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Are companies managed by overconfident CEO financially constraint? Investment–cash flow sensitivity approach

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Abstract

Research background: Overconfidence is one of the biases and fallacies that affect a cognitive process. Indeed, overconfidence has some serious consequences even in corporate finance. The literature is not consistent as for the impact of overconfidence on investment and financing decisions. Additionally, we include the issue of financial constraints to our analysis as investment-cash flow sensitivity (ICFS) is perceived as the measure of financial constraints.

Purpose of the article: The aim of this paper is to test investment-cash flow sensitivity and financial constraints under managerial overconfidence. We think that companies managed by overconfident managers show a higher relation between cash flows and investment and demonstrate bigger financial constraints.

Methods: In this paper, we test investment-cash flow sensitivity and financial constraints under CEO overconfidence among panel data of Polish private firms. We collect the unique sample of 145 non-listed companies by surveying the CEOs on their overconfidence. We collect the financial data of surveyed companies covering the 2010–2016 period. Total number of observations is 1015.

Findings & Value added: First, we find a positive and higher relation between the investment-cash flow sensitivity for companies managed by overconfident managers which is in line with recent research. As for the financial constraints we find lower level of financial constraints among the companies managed by overconfident managers. This might be evidence that despite having lower financial constraints the companies managed by overconfident managers intentionally choose internal funds as the main source of financing and refrain from using external funds. To the best of our knowledge, this paper is the first empirical study for Polish companies on the relation between CEO overconfidence and financial decisions.

Introduction

Overconfidence is one of the biases and fallacies which affect cognitive processes and which can have some serious consequences. Researchers have offered overconfidence as an explanation for the activity of individual practicing all professions (Johnson, 2004). It has been studied since 60ies of the XX century and eventually, overconfidence was identified as a complex phenomenon (Moore & Healy, 2008)

Overconfidence also affects financial decisions and financial performance. Overconfident managers are convinced that they have better knowledge and abilities than other and this brings about a situation in which they refrain from getting new information, from listening to expert advice and opinion. Furthermore, if overconfident managers use new information, it is looked at as merely confirming their own beliefs (Paredes, 2004). Reluctance to gain and utilize new knowledge makes overconfident managers miss investment opportunity or signs of failure (Goel & Thakor, 2008). Hence, overconfident managers continue project no matter what its prospects are (Baker *et al.*, 2007). What is more, overconfident managers find it difficult to learn from past experience and correct their behavior (Heaton, 2002). They attribute all success to their own endeavors and at the same time they attribute any failure to the activity of others. Indeed, overconfident managers are convinced that their prospects are superior to others, they overestimate the possibility of success and, at the same time, they underestimate the possibility of failure. They also think that the market undervalues the prospects of the companies they run (Malmendier & Tate, 2005).

Overconfident decision-making has been observed in the results of much business activity. It is seen as an important factor affecting both corporate investment and financing decisions. As for corporate investment, there is no consensus. There are some research demonstrating overinvestment and some underinvestment as the result of overconfidence. In the Heaton (2002) model, optimistic managers were found to overestimate the value of investment projects. As a result, optimistic managers tend to invest more than non-optimistic ones. Moreover, Malmendier and Tate (2008) try to explain the merger decision-making process using managerial overconfidence and managerial overestimation of their own ability to generate returns. Ben-David *et al.* (2007) also stress the importance of the association of overconfidence with higher investments. Furthermore, also Campbell *et al.* (2011) found that overconfident managers invest more. Pikulina *et al.* (2017) linked higher confidence with higher investment level, but Mal-

mendier and Tate (2005) and Gervais *et al.* (2011) think that underinvestment is possible when managers are overconfident.

With regard to financing decisions, there are no unambiguous results — some research show excessive usage of debt (eg. Barros & Silveira, 2008; Ben-David *et al.*, 2007; Hackbart, 2009; Park & Kim, 2009; Rihab & Lotfi, 2016) and some reveal debt conservatism (Malmendier *et al.*, 2011; Hackbart, 2009). Still, some researches indicate that companies managed by overconfident managers have similar debt ratios as companies managed by non-overconfident managers (Wrońska-Bukalska, 2018).

The lack of consistency in research findings on investment and financing decisions of overconfident managers gives a good rationale for further research. We think that the investment decisions of overconfident managers depend on access to funds (especially internal). What is more, access to internal financing might be the explanation of investment decision-making and might explain both under- and overinvestment. Indeed, access to internal funds might be also the explanation for using excessive debt or for showing debt conservatism. Thus, companies managed by overconfident managers use internal cash flow as much as they can to finance excessive investment. If the cash flow is insufficient, the companies then try to gain external funds. That is why some companies managed by overconfident managers show low debt ratio (cash flow is sufficient to finance excessive investment) and some demonstrate excessive use of debt (cash flow is not sufficient).

The relation between investment and cash flow is heavily studied in corporate finance research. In this, some researchers state that a higher relation between cash flow and investment is a sign of bigger financial constraints (Fazzari *et al.*, 1988). Some (Kaplan & Zingales, 1997), however, are of the opposite opinion after having additional measures of financial constraints confronted with investment-cash flow sensitivity (ICFS).

