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IAS-19 AND THE CHALLENGES OF COMPARABILITY: MULTINATIONAL PENSION DISCLOSURES ACROSS IFRS AND US GAAP

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ABSTRACT

Defined benefit pension plans remain among the most complex areas of financial reporting under IAS-19. This study examines whether the removal of the 2007 SEC reconciliation requirement created valuation and forecasting challenges for investors because of differences in pension reporting. A panel of multinational firms was analysed using regression and machine learning methods. PensionBridge, a measure of cross-standard pension reporting gaps, was evaluated alongside pension intensity and firm-level controls. Results from baseline and quantile regressions show that larger PensionBridge values are associated with higher forecast errors, greater forecast dispersion, and increased loan-spread sensitivity. A stronger effect is observed for firms with limited analyst coverage and in jurisdictions with weaker enforcement. Machine learning models confirm non-linear patterns and threshold effects. Event-study estimates indicate negative short-term reactions immediately after 2007, while difference-in-differences (DiD) averages show small positive effects across the full post period, highlighting the distinction between timing and average market responses. The evidence suggests that pension reporting differences under IAS-19 created significant market consequences, and investor adjustment was required over time, and monitoring resources were needed after reconciliation tables were removed.

Keywords: Pension accounting, Financial reporting, Defined-benefit plans, Market reactions

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INTRODUCTION

Defined benefit pension plans are complex to account for because their values depend on actuarial assumptions, discount rates and expected returns that vary across firms and countries. Interpretation is therefore made difficult for investors (Barth et al., 2001; Kvaal & Nobes, 2011). Under the US Generally Accepted Accounting Principles (US GAAP), ASC 715 records actuarial gains and losses through gradual amortisation, while IAS-19 reports remeasurements directly in Other Comprehensive Income (OCI). Foreign Private Issuers (FPIs) listed in the United States previously used reconciliation tables to explain adjustments between International Financial Reporting Standards (IFRS) and US GAAP, which improved clarity of pension disclosures.

Although defined-contribution plans have expanded in many markets, legacy defined-benefit obligations are still carried out by many listed companies. These obligations remain financially meaningful through projected benefit obligation, plan assets and actuarial remeasurements. For these firms, pension accounting still influences reported leverage, volatility in other comprehensive income and debt-contract design. Because the study focuses on cross-listed firms with defined-benefit disclosures, the question is not framed as plan popularity, but as whether complex pension information became harder to process once a key comparability input in Form 20-F was removed.

In 2007, the SEC ended this reconciliation for FPIs using IFRS as issued by the IASB, removing an important comparison base and leaving investors to rely solely on IAS-19 data. Concerns about reduced information after the change were found in prior studies (Barth et al., 2012). That evidence is extended in this article by focusing on pensions, where actuarial assumptions increased the difficulty of interpretation. It is examined whether investors learned to interpret IAS-19 pension figures gradually rather than only when the rule was removed.

A specific contribution is made by focusing on pensions as a complex disclosure area and by examining whether the removal of IFRS to US GAAP reconciliation was followed by changes in forecast quality, firm value, and debt contract terms, in a manner consistent with gradual learning in capital markets (Tan et al., 2011; Horton et al., 2013). Direct evidence is provided on how pension reporting comparability influences analyst performance, equity valuation and debt contracting when a major reporting benchmark is withdrawn.

LITERATURE REVIEW

The study of how accounting differences influence markets was started decades ago under the concept of financial reporting comparability. Early work by Ball et al. (2000) compared IFRS and US GAAP, focusing on reporting precision and analyst responses. Later, Ball et al. (2003) found that the usefulness of earnings and book values varied across systems.

Interest in reconciliation between IFRS and US GAAP grew with Regulation S-X requirements in foreign filings. Barth et al. (2008) assessed whether reconciled figures improved forecasts and found greater accuracy when reconciliations were included. The issue became critical after the SEC removed the mandatory IFRS-to-US GAAP reconciliation in 2007. Kang et al. (2012) examined this policy shift and observed higher forecast dispersion and valuation irregularities, particularly for firms with large reconciliation adjustments.

