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# The financial close process in German corporations: Developing and testing a theoretical model

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## Abstract

***Research Question***: What variables affect the days to financial close for corporations?

***Motivation***: The tightening of reporting deadlines, new disclosure requirements such as using XBRL, and ever-increasing demand for high-quality financial information have increased attention to the financial close process. However, academic research is sparse in this area, and no paper has developed a theoretical model for the financial close process.

***Data***: The data were collected from 55 German corporations in different industries.

***Tools***: The questionnaire survey was used to collect the data, which was analyzed via multiple regression techniques.

***Findings***: The statistical analysis indicates that the model's overall fit is high. The technological challenges and technological strengths come out to be the most important explanatory variables. However, the peripheral challenges and the number of consolidating entities have a counterintuitive result; those variables are negatively related to the days to close. Also, size was significantly positively associated with days to close. Based on the practitioners' opinions, we also identified the critical best practices in the accounting and technology areas.

***Contribution***: The contributions of this paper are as follows. We develop a pioneering theoretical model for the financial close process based on academic and practitioner research. The model indicates a high explanatory power indicating that our research has further potential. The technological abilities of the organizations are the most significant determinants of the days required for the financial close process. Finally, the rank-ordered

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best practices should provide guidance to the consultants and accountants. The broader implications for further research are also discussed.

**Keywords**: the financial close process, days to close, last mile of finance, best practices in the financial close process

## JEL Codes: ML 41

## 1. Introduction

This paper aims to investigate the variables that affect the days required for the financial close. The financial close process refers to the end-of-period process of updating accounts, making accounting adjustments, and may include steps such as reconciliations management, foreign currency translations, consolidations, and financial control compliance, among other things (PCAOB, 2007; Gartner, 2007). The tightening of reporting deadlines, new disclosure requirements such as using XBRL, and ever-increasing demand for high-quality financial information have increased attention to the financial close process. Additionally, Gallemore and Labro (2015) use the speed of the financial close process as a proxy for the quality of a company's internal information environment.

The increased focus on the financial close process has resulted in an explosion of financial consolidation tools (Gartner, 2016). However, academic research is sparse in this area, except for a couple of papers. Janvrin and Mascha (2014), based on the literature review, identify the following factors that affect the financial close process: the need to meet or beat analyst expectations, collaboration among multiple participants, the process of management estimates, and the impact of new regulations such as Sarbanes Oxley (SOX), SEC's XBRL mandate (SEC, 2018), and complex accounting standards (for example, FASB, 2007).[i] The authors also list risks and obstacles in the financial close process based on the field investigation, some of which are later used in developing our model. Janvrin et al. (2020) also investigate how auditors audit the financial close process in SOX (404b) integrated versus a financial statement audit.

However, no paper has developed a theoretical model for the financial close process to the best of our knowledge. The practitioner literature discusses numerous problems and best practices in the financial close process (Keller, 2006; KPMG and Trintech, 2021; Parcells, 2016), which we use in our study. We develop a comprehensive model for the financial close process and test it using a survey of German companies. The study addresses three questions.

1. How are the challenges – accounting, technological, organizational, and peripheral –related to the days for the annual close?
2. How are the strengths – accounting and technology –related to the days for the annual close?
3. What is the explanatory power of these variables?

Thus, the variables that affect the days required in the financial close process are accounting challenges, technological challenges, organizational challenges, peripheral challenges, accounting strengths, and technology strengths. We developed a detailed questionnaire to measure these variables. Using a survey methodology, we collected information from German companies. The results indicate that the variables have significant explanatory power, the $R^2$ in the first regression is .28, and the second regression is 0.36. Such large $R^2$ values suggest that the model developed in this study has potential. The technological challenges and technological strengths emerge as the two most important variables that affect the days to close. The peripheral challenges and the number of consolidating entities have a counterintuitive result; those variables are negatively related to the days to close. This needs further investigation. Also, size was significantly positively associated with days to close.

The paper contributes to the literature in the following areas. First, the paper develops a pioneering theoretical model for the financial close process based on previous research. Second, this model is tested using empirical data collected via the survey method. Data collection has been a problem in this area. Third, the model has high $R^2$ values indicating significant explanatory power, which suggests that this line of inquiry has potential. Fourth, our analysis indicates that technological challenges and strengths affect the days to the financial close most significantly. Thus, technological sophistication may result in wide variation in the days required in the financial close process. Finally, there are some counterintuitive results, such as peripheral challenges and the total number of consolidating entities being negatively related to the day required for the financial close process. This poses further questions regarding the interplay of these variables with technology and the size of the corporation, and the need to further expand the sample and conduct research in different national settings.

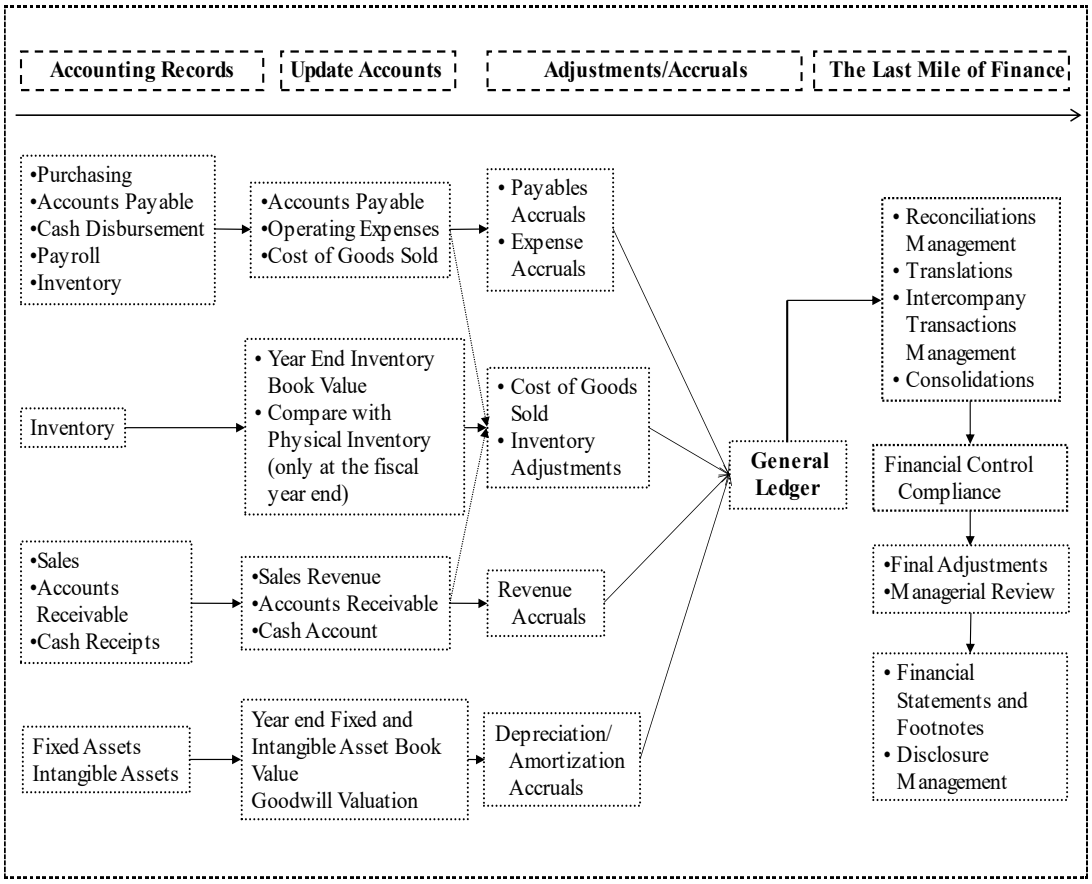
The rest of the paper is organized as follows. Section 2 reviews the literature and develops a theoretical model. Section 3 discusses the research design and presents the statistical analysis. Section 4 discusses the effectiveness of various best practices to aid the financial close process. Finally, section 5 discusses the results and concludes the paper.

