

Earnings Management and Investor Protection:

Accounting Reading Group - Assignment III

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Aug 9, 2024

Abstract

This project uses the TRR 266 Template for Reproducible Empirical Accounting Research (TREAT) to provide an infrastructure for open science-oriented empirical projects. Leveraging external Worldscope data sets on financial data, the repository showcases a reproducible workflow that integrates Python scripts for data analysis. The project's output demonstrates a comprehensive application of skills to replicate and extend the findings from the seminal paper by Leuz, Nanda, and Wysocki (2003), particularly in providing descriptive statistics for the four individual earnings management measures as well as the aggregate earnings management score across various countries. In doing so, it documents and discusses the research design choices made and the variations between the original and reproduced results. This code base, adapted from TREAT, should give you an overview on how the template is supposed to be used for this specific project and how to structure a reproducible empirical project.

1 List of Abbreviations

EM: Earnings Management **IDE:** Integrated Development Environment **UK:** United Kingdom

US: United States **WRDS:** Wharton Research Data Services

2 Introduction

The aim of the following paper is to illustrate how to use open science tools in empirical accounting research. The original study by Leuz, Nanda, and Wysocki (2003) examines systematic differences in earnings management (EM) across 31 countries and proposes that these differences are influenced by the level of investor protection. Specifically, they argue that stronger investor protection reduces earnings management by limiting insiders’ ability to acquire private control benefits.

This paper presents details on a replication of Table 2 Panel A from the seminal study by Leuz, Nanda, and Wysocki (2003). The original table provides descriptive statistics for four individual earnings management measures and the aggregate earnings management score across various countries, highlighting significant differences in EM practices between Continental Europe, Asia, and Anglo-American countries.

The project uses data from the Worldscope Database through Wharton Research Data Services (WRDS), focusing on the fiscal years 1990 to 1999 and covering multiple countries. The replication aims to follow the research design by Leuz, Nanda, and Wysocki (2003) as closely as possible with the available data. It employs four individual earnings management measures: earnings smoothing using accruals (EM1), the correlation between changes in accruals and cash flows (EM2), the magnitude of accruals (EM3), and the ratio of small profits to small losses (EM4). These measures are combined to create an aggregate earnings management score, providing a comprehensive overview of EM practices.

The analysis includes pulling and filtering the relevant financial data, identifying relevant companies and countries based on the authors’ requirements, calculating the EM measures for each country, and examining the relationship between each country’s aggregate earnings management score and its ranking based on explicit assumptions made whenever the paper by Leuz, Nanda, and Wysocki (2003) is not clear on how to proceed. The complete computation code for EM measures is available in `code/python/do_analysis.py` for detailed review if necessary. Code snippets will be presented only in exceptional cases to highlight specific points.

The replicated table is shown below, followed by the research design assumptions in Section 3, documentation of the replication steps in Section 4, a detailed comparison in Section 5, and

concluding remarks in Section 6.

3 Research Design Choices and Assumptions

The aim of Assignment III is to replicate a specific empirical table (Table 2 Panel A) from the seminal paper by Leuz, Nanda, and Wysocki (2003). This table involves calculating the EM measures for firms across various countries over a defined period and examining the relationship between these measures and investor protection. The replication process includes data loading, preparation, cleaning, and normalization, followed by the application of statistical methods to compute and interpret financial metrics. For Assignment III, I pulled data from the Worldscope database through WRDS and used the Python programming language to carry out the empirical analysis. Visual Studio Code was used as the Integrated Development Environment (IDE) for writing, debugging, and optimizing the Python code.

The replication is based on data pulled from the Worldscope database, specifically from the `wrds_ws_company` and `wrds_ws_funda` tables, which were merged for the analysis. The first table provides company profile information, including items such as ISIN, Worldscope Identifiers, company name, and the country where the company is domiciled Wharton Research Data Services (2024a). The latter table contains Fundamentals Annual data at the company-year level, including items such total assets, net income, and other relevant financial variables Wharton Research Data Services (2024b).