We think that studying investment-cash flow sensitivity and financial constraints might shed a light on the pattern of overconfident managers' financial decision-making.

The aim of this paper is to test the investment — cash flow sensitivity and financial constraints under managerial overconfidence. We hold that companies managed by overconfident managers show higher association between cash flows and investment and reveal greater financial constraints. The higher relation between investment and cash flow might explain the specific financial decisions of overconfident CEO, but our results might also be a recognition for using investment-cash flow sensitivity as an effective measure of financial constraints.

We use the expressions “CEO” and “manager” interchangeably. As most research on the ICFS and overconfidence come from the United States and refer to the CEO (Chief Executive Officer) and Anglo-Saxon model of corporate governance. However, in the continental model of corporate governance, there is no CEO position but presidents (managers) with similar scope of duties and responsibilities.

In this paper, we test the investment-cash flow sensitivity (ICFS) and financial constraints among a panel data of a set of private firms operating in Poland. In doing so, we collect unique sample of 145 non-listed companies by surveying the CEOs on their overconfidence. We then divide the sample into two subsamples depending on the overconfidence. We collect the financial data of surveyed companies covering the 2010–2016 period. The total number of observations is 1015. We compare cash flow, investment and financial constraints in the subsamples. To compare the subsamples, we used the nonparametric U Mann Whitney test (for independent subsamples) as the distribution of the variables is not normal. To identify investment-cash flow sensitivity, we applied univariate and multivariate regression analysis. This approach is in accordance with Fazzari *et al.* (1988) model. Fazzari *et al.* (1988) assumed that the relation between Investment and Cash Flow is a good measure to identify the financial constraints. Additionally, we implemented Kaplan and Zingales index (Kaplan & Zingales, 1997) and SA index (Hadlock & Pierce, 2010). These indexes are assumed to be better measures of financial constraints than the Fazzari *et al.* (1988) model.

Our approach differs from those in references in a several ways: 1) we apply original way of identifying and measuring overconfidence, 2) we employ the Fazzari *et al.* (1998) approach to identify investment–cash flow sensitivity, 3) we implement the KZ index (after Kaplan & Zingales, 1997) to identify the financial constraints, 4) we implement also SA index (after Hadlock & Pierce, 2010) to identify financial constraints, while in most research the KZ index alone is used to measure investment-cash flow sensitivity.

To the best of our knowledge, this paper is the first empirical study of Polish companies on the relationship between CEO overconfidence and financial decision-making.

The results support a number of recent findings reported in the literature. As a result of the study, we find a positive and higher investment-cash flow sensitivity for companies managed by overconfident managers. This development is in line with recent research. As for the financial constraints we note lower level of financial constraints among the companies managed

by overconfident managers. This might be evidence that, despite having lower financial constraints, the companies managed by overconfident managers intentionally utilize internal funding.

The rest of this paper is organized as follows. Section 1 provides a literature review on investment–cash flow sensitivity and financial constraints. Section 2 provides a literature review on investment-cash flow sensitivity and overconfidence. Next section describes the empirical methodology and the sample. The empirical results are presented in Section 4. Section 5 provides discussion with previous research findings and offers concluding remarks.

Literature review and hypotheses development

Investment — cash flow sensitivity and financial constraints

According to Modigliani and Miller (1958), in a perfect market, a firm's capital investment would be irrelevant to its internally generated cash flow. However, in the 70-ies of the XX century studies have shown that real markets are imperfect, and thus the capital investment of a firm might be associated with internal cash flow.

There is quite abundant literature on the close relation between internal cash flow and investment. For example, the best known, the research of Fazzari *et al.* (1988) and Kaplan and Zingales (1997) estimate investment–cash flow sensitivities as positive and statistically significant. Moreover, the research of Kadapakkam *et al.* (1998), Cleary (1999), Baker *et al.* (2003), Rauh (2006), Hennessy *et al.* (2007), Almeida *et al.* (2010), and Erickson and Whited (2012), Chen and Chen (2012), Lewellen and Lewellen (2016) suggest that investment and cash flow are strongly linked with a firm's investment practices.

The problem of the investment-cash flow relationship is important as in the literature investment-cash flow sensitivity (ICFS) was coined as a measure of financial constraints (Fazzari *et al.*, 1988) A firm is said to be financially constrained if its investment is limited by its generation of internal funds because it is unable to obtain sufficient external funds. Still, the empirical literature has found financial constraints to be difficult to identify, because these have latent characteristics. Financial constraints are, therefore, usually measured indirectly through variables that are assumed to be related to financial constraints. More current literature interprets investment-cash flow sensitivities as an indication of the existence of firm level financial constraints. Beginning with Fazzari *et al.* (1988), the association

between cash flow and investment was perceived as demonstrating the degree of financial constraints. The notions of Fazzari *et al.* (1988) is confirmed in some research (eg. Bond & Meghir, 1994; Carpenter *et al.*, 1994; 1998; Hoshi *et al.*, 1991; Kashyap *et al.*, 1994; Mizen & Vermeulen, 2005; Whited, 1992; Mulier *et al.*, 2016).

