 1996; Dater, Naik, Radcliffe 1998; Brennan, Chordia, Subrahmanyam 1998). Other studies show market

liquidity to be a risk factor. Shares with higher sensitivity to changes in aggregate liquidity have higher expected profits (Pastor, Stambaugh 2003).

Amihud and Mendelson (1986) were the first to study the impact of the liquidity of financial instruments on their price and on the rate of return. Because an investor who wants to buy a stock immediately (at the ask price) pays more than an investor who would like to sell immediately (at the bid price), it can be assumed that the ask price includes a premium (surplus price) for the immediate purchase of shares; the bid price includes a concession (price reduction) for immediate sale. Therefore, the bid-ask spread, which includes the sum of the purchase premium and the sales license, can be treated as the price that investors must pay for liquidity in the form of the immediate execution of the order. In the studies presented in this work, spread is thus treated as a natural measure of the cost of liquidity or the cost of a lack of liquidity. With spread understood in this way, the basic question arises as to how it should affect the rate of return on shares. The intuitive answer, in this case, does not seem difficult. When taking into account the rate of return in the valuation of shares, investors should require a higher rate of return on shares with a low spread in order to compensate for the higher costs associated with making transactions. There should, therefore, be a positive correlation between the rate of return and the spread of shares (Amihud, Mendelson 2012).

Investment decisions should, therefore, take into account not only the risk of return on shares, but also their liquidity. While in the first case, the investor may reduce the risk by diversifying or applying hedging transactions, he can do little to avoid the cost of low liquidity.

4 Data and measures of liquidity

Collecting relevant data is a very important element of the whole research work. In the case of developed financial markets, access to data is easier, while in the case of developing markets, this is not always the case. Therefore, to obtain the most accurate data, a number of databases were searched from public institutions (the Warsaw Stock Exchange, Narodowy Bank Polski) as well as private ones (Bloomberg, Reuters, Notoria). In each case, the comments to the applied methodology for calculating selected data were analyzed, and their quality was thoroughly checked. The researches were conducted on a group of companies listed on the Warsaw Stock Exchange in the period: 30 April 2012 – 31 December 2017. Companies that met all the conditions were selected for the study:

– they were listed on the Warsaw Stock Exchange throughout the audited period,
– they belonged to the Warsaw Stock Exchange Index,
– the shares of these companies were quoted on a continuous basis (as of December 2017);
– the Reuters database contained stock prices of the analyzed companies at the end of all 79 analyzed months.

In this way, 221 companies that met the above-mentioned criteria were selected. Data regarding the volume of trade and spread came from the official WSE website, while price data came from the Reuters platform. The prices have been adjusted for capital changes in the type of subscription rights, dividends, and splits. The study was conducted on quarterly rates calculated based on prices from the last day of each quarter. The WIBOR (Warsaw Interbank Offer Rate) rate was chosen as the rate of return on risk-free assets. Data from financial statements regarding the size of the company's assets, equity, and size of liabilities came from the Notoria website. Meanwhile, the P/BV and ROA indicators came from the Bloomberg database.

The aim of this research was to check how the liquidity of a company's assets affects the liquidity of shares issued by the company. Three popular liquidity measures were used for this research: spread, turnover ratio, and Amihud's liquidity ratio (2002).

Spread as a measure of liquidity has been used by many researchers, starting with Amihud and Mendelson (1986a). Other research carried out by Stolla (2000) provides an overview of liquidity measures based on the definition of the bid/ask spread and is determined based on intraday trading data. The spread measured in this way is treated as a natural determinant of liquidity costs (Gajdka, Gniadkowska, Schabek 2010).

The turnover ratio is simply the average number of shares in a given company traded in a given period divided by the number of shares in the company in that period. The turnover rate is a non-quantified (or a percentage) value (Campbell, Grossman, Wang 1993), as a relative size. Being unencumbered by the effect of the size of the company is particularly useful in any comparative analysis of the liquidity of capital assets.