Following Leuz, Nanda, and Wysocki (2003), I focus the analysis on companies across various countries, ensuring that the data accurately reflects the fiscal years 1990 to 1999 as specified in the original study. The replication aims to mirror the research design as closely as possible with the available data.

In addition, I impose the following assumptions to ensure clarity and consistency where the paper by Leuz, Nanda, and Wysocki (2003) does not provide explicit guidance:

1. The original paper references the November 2000 version of the Worldscope Database. However, the data used for this analysis represents the latest available version, updated in July 2024, with quarterly frequency updates (Wharton Research Data Services 2024c). Due to potential adjustments and updates made to the database since November 2000, there may be

differences between the databases that could affect the results. For example, companies may restate financials after the original reporting period, so that these restatements are reflected in the later database version rather than the historical one. Moreover, the data vendor Refinitiv regularly updates its databases to correct errors and add new information, which may be included in the later data but not in the November 2000 snapshot.

2. The original paper outlines key terms that will be used in this project to ensure consistency and accuracy in the replication. Leuz, Nanda, and Wysocki (2003) define earnings management as the manipulation of a firm’s reported economic performance by insiders to deceive certain stakeholders or to affect contractual results. Authors describe investor protection as a key institutional factor that limits insiders’ acquisition of private control benefits, thereby reducing their incentives to manage accounting earnings by ensuring strong and well-enforced rights for outside investors. Finally, private control benefits are the benefits that insiders can gain from controlling a firm, which can include financial gains or other advantages that are not shared with other stakeholders Leuz, Nanda, and Wysocki (2003).
3. While pulling the data for analysis, I encountered negative values for some key financial metrics such as operating income (`item1250`), or net income before preferred dividends (`item1651`). The paper by Leuz, Nanda, and Wysocki (2003) does not explicitly specify how to handle negative values in key financial metrics. For the purpose of this replication study, I will include negative values in the analysis. Including these values ensures that the analysis captures the full spectrum of earnings management activities across different countries.
4. Another potential source of discrepancies between the original and replicated tables may be the choice of variables pulled from Worldscope. For example, in the `wrds_ws_funda` table, both `item1151` and `item4051` are named “DEPRECIATION, DEPLETION AND AMORTIZATION” Wharton Research Data Services (2024b). I chose `item1151` from the Income Statement rather than `item4051` from the Cash Flow Statement, based on the Excel Industrials Template by Wharton Research Data Services (2024d). Since the authors do not specify the choice of variables used from the database, this could cause differences in the results.
5. The EM measures are based on scaled variables (e.g., operating cash flow scaled by lagged total assets). As such, the currency of the relevant data items should not affect the results as long

as the same currency is used consistently for both the numerator and the denominator. This approach ensures comparability across different countries, regardless of their local currencies. Additionally, according to a document by (Thomson Financial 2007, 20), all Worldscope data is consistently reported in the local currency of each firm’s country of domicile, eliminating the need for currency conversions in this project.

6.

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7. It is assumed that Penman (2013) restricted the possible P/B values to a range of 0 to 7 to exclude outliers. Hence, extreme P/B values that are negative and very high (greater than 7) are excluded to focus the analysis on firms with more stable and reasonable valuations, reducing the impact of outliers.

By following the steps provided in Section 4 and adhering to the assumptions made, I successfully replicated the analysis and produced the required table. A thorough step-by-step approach, with each step clearly documented, helped to understand and verify the outputs.

4 Replication Steps

4.1 Step 1: Pulling the Data and Managing the Databases

In contrast to Assignment I, where the data was provided externally, Assignment III involves additionally pulling data directly from the Worldscope database, merging relevant tables, and preparing the data for further analysis from raw data to final output.

To ensure the integrity of the data, I filtered out rows with empty `item6105` (Worldscope Permanent ID) values, as this identifier is critical for firm/year level filtering in the data preparation step. In total, 125 observations from the dynamic data and 10,306 observations from the static data were removed. To compile the dataset, the dynamic and static datasets were merged on the `item6105` identifier, representing the unique Worldscope Permanent ID. WRDS advises using this identifier consistently within Worldscope data since it remains stable over time (Wharton Research Data Services 2024e). An inner join was used for this merge, because this approach ensures that only the complete and consistent data from both tables is retained.

