

# Factoring and performance: evidence from Portuguese firms

Managerial  
Finance

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## Abstract

**Purpose** – This study examines within-firm associations between factoring use and firms' financial ratios, with the aim of understanding its accounting implications for corporate financial statements.

**Design/methodology/approach** – Using a unique, large panel dataset of Portuguese firms (2009–2022) comprising 926,593 firm-year observations, we estimate fixed-effects models to document how the use of factoring is associated with changes in liquidity, solvency, and profitability indicators. Firm-level controls and year fixed effects are included to account for observable and unobservable heterogeneity.

**Findings** – The results suggest that factoring use is consistently associated with higher liquidity and solvency ratios, alongside lower net profitability (ROA and ROE), but higher operating return on sales. These patterns point to a systematic tension between improvements in balance-sheet indicators and costs reflected in the income statement. This tension helps explain the continued use of factoring despite its adverse association with net profitability.

**Research limitations/implications** – The analysis is descriptive and does not identify causal effects, as firms self-select into factoring. The relatively low share of firms using factoring may also limit generalizability. Future research could explore identification strategies and sectoral heterogeneity.

**Practical implications** – The findings suggest that factoring is associated with improvements in financial statement presentation, particularly in liquidity and solvency, but also involves costs that affect profitability. This trade-off is relevant for managers evaluating short-term financing strategies. Policymakers may also consider promoting factoring as a viable financing channel for SMEs facing credit constraints.

**Originality/value** – This study contributes by providing large-scale evidence on the accounting consequences of factoring, documenting and interpreting the trade-off between balance-sheet improvements and income-statement costs rather than identifying causal effects.

**Keywords** Factoring, Short-term financing, Treasury management, Corporate finance, Liquidity, SMEs

**Paper type** Research article

## 1. Introduction

Access to short-term financing is a central concern in corporate finance, particularly for firms facing liquidity constraints and limited access to traditional credit markets. Among the available instruments, factoring has gained increasing relevance as a mechanism that allows firms to convert accounts receivable into immediate cash, thereby supporting working capital management and operational continuity.

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Despite its growing use in practice, empirical evidence on the financial implications of factoring at the firm level remains limited, particularly in large-scale settings. Existing studies have predominantly relied on survey data or qualitative approaches, focusing on firms' motivations for adopting factoring or on institutional determinants of its use. As a result, less is known about how factoring is systematically associated with firms' financial statements across multiple dimensions.

This paper addresses this gap by providing a large-scale descriptive analysis of within-firm associations between factoring use and financial ratios in Portuguese firms over the period 2009–2022. Using a comprehensive panel dataset with over 926,000 firm-year observations, we document how factoring is associated with changes in liquidity, solvency, profitability, and balance-sheet structure.

Rather than attempting to identify causal effects, the paper focuses on mapping empirical regularities and interpreting their accounting implications. In particular, we organize the analysis around a central tension that emerges consistently in the data: while factoring is associated with improvements in balance-sheet indicators—such as liquidity and solvency—it is also associated with lower net profitability due to its cost structure. At the same time, some operating indicators, such as return on sales, improve, suggesting gains in cash flow management and operational efficiency.

This tension between balance-sheet improvements and income-statement costs provides a coherent interpretive framework for understanding the role of factoring in corporate finance. It helps explain why firms may continue to use factoring despite its adverse association with profitability measures: the benefits in terms of liquidity, financial stability, and financial statement presentation may outweigh the costs reflected in earnings.

The contribution of this study is therefore twofold. First, it provides one of the largest firm-level analyses of factoring in a European context, documenting consistent patterns across a wide set of financial indicators. Second, it offers a structured interpretation of these patterns by highlighting the trade-off between accounting improvements and cost implications, thereby reframing factoring not as a uniformly beneficial or detrimental financing tool, but as one characterized by a systematic internal tension.

Portugal provides an interesting setting for this analysis, given its high prevalence of SMEs, structural constraints in access to credit, and exposure to significant macroeconomic disruptions during the sample period, including the European debt crisis and the COVID-19 pandemic. These features make it particularly relevant to examine how firms use alternative financing instruments, such as factoring, and how this use is reflected in their financial statements.

The remainder of the paper is structured as follows. [Section 2](#) reviews the relevant literature and outlines the empirical expectations. [Section 3](#) describes the data. [Section 4](#) presents the methodology. [Section 5](#) reports the results. [Section 6](#) discusses the findings and concludes.

## 2. Literature review and empirical expectations

Capital structure decisions are central to corporate finance, influencing firms' financial sustainability, cost of capital, and ability to compete in dynamic markets ([Degryse et al., 2010](#)). Traditional theories, such as [Modigliani and Miller \(1958\)](#), highlight the irrelevance of capital structure under perfect markets, while subsequent developments, including the trade-off theory ([Esghaier, 2023](#)) and the pecking order theory ([Myers and Majluf, 1984](#)), emphasize the role of financing costs, information asymmetries, and firm-specific constraints. Life-cycle perspectives further suggest that financing choices evolve over time depending on firm characteristics and access to capital ([Berger and Udell, 1998](#)).

In this context, factoring can be viewed as a form of short-term external financing that enables firms to convert accounts receivable into immediate liquidity. Unlike traditional bank loans, factoring is directly linked to firms' operating activities and may involve transferring credit risk to the factor ([Klapper 2005](#)). This makes it particularly relevant for firms facing

credit constraints, especially SMEs (Soufani, 2002). Empirical research on capital structure determinants has consistently identified profitability, size, liquidity, and firm age as key drivers of financing decisions (Boateng *et al.*, 2022; Neves *et al.*, 2020; Rani *et al.*, 2020; Kumar *et al.*, 2017). Empirical studies on factoring suggest that its use is associated with firm size, financing constraints, and institutional environments (Soufani, 2000; Summers and Wilson, 2000; Mol-Gómez-Vázquez *et al.*, 2018). More recent evidence also highlights its role during periods of financial stress, such as the COVID-19 pandemic, when it can support liquidity amid tightening credit conditions (Park *et al.*, 2020).