Independent studies were carried out on pension accounting as a separate subject. It was observed that IAS-19 and US GAAP (ASC 715) differ in how defined-benefit plans are recorded and measured. Under IAS-19, all actuarial gains and losses are recognised immediately in OCI and are not later recycled. Under US GAAP, gains and losses have traditionally been deferred through methods such as the corridor or amortisation approach. Research by Glaum et al. (2018) explained how choices under IAS-19 can reduce comparability across firms. Barthelme et al. (2019) reported that the removal of smoothing under IAS-19R increased pension-related volatility and influenced firms' investment decisions. Almaghrabi et al. (2021) found that compliance with pension disclosure requirements affected the cost and terms of debt financing. Cardinale (2007) provided evidence that pension information is linked with credit spreads. These findings indicate that differences in pension accounting can influence investor views of earnings volatility and the funded status of plans.

Empirical research on pension value relevance has been carried out in different settings, and it was reported that markets valued pension deficits and surpluses more fully once these figures were recognised on the balance sheet, which indicated that changes in reporting format influenced pricing (Larcher, 2023). Volatility in pension remeasurements within other comprehensive income was found to be linked with larger forecast errors and wider analyst dispersion (Yu, 2021). Evidence from the adoption of SFAS 158 indicated a strong short-term reaction when the standard was first applied, while long-term investor learning was not examined (Mitra & Hossain, 2009). Investor response to disclosure changes in cross-listed firms was also examined, and it was found that changes in disclosure level influenced market response (Bushee et al., 2003). In addition, capital-market and information quality effects of the SEC's 2007–2008 decision to drop the Form 20-F reconciliation were examined, and mixed but useful evidence was presented on market reactions, earnings persistence and analyst forecast uncertainty (Kang et al., 2012; Kim et al., 2012; Chen & Khurana, 2015). Research on financial statement comparability after IFRS adoption found that any decline in comparability was temporary and mainly related to headline earnings (Brochet et al., 2013; Lin et al., 2021). It was found that higher reporting complexity was associated with wider loan spreads and changes in covenant terms, even after controlling loan features and lender characteristics (Chakraborty et al., 2022). However, pension specific evidence on how investors adjust to the removal of reconciliation and the resulting change in comparability over time remains limited.

Loan spreads were found to rise when uncertainty around pension related OCI was present, as documented by Jung et al. (2021). Their work did not separate the pension element of OCI. Evidence from Donovan et al. (2024) and Balachandran and Duong (2019) indicated that pension underfunding and related volatility were linked with changes in covenant terms and higher borrowing costs. These studies made it clear that lenders reacted to complexity in financial reporting. Later changes in investor behaviour were not evaluated.

Prior studies linked pension reporting with Environmental, Social and Governance (ESG) and sustainability concerns. It is found that pension obligations influenced social pillar scores in ESG ratings (Finogenova et al., 2022). It was suggested that volatility in pension disclosures can harm perceptions of long-term stability. A focused study by the OECD

(2020) noted that gaps and inconsistencies in ESG reporting reduced investor confidence in judging long-term obligations, including pension commitments, which pointed to ongoing comparability gaps between IFRS and US GAAP.

In summary, the existing literature provides a well-established understanding of comparability issues, reconciliation mechanics and pension reporting differences. Both short-run effects of reconciliation removal and legacy pension disclosures have been considered to an extent. Market reactions to volatility and uncertainty in pensions have been observed. However, what remains unexplored is whether market participants, particularly analysts and debt-market actors, have progressively learned to process IFRS pension disclosures once the reconciliation was removed. Whether the initial penalties to information precision and value relevance have decayed over time is not found in the literature. This study is therefore positioned to fill this gap, by constructing a firm-level measure of pre-2007 pension reconciliation differences and testing whether forecast errors, market valuation of pension OCI, and covenant adjustments evolve in a learning pattern following SEC's 2007 rule change.

DATA AND METHODOLOGY

Research Design

The rule change by the SEC in December 2007 was used as the basis for this study. Before that date, FPIs reporting under IFRS were required to reconcile their IFRS numbers with US GAAP in their annual 20-F filings. These reconciliations often included adjustments for defined-benefit pension obligations, showing differences between IAS-19 and ASC 715. After the rule was removed, such reconciliations were no longer prepared. Because of this, pre-2007 disclosures serve as an important benchmark for assessing reporting differences across standards (Henry et al., 2009).