In contrast, Kaplan and Zingales (1997) questioned the interpretation of investment–cash flow sensitivity as a measure of financial constraints. They prepared their own measure of financial constraints (the KZ index). Cleary (1999) shows that least financially constrained U.S. firms also exhibit greater investment–cash flow sensitivity. However, Chen and Chen (2012) find investment–cash flow sensitivity is unrelated to financial constraints, while Gomes (2001) showed that ICFS is theoretically not sufficient for measuring financial constraints. What is more, Gatchev *et al.*, (2010) indicated that ICFS does not acknowledge the multifaceted interdependence between financial and investment decisions and provides an incomplete and misleading view of true financial constraints.

After Kaplan and Zingales (1997), Whited and Wu (2006) also prepared their own measure of financial constraints (the WW index). In addition, in 2010 a new measure was introduced by Hadlock and Pierce (the SA index). These new measures of financial constraints are alternatives to investment–cash flow sensitivity.

Investment — cash flow sensitivity and overconfidence

Malmendier and Tate (2005) picture the specific way overconfident CEO make financial decisions and argue that managerial overconfidence can account for corporate investment distortions. Accordingly, overconfident managers overestimate the returns to their investment projects and view external funds as unduly costly. Thus, they overinvest when they have abundant internal funds, but curtail investment when they require external financing. Overconfident CEOs also systematically overestimate the return of their investment projects. If they have sufficient internal funds for investment and are not disciplined by the capital market or corporate governance mechanisms, they overinvest. If they do not have sufficient internal funds, however, they are reluctant to issue new equity because they perceive the stock of their company to be undervalued by the market. They are also reluctant to gain new bank loans because they hold that banks undervalue their investment projects as well. As a result, they curb their investment. What is more, additional cash flow provides an opportunity to invest closer to their desired level. Such conclusions may succeed to explain overinvestment and underinvestment problems. They assume that in companies

managed by overconfident managers the relation between investment and cash flow is higher. And they find that investment of overconfident CEOs is significantly more responsive to cash flow.

In the first study out of the United States, Lin *et al.* (2005) investigate the impact of managerial optimism on firm's investing activities. Among the listed companies from Taiwan, they find a positive correlation between investment and internal cash flow.

Glaser *et al.* (2008) also discover that firms with optimistic managers invest more. Moreover, the investment-cash flow sensitivity is higher for firms with optimistic managers.

Huang *et al.* (2011), in the results of their study of companies operating within the Chinese market demonstrate that the average top executives' overconfidence leads to increased investment-cash flow sensitivity. However, this relation holds significance only for companies with state-owned entities as controlling shareholders and it is not significant for non-state controlled firms. This is because when running a regression using a proxy of agency cost, state-controlled companies have significantly greater agency cost than non-state controlled. Additional tests on a sub-sample also reveal that the positive effect of top executives' overconfidence on investment-cash flow sensitivity only holds for companies that exhibit high agency cost.

Mohamed *et al.* (2014) document that for American firms the coefficient between investment and internal funds becomes positive and significant at the one percent level for companies managed by optimistic managers. Hence, managerial optimism has a large effect on corporate investment, especially in the case of constrained firms. Even if the correlation between investment and cash flow is negative and highly significant, with the introduction of optimism bias, they observe a positive interaction between firms' investment and internal financing source availability. Firms with optimistic managers are thus exposed to investment distortions problems; this is because they expose their investment projects to investment — cash flow phenomena. They will intensively invest when internal financing is available and they may refuse good investment projects with positive NPV in the case of short cash.

Maditinos *et al.* (2015), on researching companies operating in Greece, confirmed that the investments of firms with optimistic managers are found to be more sensitive to cash flow than the investments of firms with managers who are not optimistic. Optimism is, hence, demonstrated to be extremely influential upon investment.

Koo and Yang (2018), using a sample of Korean-based firms, note that overconfident managers encourage higher investment cash flow sensitivity

than their rational peers. Their findings imply a higher incidence of excessive investment commitments driven by overconfident managers.

In the aforementioned work, Malmendier and Tate (2005) and Glaser *et al.* (2008) and Mohamed *et al.* (2014) use the KZ index as a measure of investment–cash flow sensitivity. Other research applied modified Fazzari *et al.* (1988) approach using an OLS regression model with investment as the dependent variable and cash flow as independent.

It is important to mention that all authors implement different measures of overconfidence. Holder 67, Longholder, and Net Buyer is applied by Malmendier and Tate (2005) and Mohamed *et al.* (2014). The forecast bias as an overconfidence measure is used by Lin *et al.* (2005), and Huang *et al.* (2011), as well as by Koo and Yang (2018). In contrast, Glase *et al.* (2008) and their followers Maditinos *et al.* (2015) use insider stock trading as a measure of overconfidence.

Following the results from previous research, we formulated the hypotheses:

H1: Companies managed by overconfident managers show higher relation between investment and cash flow than do companies managed by the non-overconfident ones.