Despite these contributions, the empirical literature on factoring remains relatively limited, particularly in large-scale firm-level settings. Existing studies have often relied on survey-based or qualitative approaches, with less emphasis on systematically documenting how factoring is associated with firms' financial statements across multiple dimensions. This study addresses this gap by providing a descriptive analysis of within-firm associations between factoring use and financial ratios using a large panel dataset of Portuguese firms.

Rather than testing causal relationships, the analysis focuses on identifying consistent empirical patterns and interpreting their accounting implications. In particular, we organize the discussion around a central tension that emerges from both theory and prior evidence: while factoring is associated with improvements in liquidity and solvency, it also involves costs that may be reflected in lower profitability (Kozarevic and Hodzic, 2016; Soni, 2024; Hashim *et al.*, 2023). This tension between balance-sheet improvements and income-statement costs provides a useful framework for interpreting the role of factoring in corporate finance.

To structure the empirical analysis, we examine expected associations between factoring use and four dimensions of financial reporting: financial structure, operating indicators, profitability, and equilibrium indicators.

With respect to financial structure, factoring may be associated with stronger balance sheet indicators, such as financial autonomy and solvency. Since factoring provides liquidity without necessarily increasing traditional liabilities, firms that use it may exhibit improved financial ratios (Soufani, 2002; Klapper 2005).

*H1.* Factoring use is expected to be positively associated with financial structure indicators (financial autonomy and solvency).

Regarding operating indicators, factoring accelerates the conversion of receivables into cash, thereby enhancing firms' ability to meet short-term obligations. Prior studies document positive associations between factoring and liquidity measures (Kozarevic and Hodzic, 2016; Soni, 2024).

*H2.* Factoring use is expected to be positively associated with operating indicators (general and reduced liquidity).

In terms of profitability, the cost structure of factoring suggests a different pattern. While factoring may support cash flow management and operational efficiency, its associated fees are expected to be reflected in lower net profitability, particularly in measures such as ROA and ROE (Hashim *et al.*, 2023). At the same time, improved cash flow timing may be associated with better operating performance, as reflected in return on sales.

*H3.* Factoring use is expected to be negatively associated with profitability indicators (ROA and ROE) and positively associated with operating return on sales (ROS).

Finally, factoring may have distinct implications for equilibrium indicators. Although it may be associated with lower reported indebtedness, as it does not always appear as traditional debt, it still reflects reliance on external financing and may be linked to financing-related costs captured in income-based measures (Summers and Wilson, 2000; Soni, 2024).

*H4.* Factoring use is expected to be negatively associated with indebtedness (LEV).

Overall, these expectations reflect a broader pattern in which improvements in balance-sheet indicators coexist with costs reflected in the income statement. The empirical analysis that follows documents these associations and interprets their implications in a large-scale firm-level setting.

3. Sample

The *Banco de Portugal* (Portuguese Central Bank) Microdata Research Laboratory provided a database to test the defined research hypotheses. This dataset comprises variables of different natures at the company level (926,593 observations from Portuguese companies) and is organized over the period 2009 to 2022. As this is the data source, all treatment, analysis, and estimates carried out had to be performed directly on the platform provided by the Bank of Portugal. The Stata software was used for data analysis. Although we recognize the importance of including detailed information about the total number of distinct firms included in the sample, and the distribution of firms across different sectors, to ensure transparency regarding data integrity, it was not possible to identify the companies, nor even the sector of activity, as the rules of the Banco of Portugal value and demand data anonymity issues for researchers to use this data.

4. Methodology and empirical specification

We use a panel data econometric approach to empirically test the relationship between factoring and firms’ financial performance. Our dataset consists of annual firm-level observations, making panel data techniques suitable for controlling unobserved heterogeneity and capturing the evolution of firms over time.

Given our hypotheses (H1–H4), which examine how factoring affects distinct sets of financial ratios, we estimate a series of models where each financial ratio is used as a dependent variable, and the key explanatory variable is a dummy indicator for whether the firm used factoring services in a given year (fact).

We estimate fixed-effects (FE) and random-effects (RE) models and use the Hausman test to select the most consistent specification. Consistent with prior studies (Soufani, 2000; Kozarevic and Hodzic, 2016), the FE model is preferred because it controls for firm-specific time-invariant characteristics, such as managerial style or corporate culture, that may influence financing choices and performance.

The baseline model specification is:

$$y_{it} = \beta_0 + \beta_1 fact_{it} + \beta_2 controls_{it} + u_i + \epsilon_{it} \tag{1}$$

Where  $Y_{it}$  represents the financial ratio of firm  $i$  in year  $t$ ;  $fact_{it}$  is a dummy equal to 1 if firm  $i$  used factoring in year  $t$ , and 0 otherwise;  $controls_{it}$  is a vector of firm-level control variables;  $\mu_i$  captures firm-specific fixed effects, and  $\epsilon_{it}$  is the error term.

The coefficient of interest,  $\beta_1$ , measures the effect of factoring on the outcome variable and directly tests H1–H4.

To capture the multi-dimensional effects of factoring, we group financial ratios into four categories, corresponding to our hypotheses (See Table 1). These ratios are standard measures of corporate financial performance and are commonly used in research on capital structure and liquidity (Rani et al., 2020).