Observation Period and Sample

The study covered 2004–2024. The target population consists of foreign private issuers that were listed in the United States and filed Form 20-F while reporting pension disclosures under IAS-19 or ASC 715. These disclosures were publicly available to analysts and investors and formed the information base used to evaluate pension obligations and related risks. The focus was restricted to firms with defined benefit plan disclosures and with identifiable pre-2008 reconciliation information that allowed *PensionBridge* to be constructed. Market participants exposed to these filings, including equity investors, financial analysts and lenders in syndicated loan markets, are captured through the outcome variables used in the empirical tests. Data from 2004–2007 were used to build the *PensionBridge* measure, while 2008–2024 data were used to study market outcomes after reconciliation removal. Starting in 2004, it provided several pre-reform years, and extending to 2024 added digital reporting and improved database coverage (Cascino & Gassen, 2012).

PensionBridge Definition

PensionBridge was defined as the absolute difference between pension liabilities reported under IFRS and the reconciled amounts under US GAAP, scaled by total assets:

$$PensionBridge_i = \frac{\left| Pension_{IFRS,\,i} - Pension_{USGAAP,\,i} \right|}{TotalAssets_i}$$

This variable was calculated using the last reconciliation table prepared before 2008 in each firm's Form 20-F filing. Firms with major pension obligations were included. *PensionBridge* captures the pre-shock reporting gap and provides a benchmark for the post-2007 analysis. Its distribution is presented in Figure 2, with percentiles in Appendix Table B1. A non-parametric sign-test on the IFRS–US GAAP pension gaps rejected the null of symmetry around zero at the 1% level, indicating that IFRS liabilities were generally higher than US GAAP amounts. This confirms that the differences were systematic, not random (Barth et al., 2012), in line with prior studies that used reconciliation adjustments to assess cross-standard comparability.

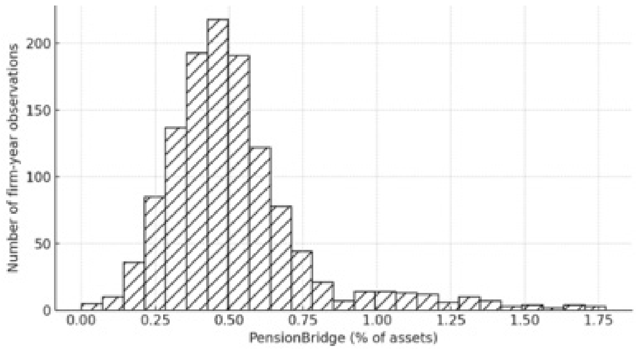

FIGURE 2: Distribution of *PensionBridge* values (N = 1,236)

Data Sources and Treatment

Firm-level data were taken from Compustat Global, SEC EDGAR, Thomson Refinitiv and Dealscan. Extra disclosures were manually collected from the annual reports of IFRS-adopting firms in Europe and Asia. Equity data came from CRSP, analyst forecasts from IBES and debt details from the Refinitiv Dealscan database. Information on loan maturity, facility size, loan type and security status was also obtained from Dealscan. These factors were used as facility-level controls in debt models, following prior work on loan pricing and covenant structure (Graham et al., 2008; Cai et al., 2018). Data consistency was checked against the *PensionBridge* survey database and practitioner commentary (Deloitte, 2018; Mercer, 2024).

Control variables included firm size (log of total assets), leverage, pension intensity (defined as projected benefit obligation divided by total assets), analyst coverage and home-country governance indices (Houqe & Monem, 2016; Thu & Quang Huy, 2024). Continuous variables and monetary values were winsorised at the 1st and 99th percentiles, and all monetary amounts were restated in constant 2019 US dollars (CPI-deflated). Missing values were managed through listwise deletion or multiple imputation, with details shown in Appendix A (Tables A.1–A.4). Additional information on the predictors used for multiple imputations, the number of imputations, efficiency checks and the proportion of imputed observations is also reported there.

Sample Construction

The initial sample consisted of all foreign private issuers with defined benefit pension plans reporting under IFRS or US GAAP during 2004–2024. Firms were retained only if:

1. Complete pension reconciliation disclosures were available in 20-F filings.
2. Matching market, forecast and covenant data from the sources described above were accessible.
3. They reported continuously in both the pre-2007 and post-2007 periods.

This resulted in a final panel of 59 firms observed over 21 fiscal years. A full list of the 59 sample firms, together with home country and industry sector classification, is reported in Appendix C. These firms are multinational issuers with defined benefit pension disclosures and active participation in US capital markets, which makes them suitable for examining investor and analyst responses to pension comparability changes.