It is expressed by the formula:

$$Turnover_{it} = \frac{\sum_{j=1}^{d_t} vol_{it}}{SO_{it}} \tag{1}$$

where:

vol_{it} – is the average number of shares i traded in period t,

SO_{it} – is the number of shares i occurring in period t.

In the case of an instrument with a turnover ratio of 100%, we can say that during the audited period, all shares were traded.

The most popular measure of the illiquidity of assets is the measure proposed by Amihud (2002). This measure is used in many of the latest empirical studies on markets around the world (see: Acharyal, Pedersen 2005; Lesmond 2005; Bekaert, Harvey, Lundblad 2007; Goyenko, Holden, Trzcinka 2009; Lischewski, Voronkova 2012). The Amihud measure is determined on the basis of daily data, usually on a monthly scale, but the design of the formula also makes it possible to calculate this measure with a different frequency than the monthly one.

Lack of liquidity is defined as:

$$ILLIQ_{it} = \frac{1}{D_{it}} \times \frac{\sum_{t=1}^{D_{it}} |R_{itd}|}{DVOL_{itd}} \tag{2}$$

where:

D_{it} – is the number of days in which stock quotes took place in a given week or month,

R_{itd} – is the absolute value of the daily rate of return for the shares under investigation,

$DVOL_{itd}$ – is the daily volume of transactions in shares and in zlotys.

This indicator shows the effect of the size of orders on prices (Amihud 2002). The measure is not specified for days with zero revolutions. The lack of liquidity ratio assumes high (low) values in the case of low (high) liquidity. In contrast to other measures, it is expressed as the average daily rate of return, per unit of monetary turnover (on the Polish market – PLN 1 thousand) (Olbryś 2013).

In the work of many researchers this indicator was used in its original form, although there are frequent modifications, such as using the inverse of the indicator. However, as Hasbrouck (2006) emphasizes, index modifications often lead to many inaccuracies in the calculation.

The most important independent variable in this study is the financial liquidity of the company. The method of measuring the financial liquidity is similar to that presented by Berger and Bouwman (2008) and Goplan, Kadan, and Pevzner (2012). Each of the company's assets specified in the balance sheet was assigned a zero value or one depending on its liquidity. Then, the individual liquidity of the assets was calculated using their book values as weights (see: Berger, Bouwman 2008; Gopalan, Kadan, Pevzner 2009; Gopalan, Kadan, Pevzner 2012). Thanks to that, it was possible to create four different alternative liquidity measures of assets.

The first measure of the liquidity of assets assigns the value of 1 to cash and its equivalent and 0 to the company's remaining assets. The first measure of Weighted Asset Liquidity (WAL) for the company i in year t is given by the formula:

$$WAL1_{i,t} = \frac{Cash\ \&Equivalents_{i,t}}{Total\ Assets_{i,t-1}} \times 1 + \frac{Other\ Assets_{i,t}}{Total\ Assets_{i,t-1}} \times 0 \tag{3}$$

WAL1 is the share of cash and its equivalent to total assets. In fact, this measure loses a great deal of information about other liquid assets that a given company has.

As for cash and its equivalent, they are certainly very liquid assets, but there are also a number of assets with average liquidity. Such assets cannot be converted into cash very quickly and, usually, costs are associated with selling them. Such assets have been specified in the second measure, expressed by the formula:

$$WAL2_{i,t} = \frac{Cash\ \&Equivalents_{i,t}}{Total\ Assets_{i,t-1}} \times 1 + \frac{Non\,Cash\,CA_{i,t}}{Total\ Assets_{i,t-1}} \times 0.5 + \frac{Other\ Assets_{i,t}}{Total\ Assets_{i,t-1}} \times 0 \tag{4}$$

Assets with medium-term liquidity include: stocks of materials, products or goods, short-term receivables. Following this line of thinking, one more group of assets can be specified which may not be high (average), but exchanging these assets for cash should not cause the companies big problems, although it can be time-consuming. The following can be counted as assets of average liquidity: long--term investments, or property, plant and equipment. This is how the third measure of liquidity of assets was created, expressed by the formula:

$$WAL3_{i,t} = \frac{Cash\ \&Equivalents_{i,t}}{Total\ Assets_{i,t-1}} \times 1 + \frac{Non\,Cash\,CA_{i,t}}{Total\ Assets_{i,t-1}} \times 0.75 + \frac{Tangible\,Fixed\ Assets_{i,t}}{Total\ Assets_{i,t-1}} \times 0.5 + \frac{Other\ Assets_{i,t}}{Total\ Assets_{i,t-1}} \times 0 \tag{5}$$