## 2. Literature review and hypotheses development

What is the accounting/financial close process exactly? PCAOB Auditing Standard No. 5 describes the period-end-financial reporting process as follows: 1) procedures used to enter transaction totals into the general ledger, 2) procedures related to the selection and application of accounting policies; 3) procedures used to initiate, authorize, record, and process journal entries in the general ledger; 4) procedures used to record recurring and nonrecurring adjustments to the annual and quarterly financial statements; and 5) procedures for preparing annual and quarterly financial statements and related disclosures. Gartner's (2007) report defines the financial close as a process for accumulating data from multiple legacy and ERP solutions, messaging the data with Microsoft Excel-based and enterprise-applications-based processes, ensuring exactness, and preparing financial and operational reports. Janvrin and Mascha (2014) define the financial close process as a company's ability to complete its accounting cycles and produce financial statements for internal management and external legal reporting while working under time (and potential resource) pressure. These definitions indicate that the financial close process touches almost all the finance and accounting functions.

The financial close process literature also often includes the term – the last mile of finance. Adler (2006) defines the last mile of finance as the series of steps involved in the close from consolidation through the company's public disclosure of its financial results. Gartner reports (2010, 2016) include the following steps in the last mile of finance – financial close process management, reconciliations management, journal entry control, intercompany transaction management, consolidations, tax preparation, financial control testing, and financial statement production and disclosure management. Driscoll (2012) sums up the last mile of finance as the close-to-disclose process. The exact sequence of these steps in the last mile of finance may not be the same for all corporations. Also, depending on the size and complexity of the corporation, the required steps may differ. We present a generalized process flow of the financial close process based on these various descriptions.

**Figure 1: A General Description of the Financial Close Process**




Most academic and practitioner research in the financial close process is US-centric. As such, we draw on this research to build a theoretical model. The financial close process in the US began to garner more attention with the increasing automation of accounting functions and regulatory requirements for faster reporting. The literature describes different types of financial close, and also, there needs to be more terminological clarity; the same term may be defined slightly differently by various authors. Also, the meaning of the terms keeps evolving.

Janvrin and Mascha (2014) classify the financial close process into the following categories. First, the hard close focuses on external reporting, where the accuracy of financial information is critical. The process generally takes place at the end of the year or quarter. The books at the year-end may be sealed and cannot be altered. Second, the soft close refers to the month or quarter-end closing for internal management reports. Third, the virtual close, which is the ability to close the books and generate financial statements at any time (O'Leary, 2012; Bragg, 2009). Doxey

(2020) contends that a soft close requires a limited number of closing steps compared to a virtual close. Finally, the process is called early close or forecast if the financial statements are estimated before the year-end.

Responding to the market criticisms of companies not having visibility into their financial statements, Cisco partnered with KPMG to reengineer their accounting systems. Around 2000, Cisco closed the books in less than 24 hours and became a symbol of new economy financial management (Jablonsky, 2001; Berinato, 2001). This is the first well-publicized case of virtual close. Jablonsky, 2001, in the broader context, describes virtual close as the development of a virtual finance organization. O'Leary (2012) discusses this initiative's successes, failures, and further developments.

The academic research is scant except for a few notable papers. Janvrin and Mascha (2014) investigate the financial close process through a detailed literature review and field investigation. The paper aims to stimulate further research on the financial close process. Based on the literature review, the authors argue that further research is required in the financial close process. For our purposes, the relevant findings of this paper investigate the problems encountered in the closing of the books. Based on the literature review, the authors identify the following factors: the need to meet or beat analyst expectations, collaboration among multiple participants, the process of management estimates, and the impact of new regulations such as Sarbanes Oxley (SOX), SEC's XBRL mandate (SEC, 2018), and fair value accounting standard (FASB, 2007). The authors also list risks and obstacles in the financial close process based on the field investigation, some of which are later used in developing the model. Janvrin et al. (2020) also investigate how auditors audit the financial close process in SOX (404b) integrated versus a financial statement audit. The auditors primarily relied on walkthroughs and performed nominal reviews of entity-level controls related to the financial close process. Additionally, the auditors did not test controls in the links between the general ledger and supporting systems, including access controls. In the integrated audits, the auditors relied on these results while performing financial statement audits. However, financial statement-only auditors did reperformance checks on the controls and did not rely on walkthroughs. The authors also discuss the implications of their results. Kwon et al. (2017) use a case study to show the positive effects of automation, redesigning systems, and changing operating processes, among other things, on the financial close process.

