Information Asymmetry, Capital Structure and Equity Value of Firms Listed on the WSE

Milena Gralewska
University of Warsaw, Faculty of Economic Sciences
m.gralewska2@student.uw.edu.pl

Anna Białek-Jaworska[1]
University of Warsaw, Faculty of Economic Sciences
abialek@wne.uw.edu.pl
https://orcid.org/0000-0003-4520-8916

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ABSTRACT

The paper investigates the impact of capital structure and information asymmetry on the value of companies listed on the Warsaw Stock Exchange. The study was conducted using the ordinary least squares (OLS) method on a sample of 273 companies in 2017 and the GMM dynamic panel-data approach with instrumental variables. Data retrieved from the Notoria, Bloomberg and Orbis databases were used. The results show that despite its impact on reducing the cost of capital, increasing debt does not lead to an increase in equity value. Therefore, the benefits of higher short-term leverage are limited and visible only for long-term debt. On the other hand, despite bigger information asymmetry, companies are valued higher, which means that asymmetrical information does not necessarily hurt valuation in the short term but in the long term. The results contribute to the literature on firms' use of leverage under information asymmetry, showing higher trust in cash flow than profits in books.

JEL Classification: A1, B2, C5, G1, G2, G3

Keywords: information asymmetry, capital structure, market value of the company, WACC.

1. INTRODUCTION

The appropriate choice of financing sources is one of the dominant problems of corporate finance. Despite many theoretical considerations and empirical studies in the literature, no consensus has been reached. Modigliani and Miller (1963) were precursors in this field. They pointed out that thanks to the debt tax shield, the company's value increases as the share of interest-bearing debt in the capital structure increases. In turn, considerations of Miller (1958, 1963) on the existence of bankruptcy costs and corporate income tax (CIT) and personal income

[1] Corresponding author.

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tax (PIT) led to the conclusion that the relationship between leverage and company value depends on tax benefits. This implies that the tax benefits of debt are limited. The value of a company using debt increases as the degree of indebtedness increases, but only until the interest tax shield from reducing the income tax base by the interest paid on the interest on the debt is used.

Moreover, non-debt tax shields, e.g. depreciation deductions, the amount restrictions on the deductibility of interest on the debt (introduced in 2018 by an EU directive) and the possibility to deduct tax losses from future income for no more than five years, mean that increasing the debt share in the capital structure does not give the company unlimited opportunities to increase its market value (Leszczyłowska, 2018).

The paper aims to examine the influence of capital structure and information asymmetry on the equity value of companies listed on the main trading floor of the Warsaw Stock Exchange.

The research problem undertaken in this paper is still relevant because the results of previous studies are not unambiguous due to the difficulty of measuring the phenomenon of information asymmetry. Drobetz (2010), Fauver and Naranjo (2010) and Fosu, Danso, Ahmad and Coffie (2016) explain the negative correlation between information asymmetry and equity value by the presence of agency costs, adverse selection and moral hazard.

Huynh, Wu and Duong (2020) point out the ambiguous effect of the information asymmetry phenomenon on equity value, while Botosan (1997), Dierkens (1991) and Bharath, Pasquariello and Wu (2009) argue that the relationship between these variables may be strongly influenced by capital structure.

The study was conducted using the ordinary least squares (OLS) method on a sample of 273 companies listed on the primary market of the Warsaw Stock Exchange. The companies' financial data refer to 2017 and are taken from the Notoria database, and information asymmetry measures are retrieved from the Bloomberg database. For the robustness check, we retrieved panel stock data from the Orbis database for 2007–2021 and applied GMM with instrumental variables. We contribute to the literature on asymmetry information impact on the capital structure due to the limited studies for companies listed on the Polish stock exchange (Jerzemowska, 1999; Gajdka, 2002; Czekaj, 2015; Białek-Jaworska and Nehrebecka, 2016; Koralun-Bereźnicka, 2016; Pawlonka and Franc-Dabrowska, 2018; Szomko, 2020). Additionally, there is a particular lack of studies linking the use of companies' debt with the common phenomenon of information asymmetry. Stereńczak (2020) suggests that on the Polish stock market, there exists a stock liquidity premium, which constitutes only a tiny fraction of returns and does not increase during periods of a bearish market. This is because of the lengthening of the average holding period when market liquidity decreases.

The remainder of the paper is as follows. Section 2 reviews the literature and empirical studies on the factors that influence the value of a company. The control variables used in the empirical study were selected based on this. Section 3 describes the data and the research design methodology. Section 4 shows the results. First of all, it starts with the verification of the research hypotheses. Then, it answers whether leverage negatively correlates with equity value due to the limited tax benefits of debt. Furthermore, it verifies how information asymmetry and control variables used in the study, such as firm size, the tangibility of assets, amount of cash flow, and profitability of the company and its business profile, correlate with equity value. Finally, section 5 considers the robustness of the results by applying additional information asymmetry measures to OLS models and a dynamic panel-data approach (GMM) to check how information asymmetry affects percentage change in equity value. Section 6 concludes.

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2. LITERATURE REVIEW

The literature reveals that the impact of capital structure on enterprise value differs. Myers (1984) and Stulz (1990) show a negative correlation between these variables. Higher leverage increases the underinvestment or overinvestment problem. According to King and Santor (2008), Fama and French (1998), Brigham and Houston (2012), the negative relationship between the increase in debt and enterprise value is due to the presence of additional costs (agency costs, bankruptcy, among others) and financial risks to which shareholders are exposed. However, Modigliani and Miller (1963), Jensen (1986) and Robb and Robinson (2014) point out that the use of (interest-bearing) debt has a significant positive impact on the enterprise value, as the returns achieved in this way exceed the average interest cost. Furthermore, Jensen (1986) and Gul and Tsui (2010) argue that leverage reduces agency costs, positively impacting equity value. Miller (1989), Ibhagui and Olokoyo (2018), Lin and Chang (2011), Fosu, Danso, Ahmad and Coffie (2016) also indicate an ambiguous relationship between leverage and equity value, which may be due to the threshold relationship between these variables, among others. Based on the literature cited and research, we formulate **hypothesis H1**: *Long-term leverage negatively correlates with equity value*.

Information asymmetry increases the incentives to use short-term debt among risky borrowers (Diamond 1991; Flannery 1986) to signal that they have favourable private information about future outcomes, resulting in lower borrowing costs. Shorter maturities are associated with more substantial information asymmetries. In the presence of information asymmetry, borrowers use short-term debt to signal their quality and commitment to repayment. Smaller firms with less tangible assets are more opaque. Therefore, they prefer shorter maturity debt (Berger et al., 2005; Custódio et al., 2013; Demirgüç-Kunt et al., 2015; Magri, 2010; Ortiz-Molina and Penas, 2008). Distinguishing short-term and long-term debt, we state supportive **hypothesis H1A**: Short-term leverage positively correlates with equity value.

According to Huynh, Wu and Duong (2020), the phenomenon of information asymmetry and the appropriate capital structure choice should be looked at together due to their possible correlation. Indeed, the strength with which information asymmetry affects the equity value may depend intensely on leverage. For example, according to Botosan (1997), the cost of equity is lower for companies with higher levels of information asymmetry. Similarly, Dierkens (1991) observed that companies announce share issues when their information asymmetry is relatively low. On the other hand, He, Lepone and Leung (2013) find that the dispersion of analysts' forecasts increases the ex-ante cost of capital. Moreover, Shen's (2014) research indicates that companies replace equity with debt when information asymmetry increases. Bharath, Pasquariello and Wu (2012) suggest that information asymmetry can directly impact the capital structure, determining investment decisions and shaping the enterprise value.