H2: Companies managed by overconfident managers show bigger financial constraints than do companies managed by the non-overconfident.

We opine that an approach including both investment-cash flow sensitivity and financial constraints might explain the investment behavior of companies managed by overconfident managers. We hold that overconfident managers overvalue their projects and think that financial market (eg. banks) undervalue their projects. That is why companies managed by overconfident managers do not use external (especially debt) funds. Instead, they depend on internal funds (cash flow), hence, companies managed by overconfident managers have lower or similar debt ratios.

Research methodology

We are aware that there are a lot of measures of overconfidence. By far, the most influential proxies for managerial overconfidence have been constructed by Malmendier and Tate (2005), whose proxies and dataset have been used in many other studies into overconfidence: based on options (longholder, holder 67), shares (net buyer), and based on press. Other

methods of identifying CEO overconfidence were based on the frequency of upward-biased earnings forecasts (Lin *et al.*, 2005) or frequency of M&A made by managers (Doukas & Petmezas, 2007). Another method of identifying overconfidence was based on higher CEOs' relative compensations (Hayward & Hambrick, 1997). The methods commonly used to identify CEO's overconfidence allow to evaluate the overconfidence by behavior not by beliefs. And human behavior might sometimes result from the strategy implemented by the company not from managers' beliefs (e.g. frequency of M&A). Additionally, those measures might be applied only to listed companies. To identify and measure the overconfidence, we followed the methodology of Wrońska-Bukalska (2016) who assumed (after Moore & Healey, 2008) that overconfidence is a complex phenomenon consisting of overestimation, overplacement and overoptimism. She uses the survey approach to identify overconfidence and developed an original method of overconfidence measuring. This methodology allows identifying the managerial overconfidence and separate overconfident (OC) managers from the non-overconfident (nonOC).

The sample in our study comes from non-listed enterprises based in Poland. The data refer to the companies that were willing to take part in the survey on overconfidence. Our research also covers specific managerial traits (overconfidence) and the financial data of 2010–2016. It includes only those companies that meet the following requirements: established before 2010, in business for the whole 2010–2016 period, the same president/manager being in place for the whole period of 2010–2016, complete financial statement being available, the enterprises excluding insurance and banking companies. We collected 145 surveys from the company presidents (managers) and were able to divide the sample (1015 observations) into two subsamples: non-overconfident managers (nonOC — 78 companies and 546 firm-year observations) and overconfident managers (OC — 67 companies and 469 firm-year observations).

The descriptive statistics of investment and cash flow level and other data are presented in Table 1. We identify CF as operating cash flow, Investment as increase in fixed assets, Capital as net property, plant, and equipment (after Kaplan & Zingales, 1997) and Capital stock as the book value of share capital (after Fazzari *et al.*, 1988). The financial data: CF, I, Net profit, Total Assets, Capital, Capital stock, Sales revenue were present in thousand PLN, while employment in number of employees, and age in number of years since the company was established till the current year of analysis.

To compare the basic characteristics of two subsamples — independent samples, we employed nonparametric U Mann-Whitney test. We could not

use parametric test to compare the means as the distributions of the characteristics are not normal — normality test of Shapiro-Wilk proved that none of the variables have normal distribution (with p-value 0.000).

The data in Table 1 show that companies managed by overconfident managers have a higher level of total assets, and they invest more and have higher operating cash flow, but lower net profit, and are younger. At the same time, the overconfidence is of no impact for the value of capital, capital stock, sales revenue and employment. This means that cash flow, investment and total assets might be the result of the managerial overconfidence.

What is more, higher investment and cash flow ratios that should be calculated in relation to higher total assets for companies managed by overconfident managers might prove that these companies have similar investment and cash flow ratio as companies managed by the non-overconfident (having lower investment, cash flow, and total assets). Because calculating cash flow and investment in relation to the total assets might distort our analysis, we decided to calculate all ratios in relation to capital stock (after Fazzari *et al.*, 1988) and capital (after Kaplan & Zingales, 1997).

To identify the investment-cash flow sensitivity, we follow the approach of Fazzari *et al.* (1988), who used multiple regression analysis to model the relation between investment and cash flow:

$$\left(\frac{I}{K}\right)_{it} = f\left(\frac{X}{K}\right)_{it} + g\left(\frac{CF}{K}\right)_{it} + u_{it} \quad (1)$$

where I represents investment in plant and equipment for firm i during period t ; CF is operating cash flow for firm i during period t ; X represents a vector of variables, including lagged values, which have been emphasized as determinants of investment from a variety of theoretical perspectives (Cash pool, Leverage, Dividend payout). All variables are divided by the beginning-of-period capital stock (K). The higher the “ g ”, the more sensitive the investment is to cash flow. According to Fazzari *et al.* (1988), the more sensitive investment to cash flow the higher financial constraints. We calculated dependent and independent variables in a Fazzari *et al.* (1988) way (Table 2). Additionally, we calculated univariate regression analysis to model the relation between investment and cash flow. We also apply multivariate regression analysis to identify the “ g ” factor and other factors that can affect the investment decisions (Table 3). The “ g ” factor is the measure of investment-cash flow sensitivity and the measure of financial constraints according to Fazzari *et al.* (1988).