Under the context of the raised hypothesis (H1:), if factoring is associated with higher solvency and autonomy without directly increasing liabilities, we expect positive coefficients for FA and SOLV; (H2:), since factoring generates immediate liquidity, we expect positive coefficients for GL and RL; (H3:), because factoring involves high costs, we expect adverse effects on ROA and ROE, but a positive association with ROS due to improved sales conversion into operating profit. Finally (H4:), factoring may reduce reported indebtedness (as indicated by a negative coefficient for LEV).

**Table 1.** Dependent variables

| Hypothesis | Dimension                | Variable                        | Specification                                        |
|------------|--------------------------|---------------------------------|------------------------------------------------------|
| H1         | Financial Structure      | FA (Financial Autonomy)         | Equity / Total Assets                                |
|            |                          | SOLV (Solvency)                 | Equity / Total Liabilities                           |
| H2         | Operating Indicators     | GL (General Liquidity)          | Current Assets / Current Liabilities                 |
|            |                          | RL (Reduced Liquidity)          | (Current Assets – Inventories) / Current Liabilities |
| H3         | Profitability Indicators | ROA (Return on Assets)          | Net Income / Total Assets                            |
|            |                          | ROE (Return on Equity)          | Net Income / Equity                                  |
|            |                          | ROS (Operating Return on Sales) | Operating Income / Turnover                          |
| H4         | Equilibrium Indicator    | LEV (Indebtedness)              | Total Liabilities / Total Assets                     |

**Source(s):** Prepared by the authors

The primary independent variable, Factoring (*fact*), is a binary indicator equal to 1 if a firm used factoring services in a given year and 0 otherwise. This variable directly captures firms' reliance on factoring as a financing strategy. By linking this variable to the various dependent ratios, we test whether factoring substitutes for traditional debt or creates distinct balance sheet and performance effects.

To isolate the effect of factoring, we include firm-level controls identified in prior literature on capital structure and financing decisions (Soufani, 2000; Rani *et al.*, 2020): (1) Firm size (*nempl*): Measured by the number of employees. Larger firms often have more diversified operations and better access to financing, which may affect both factoring use and financial performance; (2) Firm age (*age*): Number of years since incorporation. Older firms may exhibit greater financial stability and relationships with creditors; (3) Legal form (*jurnat*): A categorical variable capturing the firm's legal structure, which can influence its financing choices and access to factoring.

These variables help reduce omitted-variable bias by controlling for firm-specific characteristics that are correlated with factoring decisions and financial outcomes.

We estimate separate regressions for each dependent variable. H1 is tested by regressing FA and SOLV on the use of factoring, controlling for other variables. H2 is tested using GL and RL as dependent variables. H3 is tested using ROA, ROE, and ROS. H4 is tested using the leverage ratio (LEV), which captures the extent to which firms rely on external financing as recorded on the balance sheet.

The statistical significance and sign of  $\beta_1$  provide direct evidence for or against each hypothesis. Standard errors are clustered at the firm level to correct for potential heteroskedasticity and autocorrelation. Year fixed effects are included to capture macroeconomic shocks such as the European debt crisis and the COVID-19 pandemic, which may influence both factoring use and financial performance.

By structuring the empirical design around these hypotheses, the methodology directly addresses the study's main contribution: providing large-scale, firm-level evidence on the trade-offs of factoring. The use of fixed-effects models mitigates concerns about unobserved heterogeneity. At the same time, categorizing dependent variables allows for a nuanced understanding of how factoring simultaneously affects liquidity, solvency, profitability, and leverage. This approach offers a more comprehensive and theoretically grounded perspective than prior studies, which often relied on surveys or limited samples.

## 5. Results

Analyzing the database used, we found that the *dummy* variable *fact* registers 4,256,804 observations, of which 97.34% of companies did not use factoring and 2.66% did over the

period under study. Therefore, the percentage of companies using factoring remains very low, a trend also observed in other studies (Klapper 2005; Kouvelis and Xu, 2021), regardless of the sector of economic activity in which they are engaged, making this study even more relevant. We recognize the potential imbalance between the treated (firms that use factoring) and the untreated (firms that do not use factoring). To address this imbalance, we have employed a longitudinal analysis using fixed-effects models, which allow us to control for unobserved, time-invariant firm characteristics. This approach helps mitigate the impact of individual firm differences that could otherwise confound our estimates. By focusing on within-firm variations over time, the fixed-effects model enables us to isolate the effect of factoring on financial performance while accounting for factors that may influence both the decision to use factoring and the outcomes. This methodological choice enhances the robustness of our findings by reducing bias stemming from unobserved heterogeneity across firms.

Descriptive statistics are fundamental for understanding the distribution of variables and verifying the appropriateness of the data for the econometric methods applied (Table 2). Given the presence of outliers, all ratios were winsorized at levels above (below) the 90th percentile (10th percentile). In our analysis, we chose to winsorize the data at the 10th and 90th percentiles to mitigate the influence of extreme outliers that could skew our results. This approach allows us to retain a substantial portion of the data while reducing the potential distortion caused by extreme values, which can obscure the underlying patterns and relationships we aim to investigate. By limiting the effect of these outliers, we enhance the robustness of our statistical estimates and provide a clearer picture of the central tendencies within our dataset, which, with the traditional winsorization values (1%–99%; 5%–95%), was not possible to achieve.

Table 2 presents information on the sample’s observations, indicating that the financial ratios exhibit variability between the observed companies, reflecting different cash, liquidity, and profitability profiles.

Subsequently, the Hausman test was performed to determine which model best fits the intended analysis (Table 3). This led to the conclusion that the fixed-effects model would be preferable to the random-effects model (Prob > chi2 = 0.0000).

Financial autonomy is a measure of a company’s ability to finance its assets with its own capital. It displays the percentage of assets funded by equity and is an indicator of a company’s financial strength. Analyzing Table 3, regarding the *fact* variable, we found a positive coefficient, reflecting that, on average, the use of factoring is associated with an increase of approximately 0.13% points in the financial autonomy ratio of companies. At the 1% significance level, the coefficient is statistically significant, indicating a relationship between the use of this financial operation and variations in companies’ financial autonomy.