The practitioner research (Adams, 2002; Hallet, 2002; O'Rourke, 2002; Adler, 2011; Driscoll, 2012; Parcells, 2016) discusses various aspects of the close process, problems, solutions, and benefits. These are mainly based on the authors' experiences handling the financial close process. The other stream of research comes from consultants and accounting firms specializing in financial close (for example, SGV & Co., 2001; PriceWaterhouseCoopers, 2007; and KPMG and Trintech, 2021). The conclusions in this stream of research are based on personal opinions,

field-based observations, and the implementation of specific tools. The primary problems that delay the close process, as identified in this literature, are given below,

- Manual systems
- Multiple ERP systems
- Legacy systems
- Inconsistent data definitions
- Management problems
- Number of consolidating entities
- Complex operations, non-value-added activities
- Inadequate documentation
- Inadequate controls over non-routine transactions
- Misstated accruals and estimates
- Mismanaged account reconciliations
- Excessive reliance on spreadsheets
- Shorter reporting deadlines
- Unclear roles and responsibilities
- Incorrect organizational structure

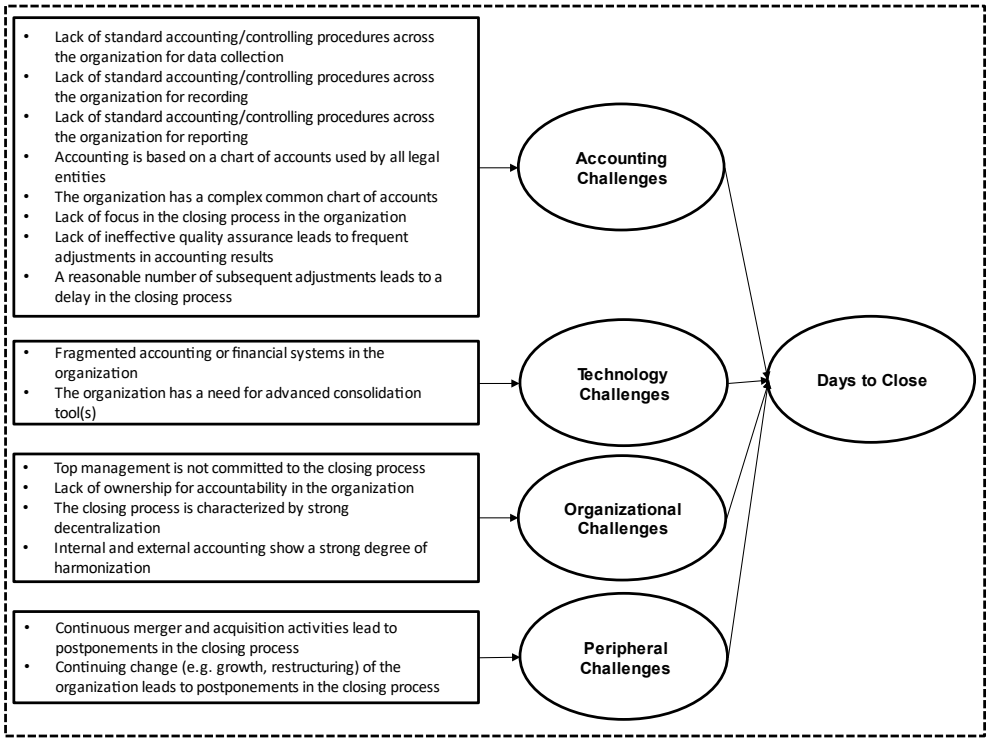
The solutions primarily revolve around having a single ERP instance, automation, software tools, and reengineering accounting/finance processes. The benefits include faster and more reliable financial reporting, simplified processes, and reduced risks such as restatements. Note that these problems and benefits have been identified over a couple of decades. As such, its present relevance remains questionable.

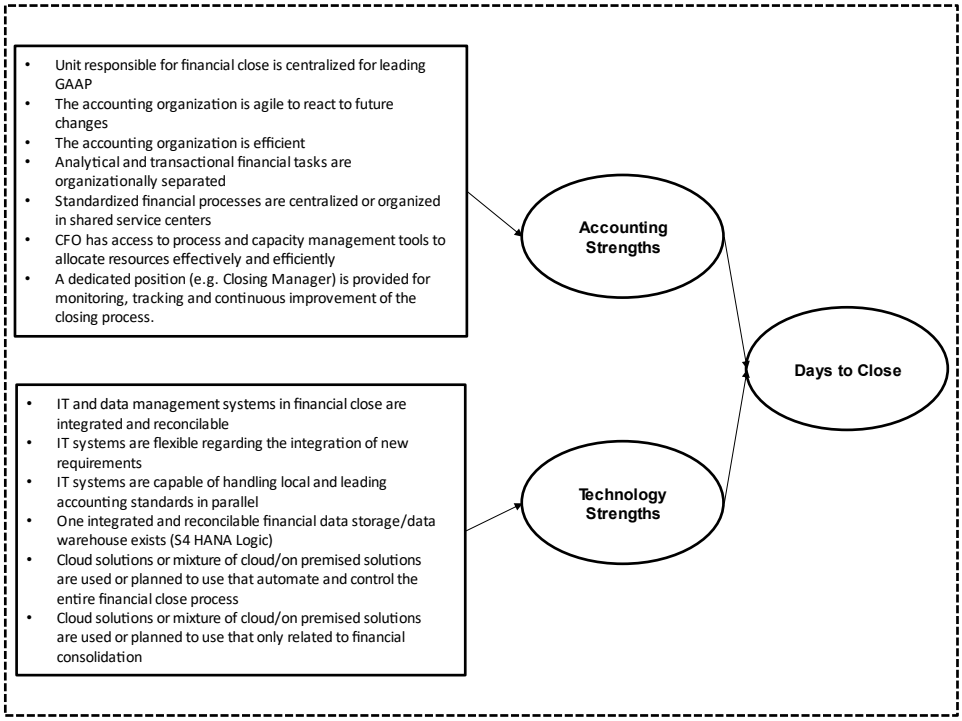
The empirical observations from the field are rare. However, the Institute of Management and Administration (IOMA) (2010) report is an exception. This report has the following recommendations for fast close – invest in robust information technology and implement best practices. The report attempts to identify the best practices. IOMA surveyed 180 companies from different sectors and developed benchmarks for closing efficiency and effectiveness, scheduling and timing range for closing activities, and implementation and effectiveness of best practices. The report provides a distribution of the length of the close for a month, quarter, and year, work done on account reconciliations, number of spreadsheets used in the process, use of single or multiple financial systems, and use of best practices such as the use of standard journal entries. Additional information regarding median staff hours to perform the close, median days to perform the annual close by revenue, and the ratio of management to staff hours in the annual close is also provided.