Based on a study conducted on American companies, they found that debt financing increases with information asymmetry. Similarly, Gao and Zhu's (2015) study found that companies with big information asymmetry use more debt in their capital structure but less long-term debt. Krishnaswami, Spindt and Subramaniam (1999) argue that companies with favorable information about their value and future earnings prefer to issue debt securities (corporate bonds), which are relatively less sensitive to information asymmetry. This inference is consistent with the pecking order theory.

The agency theory (e.g., Myers and Majluf, 1984) concerns the conflict of interests and information asymmetries between corporate insiders (e.g., managers) and outsiders (e.g., existing and prospective shareholders), while the market microstructure theory concerns information asymmetries between informed and uninformed traders. Diamond (1985) shows that smaller information asymmetries between corporate insiders and outsiders result in smaller information asymmetries between traders because the public release of inside information to

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outsiders makes traders' beliefs more uniform and reduces information asymmetries between informed and uninformed traders. Next, Chung et al. (2010) confirm that bigger information asymmetry between corporate insiders and outsiders results in bigger information asymmetry among traders.

Information asymmetry measures commonly found in the market microstructure literature include the price impact of trade, the adverse selection component of the spread, and the probability of information-based trading (Bharath et al., 2009; Easley, Kiefer, O'Hara, & Paperman, 1996). The former assesses the extent to which a trade alters share price and captures the value of private information held by informed traders. Moreover, Chung et al. (2015) use also the dispersion of financial analysts' earnings forecasts, the number of analysts following a firm, an aggregate (composite) metric, and the principal component of these information asymmetry measures.

One of the main problems in researching information asymmetry is the difficulty of measuring it since it is not a directly observable and easily measurable phenomenon. For this reason, this study uses several indicators to approximate information asymmetry. One of the ways of measuring information asymmetry is a group of methods based on observing market transactions concerning a given company. This group includes market microstructure indicators such as the bid-ask spread (the difference between the selling price and the buying price of an asset) and the beta coefficient (the correlation coefficient between the return on an investment in a given company's stock and a hypothetical investment in a market index). The precursor to using the bid-ask spread as a measure of information asymmetry was Demsetz (1968), followed by subsequent researchers, including Kyle (1985) and Glosten and Milgrom (1985). They demonstrated that information asymmetry increases the risk of adverse selection of market participants, which in turn increases the spread. The use of the beta coefficient as an indirect measure of information asymmetry was supported by Easley and O'Hara (2005). They argue that outside investors' varying access to information affects the price of securities. However, the above methods do not guarantee the complete effectiveness of measuring information asymmetry. Studies show that information asymmetry can have different effects on the difference in the bid and ask prices of securities – according to Madhavan, Richardson and Roomans (1997), the contribution of adverse selection costs to the spread is about 40%, while in a study by Kaul and Nimalendran (1990), it is only about 10%.

Furthermore, methods that identify firms that require specialized knowledge involve the risk that their value may be driven by economic factors other than information asymmetry. A market-to-book ratio, which is also often used as a measure of information asymmetry, may only indirectly indicate the level of information asymmetry and mainly relates to their monopoly power, for example (Clarke, 2000). Accounting-based indicators of the earnings quality or the share of intangible assets in assets are also used to measure information asymmetry. The former is mainly based on estimating the quality of accruals by discretionary accruals. Measurement errors of asymmetry, in this case, may result from industry diversity of the structure of accruals and business risk. The latter helps determine the extent to which some assets are more difficult to value for outside investors and determine the expected growth opportunities of the business. Asset intangibility ratios and ratios indicating growth opportunities (i.e., market-to-book ratio) can also reflect the risks associated with investing in a company (Kubiak, 2013). The cited research results indicate that information asymmetry is an essential factor determining equity value. Its occurrence may negatively influence investment decisions which ruin the equity value. Moreover, its influence may be intensely dependent on leverage. The above considerations based on the literature lead to **hypothesis H2**: *Information asymmetry measured by bid-ask spread is negatively correlated with equity value.*

H2A: *Applied beta is negatively correlated with equity value.*

H2B: *Market-to-book ratio is positively correlated with equity value.*

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H2C: *Information asymmetry measured by discretionary accruals negatively correlates with equity value.*

H2D: *Information asymmetry measured by intangibility is negatively correlated with equity value.*

Among the factors influencing the equity value and the phenomenon of asymmetric information and capital structure, studies distinguish, among other things, the firm size, the tangibility of assets, cash flows, and the company's profitability and business profile.

The larger the company is, the easier it is to obtain internal and external financing, which translates into equity value. However, contrary to initial assumptions, studies by Yang and Chen (2009) and Martínez-Sola (2013) show a negative correlation between these variables. As an explanation, they point out that small companies are less exposed to the agency problem and have a more flexible organizational structure, making it easier for them to adapt quickly to change. A negative correlation between company size and firm value is confirmed by Maury and Pajuste (1999) and Fosu, Danso, Ahmad and Coffie (2016), who point out that larger companies are likely to be mature companies for which valuation tends to be low.

Asset tangibility, or the share of fixed assets in a firm's asset structure, can also determine its value. However, this correlation is not straightforward, according to Fosu, Danso, Ahmad and Coffie (2016). On the one hand, companies with a higher share of fixed assets in total assets have fewer intangible assets such as know-how, patents, trademarks, which suggests a negative correlation between tangibility and company value (Maury & Pajuste, 2005). But on the other hand, companies with higher tangibility have less information asymmetry. They hence are less exposed to its negative consequences, which positively affects their value through the structure and cost of capital. Gassen and Fülbier (2014) examined the impact of debt financing on earnings smoothing. When assessing its financial health, investors obtaining information about a company focus on its reported earnings and stability (a measure of the risk of not meeting credit covenants). The results indicate that as the share of external financing in the capital structure increases, the propensity to smooth profits increases. In contrast, according to Boulland, Filip, Ghio and Paugam (2018), investors pay more attention to a firm's ability to generate cash surplus (cash flow from operations) than the profits reported in the income statement. This means that investors are aware of the earnings smoothing by companies (reducing their volatility), so they attach more importance to cash flow, which is not subject to distortion (active shaping). Therefore, a positive relationship is expected between generated operating cash flows and the market value of a company (equity value).

Investors pay less attention to a company's profitability determined on the basis of profit calculated on an accrual basis (in the income statement). However, given investor distrust and suspicion that the income has been actively shaped (using earnings management tools), it is expected that there is a negative correlation between operating margin (a measure of profitability) and the equity value (Grabiński & Wójtowicz, 2019). This implies that the more profitable a company is "on paper", the lower its equity value.

Research by Rodríguez and Molina (2013) indicates that cash holdings vary across companies in different sectors. This implies, therefore, that equity value varies between industries.

3. METHODOLOGY AND DATA

The study included 273 companies out of the 482 listed on the primary market of the Warsaw Stock Exchange. The banking, insurance and finance sectors were excluded from the sample as their activities include collecting and storing or investing cash, debt trading and lending. Therefore, including them could distort the estimation results. Companies whose financial statements did not contain complete data needed to define the variables used in the model were

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also removed from the sample. In addition, companies for which the Bloomberg database did not contain data on applied beta and bid/ask spread were excluded. We analyze a separate total sample and subsample, excluding those that reported negative cash flows in 2017. Table 1 presents the characteristics and composition of the research sample. The data refer to 2017 and come from the Notoria and Bloomberg databases.