Complementing these results, the model was applied to the solvency indicator. This allows us to understand what percentage of total liabilities a company can settle with its equity. Thus,

Table 2. Descriptive statistics

| Variable | N         | Average | SD   | CV    | Min   | Max   |
|----------|-----------|---------|------|-------|-------|-------|
| FA       | 6.459.434 | 0.16    | 0.15 | 0.97  | 0     | 0.41  |
| SOLV     | 6.459.434 | 0.42    | 0.42 | 1.00  | 0     | 1     |
| GL       | 6.078.761 | 3.50    | 3.90 | 1.11  | 1     | 13.17 |
| RL       | 6.678.761 | 2.82    | 3.25 | 1.15  | 0.46  | 10.84 |
| ROA      | 6.459.434 | −0.02   | 0.16 | −9.61 | −0.36 | 0.20  |
| ROE      | 4.494.704 | 0.14    | 0.46 | 3.33  | −0.69 | 1     |
| ROS      | 5.230.484 | −0.02   | 0.21 | −9.50 | −0.50 | 0.25  |
| LEV      | 6.459.434 | 0.63    | 0.33 | 0.53  | 0.07  | 1     |

Source(s): Prepared by the authors. N – sample size. Average – Mean. SD – Standard deviation. CV – Coefficient of variation. Min – Minimum. Max – Maximum

**Table 3.** FA and SOLV–Fixed and random effects models

| Variable | FA<br>Fixed effects    | Random effects          | SOLV<br>Fixed effects   | Random effects          |
|----------|------------------------|-------------------------|-------------------------|-------------------------|
| fact     | 0.00129***<br>(2.88)   | 0.00454***<br>(10.42)   | 0.01185***<br>(11.4)    | 0.01125***<br>(11.06)   |
| age      |                        | −0.00111***<br>(−74.42) |                         | −0.00405***<br>(−99.24) |
| jurnat   | −0.00001***<br>(−9.90) | −0.00001***<br>(−25.13) | −0.00005***<br>(−14.75) | −0.00004***<br>(−24.00) |
| nempl    | 0.00002***<br>(12.91)  | −0.00002***<br>(13.94)  | 0.00001***<br>(2.73)    | −0.00001***<br>(3.11)   |

**Note(s):** \*, \*\*, \*\*\* statistically significant coefficients for 10%, 5% and 1%, respectively. Fixed Effects– $R^2 = 0.0021$ ; Random Effects– $R^2 = 0.0116$ ; Hausman Test: Prob >  $\chi^2 = 0.0000$ ; for FA. Fixed Effects– $R^2 = 0.0025$ ; Random Effects– $R^2 = 0.0186$ ; Hausman Test: Prob >  $\chi^2 = 0.0000$ ; for SOLV

the higher the ratio, the greater the likelihood that creditors will recover their debts, and the greater the company's ability to meet its obligations on time. According to the results presented in Table 3, the dummy variable coefficient indicates that factoring is associated with an increase of approximately 1.19% points in the solvency ratio of the companies under study (statistically significant at the 1% level).

Therefore, we can say that financial autonomy and solvency are positively associated with factoring (H1). This may be because, although it is an external financing option, the operation does not appear to have the same impact on companies' liabilities as traditional bank loans. In other words, it potentially alleviates the substantial impact that bank loans have on liabilities, ensuring a steady, predictable cash flow that allows companies to increase their solvency capacity for commitments. This finding is consistent with Soufani's (2002) study, which found that companies with credit restrictions and a significant bank loan component in their liabilities are more likely to resort to credit via factoring, seeking alternative financing options to meet their obligations over time.

The findings highlight several important contributions, novel insights, and implications regarding the relationship between financial autonomy, solvency, and factoring. Firstly, the research provides empirical evidence supporting the hypothesis that financial autonomy and solvency are positively associated with factoring. This contribution is significant as it is consistent with the fact that factoring serves as an effective financing alternative for firms, particularly in enhancing their financial health, in a country where most of its entrepreneurial tissue is composed of SMEs. Moreover, the study emphasizes the distinct nature of factoring compared to traditional bank loans. It reveals that factoring may not affect firms' liabilities in the same way as bank loans do, suggesting it can alleviate the substantial burden associated with traditional debt. This novel perspective challenges the conventional view of external financing, positioning factoring as a viable option for firms seeking to manage their debt levels more effectively. However, it is still underused by Portuguese SMEs (only 2.66% of firm-year observations involve factoring). Additionally, the research highlights that factoring may reflect consistent, predictable cash flow, enabling companies to enhance their solvency. This insight introduces a new dimension to understanding corporate financing strategies, highlighting how firms can leverage factoring to enhance their financial stability. From a practical standpoint, these findings offer valuable insights for managers and financial decision-makers. Understanding the positive association between factoring and financial autonomy can guide firms in making informed financing decisions, particularly for those facing credit restrictions or significant bank loan components in their liabilities. The study suggests that such firms should consider factoring as a strategic financing option to enhance their ability to meet long-term obligations. Furthermore, these findings have significant policy

implications, underscoring the importance of promoting factoring as an alternative financing solution for SMEs, particularly during periods of economic uncertainty. Encouraging the use of factoring can strengthen firms’ financial resilience and contribute to broader economic stability.

Regarding the operating indicators, the Hausman test indicates that the fixed-effects model is preferable to the random-effects model (Prob > chi2 = 0.0000), as shown in Table 4.