While there is a lot of debate whether the investment-cash flow sensitivity is a proper measure of financial constraints, we also consider other

measures of financial constraints. One of them is the KZ index, another one is the WW index and one more is the SA index.

According to Kaplan and Zingales (1997), the KZ index is calculated in the following way:

$$KZ_{it} = -1.001909 * \frac{CF_{it}}{K_{it-1}} + 0.2826389 * Q_{it} + 3.139193 * \frac{Lev_{it}}{K_{it-1}} - 39.3678 * \frac{Div_{it}}{K_{it} - 1} - 1.314759 * \frac{C_{it}}{K_{it} - 1} \quad (2)$$

where CF is operating cash flow; Q is the market value of assets divided by the book value of assets; Lev is debt; Div is the value of dividend paid out; C is cash holdings; and K is capital is measured as net property, plant, and equipment. All the data are for firm i during period $t-1$. All variables are divided by the beginning-of-period capital (K — net property, plant and equipment). The higher KZ index is, the greater financial constraints. Kaplan and Zingales (1997) do not refer to investment-cash flow sensitivity. In our analysis, we included all variables but Q . We had to exclude the Q variable (the market value of assets divided by the book value of assets) as we were dealing with private companies. Drawing on the achievements of Kaplan and Zingales (1997), we calculated all the variables and the KZ index according to Kaplan and Zingales (1997) model (Table 2). Additionally, we employed univariate regression analysis to model the relation between investment and cash flow. We also apply multivariate regression analysis to identify other factors that can affect the investment decisions (Table 4).

As for the WW index, Whited and Wu (2006) calculated it using the following notation:

$$WW = -0.091 CF_{it} - 0.062 DIVPOS_{it} + 0.021 TLTD_{it} - 0.044 LNTA_{it} + 0.102 ISG_{it} - 0.035 SG_{it} \quad (3)$$

where CF is the ratio of cash flow to total assets; $DIVPOS$ is an indicator that takes the value of one if the firm pays cash dividends; $TLTD$ is the ratio of the long-term debt to total assets; $LNTA$ is the natural log of total assets; ISG is the firm's three-digit industry sales growth; SG is firm sales growth. All the data are for firm i during period t . The higher the value of the index is, the greater the effect of financial constraints. Whited and Wu (2006) do not refer to investment-cash flow sensitivity. Most of the variables in the WW index are based on the total assets, and the total assets differ significantly between the subsamples (Table 1). In our analysis, we have to skip this measure of financial constraints because calculating cash flow and

investment in relation to (higher with statistical significance for OC sample) total assets might distort our analysis, results and conclusions.

Hadlock and Pierce (2010) find that the firm's size (the natural logarithm of total assets) and the firm's age are effective indicators of the level of financing constraints and construct the SA index:

$$SA = -0.737 \text{ SIZE} + 0.043 \text{ SIZE}^2 - 0.040 \text{ AGE} \quad (4)$$

where *SIZE* is the log of book assets, and *AGE* is the number of years. According to Hadlock and Pierce (2010), the SA index is a reverse index of financial constraint, that is, the larger the index value, the lower the degree of financial constraint. Hadlock and Pierce (2010) do not refer to investment-cash flow sensitivity. In our analysis, we calculated the SA index (Table 2).

We calculated the “g” factor describing the investment-cash flow sensitivity according to Fazzari *et al.* (1988) model — Table 3. Because the value of capital (net property, plant, and equipment) and capital stock (share capital) is no of impact, we decided to calculate only the KZ index and Hadlock and Pierce's SA index — Table 2. As most of the variables in the WW index are based on the total assets, we have to skip this measure of financial constraints because calculating cash flow and investment in relation to total assets (higher with statistical significance for OC sample) might distort our analysis, results and conclusions..

Results

The descriptive statistics of variables and two indexes (KZ and SA) are found in Table 2. Table 2 is divided into three parts.

In the first part of Table 2 we calculated the variables according to Fazzari *et al.* (1988) model. To name these variables we added the abbreviation of three authors of the Fazzari *et al.* (1988) model — FHP (Fazzari, Hubbard, and Petersen) to distinguish them from other variables. Among these variables there are Investment — I (FHP) — increase in the fixed assets, Cash Flow — CF (FHP) — operating cash flow, Cash — Cash (FHP) — cash pool, Leverage — Lev (FHP) — total liabilities, Dividend — Div (FHP) — the value of dividend. When calculating these variables, we divided them by the beginning-of-period capital stock (K) as in Fazzari *et al.* (1988) model. All these variables were later (Table 3) used to assess the “g” factor describing the relation between cash flow and investment (ICFS).

The second part of Table 2 presents variables calculated according to Kaplan and Zingales (1997). They are differently calculated than by Fazzari *et al.* (1988) as the value of Investment, Cash Flow, Cash, Leverage, Dividend are divided by the beginning-of-period capital (K — net property, plant and equipment) according to Kaplan and Zingales (1997) model. To name these variables we added the abbreviation of two authors of the Kaplan and Zingales (1997) model — KZ. Additionally, we calculated the KZ index following estimates parameter of Kaplan and Zingales (1997) model.

