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## CHANGES IN CASH LEVELS OF PUBLIC COMPANIES IN POLAND IN THE PERIOD 2001–2019

### Abstract

**Background:** The subject of this paper is related to cash management and determinants of companies' cash holdings within the framework of corporate finance theory. One phenomenon that has received considerable attention is the upward trend in cash holdings of US public firms, which has been explored in a number of US studies. There are no studies explaining whether cash management trends in Poland are similar to those observed in the biggest world economy. In empirical studies devoted to cash management in Poland, the analysis of aggregate data has been of little interest.

**Research purpose:** The focus of this article is on presenting the course of changes in cash holdings maintained by public companies listed on the Warsaw Stock Exchange in the period from 2001 to 2019 and explaining them in the framework of corporate finance theory.

**Methods:** Changes in the average and aggregate cash-to-assets ratio were analysed. In order to determine how these changes of cash-to-assets ratios are explained with changes of selected macro- and microeconomic variables, linear regression models for firm-averages and panel data models were estimated.

**Conclusions:** The study shows that changes in cash holdings of listed companies in Poland differed from the trends observed among big US corporations. It also indicates that companies' approaches to cash management were very much aligned with that explained by the finance theory.

**Keywords:** cash management, cash and short-term investments, panel models.

**JEL classification:** G32

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## 1. Introduction

Cash management or, more broadly, working capital management in an enterprise, a vital issue from the practitioners' perspective, is relatively rarely analysed within the corporate finance theory framework compared to capital structure or dividend policy. Nevertheless, phenomena observed in this area sometimes draw much interest and prompt research to explain them. One phenomenon that received considerable attention in the second decade of this century is the recent tendency among US corporations to maintain high cash levels.<sup>1</sup> Researchers are in disagreement about its causes. Some view it as a response to changes in cash-flows riskiness,<sup>2</sup> others attribute it to the changing nature of public companies or, generally, to the types of assets held by US corporations,<sup>3</sup> and still others associate it with lower opportunity costs of holding cash.<sup>4</sup> There are also those who explain it in terms of agency costs arising from management's low share of equity,<sup>5</sup> as well as those who explain it in terms of globalization or tax system changes.<sup>6</sup>

The phenomenon has been explored in several US studies, but a conclusive explanation of where it comes from has not yet been provided. Polish researchers have not taken much interest in it. There are no studies explaining whether cash management trends in Poland are similar to those observed in the biggest world economy or whether companies in Poland manage cash according to their own unique rules. In empirical studies devoted to cash management in Poland, the

<sup>1</sup> See e.g., **J. Graham, M. Leary**, *The Evolution of Corporate Cash*, Review of Financial Studies 2018/31 (11), pp. 4288–4289; **J. Graham, M. Leary**, *The Evolution of Corporate Cash*, Journal of Applied Corporate Finance 2018/30 (4), pp. 36–37.

<sup>2</sup> **T. Bates, K. Kahle, R. Stulz**, *Why do US firms hold so much more cash than they used to?*, Journal of Finance 2009/64, pp. 1985–2021.

<sup>3</sup> **A. Falato, D. Kadyrzhanova, J. Sim**, *Rising intangible capital, shrinking debt capacity, and the US corporate savings glut*, Working Paper, Federal Reserve Board, Washington, D.C. 2013; **J. Begenau, B. Palazzo**, *Firm selection and corporate cash holdings*, Journal of Financial Economics 2021/139 (3), pp. 697–718.

<sup>4</sup> **M. Boileau, N. Moyen**, *Corporate cash holdings and credit line usage*, International Economic Review 2016/57, pp. 1481–506; **J. Azar, J. Kagy, M. Schmalz**, *Can changes in the cost of carry explain the dynamics of corporate “cash” holdings?*, Review of Financial Studies 2016/29 (8), pp. 2194–2240.

<sup>5</sup> See **B. Nikolov, T. Whited**, *Agency conflicts and cash. Estimates from a dynamic model*, Journal of Finance 2014/69, pp. 1883–1921.

<sup>6</sup> See, e.g., **M. Faulkender, K. Hankins, M. Petersen**, *Understanding the Rise in Corporate Cash: Precautionary Savings or Foreign Taxes*, Review of Financial Studies 2019/32 (9), pp. 3299–3334.

analysis of aggregate data for companies has been of little interest. Instead, such research predominantly focuses on case studies that investigate that issue or that look at the level of a single sector of the economy.<sup>7</sup> Our study fills this research gap by examining changes in the levels of cash held by public companies in Poland from 2001 to 2019 and by trying to explain them in terms of financial theory developments.