General liquidity is a financial indicator that measures a company’s ability to settle its short-term debts, such as amounts payable to suppliers, the government, and financial institutions, using its current assets. Considering the data from Table 4, we found that companies that used factoring had, on average, a general liquidity ratio 18.00% points higher than those that did not. Reduced liquidity is a ratio that results from recognizing that a company’s inventories are generally the least liquid assets of its current assets. Thus, it is an indicator that complements general liquidity, as it considers the inventory item’s influence on an entity’s liquidity. Based on the coefficient obtained for the fact variable, we can say that there is a positive association between factoring and the ratio. Companies that opted for this financial operation had a lower liquidity level, approximately 13.04% points lower than those that did not. Both results were statistically significant at  $p = 0.01$  (Table 4).

Both general liquidity and reduced liquidity have a positive association with the use of factoring (H2), which corroborates the results presented by Kozarevic and Hodzic (2016) and Soni (2024), who, in their studies, found evidence that the use of factoring was related to a significant increase in the liquidity of the companies under analysis. According to the authors, generating immediate liquidity is the principal added value this operation offers members. The results underscore the importance of factoring as a strategic tool for financial management. For companies facing liquidity constraints, this study highlights factoring as an effective option to rapidly generate liquidity, which can be vital for maintaining operations, seizing growth opportunities, or navigating financial challenges. The empirical evidence presented can inform financial decision-makers and corporate managers about the tangible benefits of factoring. Understanding the extent to which factoring can enhance liquidity may prompt firms to reconsider their financing strategies, particularly in industries where cash flow management is critical. From a policy perspective, encouraging the adoption of factoring could improve financial stability for these firms, fostering economic growth and resilience across the broader economy.

Regarding the profitability indicators (Table 5), a Hausman test indicated that the fixed-effects model is preferable to the random-effects model (Prob > chi2 = 0.0000). Asset profitability (ROA) is a ratio that measures a company’s efficiency. Linking net income to

Table 4. GL and RL–Fixed and random effects models

| Variable | GL                      | Random effects          | RL                      | Random effects          |
|----------|-------------------------|-------------------------|-------------------------|-------------------------|
|          | Fixed effects           |                         | Fixed effects           |                         |
| fact     | 0.18004***<br>(15.82)   | 0.04526***<br>(4.14)    | 0.13040***<br>(14.03)   | 0.02800***<br>(3.13)    |
| age      |                         | −0.00229***<br>(−6.89)  |                         | 0.00312***<br>(11.13)   |
| jurnat   | −0.00043***<br>(−10.63) | −0.00002***<br>(−1.42)  | −0.00039***<br>(−11.69) | −0.00001***<br>(−1.03)  |
| nempl    | −0.00035***<br>(−7.45)  | −0.00067***<br>(−19.60) | −0.00034***<br>(−8.74)  | −0.00053***<br>(−18.71) |

**Note(s):** \*, \*\*, \*\*\* statistically significant coefficients for 10%, 5% and 1%, respectively. Fixed Effects– $R^2 = 0.0000$ ; Random Effects– $R^2 = 0.0007$ ; Hausman Test: Prob > chi<sup>2</sup> = 0.0000; for GL. Fixed Effects– $R^2 = 0.0000$ ; Random Effects– $R^2 = 0.0006$ ; Hausman Test: Prob > chi<sup>2</sup> = 0.0000; for RL

**Table 5.** ROA, ROE, and ROS–Fixed and random effects models

| Variable | ROA                      |                         | ROE                    |                        | ROS                     |                        |
|----------|--------------------------|-------------------------|------------------------|------------------------|-------------------------|------------------------|
|          | Fixed effects            | Random effects          | Fixed effects          | Random effects         | Fixed effects           | Random effects         |
| fact     | −0.00049***<br>(11.4)    | 0.00704***<br>(14.23)   | −0.01194***<br>(−7.22) | −0.00567***<br>(−3.66) | 0.00555***<br>(7.99)    | 0.0136***<br>(20.51)   |
| age      |                          | −0.00059***<br>(−40.22) |                        | 0.00441***<br>(99.6)   |                         | −0.00066***<br>(31.42) |
| jurnat   | −3.24e-07***<br>(−14.75) | −0.00002***<br>(−27.39) | 0.00010***<br>(−14.89) | 0.00003***<br>(11.87)  | −7.56e-06***<br>(−2.92) | −0.00002***<br>(23.67) |
| nempl    | 0.00001***<br>(2.73)     | 0.00002***<br>(13.44)   | 9.32e-06***<br>(1.35)  | 0.00001***<br>(3.56)   | 0.00002***<br>(9.69)    | 0.00003***<br>(17.92)  |

**Note(s):** \*, \*\*, \*\*\* statistically significant coefficients for 10%, 5% and 1%, respectively. Fixed Effects– $R^2 = 0.0003$ ; Random Effects– $R^2 = 0.0033$ ; Hausman Test: Prob >  $\chi^2 = 0.0000$ ; for ROA. Fixed Effects– $R^2 = 0.0012$ ; Random Effects– $R^2 = 0.015$ ; 1Hausman Test: Prob >  $\chi^2 = 0.0000$ ; for ROE. Fixed Effects– $R^2 = 0.0020$ ; Random Effects– $R^2 = 0.0037$ ; Hausman Test: Prob >  $\chi^2 = 0.0000$ ; for ROS

assets measures the ability of the company’s assets to generate income. The higher the ROA, the more profits the company’s assets generate. Analyzing [Table 5](#), a negative coefficient for the *dummy* variable is reported, meaning that, on average, factoring is associated with a decrease in the asset’s profitability ratio. Return on equity (ROE) is an indicator that relates the net profit of a company to the amount invested by its partners and shareholders. That is, it allows us to measure the return on invested capital. Consistent with the results for the ROA ratio, shown in [Table 5](#), companies that used factoring had, on average, a 1.19% point lower return on equity than those that did not.