For comparison, based on the WAL3 measure, one more measure of asset liquidity was constructed based on the market value of a given company. This measure was expressed by the formula:

$$MWAL_{i,t} = \frac{Cash\ \&Equivalents_{i,t}}{Market\ Assets_{i,t-1}} \times 1 + \frac{Non\,Cash\,CA_{i,t}}{Market\ Assets_{i,t-1}} \times 0.75 + \frac{Tangible\,Fixed\ Assets_{i,t}}{Market\ Assets_{i,t-1}} \times 0.5 + \frac{Other\ Assets_{i,t}}{Market\ Assets_{i,t-1}} \times 0 \tag{6}$$

In addition, the model uses control variables that also affect the liquidity of shares of a given company. The control variables used in the study are:

ROA – return on assets,

BHAR – above-average rate of return on shares of a given company,

P/BV – price-to-book value ratio,

VOL – volatility of share prices of a given company,

CAP – the size of the company expressed by its market capitalization.

In the case of capitalization and variability, a natural logarithm was used to take into account the literature suggsted by Banz (1981) and Fama and French (1993) about the non-linear relationship between these variables and the liquidity of shares.

Table 1 presents the basic statistics of the data used in the study.

A study was performed on the occurrence of collinearity in the model using the Variance Inflation Factor (VIF) statistics. The independent variables were not collinear because most VIF values were < 5.

Table 2 shows the correlations between the most important variables used in the study.

5 Methodology and results

The purpose of the study is to determine if there is a statistically significant relationship between the liquidity of the shares and the liquidity of the assets held by the company. The applied research methodology is similar to that described by Goplan, Kadan, and Pevzner (2012). First the relationship between the liquidity of assets and the liquidity of shares was checked. For this purpose, the model is estimated according to the formula:

$$Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Controls_{i,t} + \varepsilon_{i,t} \tag{7}$$

where:

$Y_{i,t}$ – is one of three liquidity measures (spread, ILLIQ or turnover) calculated for the company i at time t,

$X_{i,t}$ – is one of four asset liquidity measures (WAL1, WAL2, WAL3, MWAL) calculated for the company i at time t,

Controls – these are control variables (ROA, P/BV, CAP, VOL, BHAR) calculated for the company i at time t.

Based on the methodology described by Goplan, Kadan, and Pevzner (2012), the relationship between liquidity of shares and liquidity of assets, as well as control variables for the collected data, was first tested according to formula (7) to obtain the results described in Table 3. In total, 12 calculations of different model variants were carried out, taking into account all the variables concerning the liquidity of shares and liquidity of assets in turn. Several models were estimated by the ordinary least squares (OLS) method with inclusion of different independent sets of variables. The model specification was also analyzed using the RESET test, which indicated the correctness of the model used (p-value > 0.05). The RESET test results obtained show that the specification of the variables in the model is correct.