Moreover, an additional filter is applied to retain only company rows. This is achieved by selecting rows where the `item6100` field equals ‘C’, indicating that the Worldscope Identifier represents a company. This step ensures that the analysis includes only company data, excluding averages, exchange rates, securities, or stock indices, as indicated by (Wharton Research Data Services 2024e).

As required by Leuz, Nanda, and Wysocki (2003), financial institutions are removed from the analysis based on their SIC codes. This is done by filtering out rows where the `item7021` identifier, representing the SIC code, falls within the range of 6000 to 6999. Hence, the dataset focuses only on non-financial companies, aligning with the methodology of the original paper.

Finally, additional filtering ensures that only data from the 31 countries, as given in the paper, is included. These filtering steps were applied to reduce the dataset size and improve the workflow.

Notably, the configuration file utilizes additional refinement as proposed by (Wharton Research Data Services 2024e). Using `A` (Annual) in `freq` variable ensures that the data represents the financial information reported on an annual basis, which is consistent with the paper’s methodology. This excludes data reported on a current, daily, or quarterly basis.

After retaining only relevant company data, filtering out financial institutions, and focusing on specified countries, the processed data was then saved to a CSV file at the path `data/pulled` specified in the configuration file `config/pull_data_cfg`.

4.2 Step 2: Data Preparation

In order to verify the pulled data, I checked the dataset for duplicate firm-year observations based on the combination of the Worldscope Permanent ID (`item6105`) and the fiscal year (`year_`) and confirmed that there were no duplicates present, ensuring the accuracy of the data for further analysis. As the original study does not specify the net income measure, `item1651` (Net Income before Preferred Dividends) was used as the variable for net income. This choice aligns with the final net income figure reported in the income statement, based on the Excel Industrials Template by Wharton Research Data Services (2024d).

To prepare the data sample in line with the methodology outlined in the paper, it is essential to follow the requirements, as instructed by Leuz, Nanda, and Wysocki (2003). Firstly,

countries with sufficient firm-year observations must be filtered. Each country should have at least 300 firm-year observations for certain key accounting variables, including total assets, sales, net income, and operating income. In this step, no countries were eliminated as all countries met the requirement, which aligns with the paper’s overview of countries.

In the second filtration step firms with adequate consecutive data must be identified. Each firm must have income statement and balance sheet information for at least three consecutive years, with all key accounting variables mentioned above present. If a firm had at least three consecutive years of complete data at any point, all its data entries were retained in the final dataset. Therefore, only those countries and firms that meet these criteria for all specified variables are retained in the dataset.

During the preparation step, 8,265 firms and 20,521 firm-year observations (all due to second filtration step) were dropped, resulting in a final dataset with 18,040 firms and 123,469 firm-year observations. The differences in the numbers between the prepared dataset and the figures mentioned in the paper (70,955 firm-year observations and 8,616 non-financial firms) could be due to the assumptions such as variations in initial datasets, data updates, and filtering criteria listed in Section 3. However, the original study might have included additional data cleaning steps not explicitly mentioned, such as handling outliers, specific industry exclusions, or other criteria, which could affect the final counts.

Now that it is clear that the number of observations for this project is significantly higher than that in Leuz, Nanda, and Wysocki (2003) study, in order to illustrate the differences and compare the firm-year observations, Table 1 from Leuz, Nanda, and Wysocki (2003) was partially replicated (only columns on countries and firm/year observations) to distinguish specific discrepancies that could arise for certain countries.

The results in Table 2 show a higher number of firm-year observations for almost all countries compared to the paper by Leuz, Nanda, and Wysocki (2003), likely due to database updates leading to a more comprehensive dataset. The trend in the number of firm-year observations across countries is consistent with the paper, with larger capital markets like Japan, the United Kingdom, and the United States having the highest numbers. The distribution of observations in my dataset shows higher mean and median values compared to the paper by Leuz, Nanda, and Wysocki (2003), indicating a greater overall number of firm-year observations, while the minimum

values are relatively close, suggesting that the overall distribution of observations across countries remains broadly similar.