The operating profitability of sales (ROS) is an indicator that estimates the return on operating results from turnover. Thus, the higher this ratio’s value, the greater the company’s capacity to generate results from its activities. According to [Table 5](#), the *fact* variable has a positive coefficient, indicating that the use of factoring is associated with higher operating profitability for the companies under study. It should be noted that all coefficients are statistically significant at the 1% significance level ([Table 5](#)).

In this sense, we highlight the ROA result, which is based on the arguments presented by [Hashim et al. \(2023\)](#), suggesting a negative relationship between this indicator and the use of factoring ([H3](#)). Similarly, there is the ROE ratio. This result may be related to the financial costs associated with external financing. As a result, the net result obtained by the adherents decreases, negatively affecting the indicators that measure this item. On the other hand, we have a ratio of operating profitability to sales, for which a positive association holds. Since it anticipates the amount to be received from sales, it improves cash flows, reflecting greater efficiency in converting sales into operating profit. It should be noted that the results for the control variable, company size (*nempl*), were consistent with the study by [Danial Hashmi et al. \(2020\)](#). As obtained by the authors, there was a positive association between the number of employees in the company’s service and the ROA and ROE ratios, suggesting that an increase in the number of employees and the size of the company is associated with greater productivity and operational efficiency in the use of available assets for profit generation.

The study reveals a nuanced relationship between factoring and different profitability indicators. While ROA and Return on Equity (ROE) exhibit a negative correlation with factoring, the positive association with the operating profitability-to-sales ratio highlights the complexity of factoring’s financial implications. This dual impact provides a fresh perspective on how factoring affects firms’ financial health, suggesting that while it may introduce financial costs, it also enhances cash flow efficiency. The negative relationship between ROA and ROE suggests that firms utilizing factoring may incur higher financial costs associated



with external financing. This finding is crucial for financial decision-makers, as it underscores the importance of carefully weighing the trade-offs of factoring. Firms must weigh the benefits of improved cash flow against the potential negative impact on profitability ratios, particularly in a competitive market like Portugal. The positive association between operating profitability and sales, as well as the factoring factor, suggests that firms can enhance their operational efficiency by using factoring. This insight is particularly relevant for Portuguese firms seeking to optimize cash flow management. By anticipating cash inflows from sales, companies can improve their liquidity and overall operational performance, which is vital for sustaining growth in a challenging economic environment. The consistent results regarding the control variable of company size, particularly the positive association between employee count and ROA and ROE, reinforce the importance of human capital for operational efficiency. This finding suggests that as firms expand and invest in their workforce, they are better equipped to leverage financing options, such as factoring, effectively, resulting in enhanced productivity and profitability. Given the challenges SMEs face in Portugal, the findings advocate policies that support access to factoring as a viable financing option. By promoting awareness and understanding of how factoring can improve cash flow and operational efficiency, policymakers can strengthen SMEs’ financial resilience, ultimately contributing to economic stability and growth in the region.

Regarding the equilibrium indicator (Table 6), the Hausman test indicates that the fixed-effects model is preferred over the random-effects model (Prob > chi2 = 0.0000). We focus on the indebtedness ratio (LEV), which captures the extent to which firms rely on external financing recorded on the balance sheet.

The debt ratio represents the proportion of a company’s assets financed through liabilities and is therefore a key indicator in corporate treasury management. The results reported in Table 6 show a negative coefficient for the fact variable, indicating that factoring use is associated with a lower debt ratio. On average, firms using factoring exhibit a reduction of approximately 2.4% points in this indicator, with the coefficient being statistically significant at the 1% level.

This pattern suggests that factoring is associated with improvements in balance-sheet indicators related to indebtedness. Consistent with Klapper (2005), this finding indicates that factoring is not treated as a traditional loan and does not necessarily increase reported liabilities. As a result, firms using factoring may display lower debt ratios, even though they rely on external financing.

A key finding of this study is that factoring is associated with improvements on the balance sheet of the companies that comprise the sample. As we can see, the ratios associated with balance sheet headings suggested a positive relationship with factoring. A possible explanation for this aspect is based on the non-recourse factoring modality. As previously

Table 6. LEV–Fixed and random effects models

| Variable | LEV<br>Fixed effects    | Random effects         |
|----------|-------------------------|------------------------|
| fact     | –0.02398***<br>(–32.73) | –0.02474***<br>(34.44) |
| age      |                         | 0.00279***<br>(90.28)  |
| jurnat   | 0.00004***<br>(17.49)   | 0.00002***<br>(15.56)  |
| nempl    | –0.00001***<br>(–4.68)  | –0.00001***<br>(–4.53) |

Note(s): \*, \*\*, \*\*\* statistically significant coefficients for 10%, 5% and 1%, respectively. Fixed Effects–R<sup>2</sup> = 0.0028; Random Effects–R<sup>2</sup> = 0.0231; Hausman Test: Prob > chi<sup>2</sup> = 0.0000; for LEV

mentioned, in this typology, the adhering company benefits from managing and collecting credits, while also covering insolvency risks or defaults by debtors. The financial institution assumes the entire risk of uncollectability. That is, there is a credit risk transfer from the adhering company to it. Considering this, it proves to be a strategy that company managers can follow. At certain times, whether to attract new investments, apply for new projects, or obtain new financing, a risk analysis reveals specific conditions and minimum limits for companies' financial ratios. External stakeholders analyze these limits and serve as a basis for decision-making. In this sense, factoring can become a handy financing alternative. In other words, the member assigns all unpaid invoices under the accounts receivable heading to the bank. Subsequently, the bank finances them; therefore, the customer account is settled in the cash and bank deposits section of the accounting records. This change is notable in the balance sheet structure because we have moved from an illiquid to a liquid asset. As a result of this change, companies gain greater capacity to influence external decision-makers, improving their financial ratios and cash availability, which in turn translates into better performance.