Part A of Table 3 presents the calculations of models in which the spread was dependent. Columns 1 to 4 present the calculations for four models where the dependent variable (spread) depended on four different liquidity measures of the company's assets: WAL1, WAL2, WAL3, and MWAL. As can be seen from the calculations presented in Part A, only the WAL2 measure has no significant statistical significance on the shares' liquidity expressed as a spread. In the case of the other three liquidity measures of assets – WAL1, WAL3, and MWAL – these measures affect the liquidity of the shares expressed as a spread. The first measure of liquidity of assets, WAL1, is negatively correlated with the liquidity of the shares expressed as a spread, which is consistent with the fact that the spread is perceived in the literature as a measure of the lack of liquidity (see: Amihud, Mendelson 1986a; Gajdka, Gniadkowska, Schabek 2010). The results obtained for the Polish market for the WAL1 measure are in line with the results obtained by Goplana, Kadan, and Pevzner (2012) for highly developed markets. The other two measure – WAL3 and MWAL – which also have a significant impact on the liquidity of shares expressed as a spread, have a positive sign, i.e. an asset liquidity pattern should be accompanied by an increase in the spread, and hence a decrease in the liquidity of shares. Such a situation may be caused by the fact that the Polish market is still considered to be a developing market, which may sometimes make it difficult for investors to make rational decisions. In addition, the WAL3 and MWAL measures specify assets whose liquidity may not be high (average); however, exchanging these assets for cash should not cause the company major problems, but it can be time-consuming. The following can be counted as assets of average liquidity: long-term investments, or property, plant and equipment. Improving the company's liquidity through the sale of, for example, property, plant and equipment, may not be looked on favorably by stock market investors. This, in turn, may result in a reduction in the liquidity of trading in the shares of such a company.

From the other control variables used in the models, only the variable representing the company size measured by capitalization, the variable determining the volatility of share prices of the company and an above-average rate of return on shares the company have a significant impact on the liquidity of the shares expressed as a spread. As follows from the calculations presented in Table 3, part A, the sign of parameters standing next to the variable representing the size of the company measured by capitalization and an above-average rate of return on shares of the company is negative. In other words, an increase in the size of the company and an above-average rate of return on shares of the company should be accompanied by a decrease in the spread, i.e. an increase in the liquidity of the shares of the company. On the other hand, the sign of the parameter in front of the variable determining the volatility of share prices is positive. This means that the greater the volatility of the share price of a given company, the less liquidity its shares should have. The other two variables, i.e. the price-to--book ratio and the return on assets ratio, do not materially affect the liquidity of the shares expressed as a spread. The adjustment of all four models to real data, measured by the adjusted R2 factor, is approximately 0.23.

Part B of Table 3 presents the calculations of models in which the variable liquidity ratio (ILLIQ) of Amihud (2002) was dependent on variables. Columns 1 to 4 present the calculations for four models where the dependent variable (ILLIQ) depended on four different liquidity measures of the company's assets: WAL1, WAL2, WAL3, MWAL. As can be seen from the calculations presented in Part B, all liquidity measures of assets: WAL1, WAL2, WAL3, and MWAL have an impact on the liquidity of the shares expressed as ILLIQ. All of these measures are also negatively correlated with the liquidity of the shares expressed as ILLIQ. The results obtained for the Polish market for all liquidity measures of assets are in line with the results obtained by Goplana, Kadan, and Pevzner (2012) for highly

developed markets. From the other control variables used in the models, the variable representing the size of the company measured by capitalization, the variable specifying the volatility of the share prices of a given company and above-average rate of return on shares of a given company have a significant impact on the liquidity of the share expressed as ILLIQ. As can be seen in Part B of Table 3, the sign of parameters standing next to the variable representing the size of the company as measured by capitalization and an above-average rate of return on shares of the company is negative. In other words, an increase in the size of the company and an above-average rate of return on shares of the company should be accompanied by a decline in ILLIQ, i.e. an increase in the liquidity of shares of the company. On the other hand, the sign of the parameter in front of the variable determining the volatility of share prices of the company is positive. This means that the greater the volatility of the share price of the company, the less liquidity its shares should have. The other two variables, i.e. the price-to-book ratio and the return on assets ratio, do not have any impact on the liquidity of the shares expressed as ILLIQ. The adjustment of all four models to real data, measured by the adjusted R2 factor, is approximately 0.09.