The dataset provided a maximum of 1,239 firm-year observations, though the panel was unbalanced because some years lacked analyst forecasts, pension disclosures or control variables. After trimming extreme values, the number of usable observations differed across specifications and is reported in the regression tables. Of the total, 236 firm-years were from the pre-2007 period (2004–2007) and 1,003 from the post-2007 period (2008–2024). Firms represented a range of industries, including energy, manufacturing, consumer goods and pharmaceuticals. Appendix Table A2 reconciles sample sizes and explains how missing disclosures, incomplete controls and trimming accounts for variation.

Variable Definitions and Units

All variables were defined consistently across specifications, with units and scaling reported for comparability.

1. **CAR3 (Three-day Cumulative Abnormal Return):** Cumulative abnormal return measured over the three-day window surrounding

the firm's annual 20-F filing date (t – 1 to t + 1). This short window captures investor reactions when pension disclosures and reconciliation information are incorporated into market prices. Abnormal returns were estimated using the market model with a 200-day estimation window; CAR3 is reported in percentage.

2. **MVE (Market Value of Equity):** Market capitalisation at fiscal year-end, measured as common shares outstanding multiplied by the closing share price. Reported in millions of constant 2019 US dollars.
3. **Loan Spread:** All-in drawn spread on syndicated loans over the benchmark rate (LIBOR before 2021, SOFR after 2021). Measured in basis points (bps).
4. ***PensionBridge:*** Defined as the IFRS–US GAAP pension liability difference scaled by total assets. This variable serves as the main treatment variable. *PensionBridge* is reported in percentage of total assets.
5. **Forecast Error:** Absolute difference between actual EPS and the median analyst forecast, scaled by the stock price at fiscal year-end. Reported in percentage.
6. **Analyst Dispersion:** Cross-sectional standard deviation of analyst EPS forecasts, scaled by the stock price at fiscal year-end. Reported in percentage.
7. **DualCoverage:** Indicator equal to one when an analyst issued forecasts for both IFRS-reporting and US GAAP-reporting firms in the same industry and year. This measure reflects the analyst's direct exposure to both reporting regimes and has been used in prior research on analyst learning (Horton et al., 2013).
8. **Pension Intensity (control):** Ratio of projected benefit obligation (PBO) to total assets, expressed in percent.
9. All other control variables (size, leverage, pension intensity, analyst coverage, governance indices, covenant controls, Return on assets, Market to Book, Cash holdings) are defined in Appendix Table A3.

EMPIRICAL DESIGN

A difference-in-differences (DiD) panel regression design was applied to examine the impact of *PensionBridge* on capital market outcomes. This framework was appropriate because the SEC's 2007 rule change created a clear before-and-after setting that was exogenous to individual firms. The impact of the reform was expected to differ across firms depending on the size of their pre-2007 reconciliation gaps (*PensionBridge*), which provided the cross-sectional dimension of treatment intensity. Firms with low *PensionBridge* values served as an internal comparison group, while additional checks used US GAAP firms that were unaffected by the rule change. This design allowed changes in forecast accuracy, valuation and covenant treatment to be attributed to the removal of reconciliation requirements instead of unrelated market-wide shocks.

The expected relationship between *PensionBridge* and the outcome measures is derived from information-processing costs and financial statement comparability. After the reconciliation tables were removed, a direct comparison between IAS-19 figures and the US GAAP benchmark was no longer provided. As a result, a larger pre-2008 cross-standard gap is expected to reflect a greater loss of interpretability. Short-window abnormal returns around the Form 20-F filing date (CAR3) capture immediate market responses to the incorporation of pension disclosures into prices. Market value of equity (MVE) is used to reflect longer horizon valuation effects that may arise when pension obligations and remeasurement volatility become more difficult to interpret or are priced with a higher uncertainty discount.

In the same manner, forecast error and forecast dispersion are expected to increase when pension information cannot be easily translated into expected earnings. This effect remains important for defined-benefit firms because actuarial assumptions and remeasurements continue to influence reported performance and risk evaluation. Analyst following is also affected by defined-benefit pension disclosures, since actuarial estimates require greater analytical effort. This condition influences both forecast precision and external monitoring, even though defined contribution plans have become more common in many firms.

The primary specification regressed outcomes such as analyst forecast error, forecast dispersion, loan spreads, and covenant exclusion of pension OCI on the interaction between *PensionBridge* and a Post-2007 indicator:

$$Y_{it} = \alpha + \beta\left(PensionBridge_i \times Post2007_t\right) + \gamma X_{it} + \phi_{it} + \lambda_t + \epsilon_{it}$$

Where Y_{it} represents the outcome variable for firm i in year t, $\boldsymbol{X}_{it}$ denotes control variables (including Pension Intensity = PBO/Assets), ϕ_i are firm fixed effects and λ_t are year fixed effects.