To provide an economically meaningful interpretation of the results, we compare the estimated coefficients with the sample means of the dependent variables. Overall, the magnitude of the estimated associations is economically moderate, despite being statistically significant.

For financial structure indicators, the estimated coefficient for financial autonomy corresponds to approximately 0.8% of its sample mean, while the effect on solvency represents around 2.8% of its average value. For liquidity indicators, the associations are somewhat larger, with estimated effects of approximately 5.1% and 4.6% of the sample means for general and reduced liquidity, respectively.

Regarding profitability, the estimated effects suggest a reduction in ROE of approximately 8.5% relative to its sample mean, while the effect on ROA is smaller in relative terms. In contrast, the positive association with operating return on sales appears larger in proportional terms, although this should be interpreted with caution, given the negative sample mean of this variable.

Finally, the estimated association with the debt ratio corresponds to a reduction of approximately 3.8% relative to its average value, indicating a moderate improvement in balance-sheet leverage indicators.

Taken together, these results suggest that factoring is associated with systematic but economically moderate differences in firms' financial ratios, reinforcing the interpretation of the findings as descriptive patterns rather than large causal effects.

## 6. Discussion of results and concluding remarks

The present study sought to investigate the potential of factoring and its importance in companies' treasury management. This complex financial operation is available to companies relating to three entities: the adherent, the debtor, and the factor. Estimates were made to answer the defined research questions, using the fixed effects model, which allowed us to understand the impact of the operation on different financial ratios of the companies. In summary, this study's findings underscore the positive relationship among financial autonomy, solvency, and factoring, and contribute to the literature by emphasizing the distinct advantages of factoring over traditional financing methods. The insights gained from this research offer practical implications for financial decision-making and policy formulation, positioning factoring as a valuable tool for enhancing corporate financial health.

Regarding the structural ratios and addressing the first defined research question, we found evidence of a positive association of factoring (FA and SOLV). This aligns with arguments in the literature (Soufani, 2002; Klapper 2005), which provide guidelines on the potential relief factoring can offer in reducing corporate liabilities compared to traditional bank loans. Thus, this operation is positioned as a valid resource primarily for companies with credit restrictions, whose total liabilities comprise a significant financing component through a bank loan.

As for the second defined research question, which pertains to the operating indicators, the results indicate that factoring is associated with improvements in GL and RL. This aligns with the referenced literature, which highlights that increased liquidity is the principal added value this operation provides to a company's treasury, ensuring it can meet its short-term obligations.

Regarding the third research question, which aimed to understand the impact of factoring on profitability indicators, we found disparate results across the ratios. For the ROA and ROE ratios, a negative relationship was identified, as well as a negative relationship with the use of factoring. As already mentioned, this is an operation that, despite its numerous advantages, has a cost component that companies must consider in their cash management. As such, this factor is reflected in the corporate profit and loss account, negatively affecting companies' net profit and, thus, these ratios. On the other hand, we obtained evidence of a positive association between the ROS ratio and companies' use of factoring operations, which anticipates the amount receivable from sales and provides greater capacity to convert it into operating profit.

Finally, regarding the equilibrium indicator, the results indicate that factoring use is associated with lower levels of reported indebtedness (LEV). This finding is consistent with the interpretation that factoring, unlike traditional debt, does not necessarily increase liabilities recorded on the balance sheet. As such, firms using factoring may exhibit improved balance sheet indicators of indebtedness.

At the same time, these results should be interpreted within the broader context of the trade-off highlighted throughout the paper. Although factoring is associated with more favorable balance-sheet positions, it still represents reliance on external financing and incurs costs reflected in the income statement. This reinforces the idea that factoring involves a tension between improvements in financial statement presentation and their associated cost implications.

In short, this study offers new data from both the academic research perspective and the perspective of companies' financial managers. That is, from the research point of view, it complements the scarce existing literature because, until then, the studies developed are essentially focused on understanding the characteristics of the companies that resort to this financial operation, as well as understanding the relationship between the macroeconomic conditions associated with greater use of factoring and whether it is associated with periods of growth or recession in the economic cycle. From the point of view of the business manager, with this study, they can obtain information not only in terms of the advantages and disadvantages that factoring can offer but also to suggest the disparate impact that it can have on the one hand at the level of the balance sheet headings and on the other hand at the level of the income statement items, allowing them to make more informed decisions about the sources of funding to be used.

A key finding of this study is that factoring is associated with improvements in the balance sheets of companies within the sample. This contribution is novel because it highlights how factoring, particularly the non-recourse modality, can enhance financial ratios related to solvency and liquidity. The emphasis on balance sheet improvement through factoring adds a new dimension to the understanding of how this financing tool can be strategically leveraged by firms. The study introduces the concept of credit risk transfer from the obligor to the financial institution, elucidating how non-recourse factoring mitigates insolvency risk. This insight is significant because it provides a theoretical framework for understanding the operational mechanics of factoring, which have not been extensively detailed in prior literature. The findings suggest that improved financial ratios resulting from factoring can enhance a company's ability to attract new investments and secure financing. This connection between factoring and external stakeholder perceptions offers a novel perspective on how financial strategies can influence investment decisions and overall corporate performance. The transition of accounts receivable from illiquid to liquid assets due to factoring is a critical insight that underscores the operational benefits of this financing method. This transformation is a unique contribution to literature, as it illustrates the practical implications of factoring on a firm's liquidity position and balance sheet structure.

While the findings are based on a sample of Portuguese firms, the implications of this research can potentially extend beyond this context. The principles of factoring, particularly the mechanisms of credit risk transfer and balance sheet enhancement, are relevant to firms operating in various international markets. However, it is essential to consider cultural, regulatory, and economic differences that may influence the effectiveness and adoption of factoring in other regions. Future studies could assess the applicability of these findings across different countries, particularly those with similar economic structures or liquidity and credit risk challenges. By doing so, financial literature can benefit from a broader understanding of factoring's role as a strategic financing tool globally.