We identified four overarching variables: accounting challenges, technological challenges, organizational challenges, and peripheral challenges. We also identified two variables: accounting strengths and technology strengths that may help in the faster annual close.[ii] Based on the review of prior literature, discussions with industry people, and one co-author's first-hand experience with German companies, we

identified numerous issues that can or have the potential to affect the financial close process. These issues were classified into six areas identified earlier. The model is given in Figure 2. [iii]

**Figure 2: A Theoretical Model of Challenges and Strengths in the Financial Close Process**






The study addresses three questions,

1. What is the strength of the relationship between accounting, technological, organizational, and peripheral challenges, and the days for the annual close?

*$H_1$: Ex ante, we expect these variables to be positively related to the days for the annual close.*

2. What is the strength of the relationship between accounting and technological strengths and days for the annual close?

*$H_2$: Ex-ante, we expect these variables to be negatively related to the days for the annual close.*

3. What is the explanatory power of these variables?

*$H_3$: Ex ante, we expect these six variables to have significant explanatory power.*

Using the same process mentioned earlier, we also identified suggested best practices for accounting, technological, organizational, and peripheral challenges. In total, we have identified 29 best practices across the four variables. These practices are prescribed by practitioners but have yet to be validated empirically. The final question in the study is to investigate if the best practices identified in the literature are considered effective in the field by the persons who close the books on a routine basis. Given the evolving and conflicting prior literature, note that there are some differences in the questions identified in challenges versus best practices, though many underlying concepts are the same. Those best practices are given in Table 1.

**Table 1: Identification of Best Practices that Aid in the Financial Close Process**

| | |
|---|---|
| **Accounting Challenges** | • Standardized accounting procedures with a common chart of accounts<br>• Simplify the common chart of accounts<br>• Standardizing of collecting, presenting, and measuring transaction information<br>• A structured process for late adjustments (based on materiality principles)<br>• Monthly close of subledgers and journals that feed data into the general ledger<br>• Reconciliations, whether subledgers to general ledgers or intercompany transactions, should be continuous, not at the period end<br>• Create automated entries for depreciation/ amortization, accruals, and provisions<br>• Minimize complex calculations for the provision and inventory measurement during the year<br>• Minimize manual data entry |
| **Technology Challenges** | • Powerful consolidation system for integrated financial consolidation purposes (in terms of matrix consolidation)<br>• The organization is standardized on the ERP level (template or ONE ERP approach)<br>• New media and tools (e.g., artificial intelligence, machine learning, robotic process automation) are broadly used |
| **Organizational Challenges** | • Establish clear accountability for closing tasks in a closing schedule<br>• Establish adherence to deadlines<br>• Establish clear and regular close communication<br>• Document your close process<br>• Assign responsibility for resolving discrepancies (intercompany reconciliation)<br>• Develop collaboration across departments to resolve recurring cross-functional issues<br>• Develop and monitor close performance metrics<br>• Approval processes are automated<br>• Key performance indicators are standardized<br>• Distribution of key performance indicators to line managers in real-time |
| **Peripheral Challenges** | • Reduce investigation levels<br>• Move routine work (non-critical activities) out of the closing crunch<br>• Prepare forms in advance<br>• Pare down the content of reports<br>• Use accruals and estimates to shorten close<br>• Input all recurring journal entries (such as accruals, depreciation/<br>• amortization, allocations) at one time<br>• Cross-train accounting personnel |

# 3. Research design and statistical analysis

## 3.1 Data collection

We used a survey instrument to collect information regarding various aspects of the financial close process. The required information cannot be collected via archival or experimental research. A standardized survey was developed and digitally administered by an independent market research institute in Germany. The order of the questions remained fixed for each respondent, but the answer choices were randomly generated to avoid order effects. If the participants had concerns regarding a particular answer, the market research firm was available for consultation. The problems were minor and resolved quickly.

The first part of the survey instrument collected demographic information such as the position of the respondents, the nature of the industry, the size of the company, and the days required for monthly, quarterly, and annual close. Additionally, we collected data for the number of legally independent entities consolidated in the financial statements. The Likert-type scale (Strongly Agree, Disagree, Neither Agree nor Disagree, Agree, and Strongly Agree) was used for concepts/questions listed in Figure 2. These questions capture challenges encountered and strengths to overcome those challenges. We have chosen only the most critical questions to keep the survey length minimum. The variables that were measured are accounting challenges (ac), technology challenges (tc), organizational challenges (orc), peripheral challenges (pc), accounting strengths (as), and technology strengths (ts). Given the lack of research in this area, the questions used to measure the variables are uneven and, in two cases (te and pc), pose statistical challenges. We also collected data regarding the total number of legally independent entities (coent) consolidated annually. We also asked if the respondents thought days to complete the financial close process were appropriate.

In the same survey, we collected perceptions of the respondents regarding the effectiveness of the best practices given in Table 1. We used another Likert-type scale (Very low effectiveness, Low effectiveness, Moderate effectiveness, High effectiveness, and Very high effectiveness) to collect the information. In the practitioner-oriented literature, we often come across best practices. Here we attempt to verify if such best practices are genuinely perceived as best practices by those who work closely with the financial close process.

We collected data from 55 German Corporations. The questionnaires were filled by persons who were closely associated with the financial close process. The data collection was done in 2019. All corporations agreed to complete the survey, which was not randomly distributed. The respondents' three most common job titles were Director of Finance and Accounting, Chief Financial Officer, and Controlling

Manager. The industries represented were manufacturing, retail and wholesale, services, and utilities and energy. We used the definitions given by European Accounting Law (European Union 2013, Article 3) and the German Commercial Code ((§ 267 HGB)[iv] to classify companies into large, medium, and small sizes.[v] According to these standards, 36.4% of our respondents work in large companies (revenue > € 500 million), 38.2% work in medium-sized companies, and 25.5% work in small companies. Approximately 80% of the companies were public or going public. The distribution of a number of legally independent entities consolidated in the financial statements indicates that approximately half the companies have less than 50 units. However, 10% of the companies have more than 500 consolidating units. Detailed demographic information is given in Table 2.