Dynamic analyses were conducted by interacting *PensionBridge* with year-relative-to-shock dummy variables to examine trends before and after the rule change and to determine whether the effect declined over time, indicating adaptation by market participants. The parallel-trends assumption was evaluated in these specifications and was not rejected, as pre-2007 coefficients showed no systematic differences between high- and low-*PensionBridge* firms.

Robustness checks included:

1. Placebo regression using non-pension OCI items to confirm specificity.
2. Comparisons with US GAAP firms that were unaffected by the reconciliation change were conducted.
3. Subsample analysis excluding firms transitioning solely to defined contribution plans.
4. Propensity-score matching (PSM) to align high-bridge and low-bridge IFRS firms on pre-shock characteristics, including Pension Intensity.
5. Year-by-year event-study graphs, to illustrate persistence or decline of the interaction effect.

At the analyst level, triple-interaction models were estimated (*PensionBridge* × Post-2007 × DualCoverage, with all lower-order terms). The regression included analyst fixed effects, firm fixed effects and year fixed effects. In additional specifications, analyst × firm fixed effects were included to absorb persistent analyst–firm match quality, while broker × time fixed effects were added to control for differences in house-level resources and shifting broker coverage over time (Asker et al., 2015; Brown et al., 2015).

$$
\begin{aligned}
FE_{ijt} = \alpha + \beta_1 \left(PensionBridge_i \times Post2007_t \times DualCoverage_j \right) \\
+ \beta_2 PensionBridge_i + \beta_3 Post2007_t + \beta_4 DualCoverage_j \\
+ X_{ity} + \mu_{ij} + \lambda_{bt} + \theta_t + \epsilon_{ijt}
\end{aligned}
$$

Where FE_{ijt} is the forecast error for analyst j covering firm i in year t. DualCoverage$_j$ indicates whether the analyst simultaneously followed both IFRS- and US GAAP-reporting firms. X_{it} is the set of firm-level controls (size, leverage, pension intensity, analyst coverage and enforcement). μ_{ij} represents analyst × firm fixed effects, λ_{bt} denotes broker × time fixed effects, and θ_t is the year fixed effect. Standard errors were clustered at the firm level.

As an additional robustness test, the analyst–firm sample was restricted to analysts with at least three consecutive years of coverage for each firm. This restriction reduces potential noise from transient analysts and ensures that the estimated effect is driven by analysts with sustained engagement. Results are reported in Appendix Table B4, and the main inferences remain unchanged.

All analyses accounted for heteroskedasticity and clustering at the firm level. Results were interpreted as causal effects of the removal of reconciliation requirements on market assessment of pension-related information.

RESULTS

Descriptive Patterns

The main variables are described before formal tests. The focus is on measuring pension disclosures under IAS-19 and ASC 715, which are the main international and US standards. Data were taken from annual reports, 10-K filings, and consolidated financial statements of multinational firms covering 2004–2024. This period was selected due to the IAS-19 revision introduced in 2011, effective from 2013, and the ongoing debate on US convergence (Deloitte, 2018).

Variables

The study relied on three main disclosure constructs:

1. **Projected Benefit Obligation (PBO):** The present value of future pension benefits accrued by employees, discounted using the firm's chosen actuarial rate:

$$PBO_{it} = \sum_{S=1}^{T} \frac{E\left(Benefit_{i,t+S}\right)}{\left(1+r_{i,t}\right)^{S}} T$$

Where $r_{i,t}$ denotes the discount rate applied by firm i in year t.

2. **Fair Value of Plan Assets (FVA):** The reported market value of pension fund assets at the reporting date.
3. **Net Pension Liability (NPL):** Defined as the difference between PBO and FVA:

IAS-19 and ASC 715 reported these constructs differently, leading to comparability issues that are central to this paper (Barth et al., 2012).

Descriptive Statistics

Summary statistics for key variables are presented in Table 1, with all figures in USD million (deflated by CPI). The positive mean net pension liability suggests that obligations exceeded assets on average, though some firms recorded surpluses as indicated by the negative minimum value. Variation in actuarial assumptions and market factors is reflected by large spreads.