Table 1
Characteristics and composition of the research sample

Criteria	No. of firms
Companies and institutions listed on the Warsaw Stock Exchange	**482**
Banks	15
financial and insurance companies	47
non-financial companies	**420**
Exclusion from the sample due to:	**147**
no data on applied beta and bid/ask spread (information asymmetry measures)	133
no financial data	14
Composition of the research sample by sector:	**273**
Trade	37
Services	37
Manufacturing	112
ICT	30
Others (construction, real estate, paper & packaging, advertising, publishing, leisure & recreation, recycling)	57
Total number of observations	**273**

Source: Own elaboration based on data from the Notoria database using Stata/IC 16.0 programme.

The ordinary least squares (OLS) method was used to perform the linear regression estimation.

The dependent variable in the model is the equity value, defined as the natural logarithm of the market capitalization, i.e. *ln*(*number of shares* × *share price*).

Quotation data were taken from the Bloomberg database as of 29/12/2017. Thus, our research is a pilot study. However, it is essential to notice that time specificity could impact conclusions. Therefore, we expand our analysis for several years (2007–2021) for robustness check. According to the literature review, the explanatory variables are the determinants of equity value. The primary test variable is long-term leverage used as a measure of capital structure to verify hypothesis H1, according to which we expect leverage to be negatively correlated with equity value. Following the studies of Danso and Adomako (2014), Fosu (2013) and Opler and Titman (1994), leverage is calculated as the ratio of long-term liabilities (interest-bearing debt) to total assets. We consider short-term leverage as the second test variable to verify hypothesis H1A related to its mitigating role in lowering information asymmetry. The following five test variables are the information asymmetry measures, i.e. applied beta, average bid-ask spread, market-to-book ratio, discretionary accruals and intangibility. These variables were chosen to verify the H2 and H2A–H2D hypotheses formulated based on the literature analysis, according to which we

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expect information asymmetry to negatively correlate with equity value except for the market-to-book ratio. In addition to information asymmetry and leverage measures, control variables suspected to be correlated with equity value were introduced into the model.

The tangibility of assets is a variable measuring the share of fixed assets in the company's total assets. The correlation between the tangibility of assets and equity value is not clear. However, according to Mauri and Pajust (2005), companies with a higher share of tangibles in assets have fewer intangible assets (i.e. patents, trademarks, know-how related to inventions and growth opportunity), which indicates a negative correlation between tangibility of assets and company value.

On the other hand, Fosu, Danso, Ahmad and Coffie (2016) indicate that the higher the level of tangible assets in a company's asset structure, the lower the level of information asymmetry due to the higher collateral role of assets in the case of debt. This implies a positive correlation between the tangibility of assets and equity value. Another control variable is firm size, measured as the natural logarithm of sales revenues generated by the company in the year under review after deducting returns, discounts, rebates and sales taxes. According to Kemper and Rao's (2013) and Dasilas and Papasyriopoulos' (2015) studies, total sales are considered a measure of company size. Mauri and Pajust's (2005) research indicates that larger companies tend to be mature, for which valuation tends to be lower. Therefore, a negative correlation between a firm size (sales) and equity value is expected. Studies by Boulland, Filip, Ghio and Paugam (2018), Walters (1999) and Rappaport (1999) indicate that a company's ability to generate cash surplus from operations is also crucial in the context of equity value formation. Based on the above studies, the cash flow variable measured as the natural logarithm of the operating cash flow generated by the company was introduced into the model. The last continuous variable is the return on assets (ROA), measured as operating profit to total assets. Profitable companies are valued higher by investors because they can generate higher returns on investment and higher dividends, so the ROA variable is expected to correlate with equity value positively. Based on Rappaport's (1999) considerations, an alternative profitability measure was also applied in the model – operating profit margin, measured as a quotient of operating profit and sales revenue in the examined year. This indicator informs about real possibilities of profit from the company's primary activity.

In the case of the long-term valuation of a company, the operating margin should have non-decreasing values. A decrease in the ratio value may signal an incorrect pricing policy or an uncontrolled cost increase. If the operating profit margin falls to a certain limit, the value of cash flows decreases to such an extent that the value added to shareholders will be zero. Thus, if the company achieves a margin value below the limit value, the increase in sales does not cause an increase in shareholder value but its "destruction" (Jakowska-Sulwalska, 2013). This implies a negative correlation between the operating profit margin and equity value. The research of Rodríguez and Molina (2013) and the considerations of Borowski (2014) and Jajuga (2015) indicate that the formation of equity value may depend on industry affiliation. Thus, the discrete variable *sector_factor* was introduced into the model.

Table 2 presents the definitions of the dependent and independent test and control variables and their expected direction of influence on the explained variable, distinguishing the explanatory variables used as measures of information asymmetry. Due to observations with negative values in some variables, the Box-Cox transformation was not used to choose the model's best functional form. Still, the best-fitting model was selected for the functional form used in the study by Fosu et al. (2016), the analysis of histograms and the method from general to specific.

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The base model has the following form:

$$y_i = \beta_0 + \beta_1 lt\_lever_i + \beta_2 appliedbeta_i + \beta_3 bidaskspread_i + \beta_4 markettobookratio_i + \\ + \beta_5 tang_i + \beta_6 sales_i \beta_7 cf_i + \beta_8 profitability_i + \sum_{j=2}^{5} \beta_9 sector\_factor_i + \varepsilon_i \quad (1)$$

where: profitability means ROA or margin, the indices j of the discrete variable result from their decoding, is a constant, ε_i is the random error, and $i = 1, 2, \ldots, 210$ (considering observations with positive cash flow) and 273 in the case of the total sample (in the robustness check section).

Table 2
Definition of variables and the expected direction of influence on the dependent variable

Variable	definition	expected sign
	Dependent variables	
Marketcap	*ln*(*equity value*) = *ln*(*number of shares* × *share price*)	
Changemarketcap	percentage change in market capitalisation measured as follows $\frac{marketcap_t - marketcap_{t-1}}{marketcap_t}$	
	Test variables	
st_lever	short-term debt / total assets	
lt_lever	long-term debt / total assets	–
Information asymmetry measures:		
bid-ask spread	variable measuring information asymmetry – variable representing the average of all bid/ask spreads taken as a percentage of the average price	–
applied beta	variable measuring information asymmetry – a statistical coefficient that measures the percentage change in a share's price, taking into account the change by one per cent of its benchmark index	–
refindex1beta1year refindex1correlcoeff1year refindex2beta1year refindex2correlcoeff1year refindex3beta1year refindex3correlcoeff1year refindex4beta1year refindex4correlcoeff1year	Betas provided by Bureau van Dijk in the Orbis database, calculated for one month, three months, one year, and three years periods, with each reference index and the correlation coefficient for each period clearly noted. The beta is calculated on a weekly basis and considers the daily prices. For the calculations, a gliding system is used. Beta is obtained by the relationship between two statistics: (1) the covariance of the returns of the stock and the returns of an index and (2) the variance of the returns of the index. The correlation coefficient allows measuring the intensity of the existing correlation between the returns of the stock and the returns of the related index.	–
stocksplitratio	A stock split is when a company's board of directors issues more shares of stock to its current shareholders without diluting the value of their stakes. As a result, a stock split increases the number of shares outstanding and lowers the individual value of each share.	
DAC	discretionary accruals equal residuals estimated by Dechow's model (the modified Jones's model), extended by the ROA, described in equation (2)	–
intangibility	intangible assets / total assets	–
market-to-book ratio	the variable measuring information asymmetry *ln*[(*book value of assets – book value of equity + market value of equity*)/ *non-cash assets*], where *the market value of equity = number of shares* × *share price*	+

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Variable	definition	expected sign
	Control variables	
Changesales	percentage change in sales measured as follows $\frac{sales_t - sales_{t-1}}{sales_t}$	
Changecf	percentage change in cash flow measured as follows $\frac{cash\ flow_t - cash\ flow_{t-1}}{cash\ flow_t}$	
tangibility (*tang*)	tangible assets/total assets	?
sales – firm size	ln(sales revenues in the year under review 2017)	–
cash flow (*cf*)	ln(cash flows from operations)	+
ROA (renturn on assets)	operating profit/total assets in panel models – ROA using profit or loss before tax	+
Margin	operating profit/revenue from sales	–
sector_factor	Discrete variable assigning the company's sector of activity: 1. Trade, 2. Services, 3. Manufacturing, 4. ICT, 5. Others	?
nace	Nace codes – binary variables equal one for the NACE code of a firm activity in a decile of EKD codes, and 0 otherwise. For example, nace0 equals 1 for two digits EKD code higher than 0 and lower than 10, nace1 equals 1 for two digits EKD code higher than ten and lower than 20 etc.	