## 2. Literature review

There is a view that in an efficient capital market, a company's cash management policy should not have an influence on its market value because an increase or a decrease in the amount of cash held by a company through a sale or a purchase of assets at a price equivalent to their market value is a zero net present value (NPV) transaction that does not change the market value of its assets. Thus, a company in need of cash could acquire it without any cost by converting less-liquid assets into cash that has the highest liquidity. However, as there are many circumstances that affect market efficiency, a transaction involving assets of different liquidity is not cost-free in most cases. Therefore, according to the trade-off theory, the amount of cash held by a company should be such that the marginal cost of the unit of cash and its marginal benefit are equal.<sup>8</sup>

As pointed out by Opler,<sup>9</sup> the benefits of maintaining cash resources are derived from transaction cost and precautionary motives. In line with the transaction cost motive, a company will seek to keep cash at a level that safeguards it from the cost of the forced sale of less-liquid assets when, unexpectedly, cash inflows are insufficient to cover cash outflows. Due to the precautionary motive, the benefit for a company from holding cash stems from the fact that it protects it from seeking external funding and paying an excessive cost when operating cash inflows are lower than expected or when new, unforeseen investment opportunities require more funding than the company can raise from internal

<sup>7</sup> See e.g., **A. Uziębło, B. Kopeć**, *Optymalizacja gospodarowania środkami pieniężnymi w przedsiębiorstwie ciepłowniczym z wykorzystaniem modelu Millera-Orra*, *Finanse, Rynki Finansowe, Ubezpieczenia* 2016/82 (1), pp. 521–531; **D. Fuksa**, *Zarządzanie środkami pieniężnymi na przykładzie przedsiębiorstwa górniczego*, *Gospodarka Surowcami Mineralnymi* 2009/25 (1), pp. 119–135; **K. Kolegowicz, M. Sierpińska**, *Cash Management in Energy Companies*, *Journal of the Polish Mineral Engineering Society*, 2020 July–December, pp. 95–100.

<sup>8</sup> **A. Dittmar, J. Mahrt-Smith, H. Servaes**, *International corporate governance and corporate cash holdings*, *The Journal of Financial and Quantitative Analysis* 2003/38 (1), pp. 111–133.

<sup>9</sup> **T. Opler, L. Pinkowitz, R. Stulz, R. Williamson**, *The determinants and implications of corporate cash holdings*, *Journal of Financial Economics* 1999/52, p. 5.

sources.<sup>10</sup> According to this viewpoint, higher cash levels will be maintained by firms that expect more investment opportunities or those that are more uncertain about the availability of funding or that face financing constraints.

That approach also assumes the existence of economies of scale in cash management. Thus, large companies should aim to keep their cash balance at a relatively lower level than small ones. Part of the problem under consideration is the substitution effect that arises from the fact that companies with a high level of other current assets can maintain relatively lower cash resources because they run a lower risk of having to use them to handle financial emergencies. For similar reasons, companies with low profits and little debt capacity are expected to hold higher cash balances.<sup>11</sup>

Another theory that is considered in the literature as explaining cash management practices of companies is pecking order or financing hierarchy theory, which suggests that there is no optimal level of cash holdings.<sup>12</sup> It claims that firms prefer internal over external financing and especially avoid issuing new shares because of the asymmetry in the information held by insiders (management) and outsiders (banks, investors) and adverse selection costs. Firms use their cash flow to finance their investments opportunities or to repay debts when due. The unused cash flow is accumulated and increases cash balances. Faced with a deficit of internal funds, the firm decreases cash holdings. The pecking order model implies that cash holdings should fall with higher recent investment spending and higher debt payments. It also suggests that firms with high profits would tend to hold high cash ratios, while, as already mentioned above, trade-off theory implies the inverse relationship.

As Opler, Pinkowitz, Stulz and Williamson<sup>13</sup> point out, there is a challenge in explaining cash holdings with the pecking order model assuming that shareholder wealth is maximized. As long as there is any cost to holding cash, a firm that accumulates cash will at some point have an excessive amount of cash, and shareholders would be better off if the firm used that cash to pay additional

<sup>10</sup> **A. Ozkan, N. Ozkan**, *Corporate cash holdings: An empirical investigation of UK companies*, *Journal of Banking & Finance* 2004/28, pp. 2103–2134; **T. Bates, K. Kahle, R. Stulz**, *Why...*, pp. 1985–2021.

<sup>11</sup> See e.g., **A. Gill, N. Mathur**, *Factors that influence corporate liquidity holdings in Canada*, *Journal of Applied Finance and Banking* 2011/1 (2), pp. 133–153.

<sup>12</sup> The theory was grounded by **S. Myers**, *The capital structure puzzle*, *Journal of Finance* 1984/39 (3), pp. 575–592 and **S. Myers, N. Majluf**, *Corporate financing and investment decisions when firms have information that investors do not have*, *Journal of Financial Economics* 1984/13 (2), pp. 187–221.

<sup>13</sup> **T. Opler, L. Pinkowitz, R. Stulz, R. Williamson**, *The determinants...*, p. 5.

dividends or to repurchase shares. The free cash flow theory by Jensen<sup>14</sup> explains why management may be reluctant to use cash in this way. This theory uses the idea of agency problems that might arise between managers and shareholders. Managers prefer to hold high cash levels to enhance the volume of total assets in their control to gain distinctive powers in the firm's investment and financing decisions. For instance, they may seek to expand their "empires" by acquiring other companies, even if the value of such acquisitions or other investments is below the cost of capital.<sup>15</sup> In line with this theory, Ferreira and Vilela<sup>16</sup> argued that firms with strong affiliations with banks and firms that practise in superior investor protection countries hold lower cash levels.

The cash levels that companies may want to hold can also be influenced by macroeconomic factors. For instance, high interest rates or expected inflation drive up the opportunity cost of keeping liquid but non-earning assets (also known as the "cost of carry"). Higher economic growth usually means more investment opportunities and may stimulate cash balances due to the precautionary motive. Similarly, the amplitude of fluctuations within the economic cycle, increasing the uncertainty as to the profitability of future projects, may lead companies to increase their cash resources for safety reasons. Another factor that may influence their level is the availability of funds in financial markets and the level of uncertainty in this regard or the level of development of the financial system itself. All these factors can be classified within trade-off theory as affecting either transaction costs or precautionary motivations for holding cash.