**Table 2: Demographic Information for Respondents, Industry, and Size**

**Breakdown of Respondents by Position (Panel A)**

| | Chief Financial Officer | Vice President of Finance | Director of Finance/ Accounting | Accounting Manager | Accountant | Controlling Manager | Controller |
|---|---|---|---|---|---|---|---|
| Frequencies | 12 | 2 | 22 | 5 | 2 | 10 | 2 |
| Percentages | 21.82% | 3.64% | 40.00% | 9.09% | 3.64% | 18.18% | 3.64% |

**Breakdown of Companies by Industry (Panel B)**

| | Manufacturing | Retail and Wholesale | Services | Utilities and Energy |
|---|---|---|---|---|
| Frequencies | 26 | 12 | 12 | 5 |
| Percentages | 47.27% | 21.82% | 21.82% | 9.09% |

**Breakdown of Companies by Revenue (Panel C)**

| | Less than € 10* | Between 10 and 25 | Between 25 and 50 | Between 50 and 100 | Between 100 and 250 | Between 250 and 500 | Between 500 and 1000 | Between 1000 and 2000 | More than 2000 |
|---|---|---|---|---|---|---|---|---|---|
| Frequencies | 7 | 4 | 3 | 3 | 5 | 13 | 11 | 3 | 6 |
| Percentages | 12.73% | 7.27% | 5.45% | 5.45% | 9.09% | 23.64% | 20.00% | 5.45% | 10.91% |

*All figures are in millions

**Legally Independent Entities in the Consolidated Financial Statements (Panel D)**

| | < 25 units | 25 to 50 | 51 to 100 | 101 to 200 | 201 to 500 | 501 to 1000 | > 1000 |
|---|---|---|---|---|---|---|---|
| Frequencies | 18 | 10 | 8 | 8 | 5 | 5 | 1 |
| Percentages | 32.73% | 18.18% | 14.55% | 14.55% | 9.09% | 9.09% | 1.82% |

The Cronbach's alpha for the survey instrument is 0.79 when the standard option (STATA) is used. We also collected data for monthly and quarterly close. Obviously, we found that managers allocated significantly more time to the annual closing process. The distribution of days for the annual close is given in Table 3. Approximately 9% of the companies complete the close in less than 11 days or take more than 31 (to 90) days. The majority of the companies complete their close within 11 to 30 days. If we compare our results with IOMA (2010) report, you can see that the days to close are similar. It appears that US corporations need a slightly lower number of days to close, but the significance of the differences is not statistically verifiable.

**Table 3: Distribution of Days for Annual Close**

| **Days for Annual Close** | | |
|---|---|---|
| | *Frequencies* | *Percentages* |
| 5 days or less | 3 | 5.45% |
| 6 to 10 days | 2 | 3.64% |
| 11 to 15 days | 10 | 18.18% |
| 16 to 20 days | 12 | 21.82% |
| 21 to 25 days | 14 | 25.45% |
| 26 to 30 days | 9 | 16.36% |
| 31 to 90 days | 5 | 9.09% |
| More than 90 days | 0 | 0.00% |
| **Total** | **55** | **100%** |

| **IOMA Report (p. 22)** | | |
|---|---|---|
| **Days for Annual Close for US Companies Circa 2010** | | |
| | *Frequencies* | *Percentages* |
| Less than 6 days | 10 | 8.9% |
| 7 to 10 days | 29 | 25.9% |
| 11 to 19 days | 30 | 26.8% |
| 20 to 29 days | 14 | 12.5% |
| 30 to 44 days | 18 | 16.1% |
| 45 to 60 days | 6 | 5.4% |
| More than 60 days | 5 | 4.5% |
| **Total** | **112** | **100%** |

## 3.2 Regression models

The dependent variable is the Days for the Annual Close (DAC). The independent variables are ac, tc, orc, pc, as, and ts. We ran two different regression models. First, we ran the OLS regression using only the challenges: ac, tc, orc, and pc. Then we ran the second OLS regression that included all variables. [vi] The control variables were the size and number of consolidating entities. We used two regressions due to the sample size. Both the regressions were run under the robust option, hence, the

absence of adjusted $R^2$ values in the results. This method provides robust results when the heteroskedasticity assumption is violated, especially in the case of small samples (Cameron and Trivedi, 2010).

*Model 1*

$$DAC = \beta_0 + \beta_1 ac + \beta_2 tc + \beta_3 orc + \beta_4 pc + \beta_5 size + \beta_6 coent + \varepsilon$$

*Model 2*

$$DAC = \beta_0 + \beta_1 ac + \beta_2 tc + \beta_3 orc + \beta_4 pc + \beta_5 as + \beta_6 ts + \beta_7 size + \beta_8 coent + \varepsilon$$

## 3.3 Descriptive statistics

The descriptive statistics for the variables of interest are given in Table 4. Given the nature of the variables and the Likert-type scale, we did not encounter any outliers in the data. The average for the days for the annual close is 22.65 days, and the minimum and maximum are 2.5 and 60.5 days, given how we have made this variable continuous. Then, Table 5 provides correlations between the variables. Overall, we do not see any highly correlated variables. The moderately correlated variables are technological and accounting challenges, and technological and peripheral challenges. This highlights the interrelated nature of the variables accounting, technological, and peripheral challenges. It is possible that problems in one area may cause problems in other areas. This issue needs further research. The signs of the correlation are mainly in the anticipated directions. The variables accounting, technological, organizational challenges and size are positively correlated with the days for the annual close, and the variables accounting and technological strengths are negatively correlated with the days for the annual close. However, peripheral challenges and total number of legally independent entities are negatively correlated with the days for the annual close, which is counterintuitive. However, it is possible that these two variables are important for bigger companies that have sophisticated systems in place to overcome the problems. This area also needs further research.

**Table 4: Descriptive Statistics**

| Variable | Observation | Mean | Std. dev. | Min | Max |
|---|---|---|---|---|---|
| cannual | 55 | 22.65455 | 13.78434 | 2.5 | 60.5 |
| ac | 55 | 2.775 | .6594224 | 1.125 | 4.375 |
| tc | 55 | 3.118182 | 1.004451 | 1 | 5 |
| orc | 55 | 2.559091 | .7200238 | 1.25 | 4 |
| pc | 55 | 2.909091 | 1.147021 | 1 | 5 |
| as | 55 | 3.644156 | .5215483 | 2.571429 | 4.714286 |
| ts | 55 | 3.575758 | .6937539 | 1.833333 | 4.833333 |
| size | 55 | 19.10858 | 1.94928 | 15.42495 | 21.63956 |

| | | | | | |
|---|---|---|---|---|---|
| coent | 55 | 4.109723 | 1.436366 | 2.525729 | 7.31322 |