The third part of Table 2 includes data required to calculate the SA index: Total Assets and Age. Additionally, we calculated the SA index following the Hadlock and Pierce (2010) formula.

As illustrated in the first part of Table 2, companies managed by overconfident managers have lower Cash Flow ratio (FHP) and Leverage ratio (FHP). For the rest of variables overconfidence seems to be of no impact (according to the approach of Fazzari *et al.*, 1988). These variables were later used to conduct regression analysis in Fazzari *et al.* (1988) way (Table 3). The regression analysis is to find out the “g” factor describing the investment sensitivity to cash flows.

The second part of Table 2 reveals that the subsamples differ in terms of Cash Flow ratio (KZ), Cash ratio (KZ), and Leverage ratio (KZ). Companies managed by overconfident managers have higher Cash Flow ratio (KZ), and lower Leverage and Cash ratios (KZ). For the rest of variables, overconfidence seems to be of no impact (according to the approach of Fazzari *et al.*, 1988 or Kaplan & Zingales 1997). On the basis of these variables the KZ index of financial constraints was calculated. The difference in the KZ index for the subsamples is statistically significant. The KZ index for companies managed by overconfident managers is lower which indicates that these companies have lower financial constraints. This finding contradicts the hypotheses 2 assuming that companies managed by overconfident managers show bigger financial constraints.

The third part of Table 2 refers to the variables and SA index developed by Hadlock and Pierce (2010). Companies managed by overconfident managers have higher total assets but are younger. These differences are statistically significant. In addition, the SA index is higher for companies managed by overconfident managers. This suggests again that they have lower financial constraints. And again, the differences are statistically significant. This finding contradicts the hypotheses 2 assuming that companies managed by overconfident managers show bigger financial constraints.

Table 3 lists the results of regression analysis for variables calculated in accordance to Fazzari *et al.* (1988) methodology. The main aim of the re-

gression analysis is to assess the value of “g” factor describing the relation between investment and cash flow (ICFS). We prepared the univariate regression analysis and multivariate regression analysis following the variables and formula developed by Fazzari *et al.* (1988). The regression analysis was carried out for the full sample and subsamples. The dependent variable is Investment, while independent variables are the following: Cash Flow, Cash, Leverage, Dividend payment. All these variables (both dependent and independent) were calculated in the Fazzari *et al.* (1988) way and their descriptive data were presented in the first part of Table 2.

Our data were tested to ascertain if the problem of multicollinearity exists. Due to the statistically significant relationship between our independent variables, we computed variance inflation factors (VIF) and Tolerance values for each pair of independent variables. The resulting VIF values were lower than 1.5, and Tolerance values were higher than 0.100 which leads us to conclude that the multicollinearity problem is absent (Zuur *et al.*, 2010).

The regression analysis R square in univariate regression analysis is quite low — the level of 0.086 means that app. 9% of the variance in the dependent variable (Investment) is explained by the independent variable (Cash Flow). But this is especially true for the full sample and non-overconfident managers sample. R square is lower for the overconfident managers’ sample — app. 3% of the variance in Investment is explained by Cash Flows. However, the independent variable is statistically significant.

Beta describing the relation between Cash Flow and Investment in Fazzari *et al.* (1988) model is the “g” factor representing the sensitivity of investments to cash flow. Herein, betas for both subsamples of univariate regression analysis are positive and statistically significant. The positive relation proves that the higher Investment are accompanied by higher Cash Flow. However, the beta for companies managed by overconfident managers is higher. This indicates that companies managed by overconfident managers show higher investment–cash flow sensitivity than do companies managed by the non-overconfident. Overconfident managers are more prone to invest bigger part of cash flows.

The regression analysis R square in multivariate regression analysis is higher than in univariate regression analysis, but still quite low — app. 40% of the variance in the dependent variable (Investment) is explained by the independent variables (Cash Flow, Cash Pool, Leverage and Dividend Payout Ratio). However, this is especially true for the full sample and non-overconfident managers sample. R square is lower for the overconfident managers’ sample — app. 15% of the variance in Investment is explained

by all independent variables. But the independent variables are statistically significant (except for cash).

However, also the “g” factor in multivariate regression analysis is positive and statistically significant. The results of multivariate regression analysis support the importance of cash flow in deciding on investment. And again, the beta for companies managed by overconfident managers is higher. This indicates that companies managed by overconfident managers show higher investment–cash flow sensitivity than companies managed by the non-overconfident do. This confirms the hypotheses 1 assuming that companies managed by overconfident managers show higher Investment sensitivity to Cash Flows.