Empirical studies have provided evidence that partly supports views formulated within different theories by studying the impact of various proxies for determinants of cash holding behaviour that results from these theories. Many authors emphasized that it is difficult to empirically support one theory over the others unambiguously.<sup>17</sup>

While early investigations into the relationship between a company's size and its cash resources yielded inconclusive results, later works, especially those

<sup>14</sup> **M. Jensen, W. Meckling**, *Theory of the firm: managerial behaviour, agency costs and ownership structure*, *Journal of Financial Economics* 1976/3 (4), pp. 305–360.

<sup>15</sup> See e.g., **Y. Kusnadi, K. Wei**, *The determinants of corporate cash management policies: Evidence from around the world*, *Journal of Corporate Finance* 2011/17 (3), pp. 725–740.

<sup>16</sup> **M. Ferreira, A. Vilela**, *Why do firms hold cash? Evidence from EMU countries*, *European Financial Management* 2004/10 (2), pp. 295–319.

<sup>17</sup> See e.g., **T. Opler, L. Pinkowitz, R. Stulz, R. Williamson**, *The determinants...*, pp. 3–46; **L. Alles, Y. Lian, C. Xu**, *The determinants of target cash holdings and adjustment speeds: An empirical analysis of Chinese firms*, *SSRN Electronic Journal* 2012, pp. 1–32, <http://www.ssrn.com/abstract=1981818>; accessed 20.11.2021.

published after 1999, pointed to a negative correlation between a company's size and the amount of cash it held.<sup>18</sup> Several studies reported a positive association between companies' cash holdings and their investment opportunities and/or the cost of acquiring external finance.<sup>19</sup> Boileau and Moyen<sup>20</sup>, as well as Azar, Kagy and Schmalz,<sup>21</sup> have demonstrated a negative relationship between cash ratios and a liquidity premium or the cost of carry. Ozkan and Ozkan<sup>22</sup> proved that firms' growth opportunities, cash flows, liquid assets, leverage and bank debt are important in determining cash holdings of UK companies. Begenau and Palazzo<sup>23</sup> provided evidence for the negative relationship between a company's profitability and the level of cash balances. Several studies have found a correlation between the level of cash and agency costs. For instance, Harford<sup>24</sup> and Harford, Mansi and Maxwell<sup>25</sup> showed that because worse-managed companies spend more on unprofitable acquisitions that reduce their value, they maintain lower cash levels.<sup>26</sup> Phan, Nguyen, Nguyen and Hegde<sup>27</sup> found evidence that economic policy uncertainty is positively related to cash holdings due to firms' precautionary motives. Lastly, Faulkender, Hankins and Petersen studied the role of falling foreign corporate tax rates, coupled with relaxed restrictions on income shifting, in explaining the dramatic rise in US corporate cash.<sup>28</sup> They showed that this run-up is concentrated in the foreign subsidiaries of multinational companies. Such companies shift income to low tax jurisdictions, and their foreign subsidiaries are where we observe the largest accumulations of cash.

<sup>18</sup> See e.g., **T. Opler, L. Pinkowitz, R. Stulz, R. Williamson**, *The determinants...*, p. 5.

<sup>19</sup> See e.g., **C. Kim, D. Mauer, A. Sherman**, *The determinants of corporate liquidity: Theory and Evidence*, *Journal of Financial and Quantitative Analysis* 1998/33, pp. 335–359; **T. Opler, L. Pinkowitz, R. Stulz, R. Williamson**, *The determinants...*, p. 3; **T. Bates, K. Kahle, R. Stulz**, *Why...*, pp. 2018–2019; **L. Riddick, T. Whited**, *The corporate propensity to save*, *Journal of Finance* 2009/66, pp. 1729–1766; **A. Falato, D. Kadyrzhanova, J. Sim**, *Rising...*, pp. 1–6; **J. Begenau, B. Palazzo**, *Firm...*, pp. 712–717.

<sup>20</sup> **M. Boileau, N. Moyen**, *Corporate...*, p. 1481.

<sup>21</sup> **J. Azar, J. Kagy, M. Schmalz**, *Can...*, pp. 2226–2227.

<sup>22</sup> **Ozkan A., Ozkan N.**, *Corporate...*, pp. 2103–2134.

<sup>23</sup> **J. Begenau, B. Palazzo**, *Firm...*, p. 697.

<sup>24</sup> **J. Harford**, *Corporate cash reserves and acquisitions*, *Journal of Finance* 1999/54, pp. 1969–1997.

<sup>25</sup> **J. Harford, S. Mansi, W. Maxwell**, *Corporate governance and firm cash holdings in the US*, *Journal of Financial Economics* 2008/87, pp. 535–555.

<sup>26</sup> See also, e.g., **A. Dittmar, J. Mahrt-Smith, H. Servaes**, *International...*, pp. 111–133.

<sup>27</sup> **H. Phan, N. Nguyen, H. Nguyen, S. Hegde**, *Policy uncertainty and firm cash holdings*, *Journal of Business Research* 2019/95, pp. 71–82.