Source: Own elaboration based on definitions from the Bloomberg, Notoria and Orbis database and discussed literature.

$$\frac{TA_{it}}{A_{it-1}} = \alpha \frac{1}{A_{it-1}} + \alpha_2 \frac{\Delta REV_{it} - \Delta REC_{it}}{A_{it-1}} + \alpha_3 \frac{PPE_{it}}{A_{it-1}} + \alpha_4 ROA_{it} + \varepsilon_{it} \quad (2)$$

where:

TA_t – total accruals in year t, described in equation (2);
A_{t-1} – total assets in year $t-1$;
ΔREV_t – revenues in year t minus revenues in year $t-1$;
ΔREC_t – net receivables in year t less net receivables in year $t-1$;
PPE_t – gross property, plant and equipment in year t;
ROA_t – return on assets in year t;
ε_{it} – a random error.

$$TA_{it} = \frac{(\Delta CA_{it} - \Delta CL_{it} - \Delta RMK_{it} - \Delta CASH_{it} \Delta DEP_{it})}{A_{it-1}} \quad (3)$$

where:

ΔCA_t – change in current assets in year t;
A_{t-1} – lagged total assets (in year $t-1$);
ΔCL_t – change in current liabilities (without debt) in year t;
ΔRMK_t – change in prepaid expenses in year t;
$\Delta CASH_t$ – change in cash and cash equivalents in year t;
DEP_t – depreciation and amortization expense in year t.

Table 3 shows the descriptive statistics of continuous variables.

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Table 3
Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
marketcap	273	12.4439	1.684	9.2017	17.6296
st_lever	273	0.06023	0.1061	0	0.74
applied_beta	273	0.5224	0.2155	-0.3503	1.4097
bid_ask_spreed	273	0.3479	0.4689	0.0107	1.8
markettobookratio	273	2.2471	5.259	0.235	77.729
lt_lever	273	0.133	0.128	0	0.74
size	273	11.6894	2.7198	0	18.1328
cf	273	5.3831	8.1721	-12.265	17.124
ROA	273	2.985	12.525	-70.213	39.228
margin	273	0.1465	5.227	-60.909	9.252
tangibility	273	0.6014	0.241	0.00075	0.9978
intangibility	273	0.0717	0.1375	0	0.7811
nda_teo_reg	273	-0.0073	0.0914	-0.5077	0.4952
nace0	273	0.0143	0.1189	0	1
nace1	273	0.0929	0.2908	0	1
nace2	273	0.2429	0.4296	0	1
nace3	273	0.0679	0.2519	0	1
nace4	273	0.2286	0.4207	0	1
nace5	273	0.0643	0.2457	0	1
nace6	273	0.1214	0.3272	0	1
nace7	273	0.1464	0.3541	0	1
nace8	273	0.0214	0.145	0	1

Source: Own elaboration based on Bloomberg and the Notoria database data using Stata/IC 16.0 programme.

The discrete variable used in the model is the company's sector_factor variable, which distinguishes five levels: 1. trade, 2. services, 3. manufacturing, 4. ICT and 5. others. Table 4 shows the statistical summary of the dependent variable within each company's sectors of activity considered in the model.

The equality of the distributions in each sector was also tested using the Kruskal-Wallis test. The value was 2.080, and the p-value was 0.7210, so the test is not statistically significant at any level of significance. There is no basis for rejecting the null hypothesis that there are no differences in the distribution of populations in the sectors studied. Therefore, it can be expected that the use of the sector_factor variable in the regression may be insignificant. Thus, we disaggregated sectors based on NACE codes into nine groups.

Before estimating the model, correlations between all variables were examined. The highest correlation was found between the firm size and cash flow (later logarithmic transformation). These variables measure different economic quantities: (1) sales revenue on an accrual basis (taking into account when receivables arise) and (2) cash surplus from operating activities (receipts (inflows) minus expenditures (outflows)) determined on a cash basis, and both are necessary to estimate the equity value correctly. Therefore, all the variables discussed above are included in the model.

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Table 4
Descriptive statistics of the dependent variable by sector_factor

Variable	N	Mean	Standard deviation	Min	Max
1. Trade	38	12.5688	1.6710	9.8469	16.6120
2. Services	37	12.2306	1.4557	9.9822	15.3435
3. Manufacturing	115	12.5716	1.8709	9.878	17.629
4. ICT	31	12.623	2.0397	9.5771	16.5817
5. Others	52	12.2156	1.449	9.2017	15.5042
nace0	6	12.98	1.008	12.11355	14.9564
nace1	40	11.934	1.518	9.577	15.343
nace2	33	12.6845	1.718	10.158	16.581
nace3	18	12.734	2.037	9.202	16.278
nace4	63	12.5764	1.752	9.847	17.602
nace5	19	12.976	1.799	9.877	16.930
nace6	65	12.4584	1.553	9.929	17.629
nace7	25	11.419	0.962	10.4133	14.288
nace8	4	15.1817	1.779	12.929	16.917

Source: Own elaboration based on data from Stata/IC 16.0.

4. RESULTS

Six regression equations were estimated using the OLS method differing in terms of modifying the definition of explanatory variables and considering the significance of coefficients at the variables taken into account. All regressions were conducted on the sample of 210 companies listed on the Warsaw Stock Exchange with positive cash flow. The baseline level of the discrete variable *sector_factor* was assumed to be level *1. trade*. Table 5. presents the results of conducted estimations and diagnostic tests.