Part C of Table 3 presents the calculations of the models in which the turnover ratio was dependent on variables. Columns 1 to 4 present the calculations for four models where the dependent variable (turnover ratio) depended on four different liquidity measures of the company's assets: WAL1, WAL2, WAL3, MWAL. As can be seen from the calculations presented in Part C, measures WAL1 and WAL2 do not have a statistically significant effect on the liquidity of the shares expressed as the turnover ratio. In the case of the other two liquidity measures of assets – WAL3 and MWAL – these measures affect the liquidity of shares expressed as the turnover ratio. The third measure of liquidity of assets, WAL3, is negatively correlated with the liquidity of the shares expressed as the turnover ratio. The results obtained for the Polish market for the WAL3 measure are not consistent with the results obtained by Goplana, Kadan, and Pevzner (2012) for highly developed markets, because the turnover ratio is a direct measure of liquidity. The remaining measure of MWAL, which also has a significant impact on the liquidity of the shares, expressed as the turnover rate, has a negative sign, i.e. an increase in the liquidity of assets should be accompanied by a drop in the liquidity of assets. The results obtained for the Polish market for the MWAL measure are consistent with the results obtained by Goplana, Kadan, and Pevzner (2012) for highly developed markets. From the other control variables used in the models, the variable determining the volatility of share prices of a given company, the price-to-book value ratio and the return on assets have a significant impact on the liquidity of the share expressed as the turnover ratio. As can be seen from the table presented in Part C, the sign of parameters standing next to the variable determining the volatility of share prices of a given company and the price-to--book value ratio is positive. That is, the increase in share price volatility of the company and the price--to-book value ratio should be accompanied by an increase in liquidity of the shares of this company. However, the sign of the parameter facing the variable determining the return on assets is negative. This means that the higher the return on assets in a given company, the less liquidity its shares should have. The variable defining the above-average rate of return on shares of a given company does not have a significant impact on the liquidity of the shares, expressed as the turnover ratio. However, as far as the variable specifying the size of the company measured by capitalization is concerned, it is statically significant only in the case of the first three models, and the sign of the parameter before this variable is negative. In the case of the 4th model, the variable determining the size of the company measured by capitalization has no statistically significant influence on the liquidity of shares expressed as the turnover ratio. The adjustment of models 1, 2, and 4 to real data, measured by the adjusted R2

coefficient, is about 0.0056. However, the adjustment of model 3 to real data, measured by the adjusted R2 coefficient, is about 0.0082.

Based on the conducted research, it should be emphasized that the analyzed models minimally explain the endogenous variable, but their purpose is not to describe the liquidity of the company's shares through the liquidity of the company's assets, but to identify further factors affecting this phenomenon.

6 Conclusions

It is quite difficult to capture the relationship between the liquidity of a company's assets and the liquidity of its shares. Often, stock market investors pay attention to only one of these aspects. However, as shown by research carried out on highly developed markets (see Berger, Bouwman 2008; Goplana, Kadan, Pevzner 2012), as well as this study carried out on the Polish market, the relationship between the liquidity of a company's assets and the liquidity of its shares actually occurs.

Literature studies and analysis of the collected empirical material allow to formulate several observations related to the liquidity of the company's assets and the liquidity of the company's shares. It should be remembered that not all of the company's assets will cause an increase in the liquidity of the company and translate into an increase in the liquidity of its shares on the capital market. Based on the conducted research it should be emphasized that the analyzed models minimally explain the endogenous variable, but their purpose is not to describe the liquidity of the company's shares through the liquidity of the company's assets, but to identify further factors affecting this phenomenon.

Conducting several separate studies using various measures describing liquidity on the data obtained for the Polish capital market confirms the hypothesis put forward at the beginning of the study that there is a statistically significant relationship between the liquidity of the shares and the liquidity of the company's assets. Regardless of the liquidity measure chosen, in most cases, the relationship between the liquidity of shares and the liquidity of the company's assets on the Warsaw Stock Exchange was confirmed. This allows us to conclude that another variable has been found which should be taken into account by investors and market analysts in the valuation of securities and the estimation of the return on investment.