<sup>28</sup> **M. Faulkender, K. Hankins, M. Petersen**, *Understanding...*, p. 3299.

### 3. Research methodology

The purpose of the research was to determine whether the factors that finance theory indicates as influencing corporate cash management affect cash holdings in listed companies in Poland. It was conducted using a group of non-financial Polish companies quoted on the Warsaw Stock Exchange, for which a complete set of data for at least three years between Q1 of 2001 to Q4 of 2019 was available in the Bloomberg database. The data were winsorized at the 1% and 99% levels to mitigate the effects of outliers. That left 284 companies to study. Two samples were analysed. One consisted of all selected companies regardless of how long they had been quoted in the period under study. The other sample comprised 21 companies that had been quoted throughout the whole analysed period. The analysis was carried out in three steps. In step one, quarterly changes in the cash-to-assets ratio were analysed for both samples. The ratio was calculated both as an average for all companies and as an aggregate for the given sample. In step two, regression models were constructed in order to determine how the cash-to-assets ratio and selected macro- and microeconomic variables were related to each other. Their parameters were estimated using the average values of the variables (ratios) for all companies. Step three involved a panel study in which the quarterly values of companies' ratios were treated as separate observations.<sup>29</sup> The panel model parameters were first estimated using Ordinary Least Squares (OLS), treating the panel data as a set of cross-sectional data, and the results of three tests for unit effects were presented. Wald's test was used to determine whether introducing different intercepts for individual objects would yield more accurate estimates of the model parameters. The rejection of the null hypothesis would mean that a fixed effects estimator should be applied. The Breusch-Pagan test is used to verify the assumption that the variance of the error term is constant for all objects. The rejection of the null would indicate that the random effects estimator should be used. The Hausman test is used to choose between a fixed effects model and a random effects model. The rejection of the null means that the model should be estimated using the fixed effects estimator.

In both types of analysis, a linear trend and dummy variables representing seasonal (quarterly) effects were introduced into the models. When the variables

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<sup>29</sup> Multiply regressions and panel data models were used to study the determinants of cash holdings e.g. by **T. Opler, L. Pinkowitz, R. Stulz, R. Williamson**, *The determinants...*, pp. 3–46; **A. Ozkan, N. Ozkan**, *Corporate...*, pp. 2103–2134; **H. Phan, N. Nguyen, H. Nguyen, S. Hegde**, *Policy...*, pp. 71–82 or **J. Graham, M. Leary**, *The Evolution...*, pp. 36–37.

were statistically non-significant, they were omitted, and the model was recalculated.

Based on the considerations in the previous section of the article, the list of proxies for determinants of firms' cash holdings was proposed. The independent variables in the models are represented by microeconomic variables that describe the sampled companies and macroeconomic variables. The choice of these variables was also driven by the need to exclude collinearity, which was tested using variance inflation factors (VIFs).

- microeconomic variables:
  - short-term debt to total assets and long-term debt to total assets – companies with better access to debt markets are expected to hold less cash,
  - current assets, excluding cash, to total assets – firms will hold less cash when they have higher levels of other current assets as a cash substitute,
  - total assets – large businesses are assumed to face lower financing costs and hold lower cash,
  - current liabilities to total assets – a positive relationship is expected because firms need more cash to offset current liabilities and avoid transaction costs,
  - price-to-book value – as a proxy for valuable expected investment opportunities, it is assumed to stimulate cash balances,
  - net income to assets – unprofitable firms may be expected to hold more cash for similar precautionary motives as firms with little debt financing or low current asset; on the other hand, pecking order theory suggests that firms with high profits tend to hold high cash balances,
  - capital expenditures to assets – recent investment spending simply consumes the firm's cash resources.
- macroeconomic variables:
  - real GDP growth – accelerated economic growth means increased investment opportunities, which may encourage firms to hold more cash,
  - cost of carry (three-month money market interest rates) – higher opportunity costs of keeping cash are expected to reduce cash balances,
  - GDP volatility (standard deviation of real GDP growth over eight quarters) – it increases the uncertainty as to the profitability of future projects and may lead firms to increase their cash resources for safety reasons,
  - uncertainty index FRED (World Uncertainty Index for Poland),<sup>30</sup>

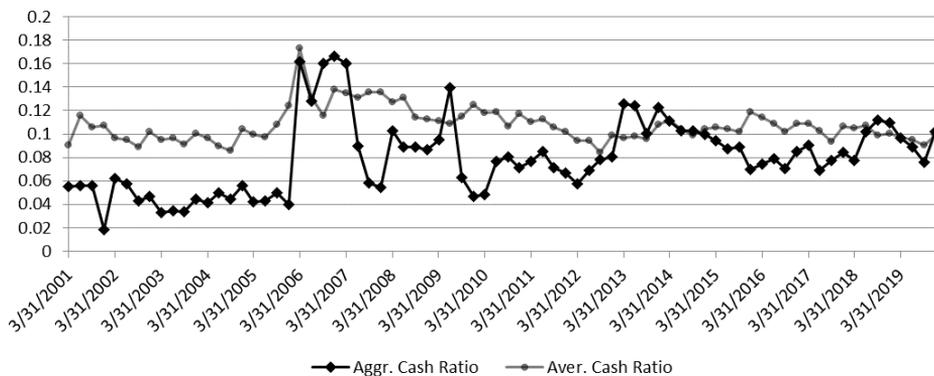
<sup>30</sup> <https://fred.stlouisfed.org/series/WUIPOL>; accessed 20.11.2021.