Table 5
Determinants of equity value

	variable	model 1	model 2	model 3	model 4	model 5	model 6
H1	lt_lever	-0.3825	-0.6995	-0.8417	-0.9289*	-0.9159*	-0.9665*
		(0.8632)	(0.8119)	(0.6351)	(0.5492)	(0.5459)	(0.5416)
H2	appliedbeta	3.1676***	3.2361***	2.2521***	1.5668***	1.5657***	1.5279***
		(0.5204)	(0.4882)	(0.3882)	(0.3460)	(0.3452)	(0.3422)
H2	bidaskspread	0.0528**	0.0294	0.0084	-0.0044		-0.0021
		(0.0242)	(0.0232)	(0.0183)	(0.0159)		(0.0157)
H2	marketto bookratio (ln)	0.1279*** (0.0466)	0.9745*** (0.1637)	0.9917*** (0.1289)	1.2181*** (0.1148)	1.2100*** (0.1107)	1.1393*** (0.0997)
	tang	1.8335***	1.9212***	1.8842***	3.0187***	3.0074***	3.1098***
		(0.4675)	(0.4369)	(0.3441)	(0.3253)	(0.3220)	(0.3203)

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Table 5 – continued

variable	model 1	model 2	model 3	model 4	model 5	model 6
sales	9.58e-08 ***	9.29e-08 ***	3.15e-08***			
	(2.22e-08)	(2.08e-08)	(1.06e-08)			
ln_sales				0.4882***	0.4873***	0.4861***
				(0.0555)	(0.0552)	(0.0548)
cf	-8.58e-08	-6.56e-08				
	(8.27e-08)	(7.76e-08)				
ln_cf			0.4646***	0.2032***	0.2030***	0.2078***
			(0.0421)	(0.0487)	(0.0486)	(0.0481)
ROA (margin)	1.9342	0.1967	-1.4031	-1.6013**	-1.5863**	-0.6542***
	(1.1961)	(1.1267)	(0.8990)	(0.041)	(0.7740)	(0.0481)
_Isector_fa_2	-0.5746	-0.6342*	-0.2728	0.2777	0.2834	0.2415
	(0.3778)	(0.3545)	-0.2811	(0.2517)	(0.2503)	(0.2479)
_Isector_fa_3	-0.4105	-0.3879	-0.3566*	-0.1714	-0.1648	-0.1529
	(0.2909)	(0.2789)	-0.2144	(0.1868)	(0.2454)	(0.1846)
_Isector_fa_4	-0.4432	-0.6134*	-0.4102	-0.1392	-0.1288	-0.1090
	(0.3920)	-0.3622	-0.2854	(0.2488)	(0.2454)	(0.2459)
_Isector_fa_5	-0.6519*	-0.6553**	-0.3891	-0.0162	-0.01135	-0.0158
	(0.3341)	-0.3132	0.2476	(0.2189)	0.2177	(0.2166)
_cons	9.7024 ***	9.7021***	5.7573***	1.8061***	1.8206***	1.7286***
	(0.3822)	(0.3541)	(0.4530)	(0.5282)	(0.5109)	(0.5224)
No. observations	210	210	210	210	210	210
R2	0.4718	0.5353	0.7116	0.7838	0.7837	0.7892
R2_adjusted	0.4388	0.5070	0.6941	0.7706	0.7717	0.7764
F Statistics	14.66***	18.91***	40.51***	59.51***	65.21***	61,47***
RESET Test	13.21***	14.02***	12.29***	2.86**	2.77**	3,7**
Breusch-Pagan Test	6.08**	7.75***	6.87***	2.62	2.58	2.48
White Test	120.52***	126.29***	138.51***	135.41***	120.61***	138.95***
Jarque-Bera Test	9.95***	9.95***	9.95***	9.95***	9.95***	9.95***

* p < 0.1, ** p < 0.05, *** p < 0.01, the deviations of the estimators (standard errors) are given in brackets
Source: Own elaboration based on regression performed in Stata/IC 16.0.

Model 5 shows that long-term leverage is negatively correlated with equity value. The obtained results are consistent with the theory of Myers (1984) and Stulz (1990) and the results of studies by King and Santor for Canadian companies (2008) and Fama and French (1998) for companies listed on the New York Stock Exchange (NYSE). Therefore, the obtained results do not give grounds to reject hypothesis H1, according to which long-term leverage is negatively correlated with equity value. This means that as the share of interest-bearing debt increases in the company's capital structure, the equity value (determined by the market and reflected in its market capitalization) decreases, in line with hypothesis H1. Such a correlation may result from underinvestment or overinvestment in the company's stock. Alternatively, it can be explained by agency costs, bankruptcy or increasing risk.

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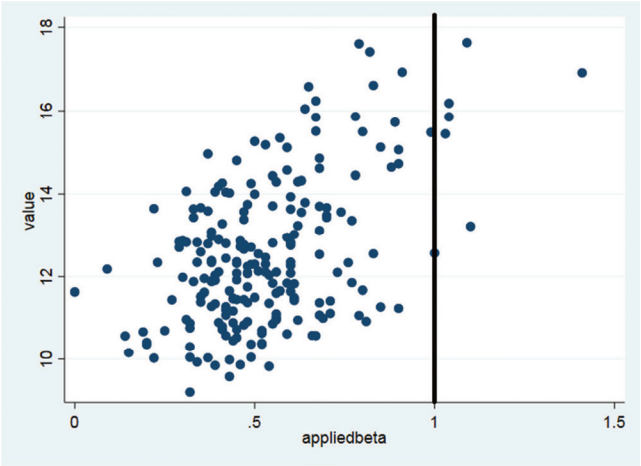
Moreover, a negative correlation between leverage and equity value may be due to the limited benefits of the interest tax shield, which are much lower than the nominal tax rate. According to the pecking order theory, companies with high profits maintain a relatively low debt ratio. This implies that the low-profitable companies have to borrow to finance investments. On the other hand, however, due to the non-high income tax, low-profitable enterprises are close to exhausting their ability to use tax deductions (Leszczyłowska, 2018). In such a situation, companies lose the ability to (immediately) deduct interest so that foreign capital ceases to be relatively more attractive (cheaper due to the tax shield) than equity.

In the final model 5, coefficients at two of the three variables measuring the information asymmetry are statistically significant (applied beta and logarithm of the market-to-book ratio), both of which positively correlate with equity value. Thus, we reject hypothesis H2A based on the positive coefficient at the applied beta variable. The higher the market-to-book ratio, the higher the level of information asymmetry. However, this study shows that the higher the market-to-book ratio, the higher the equity value. It is in accordance with H2B. This implies that information asymmetry does not necessarily hurt equity value. Similar results were obtained with another measure of information asymmetry – applied beta, which measures the volatility of share prices compared to the market. A beta ratio below 1 means that the company's share price is less volatile than the market. This implies less information asymmetry and less risk for potential investors. This means that below one, the lower the beta, the higher the equity value. In Figure 1, we can see that for most companies in the sample, applied beta oscillates around the value of 0.5. This means that the share prices of these companies are, on average, 50% less volatile than the market index (WIG) and less correlated with the WIG indicator.

Meanwhile, at the end of 2017, the equity value of companies with a higher beta was higher (positive correlation), which contradicts our expectations expressed in the H2A hypothesis. On the one hand, in a pilot cross-sectional study, the period specificity could be a factor. On the other hand, it is consistent with the theoretical approach that the equity value (fundamental, long-term) differs from the market price at a given time. This is because the estimation of the value in the valuation process is made based on individual criteria of external investors. This means that the equity value may be different for different parties. Furthermore, the difference between the equity value and the share price, in addition to the information asymmetry, consists of many other factors, including a limited number of buyers, uneconomic motivations, negotiating skills, and the need to act under duress.

Figure 1
Point plot of the equity value and applied beta variables



Source: Own elaboration in Stata/IC 16.0.

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These results lead to rejecting the H2A hypothesis, according to which we expected that information asymmetry proxied by applied beta is negatively correlated with equity value. This means, therefore, that the negative consequences of information asymmetry on the equity value have not been demonstrated. The obtained results are in line with the studies by Huynh et al. (2020), Botosan (1997), Dierkens (1991) and Bharath et al. (2009). These researchers indicated that the negative influence of information asymmetry on equity value could not be unambiguously confirmed because it may depend on the examined sample, time and individual choices of investors, who, despite information asymmetry, may value a given company higher. These studies also indicate that leverage may strongly influence the impact of information asymmetry on equity value. Information asymmetry may directly impact the company's capital structure, which determines investment decisions. The latter, in turn, shapes the equity value. This implies that the above study results could change depending on the sample studied and the leverage applied by companies.