The presentation in the empirical part of the models does not give an unequivocal answer regarding the direction of this relationship, which can be both positive and negative. Greater asset liquidity reduces uncertainty regarding valuation of assets-in-place, but it also increases future investments and the associated uncertainty. The models show that asset liquidity improves stock liquidity more in the case of firms that are less likely to reinvest their liquid assets. The relation between asset liquidity and stock liquidity also has value implications. The effect of a high cash balance in improving stock liquidity is a hitherto unknow benefit of cash. We find that an increase in coproprate cash holding is significantly more valuable for companies with less liquid stock. Also, in the context of capital valuation, e.g. when placement of shares, sale of the company where the approach related to the CAPM model prevails, the results of the study can be used for a more accurate and wider valuation that takes into account the characteristics and sensitivities of the companies indicated in this work.

Future research should cover the period after the subprime crisis and the inclusion of additional control variables describing the growth potential of the company in the study.

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Appendix

Table 1
Basic statistics of the data used in the study

	Mean	Median	Minimum	Maximum	Standard deviation
LN(CAP)	5.618899	5.409181	1.99576	10.8061	1.6917
WAL1	0.071803	0.045595	-0.00051	0.758	0.0822
WAL2	0.543799	0.531206	0.12725	2.5628	0.07886
WAL3	0.921721	0.90897	0.17997	3.9495	0.15092
MWAL	2.227213	1.750074	0.09898	27.5154	1.88099
ROA	0.014503	0.013153	-0.65426	0.5137	0.03136
P/BV	4.562873	2.8604	0.05	759.8039	15.35065
LN(VOL)	1.61618	1.496073	-1.00669	6.16	1.28911
BHAR	0.001254	-0.001734	-0.5507	0.832	0.0649
SPREAD	2.064207	1.616967	0.07027	40	2.05558
ILLIQ	0	0	0	0	0
TURNOVER	0.02411	0.011658	0.00002	3.4582	0.07463

Source: author's own elaboration.

Table 2
Correlation between variables

	WAL1	**WAL2**	**WAL3**	**MWAL**	**ROA**	**P/BV**	**LN(CAP)**	**LN(VOL)**	**BHAR**	**SPREAD**	**ILLIQ**	**TURNOVER**
WAL1	1.000											
WAL2	0.639	1.000										
WAL3	0.126	0.601	1.000									
MWAL	-0.189	-0.118	-0.029	1.000								
ROA	0.162	0.241	0.144	-0.227	1.000							
P/BV	0.059	0.040	0.003	-0.128	0.068	1.000						
LN(CAP)	0.192	0.147	0.221	-0.314	0.146	0.059	1.000					
LN(VOL)	0.053	0.014	0.000	-0.006	-0.020	0.057	0.218	1.000				
BHAR	0.081	0.083	0.042	0.085	0.097	0.020	0.070	-0.005	1.000			
SPREAD	-0.111	-0.081	-0.064	0.186	-0.089	-0.035	-0.451	0.055	-0.104	1.000		
ILLIQ	-0.090	-0.070	0.012	0.127	-0.049	-0.004	-0.285	-0.006	-0.064	0.403	1.000	
TURNOVER	-0.002	-0.013	-0.065	0.118	-0.051	0.046	-0.034	0.030	-0.011	-0.048	-0.073	1.000

Source: author's own elaboration.

Table 3
Estimation of model parameters from equation 7

	Part A – SPREAD			
	1	**2**	**3**	**4**
WAL1	-0.52759 (0.1193)**			
WAL2		-0.12717 (0.3681)		
WAL3			0.66230 (0.1910)**	
MWAL				0.05080 (0.01619)**
LN(CAP)	-0.57577 (0.0179)**	-0.57927 (0.01727)**	-0.59258 (0.0175)**	-0.56284 (0.0179)**
ROA	-0.36955 (0.9108)	-0.47925 (0.9159)	-0.89798 (0.8984)	0.01452 (0.9108)
P/BV	-0.00173 (0.0018)	-0.00183 (0.0018)	-0.00174 (0.0018)	-0.00119 (0.0018)
LN(VOL)	0.25454 (0.0222)**	0.25386 (0.0.0222)**	0.25731 (0.0222)**	0.24930 (0.0222)**
BHAR	-2.13481 (0.4369)**	-2.16406 (0.4339)**	-2.19788 (0.4327)**	-2.35936 (0.4369)**
R^2	0.23205	0.23165	0.23386	0.23345
	Part B – ILLIQ			
	1	**2**	**3**	**4**
WAL1	-9.17021E-09 (4.00132E-09)**			
WAL2		-3.56891E-09 (4.20294E-09)**		
WAL3			-3.56891E-09 (2.17724E-09)**	
MWAL				-3.56891E-09 (1.85023E-10)**
LN(CAP)	-3.67567E-09 (1.984E-09)**	-3.67567E-09 (1.971E-10)**	-3.67567E-09 (1.99702E-10)**	-3.67567E-09 (2.05504E-10)**
ROA	2.39001E-09 (1.02925E-08)	2.39001E-09 (1.04558E-08)	2.39001E-09 (1.02374E-08)	2.39001E-09 (1.04032E-08)
P/BV	1.72078E-11 (2.0887E-11)	1.72078E-11 (2.08815E-11)	1.72078E-11 (2.08118E-11)	1.72078E-11 (2.09963E-11)