- WIG<sup>31</sup> volatility (standard deviation of daily returns in the previous quarter) – higher volatility of company valuations can affect the availability of funding and increase cash balances to avoid financing frictions,
- banking assets to GDP – the development of the financial sector in the economy facilitates access to external financing and may reduce cash resources kept for safety reasons.

#### 4. Research results

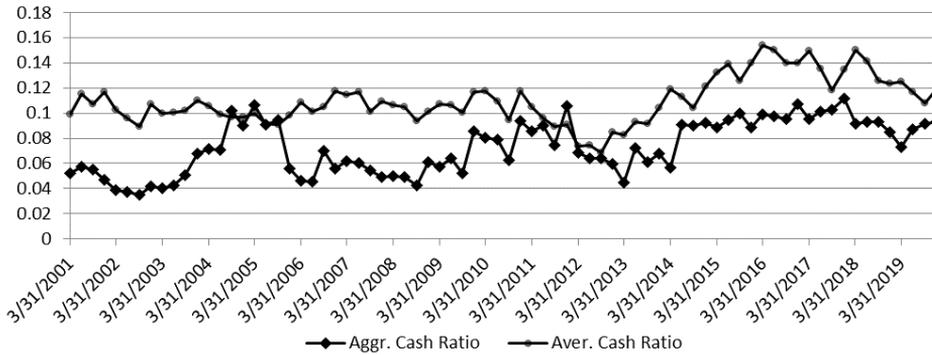
Figures 1 and 2 show how the average and aggregate cash-to-assets ratios changed in the period under study for all 284 selected companies quoted on the Warsaw Stock Exchange during the period 2001Q1–2019Q4, regardless of how long they had been quoted, and for 21 companies that had been quoted throughout the whole period under study, respectively.

FIGURE 1: *Average and aggregate Cash Ratios (284 companies)*



S o u r c e: author's calculations based on data sourced from Bloomberg database.

<sup>31</sup> WIG is the main broad-market stock index calculated by Warsaw Stock Exchange.

FIGURE 2: *Average and aggregate Cash Ratios (21 Companies)*

Source: author's calculations.

Comparing the values in 2001 and 2019 shows that the average cash ratio for all 284 companies shown in Figure 1 stayed at basically the same level throughout the sampled period. The aggregate cash ratio fluctuated more widely, especially between 2006 and 2010, which resulted in the 2019 value being higher than in 2001. Regarding the 21 companies in Figure 2, slight increases in both ratios are noticeable. During the financial crisis of 2007–2008, the aggregate cash ratio fell in both samples, with the fall being less pronounced among the 21 companies. Changes in the average cash ratio caused by the crisis years in both groups were smaller. In the bigger companies, the crisis contributed to a greater reduction in cash resources and consequently had a stronger effect on fluctuations in the aggregate cash ratio. Interestingly, after 2014, a rise in the values of both ratios (especially the aggregate ratio) can be seen, but only in the sample of 21 companies.

The second stage of the research involved examining factors that can theoretically contribute to changes in companies' cash resources. The results obtained with models using the averages of the selected variables for all companies between 2001 and 2019 are presented in Table 1.

TABLE 1: *Linear regressions (OLS) for average cash ratios*

	284 companies			21 companies	
	(1)	(2)	(3)	(1)	(2)
	1	2	3	4	5
Constant	0.3569***	0.3802***	0.3818***	0.2969***	0.3148***
Short-term debt /Assets	0.2518***	0.2446***	0.2421***	-0.2349***	-0.2199***

	1	2	3	4	5
Long-term debt /Assets	-0.1786*	-0.2158**	-0.1998**	-0.1670	-0.1621
Current Assets /Assets	-0.3084***	-0.3107***	-0.3300***	-0.3733***	-0.4233***
Total Assets	-2.4e-07	-2.1e-07	-2.0e-07	-1.3e-05***	-1.2e-05***
Current Liabilities / Assets	-0.2814***	-0.3034***	-0.2907***	0.0314	0.0291
Price / Book Value	-1.7e-05	-3.0e-06	-6.7e-05	0.0028	0.0027
Net Income /Assets	-0.0031	-0.0045	-0.0072	0.1087	0.0910
Capital Expenditures / Assets	0.6031	0.5952	0.6708**	0.1656	0.3107
GDP growth	0.0014*	0.0012	0.0011	0.0001	0.0001
Cost of carry (interest rate)	-0.0007	-0.0005	-0.0004	0.0007	0.0008
GDP volatility	0.0005	0.0016	0.0017	-0.0041*	-0.0041*
Uncertainty index FRED	-0.0077	-0.0061	-0.0062	-0.0057	-0.0055
WIG volatility	0.2703	0.3627	0.2740	0.3023	0.1969
Banking assets to GDP	-0.0153	0.0230***	-0.0231***	-0.0135	-0.0151*
Time trend	-0.0002			0.0012***	0.0011***
Q1	-0.0002	-0.0002		0.0016	
Q2	0.0006	0.0007		-0.0009	
Q3	-0.0014	-0.0013		-0.0028*	
R-squared	0.771	0.767	0.765	0.824	0.806
Adjusted R-squared	0.698	0.699	0.711	0.769	0.758
F	10.65***	11.23***	14.18***	14.86***	16.63***

Note: \*/\*\*/\*\* the regressor is statistically significant at 10%, 5% or 1% level, respectively.