On the other hand, tangibility positively affects equity value, meaning that as the share of fixed assets in total assets increases, the equity value increases. These results align with Fosu et al. (2016), who argue that companies with higher tangible assets may be less exposed to the information asymmetry problem, which positively affects their value through the capital structure and cost of capital.

Contrary to initial expectations, the study results showed that larger companies (*ln_sales*) have a higher value on average. In addition, the study also shows that cash flow (*cf*) positively impacts the equity value. This result confirms that investors pay more attention to a company's ability to generate cash surplus from operating activities than the profits shown in the income statement, which can be actively shaped (earnings management).

Contrary to expectations, the ROA variable, which measures the profitability of assets, negatively correlates with equity value. This means that the more profitable a company is, the lower its equity value. This means that investors find the cash flows shown in the cash flow statement (prepared on a cash basis) more valuable than the "on paper" profitability shown in the income statement (prepared on an accrual basis). The latter may be subject to manipulation in the company's financial statements, e.g. as a result of accounting policies regarding the creation and release of provisions and write-downs (so-called silent provisions), fair value measurement or active selection of depreciation methods.

We check robustness by estimating a regression in which an alternative measure of the company's profitability was used – the operating margin (*margin*). The results are presented in model 6. After replacing the ROA variable with the *margin* variable, determination coefficients $R2$ and adjusted R2 marginally increased from 0.7837 to 0.7892 and 0.7717 to 0.7764, respectively. There was also a decrease in the deviation of estimators of individual variables, which indicates a slight improvement in model fitting. The coefficient at the *margin* variable is statistically significant, in line with the assumptions formulated by Rappaport (1999), who lists it among the main factors shaping equity value.

Moreover, the results indicate a negative correlation between operating profit margin and equity value, which may seem surprising. However, comparing the sign of the coefficient at the cash flow variable and ROA or profit margin, it can be concluded that investors react positively to information about higher cash flow and are skeptical about the information on accrual profitability (ROA, margin). The latter may not be reflected in liquidity (cash). Therefore, it is presumed that investors are risk-averse and do not trust accrual measures of profitability. Regardless of the profitability measure used in models 5 and 6 (ROA or operating profit margin), the statistical inference regarding the relationship between individual explanatory variables and equity value is similar in both models. In particular, the results indicate that both accrual profitability measures hurt the equity value. This means that more profitable companies are less valued.

None of the coefficients at the sector_factors discrete variables turned out to be statistically significant, but the variable sector_factor was left in the model because of the cross-sector analysis.

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An ANOVA test was also conducted to verify whether the mean equity values in the groups designated by sector of activity differ and whether this difference is statistically significant. As a result of the ANOVA test with an F statistic equal to 0.88 and a p-value of 0.4763, it was found that there is no basis to reject the null hypothesis of equality of mean equity values in groups designated by sector of activity. It is possible that given a wider data set, the regression results would support the hypothesis of differentiation of equity values between sectors of activity.

5. ROBUSTNESS CHECKS

Section 5 considers the robustness of the results by applying additional information asymmetry measures to OLS models and a dynamic panel-data approach (GMM) to check how information asymmetry affects percentage change in equity value. To check the reliability of the estimates obtained, we present additional estimates below.

5.1. OLS method

First, we add models estimated on the entire sample without excluding observations with negative cash flow, considering the short-term leverage role in mitigating the negative impact of information symmetry. It allows us to compare models estimated on the total sample with models estimated on the subsample limited to observations with positive cash flow. We notice that in model 1 on the entire sample, including observations with negative cash flows, neither coefficient at cash flow nor margin variables are statistically significant. In both models (1) and (2) in Table 6, the coefficient at the short-term leverage variable is statistically insignificant. That does not allow us to verify the H1A hypothesis. The results in Table 6 reject H2 for the entire sample and a subsample of observations limited to positive cash flows. It is because information asymmetry measured by bid-ask spread positively correlates with equity value.

Table 6
Determinants of equity value by a balance of cash flow

marketcap	**MODEL 1** entire sample	**MODEL 2** positive_cf = 1
st_lever	-0.695	-1.08
	(0.6576)	(0.8929)
applied_beta	1.391***	1.766***
	(0.3809)	(0.4199)
bid_ask_spread	0.6623***	0.6799***
	(0.1537)	(0.1485)
size	0.4631***	0.3129***
	(0.0434)	(0.0628)
cf	0.0071	0.3205***
	(0.0096)	(0.0575)
margin	-0.023	-0.481*
	(0.0207)	(0.2794)
tangibility	1.979***	1.810***
	(0.3446)	(0.3688)

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Table 6 – continued

marketcap	**MODEL 1** entire sample	**MODEL 2** positive_cf = 1
nace1	-0.956*	-0.770
	(0.5350)	(0.5250)
nace2	-0.277	-0.107
	(0.5014)	(0.4900)
nace3	0.0412	0.1827
	(0.5574)	(0.5403)
nace4	0.0105	0.0139
	(0.5066)	(0.4939)
nace5	0.3031	0.3291
	(0.5576)	(0.5458)
nace6	0.5537	0.6415
	(0.5237)	(0.5177)
nace7	-0.017	0.2418
	(0.5158)	(0.5142)
nace0	1.217	-0.044
	(0.7629)	(0.7868)
_cons	4.795***	3.354***
	(0.7629)	(0.7757)
No. observations	273	212
R2	0.5504	0.6876
R2_adjusted	0.5242	0.6637
F Statistics	20.98***	28.76***
Breusch-Pagan Test	5.85*	5.04**
White Test	137.45***	128.99**
Jarque-Bera Test	13.26**	13.26**

* p < 0.1, ** p < 0.05, *** p < 0.01, the deviations of the estimators (standard errors) are given in brackets
Source: Own elaboration based on regression performed in Stata/IC 16.0.

Table 7 presents the outcomes of models' estimations separate for manufacturing and the other sectors considering alternative measures of information asymmetry – discretionary accruals (DAC) and intangibility, and distinguishing short-term and long-term leverage. The results in Table 7 reject hypothesis H1 because long-term leverage increases the equity value, controlling for DAC. The results of model (4) for manufacturing firms do not support H1A. Thus, we do not find evidence of a mitigating role of short-term debt in limiting the negative impact of information asymmetry on equity value. However, we reject the H2 hypothesis based on positive coefficients at the bid-ask spread variables. Similarly, we reject hypotheses H2A for applied beta and H2C for the non-manufacturing subsample (based on positive coefficients at the applied beta and DAC variables). We cannot verify the H2D hypothesis due to the statistically insignificant coefficient at the intangibility variable in all models in Table 7.