Regarding the limitations of this study, we note the small number of companies that used factoring, which may have influenced the results. In other words, given the database used, the low percentage of companies that resorted to the operation, compared with those that did not, is notable. On the other hand, it is essential to note the model's limited explanatory capacity. This may be due to the fact that companies' financial ratios depend on a wide range of factors, both external and internal. Thus, given the objective of the present study to understand the impact of only one factor on financial ratios, this low explanatory capacity can be attributed to this. We also acknowledge the limitations of the low representation of firms using factoring and suggest that future research could explore additional methodologies, such as propensity score matching, to complement our findings and enhance understanding of the effects of factoring across different contexts.

In order to follow up on the theme, it is suggested to carry out the study by sector of economic activity, taking into account that each sector has different levels of liquidity and financing structure, the increase of the analysis period, and the use of other methodologies, such as dynamic models, allowing the capture of lagged effects of variables, such as GMM. The possibility of exploring identification strategies to mitigate endogeneity. This may include instrumental variable (IV) approaches, where we identify valid instruments that influence the use of factoring but do not directly affect financial performance. Additionally, we can employ propensity score matching to compare firms that use factoring with similar firms that do not, thereby improving the robustness of our causal inferences. We also view the suggestion to include interaction terms as a valuable avenue for future research. By excluding these interactions from the current version, we can lay the groundwork for subsequent studies that can build upon the foundational findings of this analysis. Future research could explore these interactions with a larger dataset or a more targeted approach to examine the effects of specific economic events on factoring.

Moreover, we identify and discuss several confounding factors that may influence both the decision to utilize factoring as a financing option and the subsequent financial performance of firms. Understanding these factors is crucial, as they can complicate the interpretation of causality in our analysis. Several key confounding factors may significantly influence the relationship between factoring and financial performance. Firstly, economic conditions, such as macroeconomic factors including recessionary periods or changes in interest rates, can affect a firm's liquidity needs and its decision to engage in factoring. During economic downturns, firms may face increased liquidity constraints, prompting them to seek factoring as a quick financing solution. This external pressure can also impact financial performance metrics, such as profitability and solvency, thereby obscuring the direct effects of factoring. Secondly, firm characteristics, such as size, age, and industry sector, can influence both the propensity to use factoring and the resulting financial outcomes. For instance, smaller firms or those in specific industries may be more likely to rely on factoring due to limited access to traditional financing sources. These characteristics can skew the observed relationships, making it difficult to isolate the effect of factoring alone. Additionally, a firm's pre-existing financial conditions, such as its debt levels and cash flow status, can act as confounding variables. Firms with high debt levels may be more inclined to use factoring to manage their cash flow. However, this approach can simultaneously lead to poorer financial

performance due to their overall financial distress. This dual influence complicates the causal interpretation of the results.

Therefore, the presence of these confounding factors significantly complicates the interpretation of causality in our study. If not adequately accounted for, these variables can lead to biased estimates of the effects of factoring on financial performance. For example, if we observe that firms using factoring exhibit improved liquidity, it may be tempting to conclude that factoring is the cause of this improvement. However, if these firms are also experiencing favorable economic conditions or possess characteristics that inherently lead to better performance, the observed relationship may not accurately reflect the impact of factoring itself. Thus, failure to control these confounding factors may result in overestimating or underestimating the actual effects of factoring, obscuring the fundamental dynamics at play. For now, given the form in which the data was provided, we were unable to include these confounding factors. We leave it for future research opportunities. That is, given the potential confounding influence of these factors, future studies should consider them when examining the relationship between factoring and financial performance. Employing more advanced methodologies, such as structural equation modeling or instrumental variable approaches, can provide clearer insights into causal relationships. These methods enable researchers to more effectively isolate the effects of factoring from other influencing factors, resulting in more robust and reliable findings. By considering these confounding factors and using sophisticated analytical techniques, future research can deepen understanding of the role of factor investing in corporate finance, ultimately providing more explicit guidance for practitioners and policymakers alike.

Another limitation of the current work, which can be solved by including the previously discussed confounding factors, is the low  $R^2$  values. Low  $R^2$  values indicate that a small proportion of the variance in the dependent variable is explained by the independent variables included in the model. This raises important questions about the practical significance of our results. While our analyses may yield statistically significant coefficients, the low explanatory power suggests that other unobserved factors or variables may play a substantial role in influencing financial performance outcomes. Thus, we emphasize that statistical significance does not necessarily imply that the effect size is substantial or relevant in a real-world context. For instance, a statistically significant relationship may not translate into meaningful changes in financial performance if the effect sizes are small. Therefore, we encourage readers to interpret our findings with caution, considering both statistical significance and the context of low  $R^2$  values. Furthermore, we suggest that future research should expand the model by including additional relevant variables to enhance explanatory power. This would allow for a more comprehensive understanding of the factors that influence financial performance and could lead to more meaningful interpretations of the results.

## 7. Limitations

It is important to clarify the scope of this study. The analysis is descriptive in nature and does not identify causal effects of factoring on firms' financial performance. In particular, the results do not address potential self-selection into factoring, nor do they establish whether the observed associations reflect underlying firm characteristics or financing decisions.

Moreover, the findings should not be interpreted as indicating whether factoring is an optimal financing choice. While the evidence highlights a systematic association between balance-sheet improvements and income-statement costs, it does not imply that firms should or should not adopt factoring in specific contexts. Rather, the contribution of this study lies in documenting and interpreting these empirical patterns, providing an accounting-based perspective on the trade-offs associated with factoring.

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