Source: authors' calculations.

Table 1 shows that the cash resources in both groups of companies were significantly correlated mainly with variables that characterise the company's debt capacity (short- and long-term debt to assets) and the remaining current assets. In the great majority of cases, debt and cash are negatively correlated, meaning that more indebted companies tend to hold less cash. This may indicate that companies with more options to raise external capital maintain lower cash levels. Regarding the negative correlation between the amount of cash and the

current assets' share of total assets, a plausible explanation is the aforementioned substitution effect. Lower levels of cash ratios in companies with higher total assets, but only in the sample of 21 companies quoted throughout the period, confirm the hypothesis that large businesses face lower financing costs and hold lower cash for safety reasons. Finally, higher cash levels in the sample of 284 companies in the periods when the banking sector's share of GDP was shrinking suggest that at least some of the cash was held as a buffer for times when external funding is less available. All of these results confirm suggestions drawn from trade-off theory.

Tables 2 and 3 contain the results of a panel study in which each set of indicators used in the model to describe a company in a given quarter of a given year was a separate observation.

TABLE 2: *Panel regressions for cash ratios of 284 companies*

	Pooled OLS	Fixed effects	Pooled OLS	Fixed effects
	1	2	3	4
Constant	0.1325***	0.2711***	0.2074***	0.3088***
Short-term debt /Assets	-0.3059***	-0.1904***	-0.3034***	-0.1890***
Long-term debt /Assets	-0.1885***	-0.1734***	-0.1886***	-0.1755***
Current Assets /Assets	-0.1947***	-0.3934***	-0.1942***	-0.3944***
Total Assets	-1.8e-06***	-5.1e-07*	-1.8e-06***	-4.7e-07
Current Liabilities / Assets	0.0719***	0.0412***	0.0709***	0.0404***
Price / Book Value	0.0015***	0.0003***	0.0015***	0.0003***
Net Income /Assets	-0.0005	-0.0002	-0.0007	-0.0003
Capital Expenditures / Assets	-0.3473***	-0.1212***	-0.3355***	-0.1064***
GDP growth	0.0033***	0.0027***		
Cost of carry (interest rate)	-0.0002	-0.0008		
GDP volatility	0.0050*	0.0026		
Uncertainty index FRED	0.0034	-0.0014		
WIG volatility	0.9197***	0.5127***		
Banking assets / GDP	0.0155**	0.0082*		
Time trend	-0.0002	-0.0007***	-2.9e-05	-0.0006***

	1	2	3	4
Q1	-0.0002	7.6e-05	-0.0005	-0.0003
Q2	-0.0007	-0.0010	-0.0012	-0.0013
Q3	-0.0044**	-0.0030***	-0.0038**	-0.0026**
R-squared	0.184	0.684	0.181	0.683
Adjusted R-squared	0.182	0.677	0.180	0.675
F	140.89***	83.47***	207.78***	84.77***
Wald test	65.17***		65.09***	
Breusch-Pagan's test	558.12***		558.04.5***	
Hausman's test	145.8***		120.6***	

Note: \*\*\*/\*\* the regressor is statistically significant or the null can be rejected at 10%, 5% or 1% level, respectively.

Source: authors' calculations.

TABLE 3: Panel regressions for cash ratios of 21 companies

	Pooled OLS	Fixed effects	Pooled OLS	Fixed effects	Pooled OLS	Fixed effects
	1	2	3	4	5	6
Constant	0.1451***	0.3168***	0.1494***	0.3199***	0.1184***	0.2280***
Short-term debt /Assets	-0.3573***	-0.2630***	-0.3573***	-0.2622***	-0.3593***	-0.2701***
Long-term debt /Assets	-0.1398***	-0.1193***	-0.1403***	-0.1193***	-0.1372***	-0.1158***
Current Assets /Assets	-0.2497***	-0.4879***	-0.2502***	-0.4878***	-0.2508***	-0.4806***
Total Assets	-1.0e-06***	2.3e-07	-1e-06***	2.3e-07	-1.0e-06***	1.4e-07
Current Liab. /Assets	0.2603***	0.1605***	0.2602***	0.1594***	0.2623***	0.1665***
Price / Book Value	0.0063***	0.0057***	0.0069***	0.0058***	0.0069***	0.0058***
Net Income / Assets	0.1003***	0.0594**	0.0993***	0.0584**	0.1028***	0.0582***
Capital Expend / Assets	-0.8969***	-0.4646***	-0.8843***	-0.4537***	-0.8731***	-0.4394***

TABLE 3 (cont.)

	1	2	3	4	5	6
GDP growth	0.0002	-0.0011	5.8e-05	-0.0012		
Cost of carry (interest)	0.0005	0.0005	0.0004	0.0004		
GDP volatility	-0.0033	-0.0070	-0.0026	-0.0068		
Uncertainty index FRED	0.0078	0.0019	0.0085	0.0012		
WIG volatility	0.4823	0.0671	0.5065	0.1292		
Banking assets / GDP	-0.0139	-0.0312**	-0.0163	-0.0325***		
Time trend	0.0009**	0.0010***	0.0010**	0.0010***	0.0006***	0.0003***
Q1	0.0039	0.0024				
Q2	-0.0042	-0.0045				
Q3	-0.0046	-0.0005				
R-squared	0.345	0.536	0.343	0.536	0.341	0.531
Adjusted R-squared	0.338	0.356	0.337	0.525	0.338	0.523
F	45.71***	46.95***	54.41***	50.87***	90.41***	60.57***
Wald's test	31.81***		32.02***		31.38***	
Breusch – Pagan test	1645.3***		1647.4***		1642.5***	
Hausman test	106.15***		106.68***		77.77***	

Note: as for Table 2.