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Table 7
Determinants of equity value by sectors

marketcap	MODEL 1 entire sample	MODEL 2 entire sample	MODEL 3 non-manufac-turing	MODEL 4 manufactu-ring	MODEL 5 non-manufac-turing	MODEL 6 manufactu-ring
st_lever	-0.6677		-0.4259	-2.695**		
	(1.0097)		(1.4532)	(1.2185)		
lt_lever		1.1079***			0.81653*	0.88689
		(0.40275)			(0.45461)	(1.0103)
applied_beta	2.1516***	1.9831***	2.7721***	2.0172***	2.5213***	1.9484***
	(0.50929)	(0.50296)	(0.80967)	(0.62391)	(0.80140)	(0.64436)
bid_ask_spread	0.56208***	0.59103***	0.87001***	0.60259***	0.85193***	0.68073***
	(0.18973)	(0.18557)	(0.32205)	(0.21485)	(0.31598)	(0.22242)
size	0.33934***	0.35035***	0.15660**	0.64598***	0.17004**	0.63196***
	(0.05274)	(0.05178)	(0.06920)	(0.07183)	(0.06805)	(0.07339)
cf	0.02252*	0.02287**	0.02064	0.00432	0.02178	0.00534
	(0.01187)	(0.01148)	(0.01648)	(0.01675)	(0.01579)	(0.01719)
margin	0.02198	0.02488	-0.0086	0.14627***	-0.0040	0.14919***
	(0.02290)	(0.02247)	(0.02856)	(0.03396)	(0.02821)	(0.03479)
intangibility	0.39427	-0.0637	0.93760	10.2623	0.63882	0.42070
	(0.70836)	(0.67532)	(0.88470)	(1.1516)	(0.85174)	(1.1547)
DAC	1.7544*	1.4861	4.1369**	0.23917	3.7245**	0.24023
	(1.0041)	(0.98763)	(1.7742)	(1.0908)	(1.7610)	(1.1183)
nace1	-2.419***	-2.589***				
	(0.80948)	(0.78940)				
nace2	-1.729**	-1.777**				
	(0.77439)	(0.7587)				
nace3	-1.110	-1.222				
	(0.83806)	(0.8214)				
nace4	-1.722**	-1.832**				
	(0.77667)	(0.7609)				
nace5	-1.207	-1.632**				
	(0.84431)	(0.8320)				
nace6	-0.7174	-0.8062				
	(0.81644)	(0.8010)				
nace7	-1.443*	-1.540**				
	(0.78891)	(0.7739)				
nace8	-1.132	-1.172				
	(0.91085)	(0.8934)				
_cons	8.5029***	8.4294***	8.7758***	3.1862***	8.6218***	3.1897***
	(1.0007)	(0.9815)	(0.78045)	(0.84139)	(0.76938)	(0.8626)

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Table 7 – continued

marketcap	MODEL 1 entire sample	MODEL 2 entire sample	MODEL 3 non-manufac-turing	MODEL 4 manufactu-ring	MODEL 5 non-manufac-turing	MODEL 6 manufactu-ring
No. observations	194	194	105	89	105	89
R2	0.5074	0.5264	0.3259	0.6848	0.3473	0.6687
R2_adjusted	0.4628	0.4836	0.2697	0.6532	0.2929	0.6355
F Statistics	11.39***	12.30***	5.80***	21.72***	6.38***	20.18***
Breusch-Pagan Test	0.28	0.01	1.77	1.77	2.01	2.01
White Test	134.86**	147.28***	54.04	54.04	55.17	55.17
Jarque-Bera Test	4.51*	4.51*	4.51*	4.51*	4.51*	4.51*

* p < 0.1, ** p < 0.05, *** p < 0.01, the deviations of the estimators (standard errors) are given in brackets
Source: Own elaboration based on regression performed in Stata/IC 16.0.

5.2. Panel data

For the robustness check, we retrieved panel stock data from the Orbis database for 2007-2021. Then, we applied a two-stage Arellano-Bond estimator of the Generalized Method of Moments (GMM) with instrumental variables for dynamic panel data. The results for the sensitivity of equity value to leverage and information asymmetry, i.e., determinants of percentage change in equity value, are presented in Table 8.

The results do not confirm equity value sensitivity to short-term debt. Similarly, only model 1 provides evidence that equity value is sensitive to long-term debt. However, our findings confirm the H2 hypothesis for a long-time horizon. Thus, information asymmetry measured by bid-ask spread negatively influences the percentage change in equity value. For most information asymmetry measures related to market microstructure measured by various betas and correlation coefficients, we have no basis for rejecting the H2A hypothesis (except for the *refindex1correlcoeff1year* and *refindex1beta1year*).

Furthermore, based on the positive coefficient at the market-to-book ratio, there is no reason to reject the H2B hypothesis. Besides, the stock split ratio negatively influences the dependent variable. Finally, equity value is more sensitive to cash flow changes than standard profitability measures on an accrual basis – ROA or profit margin.

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Table 8
Sensitivity of equity value to leverage and information asymmetry

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6	MODEL 7	MODEL 8	MODEL 9	MODEL 10	MODEL 11
L1.changemarketcap	-0.3603***	-0.3368***	-0.3321***	-0.3298***	-0.3539***	-0.3539***	-0.3539***	-0.3539***	-0.3539***	-0.3539***	-0.4007***
	(0.09036)	(0.09348)	(0.09211)	(0.09256)	(0.08967)	(0.08967)	(0.08967)	(0.08967)	(0.08967)	(0.08967)	(0.08794)
L2.changemarketcap	-0.1956**	-0.1416*	-0.1164*	-0.1207*	-0.1497**	-0.1497**	-0.1497**	-0.1497**	-0.1497**	-0.1497**	-0.2605***
	(0.08155)	(0.08332)	(0.07921)	(0.07987)	(0.07443)	(0.07443)	(0.07443)	(0.07443)	(0.07443)	(0.07443)	(0.07715)
L3.changemarketcap	-0.1536**	-0.0917	-0.0996	-0.1043	-0.1023*	-0.1023*	-0.1023*	-0.1023*	-0.1023*	-0.1023*	-0.1426**
	(0.05738)	(0.05716)	(0.05648)	(0.05653)	(0.05507)	(0.05507)	(0.05507)	(0.05507)	(0.05507)	(0.05507)	(0.05405)
st_leverage	-0.4960	-0.4109	-0.5706	-0.4811	-0.7780	-0.7780	-0.7780	-0.7780	-0.7780	-0.7780	-1.071
	(0.96586)	(1.0011)	(0.99015)	(0.99024)	(0.98394)	(0.98394)	(0.98394)	(0.98394)	(0.98394)	(0.98394)	(0.95459)
lt_leverage	1.3605*	1.1768	1.0650	1.1476	0.22998	0.22998	0.22998	0.22998	0.22998	0.22998	0.20141
	(0.74960)	(0.77562)	(0.75615)	(0.77696)	(0.75299)	(0.75299)	(0.75299)	(0.75299)	(0.75299)	(0.75299)	(0.70932)
bid_ask_spread	-1.451***	-1.522***	-1.237***	-1.239***	-1.440***	-1.440***	-1.440***	-1.440***	-1.440***	-1.440***	-1.199***
	(0.41393)	(0.42873)	(0.42001)	(0.42232)	(0.40746)	(0.40746)	(0.40746)	(0.40746)	(0.40746)	(0.40746)	(0.39442)
refindex1correlcoeff1year	-1.175	1.9313*	1.8541**								
	(1.1411)	(0.84721)	(0.82801)								
refindex1beta1year				0.48621*							
				(0.2520)							
refindex2beta1year					-37.65**						
					(18.742)						
refindex2correlcoeff1year						-77.53**					
						(38.595)					
refindex3beta1year							-32.34**				
							(16.099)				