**Table 5: Pearson Correlation Matrix**

| | cannual | ac | tc | orc | pc | as | ts | size | coent |
|---|---|---|---|---|---|---|---|---|---|
| **cannual** | 1.0000 | | | | | | | | |
| **ac** | 0.2521 | 1.0000 | | | | | | | |
| **tc** | 0.2859 | 0.6909 | 1.0000 | | | | | | |
| **orc** | 0.1343 | 0.5100 | 0.3486 | 1.0000 | | | | | |
| **pc** | -0.0211 | 0.5815 | 0.6323 | 0.4214 | 1.0000 | | | | |
| **as** | -0.1882 | -0.0246 | 0.0111 | -0.0046 | 0.2876 | 1.0000 | | | |
| **ts** | -0.2378 | 0.2606 | 0.3058 | 0.1314 | 0.4859 | 0.6766 | 1.0000 | | |
| **size** | 0.2414 | 0.2624 | 0.2911 | 0.2172 | 0.3550 | 0.2305 | 0.3816 | 1.0000 | |
| **coent** | -0.0357 | 0.2649 | 0.2943 | 0.1963 | 0.3042 | 0.0363 | 0.3658 | 0.5363 | 1.0000 |

Tables 6 and 7 report the results of two regression models. In Table 6, we run the regression using only the challenges (accounting, technological, organizational, and peripheral) and using the size and consolidating entities as control variables. The results indicate that the model is significant at a 0.05 level, and $R^2$ is approximately 0.28. The variables technological challenges, peripheral challenges, and size are significant at 0.05 level, and the variable total number of legally independent entities is significant at 0.10 level. The multicollinearity diagnostics indicate that the variance inflation factor (VIF) and related statistics are within acceptable limits.[vii] Thus, the overall statistics and correlation matrix discussed earlier do not indicate a multicollinearity problem.

**Table 6: Model 1 – Regression Results**

| | | |
|---|---|---|
| Number of observations | = | 55 |
| F(6, 48) | = | 2.38 |
| Prob > F | = | 0.0426 |
| R-squared | = | 0.2780 |
| Root MSE | = | 12.423 |

| cannual | Coefficient | Robust std. error | t | P>t | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| **ac** | 3.853236 | 3.674155 | 1.05 | 0.300 | -3.534148 | 11.24062 |
| **tc** | 5.42716 | 2.639308 | 2.06 | 0.045* | .1204753 | 10.73385 |
| **orc** | 1.291184 | 3.071062 | 0.42 | 0.676 | -4.8836 | 7.465968 |
| **pc** | -5.470308 | 2.582832 | -2.12 | 0.039* | -10.66344 | -.277177 |
| **size** | 2.634948 | 1.254343 | 2.10 | 0.041* | .1129232 | 5.156973 |
| **coent** | -2.644358 | 1.487046 | -1.78 | 0.082** | -5.634264 | .3455475 |
| **_cons** | -31.83423 | 18.305 | -1.74 | 0.088 | -68.6389 | 4.970429 |

* significant at 0.05 level
** significant at .10 level

**Collinearity Diagnostics**

| Variable | VIF | SQRT VIF | Tolerance | R-Squared |
|---|---|---|---|---|
| ac | 2.34 | 1.53 | 0.4274 | 0.5726 |
| tc | 2.30 | 1.52 | 0.4347 | 0.5653 |
| orc | 1.41 | 1.19 | 0.7082 | 0.2918 |
| pc | 1.94 | 1.39 | 0.5161 | 0.4839 |
| size | 1.49 | 1.22 | 0.6698 | 0.3302 |
| coent | 1.45 | 1.21 | 0.6880 | 0.3120 |
| **Mean VIF** | 1.82 | | | |

**Note**: We use the robust regression option in all our models. Hence, the absence of adjusted $R^2$. Not using the robust option gives slightly higher values of adjusted $R^2$.

The results support all three hypotheses. They indicate that variables technological and peripheral challenges are most influential in explaining the days for the annual close. However, the coefficient of peripheral challenges is negative, indicating that a higher incidence of peripheral challenges reduces the days for annual close. A similar issue came out in the correlation matrix given in Table 5. The control variables size and the total number of legally independent entities are also significant. The sign of size is in the expected direction, but the sign of the total number of legally independent entities is in the opposite direction. We may expect that peripheral challenges and the higher number of consolidating entities will adversely affect the days to close. A likely explanation is that these problems are encountered by larger companies that already have systems and processes to take care of the related issues. The $R^2$ value indicates that the model is a good fit and has significant explanatory power.[viii]

**Table 7: Model 2 – Regression Results**

| | | |
|---|---|---|
| Number of observations | = | 55 |
| F(6, 48) | = | 2.37 |
| Prob > F | = | 0.0318 |
| R-squared | = | 0.3634 |
| Root MSE | = | 11.916 |

| cannual | Coefficient | Robust std. error | t | P>t | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| **ac** | 4.076943 | 3.453587 | 1.18 | 0.244 | -2.874767 | 11.02865 |
| **tc** | 5.509701 | 2.498365 | 2.21 | 0.032* | .4807536 | 10.53865 |
| **orc** | .5769209 | 2.835498 | 0.20 | 0.840 | -5.13064 | 6.284482 |
| **pc** | -3.808613 | 2.365586 | -1.61 | 0.114 | -8.570292 | .9530655 |
| **as** | 2.519257 | 3.583226 | 0.70 | 0.486 | -4.693404 | 9.731917 |
| **ts** | -8.260629 | 4.296732 | -1.92 | 0.061** | -16.9095 | .3882438 |
| **size** | 2.958001 | 1.165693 | 2.54 | 0.015* | .6115831 | 5.304419 |
| **coent** | -1.830719 | 1.342024 | -1.36 | 0.179 | -4.532072 | .8706347 |

| cannual | Coefficient | Robust std. error | t | P>t | [95% conf. | interval] |
|---|---|---|---|---|---|---|
| **_cons** | -24.87803 | 19.13846 | -1.30 | 0.200 | -63.40176 | 13.64569 |

* significant at 0.05 level
** significant at .10 level

**Collinearity Diagnostics**

| Variable | VIF | SQRT VIF | Tolerance | R-Squared |
|---|---|---|---|---|
| ac | 2.40 | 1.55 | 0.4173 | 0.5827 |
| tc | 2.37 | 1.54 | 0.4226 | 0.5774 |
| orc | 1.43 | 1.20 | 0.6992 | 0.3008 |
| pc | 2.29 | 1.51 | 0.4363 | 0.5637 |
| as | 2.31 | 1.52 | 0.4333 | 0.5667 |
| ts | 2.72 | 1.65 | 0.3677 | 0.6323 |
| size | 1.57 | 1.25 | 0.6388 | 0.3612 |
| coent | 1.65 | 1.28 | 0.6066 | 0.3934 |
| **Mean VIF** | **2.09** | | | |

In Table 7, we run a regression that includes two additional variables – accounting and technological strengths. The results indicate that the results are significant at 0.05 level, and $R^2$ is approximately 0.36. In this model, technological challenges and size are significant at 0.05 level, and technological strength is significant at 0.10 level. The p-value for variable peripheral challenges slightly exceeds the 0.10 level of significance, and the sign for the coefficient is still negative. Here also, the multicollinearity diagnostics indicate that VIF and the related statistics are within acceptable limits.