Table 3, cont'd

	Part A – SPREAD			
	1	**2**	**3**	**4**
LN(VOL)	9.60935E-10 (2.5417E-10)**	9.60935E-10 (2.5421E-10)**	9.60935E-10 (2.53615E-10)**	9.60935E-10 (2.54594E-10)**
BHAR	-1.3507E-08 (4.9537E-09)**	-1.3507E-08 (4.9544E-09)**	-1.3507E-08 (4.93138E-09)**	-1.3507E-08 (4.99045E-09)**
R^2	0.0865339	0.0860202	0.0920155	0.0872017
	Part C – TURNOVER			
	1	**2**	**3**	**4**
WAL1	0.008349 (0.1474)			
WAL2		0.002505 (0.01548)		
WAL3			-0.026788 (0.008)**	
MWAL				0.004935 (0.0006)**
LN(CAP)	-0.001743 (0.0007)**	-0.001691 (0.0007)**	-0.001166 (0.0007)**	-0.000017 (0.0007)
ROA	-0.117061 (0.0379)**	-0.115592 (0.0385)**	-0.100081 (0.037)**	-0.059592 (0.038)**
P/BV	0.000242 (0.000)**	0.000243 (0.000)**	0.000239 (0.000)**	0.000306 (0.000)**
LN(VOL)	0.001980 (0.0009)**	0.001991 (0.0019)**	0.001852 (0.0009)**	0.001542 (0.0009)**
BHAR	-0.005812 (0.01824)	-0.005381 (0.01824)	-0.004184 (0.01819)	-0.023391 (0.1827)
R^2	0.0056769	0.005606	0.0082671	0.005606

Note: the parameter is statistically significant for every p-value of less than 0.1, for increasing confidence intervals of 1% (***), 5% (**) and 10% (*) respectively.

Source: author's own elaboration.

Płynność aktywów i płynność akcji na przykładzie GPW

Streszczenie

Przez przedsiębiorstwa na rynku kapitałowym rozumiane są spółki, które pozyskują kapitał w drodze emisji instrumentów finansowych będących przedmiotem obrotu na rynku wtórnym. Na rynku kapitałowym charakterystyczne jest to, że ocena kondycji ekonomicznej przedsiębiorstwa dokonywana jest w odniesieniu do oczekiwań inwestorów, którzy oceniają na bieżąco decyzje podejmowane przez zarząd. Celem przedsiębiorstwa jest takie zarządzanie nim, aby maksymalizowana była jego wartość. Maksymalizacja wartości, a co za tym idzie rentowności, wiąże się z zarządzaniem płynnością finansową, której minimalny poziom mógłby doprowadzić przedsiębiorstwo do upadłości. Zarządzanie płynnością na rynku kapitałowym nie powinno odbywać się wyłącznie na podstawie porównania z innymi podmiotami w sektorze ze względu na cel działalności przedsiębiorstwa oraz oczekiwania inwestorów.