Source: authors' calculations.

The panel regressions obtained for both samples of companies also show that their cash levels were statistically significantly correlated, mainly with variables that characterise the company's debt capacity (short-term and long-term debt to assets) and the type of assets (current assets to assets). Again, the relationship between the levels of debt and cash is negative, as is the correlation between cash and current assets. Similarly, the negative correlation between the banking sector's share of GDP and the cash levels in companies confirms the previous results.

The results presented in Tables 2 and 3 show that several other variables were also significantly correlated with cash levels. In line with predictions of trade-off theory, in both samples, cash levels were positively correlated with potential investment opportunities represented by price-to-book value. The statistical significance of the GDP growth rate parameter in the sample of 284 companies also confirms the existence of this correlation. The high value of that variable reflects a good economic situation, fostering optimistic expectations about investment opportunities. The variable ‘total assets’, indicative of a company’s size, was statistically significant in both samples. As predicted by trade-off theory, the direction of its correlation with companies’ cash levels shows that big organisations maintain relatively less cash. Then, the positive sign of the parameter at WIG volatility in the sample of 284 companies is consistent with the precautionary reason for keeping a cash reserve, i.e., the amount should increase with market uncertainty. The analysis also revealed a positive correlation between the level of cash and profitability in the sample of 21 companies and a negative correlation between the level of cash and current investments in both samples, which apparently consume companies’ cash resources. The latter two observations seem to be consistent with pecking order theory, whereby there is no optimal level of cash holdings. It is simply determined by cash inflow and outflow, and firms first use their internal resources to finance investment projects, reducing cash levels. At the same time, it is difficult to explain on theoretical grounds the observed connections between the cash ratio and the current liabilities-to-assets ratio because the results of the tests presented in Tables 1–3 show the opposite directions of that correlation.

## 5. Final remarks

The study has shown that between 2001 and 2019, changes in the cash holdings of listed companies in Poland differed from the trends observed among big US corporations, which systematically increased their cash resources. The reason for this difference is not clear, although one can presume that it is because most Polish companies are not global organisations. It must be noted, however, that some results in this study are consistent with theoretical predictions. They show, for instance, that the amount of cash held by a company is negatively correlated with its size, access to external finance, or the current need to finance investment projects. It is positively correlated with potential investment opportunities and market uncertainty.

The more general conclusions from the study are as follows. In designing cash management policies, Polish listed companies take account of conclusions offered by both trade-off and the pecking order theories, similar to the results of many authors from investigations in other countries. However, the study did not explore any determinants of cash holding behaviour that results from the free cash flow theory. This opens the field for more research into cash management by companies in Poland.

## References

- Alles L., Lian Y., Xu C.**, *The determinants of target cash holdings and adjustment speeds: An empirical analysis of Chinese firms*, SSRN Electronic Journal 2012, pp. 1–32, <http://www.ssrn.com/abstract=1981818>; accessed 20.11.2021.
- Azar J., Kagy J., Schmalz M.**, *Can changes in the cost of carry explain the dynamics of corporate “cash” holdings?*, Review of Financial Studies 2016/29 (8), pp. 2194–2240.
- Bates T., Kahle K., Stulz R.**, *Why do US firms hold so much more cash than they used to?*, Journal of Finance 2009/64, pp. 1985–2021.
- Begenau J., Palazzo B.**, *Firm selection and corporate cash holdings*, Journal of Financial Economics 2021/139 (3), pp. 697–718.
- Boileau M., Moyen N.**, *Corporate cash holdings and credit line usage*, International Economic Review 2016/57, pp. 1481–1506.
- Dittmar A., Mahrt-Smith J., Servaes H.**, *International corporate governance and corporate cash holdings*, Journal of Financial and Quantitative Analysis 2003/38, pp. 111–133.
- Falato A., Kadyrzhanova D., Sim J.**, *Rising intangible capital, shrinking debt capacity, and the US corporate savings glut*, Working Paper, Federal Reserve Board, Washington, D.C. 2013.
- Faulkender M., Hankins K., Petersen M.**, *Understanding the Rise in Corporate Cash: Precautionary Savings or Foreign Taxes*, Review of Financial Studies 2019/32 (9), pp. 3299–3334.
- Ferreira M., Vilela A.**, *Why do firms hold cash? Evidence from EMU countries*, European Financial Management 2004/10 (2), pp. 295–319.
- Fuksa D.**, *Zarządzanie środkami pieniężnymi na przykładzie przedsiębiorstwa górniczego*, Gospodarka Surowcami Mineralnymi 2009/25 (1), pp. 119–135.
- Gill A., Mathur N.**, *Factors that influence corporate liquidity holdings in Canada*, Journal of Applied Finance and Banking 2011/1 (2), pp. 133–153.
- Graham J., Leary M.**, *The Evolution of Corporate Cash*, Journal of Applied Corporate Finance 2018/30 (4), pp. 36–60.
- Graham J., Leary M.**, *The Evolution of Corporate Cash*, Review of Financial Studies 2018/31 (11), pp. 4288–4344.
- Graham J., Leary M., Roberts M.**, *A century of capital structure: The leveraging of corporate America*, Journal of Financial Economics 2015/118, pp. 658–683.
- Harford J.**, *Corporate cash reserves and acquisitions*, Journal of Finance 1999/54, pp. 1969–1997.