The results indicate that the variables technological challenges and size are significant at 0.05 level. The newly added variable technological strength is significant at the 0.10 level. However, peripheral challenges and total number of legally independent entities are not significant, but the signs of the coefficients are still negative. We can speculate that technological strengths are indeed effective in countering peripheral problems and a larger number of consolidating entities. Additionally, we only used two questions to measure technological challenges. How technological strengths and weaknesses overlap and interact with other weaknesses will be a productive area of further research. The $R^2$ in this model is even higher, indicating that this line of inquiry has potential.

# 4 Effectiveness of best practices to aid in the financial close process

The literature prescribes many best practices that enhance the efficiency of the financial close process. In our survey, we asked the respondents to rate the effectiveness of these best practice solutions. The results are summarized in Table 8.

**Table 8: Effectiveness of Best Practices to Aid in the Financial Close Process**

| Effectiveness of best practice solutions for accounting-specific challenges | Very low effectiveness | Low effectiveness | Moderate effectiveness | High effectiveness | Very high effectiveness |
|---|---|---|---|---|---|
| Standardization of accounting procedures with a common chart of accounts (CCoA) | 0.0% | 12.7% | 41.8% | 29.1% | 16.4% |
| Simplification of the common chart of accounts (CCoA) | 1.8% | 18.2% | 34.5% | 32.7% | 12.7% |
| Standardizing of collecting, presenting, and measuring transaction information | 1.8% | 9.1% | 30.9% | 40.0% | 18.2% |
| Structured process for subsequent adjustments (based on the materiality concept) | 3.6% | 10.9% | 30.9% | 41.8% | 12.7% |
| Regular close (usually monthly) of subledgers and journals that feed data for the general ledger | 1.8% | 10.9% | 34.5% | 43.6% | 9.1% |
| Reconciliations of subledgers to general ledgers or intercompany transactions are performed on a continuous basis and not at the end of the period | 1.8% | 3.6% | 45.5% | 36.4% | 12.7% |
| Create automated entries for depreciation/amortization, accruals, and provisions | 3.6% | 16.4% | 36.4% | 27.3% | 16.4% |
| Minimize complex calculations for provisions and inventory measurement during the year | 1.8% | 14.5% | 40.0% | 27.3% | 16.4% |
| Minimize manual data entry | 0.0% | 16.4% | 34.5% | 29.1% | 20.0% |

**Effectiveness of best practice solutions for technological challenges**

| | Very low effectiveness | Low effectiveness | Moderate effectiveness | High effectiveness | Very high effectiveness |
|---|---|---|---|---|---|
| Powerful consolidation system for integrated financial consolidation purposes (in terms of matrix consolidation) | 1.8% | 7.3% | 40.0% | 40.0% | 10.9% |
| Organization is standardized on ERP level (template or ONE ERP approach) | 1.8% | 12.7% | 38.2% | 32.7% | 14.5% |
| New media and tools (e.g., artificial intelligence, machine learning, process automation with robotics) are broadly used | 10.9% | 23.6% | 29.1% | 20.0% | 16.4% |

**Effectiveness of best practice solutions for organizational challenges**

| | Very low effectiveness | Low effectiveness | Moderate effectiveness | High effectiveness | Very high effectiveness |
|---|---|---|---|---|---|
| Establish clear responsibility for closing tasks in a closing schedule | 3.6% | 12.7% | 23.6% | 34.5% | 25.5% |
| Establish adherence to deadlines | 0.0% | 9.1% | 25.5% | 40.0% | 25.5% |
| Establishment of clear and regular communication | 1.8% | 5.5% | 27.3% | 45.5% | 20.0% |
| Document your closing process | 1.8% | 12.7% | 32.7% | 45.5% | 7.3% |
| Assign responsibility for resolving discrepancies (intercompany reconciliation) | 1.8% | 7.3% | 29.1% | 49.1% | 12.7% |
| Develop cross-departmental collaboration to solve recurring cross-functional problems (in the sense of end-to-end) | 1.8% | 7.3% | 32.7% | 38.2% | 20.0% |

**Effectiveness of best practice solutions for organizational challenges**

| | Very low effectiveness | Low effectiveness | Moderate effectiveness | High effectiveness | Very high effectiveness |
|---|---|---|---|---|---|
| Introduction and monitoring of key performance indicators in relation to the closing process | 3.6% | 14.5% | 29.1% | 50.9% | 1.8% |
| Approval processes are automated | 5.5% | 14.5% | 27.3% | 34.5% | 18.2% |
| Key performance indicators are standardized | 1.8% | 10.9% | 30.9% | 41.8% | 14.5% |
| Distribution of key performance indicators to line managers in real time | 1.8% | 18.2% | 32.7% | 29.1% | 18.2% |

**Effectiveness of best practice solutions for peripheral challenges**

| | Very low effectiveness | Low effectiveness | Moderate effectiveness | High effectiveness | Very high effectiveness |
|---|---|---|---|---|---|
| Reduction of investigation levels | 3.6% | 14.5% | 40.0% | 32.7% | 9.1% |
| Move routine work (non-critical activities) out of the closing crunch | 1.8% | 7.3% | 38.2% | 32.7% | 20.0% |
| Prepare forms (e.g., checklists) in advance | 1.8% | 16.4% | 29.1% | 40.0% | 12.7% |
| Pare down the content of reports | 1.8% | 14.5% | 41.8% | 38.2% | 3.6% |
| Use of accruals and estimates to shorten close | 3.6% | 7.3% | 41.8% | 41.8% | 5.5% |
| Input all recurring journal entries (such as accruals, depreciation/amortization, allocations) at one time | 3.6% | 10.9% | 32.7% | 41.8% | 10.9% |
| Cross-functional personnel in accounting | 3.6% | 10.9% | 32.7% | 34.5% | 18.2% |

In Panel A, best practices for accounting-specific challenges are described. These practices are primarily under direct control by the accounting/finance departments. Overall, at least 80% of the respondents rate all the best practice solutions as having a moderate or higher level of effectiveness. The top three procedures rated highly by the respondents in the ranked order are,

- Reconciliations of subledgers to general ledgers or intercompany transactions are performed on a continuous basis and not at the end of the period
- Standardizing of collecting, presenting, and measuring transaction information
- Standardization of accounting procedures with a common chart of accounts

If we only count high to very high effectiveness, then the two procedures: a structured process for subsequent adjustments (based on the materiality concept) and regular close (usually monthly) of subledgers and journals that feed data for the general ledger, are also important.