Maksymalizacja wartości dla inwestorów oraz rentowości jest także ściśle związana z tym, co dzieje się na rynku kapitałowym. To właśnie tu podejmowane są przez inwestorów decyzje dotyczące obrotu papierami wartościowymi. Inwestorzy, wybierając, w co zainwestować swoje pieniądze, biorą pod uwagę szereg różnych czynników charakteryzujących dany papier wartościowy. Znaczna część tych czynników wpływa na płynność danej inwestycji. Niektóre są zależne od samej spółki, której papiery wartościowe chcemy nabyć, np. sposobu zarządzania czy polityki informacyjnej. Są też czynniki makroekonomiczne, niezależne od danego przedsiębiorstwa, jak struktura rynku, aktualna koniunktura, sytuacja danej branży czy konkurencyjność innych form lokowania pieniędzy, jakie w danym czasie oferują rynki finansowe.

Jednym z czynników, na który inwestorzy coraz częściej zwracają uwagę, jest płynność danego papieru wartościowego. Przez płynność aktywów na rynku finansowym rozumie się zazwyczaj koszt oraz łatwość, z jaką poszczególne rodzaje aktywów mogą być zamienione na środki pieniężne, czyli mówiąc najprościej sprzedane po cenie aktualnie dostępnej na rynku. Kategoria ta przez znaczny okres nie była w należyty sposób analizowana w ramach współczesnej teorii finansów. W rezultacie wiele podstawowych modeli zbudowanych w ramach tej teorii w swej klasycznej postaci nie uwzględniało problemów związanych z płynnością.

Celem artykułu jest prezentacja problemu płynności finansowej i płynności aktywów na rynku finansowym. Integracja tych dwóch podejść powinna pokazać, czy płynność aktywów danej spółki będzie miała wpływ na płynność jej walorów notowanych na rynku kapitałowym.

Zastosowana metodologia badawcza jest podobna do opisanej przez Goplana, Kadan i Pevzner (2012) w pracy *Asset liquidity and stock liquidity*. W tym celu dokonuje się estymacji modelu według wzoru:

$$Y_{i,t} = \alpha + \beta X_{i,t} + \gamma Controls_{i,t} + \varepsilon_{i,t}$$

gdzie:

$Y_{i,t}$ – jedna z trzech miar płynności akcji (spread, ILLIQ czy turnover) obliczona dla spółki i w czasie t,

$X_{i,t}$ – jedna z trzech miar płynności aktywów (WAL1, WAL2, WAL3, MWAL) obliczona dla spółki i w czasie t,

Controls – zmienne kontrolne (ROA, P/BV, CAP, VOL, BHAR) obliczone dla spółki i w czasie t.

Uchwycenie związku pomiędzy płynnością aktywów danego przedsiębiorstwa a płynnością jego akcji jest dość trudne. Często inwestorzy giełdowi zwracają uwagę tylko na jeden z tych aspektów. Jak jednak pokazują badania przeprowadzone na rynkach wysoko rozwiniętych (Bergera, Bouwman 2008; Goplana, Kadan i Pevzner 2012), jak też badanie zaprezentowane w niniejszym opracowaniu, przeprowadzone dla rynku polskiego, związek pomiędzy płynnością aktywów danego przedsiębiorstwa a płynnością jego akcji w rzeczywistości występuje.

Przeprowadzenie kilku osobnych badań z wykorzystaniem różnych miar opisujących płynność na danych pozyskanych dla polskiego rynku kapitałowego potwierdza postawioną na początku pracy hipotezę, że istnieje istotna statystycznie zależność pomiędzy płynnością obrotu daną akcją a płynnością aktywów tej spółki. Niezależnie od wybranej miary płynności w większości przypadków potwierdzona została zależność pomiędzy płynnością obrotu a płynnością aktywów danej spółki na Giełdzie Papierów Wartościowych w Warszawie. Pozwala to na wyciągnięcie wniosku, że została znaleziona kolejna zmienna, która powinna być brana pod uwagę przez inwestorów oraz analityków rynku przy wycenie papierów wartościowych oraz szacowaniu stopy zwrotu z inwestycji.

Słowa kluczowe: płynność finansowa, kondycja ekonomiczna przedsiębiorstw, rynek kapitałowy, płynność akcji