The results of multivariate regression analysis reveals also that Leverage ratio and Dividend ratio are two other factors notable to companies managed by overconfident managers. With regard to Leverage, the correlation is positive: the higher leverage, the higher investment ratio. The reason for higher leverage is the demand for capital expenditure. This comes about because, after consuming internal cash flow, companies managed by overconfident managers seek other sources of financing (debt). As for dividends, the correlation is negative: the higher the dividend payout, the lower cash left in the company and the lower investment ratio. For companies managed by non-overconfident managers there are three important factors: Leverage, Dividend and Cash ratio. Herein, the higher Cash and Leverage, the greater Investment, but the bigger the Dividend payout, the lesser the Investment.

Discussion

Our results regarding the relation between investment and cash flow support a number of recent findings reported in the literature (Malmendier & Tate, 2005; Lin *et al.*, 2005; Huang *et al.*, 2011; Campbell *et al.*, 2011; Mohamed *et al.*, 2014; Maditinos *et al.*, 2015; Koo & Yang, 2018).

Of note, however, after implementing the KZ index (Kaplan & Zingales, 1997) and the SA index (Hadlock & Pierce, 2010) the higher investment–cash flow sensitivity in companies managed by overconfident managers is accompanied by lower financial constraints. These results are contradictory to those showing a higher relation between KZ index and CEO overconfidence (Malmendier & Tate, 2005; Glaser *et al.*, 2008; and Mohamed *et al.*, 2014).

Our research challenges the generalize notion of the relationship between investment, financing decisions and manager overconfidence. We

provide evidence that companies managed by overconfident CEO have lower financial constraints and show higher investment-cash flow sensitivity. The explanation of this discrepancy lies in overconfidence bias. Overconfident managers hold that market undervalues their firms and that is why they do not try to gain external funds. This might explain relatively low debt ratios in companies managed by overconfident managers at the similar level in companies managed by non-overconfident managers (Wrońska-Bukalska, 2018). In our research, the leverage ratios calculated both in Fazzari *et al.* (1988) and Kaplan and Zingales (1997) way are lower for companies managed by overconfident managers.

We also find that companies managed by overconfident managers invest more (in absolute terms) than do companies managed by the non-overconfident. Hence, overconfidence bias has a significant influence on a firm's investment policy. Our result support the previous work of Malmendier and Tate (2005), Lin *et al.* (2005), Huang *et al.* (2011) and Campbell *et al.* (2011).

Because we find contradictory indications on the basis of ICFS and financial constraints indexes, we cannot confirm that investment — cash flow sensitivity is a good measure of financial constraints, and in this way our findings are in line of those opposing to the concerning ICS as the measure of financial constraints (Kaplan & Zingales, 1997; Cleary, 1999; Chen & Chen, 2012; Gomes, 2001; Gatchev *et al.*, 2010).

We found “g” factor at the level of 0.100 (statistically significant). This is in line with other research on investment-cash flow sensitivity in CEE countries. Konings *et al.* (2003) found that Polish and Czech Republic companies investment are more sensitive to cash flows (comparing to Bulgarian and Romanian). They found that “g” factor is 0.07 with statistical significance. The use the expression financial constraints to describe the relation between investment and cash flow. Isachenkova and Mickiewicz (2004) analyze the financial constraints under the impact of corporate control structure for Poland and Hungary. They found that some aspects of corporate control structure in Poland have an impact on financial constraints in investment financing patterns both in Hungary and Poland. Jackowicz *et al.* (2016) also found that listed firms in Poland remain constrained by internally generated funds in their investment decisions.

Conclusions

This study explores investment and financing decisions through the behavioral approach. We investigate the impact of one of the behavioral biases -

overconfidence — on the company investment and financing policy. Our results are built upon an analysis of an original sample of 145 non-listed companies in the Polish market over the 2010–2016 period (1015 observations).

Having the literature analysed, we assumed that companies managed by overconfident managers show higher relation between investment and cash flow than companies managed by the non-overconfident ones do (H1). This means that in their financing behavior overconfident managers prefer internal to external financing. We also assumed that this internal fund preference is due to bigger financial constraints of companies managed by overconfidence managers (H2). We assumed that bigger financial constraints are accompanied by managerial overconfidence. We also think that bigger financial constraints are the main reason for not turning to external (especially debt) financing.

Through adopting an investment-cash flow sensitivity model (Fazzari *et al.*, 1988), we provide evidence of the strong effect of overconfidence bias on investment cash flow sensitivity. We find that managerial overconfidence increases investment-cash flow sensitivity. However, at the same time companies managed by overconfident managers present higher potential to obtain external funds as they present lower financial constraints. It seems that the financial standing of the companies managed by overconfident managers (lower financial constraints) justifies using debt financing, but overconfident managers intentionally refrain from doing so, instead they attempt to depend upon internal funds (higher investment-cash flow sensitivity).

This paper makes a contribution by providing evidence of an alternative source from which corporate financial decisions are impacted. The evidence indicates that managerial overconfidence plays a role in company investment and financing decisions. This paper makes a contribution by providing evidence on overconfidence in one of the country from the continental model of corporate governance. As the most of the research refer to the Anglo-Saxon model with the CEO we attempt to find the impact of president (manager) overconfidence on the financial standing of the companies.

We also contribute to the existing research by providing evidence on the measure of financial constraints. From our research we can conclude that investment-cash flow sensitivity is not the best measure of financial constraints.