In Panel B, best practice solutions for technological challenges are described. There are only three items. The first two items, a powerful consolidation system for integrated financial consolidation purposes and an organization standardized on ERP level, are considered moderately to very highly effective by more than 85% of the respondents. The third item, the use of artificial intelligence and machine learning, is not viewed favorably, perhaps because these technologies are not as yet widely used in the financial close process.

In Panel C, best practice solutions for organizational challenges are described. The top four procedures[ix], in ranked order, considered moderately to very highly effective, are given below.

- Establishment of clear and regular communication
- Establish adherence to deadlines
- Assign responsibility for resolving discrepancies (intercompany reconciliation)
- Develop cross-departmental collaboration to solve recurring cross-functional problems

In Panel D, best practice solutions for peripheral challenges are described. These overlap with accounting challenges to some extent but are more related to workflows and processes. The top three items considered moderately to highly effective in the ranked order are[x],

- Move routine work (non-critical activities) out of the closing crunch
- Prepare forms (e.g., checklists) in advance
- Input all recurring journal entries at one time
- Cross-functional personnel in accounting

The primary issues identified by the survey respondents revolve around reconciliations, standardization of workflows, communication, and cross-training. On the technology side, a powerful consolidation system and one ERP system are considered critical to the financial close process. This provides evidence that the best practices described and prescribed in the literature are indeed effective in the field.

## 5. Conclusions

This paper plans to investigate the variables that affect the days required for the financial close. We identified six variables – accounting challenges, technology challenges, organizational challenges, peripheral challenges, accounting strengths, and technology strengths. We used a survey instrument consisting of a series of questions to measure these variables. The secondary purpose was to identify the best practices that are most effective in the financial close process, according to our respondents. We run two regression models: one with the challenges and the other with challenges and strengths. Given the paucity of research in this area, we consider this a pioneering study.

The results indicate that the variables have significant explanatory power, the $R^2$ in the first regression is 0.28, and the second regression is 0.36. Such large $R^2$ values suggest that the model developed in this study has potential. The technological challenges and technological strengths emerge to be the two most important variables that affect the days to close. The peripheral challenges and the number of consolidating entities have a counterintuitive result; those variables are negatively related to the days to close. There is an interplay between these variables and technology, which may affect the accounting and organizational workflows. This needs further investigation. Also, size was significantly positively associated with days to close.

We also asked the respondents regarding their perception of best practices that are effective in the financial close process. The most critical accounting best practices are related to timely reconciliations, standardization of accounting processes, and common chart of accounts. On the technology side, we discovered that one ERP system and powerful consolidation tools are valued. In the case of the organizational side, clear communication, adherence to deadlines, assigning responsibility for reconciliations, and cross-departmental collaboration were considered the most effective. The answers to peripheral challenges are mostly related to the standardization of accounting functions and cross-functional training. These findings provide some basis for identifying effective best practices as opposed to prescriptive research of the past.

We also asked the respondents whether they thought the days to close were appropriate. Out of 55 respondents, 46 (83.6%) considered the days to close to be

appropriate. The conclusion did not differ among small, medium, or large-sized corporations. We can conclude that a vast majority of the companies are not working on reducing the days to close. Apparently, the trade-off between time and the quality of the financial information is deemed acceptable. These findings will be valuable to managers, consultants, and vendors involved in the financial close process.

The contributions of this paper to the literature can be identified as follows. We develop a first theoretical model for the financial close process based on academic and practitioner research. We collect data and empirically test this model; data collection in this area has been a bottleneck in testing theories. The model indicates a high explanatory power indicating that our research has further potential. The technological abilities of the organizations are the most significant determinants of the days required for the financial close process. This finding indicates that digitization and automation of the different workflows may lead to the shortening of the days for the financial close. We also identified the critical best practices in the accounting and technology areas based on the practitioners' opinions. The rank-ordered best practices should provide guidance to the consultants and accountants. These findings will also provide the basis for further research.

Our research has limitations. First, this research is subject to the standard limitations of survey research. Second, the sample is not large. Given the problems in collecting data in this area, increasing the sample size poses a problem. Third, a larger sample size would have allowed us to use different statistical techniques, such as factor analysis or structural equation modeling, allowing for a better classification of underlying constructs. Finally, this research is confined to a sample of German companies and needs further validation in the global context.

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[i] These are US-specific observations and not necessarily applicable in the European context.

[ii] The questions in the case of accounting (technology) challenges and strengths are not mirror images given the multi-dimensional nature of the problem.

[iii] Reasonable researchers will disagree with the types of problems, strengths, and also variables. To our best knowledge, there is no previous study of this type. We hope that the model will be refined in later studies.

[iv] German Commercial Code (HGB) of May10, 1897, as last amended by Article 8 of the Act on the further implementation of the EU prospectus regulation and on the amendment of financial market laws of July 10, 2018.

[v] There is no authoritative definition of large, medium, or small sized companies in the literature.

[vi] The days for annual close, size, and coent are categorical variables. We converted those to continuous variables by calculating a mid-point of the range and taking natural log of size and coent. We also used ologit for analysis, the results are similar to the linear regression analysis. However, Brant test indicates that parallel regression assumption is violated casting doubts on the result. This is partly due to the sample size.

[vii] Hair et al. (1998) indicate that a VIF value of greater than 10 indicates a multicollinearity problem.

[viii] Hatcher (2013) states that an $R^2$ of 0.26 and above should be considered a large effect size in multiple regression.

[ix] Two procedures tied; hence four top procedures are described.

[x] As in footnote ix.