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Table 8 – continued

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6	MODEL 7	MODEL 8	MODEL 9	MODEL 10	MODEL 11
refindex3correlcoeff1year								-74.68**			
								(37.177)			
refindex4beta1year									-34.18**		
									(17.015)		
refindex4correlcoeff1year										-76.67**	
										(38.165)	
stocksplitratio											-0.0162***
											(0.00538)
changesales	-0.0677	-0.1703	-0.1322	-0.1272	-0.1266	-0.1266	-0.1266	-0.1266	-0.1266	-0.1266	-0.0512
	(0.12582)	(0.12757)	(0.12089)	(0.1211)	(0.11784)	(0.11784)	(0.11784)	(0.11784)	(0.11784)	(0.11784)	(0.11504)
changecf	0.05690**	0.05513***	0.04650**	0.04545**	0.05009**	0.05009**	0.05009**	0.05009**	0.05009**	0.05009	0.04500**
	(0.02040)	(0.02115)	(0.02087)	(0.02100)	(0.02030)	(0.02030)	(0.02030)	(0.02030)	(0.02030)	(0.02030)	(0.01960)
profitmargin	0.00750*	0.00966**									
	(0.00370)	(0.00379)									
ROA			0.02031***	0.02042***	0.01892***	0.01892***	0.01892***	0.01892***	0.01892***	0.01892***	0.01789***
			(0.00657)	(0.00661)	(0.00638)	(0.00638)	(0.00638)	(0.00638)	(0.00638)	(0.00638)	(0.00614)
tangibility	-0.7924	-10.352**	-10.243**	-10.389**	-0.2298	-0.2298	-0.2298	-0.2298	-0.2298	-0.2298	-0.9807
	(0.53032)	(0.52926)	(0.51766)	(0.56398)	(0.56219)	(0.56219)	(0.56219)	(0.56219)	(0.56219)	(0.56219)	(0.45785)
markettobook	0.18307***										
	(0.04693)										
industry effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
time effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
_cons	1.8452	3.0059**	3.3957***	3.7568***	2.0940*	2.0940*	2.0940*	2.0940*	2.0940*	2.0940*	2.3324**
	(1.2511)	(1.2598)	(1.2621)	(1.3867)	(1.1454)	(1.1454)	(1.1454)	(1.1454)	(1.1454)	(1.1454)	(1.0963)

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Table 8 – continued

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	MODEL 5	MODEL 6	MODEL 7	MODEL 8	MODEL 9	MODEL 10	MODEL 11
No. observations	1204	1204	1204	1204	1204	1204	1204	1204	1204	1204	1204
No. groups	168	168	168	168	168	168	168	168	168	168	168
No. instruments	102	102	102	102	102	102	102	102	102	102	102
Test Walda	316.50	280.30	291.78	289.02	305.12	305.12	305.12	305.12	305.12	305.12	334.55
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Test Arellano-Bonda											
AR(1)	-4.66	-4.06	-3.89	-3.93	-3.83	-3.83	-3.83	-3.83	-3.83	-3.83	-4.23
p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	-0.79	-1.42	-1.67	-1.60	-1.69	-1.69	-1.69	-1.69	-1.69	-1.69	-0.84
p-value	0.430	0.156	0.095	0.110	0.092	0.092	0.092	0.092	0.092	0.092	0.403
Test Sargana	63.64	73.36	72.77	73.66	77.63	77.63	77.63	77.63	77.63	77.63	79.13
p-value	0.843	0.596	0.615	0.587	0.458	0.458	0.458	0.458	0.458	0.458	0.411
GMM instruments for levels											
Sargan test	52.95	62.37	63.55	63.23	66.73	66.73	66.73	66.73	66.73	66.73	60.51
p-value	0.895	0.670	0.630	0.641	0.521	0.521	0.521	0.521	0.521	0.521	0.729
Difference	10.68	10.99	9.21	10.44	10.90	10.90	10.90	10.90	10.90	10.90	18.62
p-value	0.298	0.276	0.418	0.316	0.282	0.282	0.282	0.282	0.282	0.282	0.029
iv											
Sargan test	53.27	63.21	64.91	65.87	67.04	67.04	67.04	67.04	67.04	67.04	69.80
p-value	0.905	0.674	0.617	0.584	0.544	0.544	0.544	0.544	0.544	0.544	0.450
Difference	10.37	10.15	7.86	7.79	10.59	10.59	10.59	10.59	10.59	10.59	9.33
p-value	0.240	0.255	0.447	0.454	0.226	0.226	0.226	0.226	0.226	0.226	0.315

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$, the deviations of the estimators (standard errors) are given in brackets

Source: Own elaboration based on regression performed in Stata/IC 16.0.

6. CONCLUSIONS

The study conducted on the financial data of 273 joint-stock companies listed on the primary market of the Warsaw Stock Exchange in 2017 allowed us to verify the hypotheses. Firstly, based on the regression estimation results using the OLS method, no grounds were found to reject hypothesis H1. Thus, long-term leverage negatively correlates with equity value. It is due to underinvestment or overinvestment problems, agency or default costs. Based on models 5. and 6., with a 1 pp increase in the long-term leverage, the equity value on average will decrease by about 60%.

Second, based on the agency theory, adverse selection costs and moral hazards impede access to external sources of capital. Bigger information asymmetry worsens equity value, implying a negative correlation between these variables. In the conducted study, one of the measures of information asymmetry (bid/ask spread) turned out to be statistically insignificant, but statistically significant measures (applied beta and logarithm of the market to book ratio) show a positive correlation with equity value. According to model 5, an increase in the market-to-book ratio (information asymmetry) of 1% will result in an average increase in the equity value of 1.21%. On the other hand, with an increase in applied beta of 1 pp, the average equity value will increase by over 1.5%. This means that information asymmetry does not have to impact equity value negatively. The study, therefore, provides valuable conclusions in the context of studies by Drobetz (2010), Fauver and Naranjo (2010) and Fosu et al. (2016). They indicate a negative correlation between information asymmetry and equity value due to the existing difficulties in accessing external sources of capital. Therefore, this means that the valuation of a company is made based on many subjective criteria used by investors who, for some reason, despite information asymmetry, may value a given company higher. Based on the results obtained, we reject hypothesis H2 on the negative correlation between information asymmetry and equity value in a short time (i.e., 2017). However, the GMM dynamic panel data analysis shows that information asymmetry limits growth (percentage changes) in equity value.

The influence of control variables on equity value was also verified. The results show that tangibility is positively correlated with the equity value in a short time while negatively in a long time. An increase in tangibility of one percentage point results in an average increase in the equity value of 3%. Cash flows are positively correlated with the equity value; a 1% increase causes an average increase in the equity value of 0.2%. In turn, an increase in sales volume of 1% will result in an average increase in the equity value of 0.48%. A negative correlation with equity value is observed in the case of accrual-based measures of company profitability, i.e. return on assets (ROA) and margin in a short time (i.e., in 2017). With a one percentage point increase in ROA, the equity value will decrease by almost 80% on average. On the other hand, an increase in the margin of one percentage point will result in a 48% drop in equity value. However, in the long-time horizon, both profitability (ROA or margin) and an increase in cash flow add to equity value growth. Equity value is more sensitive to cash flow than profitability measures affected by earnings management practices.

The results of this study should be a guide to investors in the stock market to pay particular attention to the cash flows reported by companies, which is a cash-based measure of profitability (although, in practice, it is used to measure liquidity). In other words, they should give more weight (importance) to liquidity than profitability based on accrual measures. Furthermore, in a short time, companies should control the proportion of interest-bearing debt in the capital structure, knowing that the tax benefits of reducing the income tax base by interest are limited and carry the risk and cost of bankruptcy.

Our study was conducted on companies limited by the availability of applied beta data and only on a selected listing day of the year (29.12.2017). This means that the statistical inference could change if the sample was extended to foreign markets or a panel study conducted over a longer period. A robustness check confirms this limitation and time sensitivity. Furthermore,

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the measures of information asymmetry used in this study could also be questioned. Given the complexity of measuring information asymmetry and the diversity of its measures, it is worth using other measures that could verify the stability of the results (robust check). Indeed, in further research on the relationship between capital structure and equity value taking into account the information asymmetry, it would be worthwhile to address this aspect and use more advanced econometric methods. Our robustness tests support these conclusions and point to directions for future research.

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