Our contribution lies also in providing evidence on investment and financial constraints and investment-cash flow sensitivity of Polish companies. This expands the existing research on ICFS in CEE countries.

Our study belongs to the wave of research papers that aims to explain the effect of CEOs overconfidence on firm's investment and financing policies. We empirically demonstrate that managerial overconfidence can have impact on financial decisions — both on the investment and financing decisions.

Our results are important for business practice (for company owners and cooperating institutions — e.g. banks). This is so because a large number of overconfident people rise through the corporate ladder to reach top management. The originality of our research lies in implementing thorough research not only on investment-cash flow sensitivity, but also on the financial constraints of the companies managed by overconfident managers. Such an approach is the first one (known to us) in assessing the relation between managerial overconfidence and financial decision-making.

However, our results are not free of limitations. One of them is applying the original model. Yet, this limitation indicates future research directions. One of them might be an attempt to adjust Kaplan and Zingales (1997) and Whited and Wu (2006) and Hadlock and Pierce (2010) to the Polish conditions. This might be done by calibrating parameter estimates on the basis of Polish conditions.

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Annex

Table 1. Descriptive statistics of basic characteristics of analysed companies

	mean	Full sample median	SD	mean	nonOC median	SD	mean	OC median	SD	U Mann Whitney
CF	89	49	417	40	35	410	108	64	425	-1.679 *
I	29,996	49	657,374	13,197	49	316,918	49,496	50	904,260	-1.933 *
Net profit	37,424	110	254,898	53,621	160	328,503	18,568	72	120,265	-2.870 **
Total Assets	8,147	3,237	15,733	6,347	3,602	12,676	9,459	3,053	17,549	-1.663 *
Capital	430,542	845	2,998,116	532,094	837	3,721,622	312,318	883	1,822,939	-0.017
Capital stock	154,151	200	1,043,601	160,007	170	981,815	147,347	240	1,112,277	-1.216
Sales revenue	483,661	8,384	3,321,290	753,360	8,464	4,448,913	167,534	7,882	774,109	-1.264
Employment	226	25	871	192	25	823	265	25	923	-0.102
Age	18	17	9	18	18	8	18	16	9	-2.942 **

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 2. Descriptive data for variables and KZ index and SA index for the full sample and subsamples

	mean	Full sample		SD	mean	nonOC	SD	mean	OC	SD	U Mann
		median				median			median		Whitney
Fazzari et al. (1988) Variables											
I (FHP)	2.5	0.2	19.9	3.4	0.3	26.4	1.6	0.2	7.0	-1.193	
CF (FHP)	7.3	0.5	58.4	12.1	0.7	78.9	1.8	0.3	9.0	-2.430	**
Cash (FHP)	2.8	0.0	15.7	3.5	0.0	19.1	2.0	0.0	10.5	-0.938	
Lev (FHP)	4.1	7.6	11.1	7.4	9.0	15.2	2.4	5.8	23.7	-3.743	***
Div (FHP)	4.8	0.0	46.5	8.0	0.0	63.1	1.1	0.0	3.9	-0.800	
Kaplan and Zingales (1997) Variables and KZ Index											
I (KZ)	3.2	0.1	3.9	2.1	0.1	4.2	5.5	0.1	3.5	-0.546	
CF (KZ)	2.1	0.2	10.5	1.8	0.2	13.3	4.4	0.2	5.8	-1.893	*
Cash (KZ)	3.8	0.3	13.0	4.3	0.3	16.3	3.2	0.3	7.9	-1.829	*
Lev (KZ)	8.7	1.7	27.9	10.3	2.0	35.6	6.8	1.5	14.8	-2.621	**
Div (KZ)	0.9	0.0	5.5	1.0	0.0	6.9	1.2	0.0	3.1	-0.720	
KZ index	4.4	3.0	127.2	8.8	3.5	138.2	-0.8	3.0	112.6	-2.045	**
Hadlock and Pierce (2010) Variables and SA Index											
Total Assets	8,147	3,237	15,733	6,347	3,602	12,676	9,459	3,053	17,549	-1.663	*
Age	18	17	9	18	18	8	18	16	9	-2.942	**
SA index	-2.8	-2.8	0.6	-2.9	-2.9	0.6	-2.8	-2.8	0.7	-2.455	**

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 3. Regression analysis results for Investment (dependent variable) according to Fazzari *et al.* (1988) model

Variables (sample)	I (FHP) full sample		I (FHP) non OC		I (FHP) IOC	
CF (FHP)	0.100 ***	0.157 ***	0.099 ***	0.145 ***	0.129 ***	0.164 ***
Cash (FHP)	x	0.117 ***	X	0.118 **	X	0.009
Lev (FHP)	X	0.062 ***	X	0.051 ***	X	0.097 ***
Div (FHP)	X	-0.262 ***	X	-0.269 ***	x	-0.297 ***
R square	0.086	0.393	0.088	0.448	0.028	0.155
F statistics	81.513 ***	140.067 ***	44.880 ***	93.284 ***	11.398 ***	18.181 ***

Note: ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.