- Harford J., Mansi S., Maxwell W.**, *Corporate governance and firm cash holdings in the US*, Journal of Financial Economics 2008/87, pp. 535–555.
- Jensen M., Meckling W.**, *Theory of the firm: managerial behaviour, agency costs and ownership structure*, Journal of Financial Economics 1976/3 (4), pp. 305–360.
- Kim C., Mauer D., Sherman A.**, *The determinants of corporate liquidity: Theory and Evidence*, Journal of Financial and Quantitative Analysis 1998/33, pp. 335–359.
- Kolegowicz K., Sierpińska M.**, *Cash Management in Energy Companies*, Journal of the Polish Mineral Engineering Society, 2020 July–December, pp. 95–100.
- Kusnadi Y., Wei K.**, *The determinants of corporate cash management policies: Evidence from around the world*, Journal of Corporate Finance, 2011/17 (3), pp. 725–740.
- Myers S.**, *The capital structure puzzle*, Journal of Finance 1984/39 (3), pp. 575–592.
- Myers S., Majluf N.**, *Corporate financing and investment decisions when firms have information that investors do not have*, Journal of Financial Economics 1984/13 (2), pp. 187–221.
- Nikolov B., Whited T.**, *Agency conflicts and cash. Estimates from a dynamic model*, Journal of Finance 2014/69, pp. 1883–1921.
- Opler T., Pinkowitz L., Stulz R., Williamson R.**, *The determinants and implications of corporate cash holdings*, Journal of Financial Economics 1999/52, pp. 3–46.
- Ozkan A., Ozkan N.**, *Corporate cash holdings: An empirical investigation of UK companies*, Journal of Banking & Finance 2004/28, pp. 2103–2134.
- Phan H.V., Nguyen N., Nguyen H., Hegde S.**, *Policy uncertainty and firm cash holdings*, Journal of Business Research 2019/95, pp. 71–82.
- Pociecha G., Brycz B.** (eds.), *Efficiency in Business and Economics*, Springer Proceedings in Business and Economics 2018, pp. 119–132.
- Riddick L., Whited T.**, *The corporate propensity to save*, Journal of Finance 2009/66, pp. 1729–1766.
- Uziębło A., Kopeć B.**, *Optymalizacja gospodarowania środkami pieniężnymi w przedsiębiorstwie ciepłowniczym z wykorzystaniem modelu Millera-Orra*, Finanse, Rynki Finansowe, Ubezpieczenia 2016/82 (1), pp. 521–531.

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## ZMIANY POZIOMU ŚRODKÓW PIENIĘŻNYCH W SPÓŁKACH GIEŁDOWYCH W POLSCE W LATACH 2001–2019

### Abstrakt

**Przedmiot badań:** Przedmiotem artykułu jest zarządzanie gotówką oraz determinanty poziomu gotówki utrzymywanego przez firmy identyfikowane w ramach teorii finansów korporacyjnych. Jednym ze zjawisk, które przyciągnęło znaczącą uwagę w ostatniej dekadzie, jest rosnący trend poziomu gotówki utrzymywanej przez amerykańskie korporacje, będący przedmiotem licznych studiów literaturowych. Brakuje natomiast badań wyjaśniających, czy w Polsce obserwuje się podobne zjawisko jak w największej światowej gospodarce. Analizy w kategoriach danych zagregowanych dla polskich firm nie wzbudziły jak dotąd większego zainteresowania.

**Cel badawczy:** Podstawowym celem artykułu jest opis kształtowania się zmian w poziomie środków pieniężnych utrzymywanych przez spółki notowane na Giełdzie Papierów Wartościowych w Warszawie w latach 2001–2019 i wyjaśnienie ich w kontekście osiągnięć teorii finansów przedsiębiorstw odnoszących się do tego problemu.

**Metoda badawcza:** Analizowano zmiany uśrednionych oraz zagregowanych wskaźników gotówki do aktywów w badanej grupie spółek giełdowych. Przedstawiono wyniki szacunków modeli regresji liniowej dla uśrednionych danych dla wszystkich firm oraz modeli panelowych, w których zmiany analizowanych wskaźników gotówkowych objaśniane są zmianami wybranych zmiennych mikro- i makroekonomicznych.

**Wyniki:** Uzyskane rezultaty wskazują, że zmiany w wielkości zasobów środków pieniężnych utrzymywanych przez spółki giełdowe w Polsce nie były zbieżne z trendami obserwowanymi w odniesieniu do wielkich korporacji amerykańskich. Wyniki badań wskazują jednocześnie, że spółki przy zarządzaniu środkami pieniężnymi zachowywały się w sposób w znacznym stopniu przewidywalny przez teorię finansów.

**Słowa kluczowe:** zarządzanie gotówką, gotówka i inwestycje krótkoterminowe, modele panelowe.