However, there are significant discrepancies, particularly for the United States, which has 41,585 observations compared to 3,792 in the original study, possibly due to more comprehensive data or changes in dataset scope. Leuz, Nanda, and Wysocki (2003) focus only on S&P 500 companies for the U.S., while this analysis uses a more comprehensive dataset from the Worldscope database, which includes detailed financial statement data and profile data on public companies globally. This broader scope results in a higher number of firm-year observations for the United States. Despite the differences in absolute numbers, the relative trends across countries align with the paper.

[Table 1 about here.]

4.3 Step 3: Analysis Implementation and Table Reproduction

In this replication step, implement the calculations for the EM measures as described in the methodology of the paper, ensuring that all statistical methods and groupings are accurately replicated.

5 Results

##Cross-check your results with the original table to ensure accuracy. Compare your results with the results in the paper. If you notice differences, discuss where they may originate. Make sure to be as specific as possible. This could involve looking at the data selection, calculation methods, or any assumptions that might differ from the original; changes in the data over time, different interpretations of the methodology, or limitations in the data sources used. Consider whether the differences are significant and what they might mean for the conclusions drawn in the paper.

The replicated table shows some similarities with the original table by Leuz, Nanda, and Wysocki (2003) in that . These findings are in line with valuation theory that .

However, the patterns are less clear in the replicated table (in particular), which stands in contrast to Leuz, Nanda, and Wysocki (2003).

6 Conclusion

##gpt: Summarize the key findings and their significance. take results and insert them here

This project demonstrates the effectiveness of using an open science and collaborative workflow for analyzing earnings management measures across various countries. By following a step-by-step approach and using the TRR 266 Template for Reproducible Empirical Accounting Research, I was able to replicate an empirical table from Leuz, Nanda, and Wysocki (2003) and provide insights into the trends of earnings management practices, which vary significantly across countries, similar to Leuz, Nanda, and Wysocki (2003).

The study by Leuz, Nanda, and Wysocki (2003) documents systematic differences in the level of earnings management across 31 countries. It suggests that insiders use EM to conceal firm performance and protect their private control benefits and that stronger investor protection reduces earnings management by limiting insiders' ability to gain private benefits. By conducting a descriptive cluster analysis after descriptive statistics that was replicated in this project, the paper identifies groupings of countries with similar institutional characteristics and demonstrates that earnings management varies systematically across these institutional clusters.

The analysis revealed that

The replication yields mixed results. While

This final assignment has required the comprehensive application of all skills learned and feedback received from previous assignments, making it a more complex project workflow. In the future, this repository can be cloned or forked (if made public) to kickstart further projects on earnings management measures analysis. Thanks for reading!

References

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index	Country	# Firm-years
1	AUSTRALIA	2099
2	AUSTRIA	686
3	BELGIUM	932
4	CANADA	4215
5	DENMARK	1326
6	FINLAND	1058
7	FRANCE	5515
8	GERMANY	5307
9	GREECE	1034
10	HONG KONG	1862
11	INDIA	2068
12	INDONESIA	978
13	IRELAND	625
14	ITALY	1591
15	JAPAN	20528
16	KOREA (SOUTH)	2038
17	MALAYSIA	2283
18	NETHERLANDS	1782
19	NORWAY	1210
20	PAKISTAN	598
21	PHILIPPINES	574
22	PORTUGAL	577
23	SINGAPORE	1291
24	SOUTH AFRICA	1334
25	SPAIN	1221
26	SWEDEN	1766
27	SWITZERLAND	1553
28	TAIWAN	1259
29	THAILAND	1664
30	UNITED KINGDOM	12910
31	UNITED STATES	41585
32	Mean	3983
33	Median	1553
34	Min	574
35	Max	41585

Table 1: Replicated table - Number of Firm-Year Observations per Country