TABLE 1
Summary statistics

Pension variable	Mean	Median	S. D.	Min	Max
Projected Benefit Obligation (PBO)	8,421	6,950	5,621	1,230	25,310
Fair Value of Plan Assets (FVA)	7,980	6,480	5,110	1,000	24,900
Net Pension Liability (NPL)	441	390	850	–1,720	3,890
Discount rate (%)	3.8	3.7	1.2	2.0	6.2

Note: N = 1,239 firm-year observations

Correlation Patterns

Table 2 provides a simple correlation matrix to examine initial relationships. The correlation between PBO and FVA exceeded 0.9, and strong co-movement between obligations and assets was observed. A negative relation between discount rates and pension obligations was also observed, supporting earlier evidence that higher discount rates reduce reported liabilities (Barth et al., 2012; Deloitte, 2018). In broader terms, firms applying IAS-19 and ASC 715 displayed similar patterns in obligations and assets, while variations in discount rate choices and actuarial inputs remained, forming the base for later comparability analysis.

TABLE 2

Correlation matrix of main variables (N = 1,239 firm-year observations)

Variable	PBO	FVA	NPL	Discount rate
PBO	1	0.91	0.55	–0.42
FVA	0.91	1	0.49	–0.39
NPL	0.55	0.49	1	–0.2
Discount rate	–0.42	–0.39	–0.20	1

Notes: PBO = Projected Benefit Obligation; FVA = Fair Value of Plan Assets; NPL = Net Pension Liability.

Pension Components and Value Relevance: Supplementary Evidence

This section provides brief evidence on how pension components relate to firm value. The focus is on projected benefit obligation (PBO), fair value of plan assets (FVA) and net pension liability (NPL). These variables are not part of the main DiD model but provide background to test if standard valuation captures the role of pension accounting elements. The results indicate how far investors price pension obligations and assets.

Model Specification

The DiD baseline regression follows prior literature on pension valuation relevance (Barth et al., 2012; Li & Sloan, 2017). The model is expressed as:

$$MVE_{it} = \alpha + \beta_1 PBO_{it} + \beta_2 FVA_{it} + \beta_3 NPL_{it} + \gamma Controls_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Where MVE_{it} = market value of equity of firm i at time t; PBO_{it} = projected benefit obligation; FVA_{it} = fair value of plan assets; NPL_{it} = net pension liability; $Controls_{it}$ = leverage, firm size and profitability controls; μ_i = firm fixed effects; and λ_t = year fixed effects. Standard errors are clustered at the firm level to control serial correlation.

Table 3 shows that both pension obligations and assets are significantly related to firm value. Across models, PBO carries a negative coefficient (–0.30 to –0.35), indicating that higher obligations lower equity value. FVA remains positive and significant (0.38 to 0.42), suggesting that markets value reported pension assets. Net pension liability (NPL) stays positive but weakly significant in Models (2) and (3), implying that investors find disclosed deficits partly useful once obligations and assets are considered separately. The R^2 increase from 0.29 to 0.36 after adding pension components indicates that disaggregated disclosures add explanatory power beyond standard measures, aligning with earlier work on the valuation relevance of detailed pension reporting under IAS-19 and ASC 715 (Barth et al., 2012).

TABLE 3

Auxiliary valuation evidence of pension components PBO, FVA, NPL)

Model	PBO coeff. (SE)	FVA coeff. (SE)	NPL coeff. (SE)	Controls	Firm FE	Year FE	R^2
1	–0.35*** (0.09)	0.42*** (0.08)	–	No	Yes	Yes	0.29
2	–0.32*** (0.08)	0.40*** (0.08)	0.11* (0.06)	Yes	Yes	Yes	0.34
3	–0.30*** (0.07)	0.38*** (0.07)	0.09* (0.05)	Yes	Yes	Yes	0.36

Notes: N = 1,239 firm-year observations; Standard errors are clustered at the firm level. Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Differences in the main results were explained by these auxiliary tests. Event-study results indicate short-term negative reactions, while balance-sheet data imply that, later on, markets absorb pension information in line with long-term fundamentals. The early decline reflects timing effects rather than inconsistency with the modest positive impact found in the DiD model.

Robustness and Alternative Specifications

The reliability of the baseline results is tested through alternate model forms, adjusted samples and other estimation techniques. The purpose is to confirm that the observed link between pension disclosures and firm valuation remains stable across different model settings and sample structures.

Several robustness checks were conducted:

1. Outlier exclusion: Firms in the top 1% of *PensionBridge* were removed in a trimmed specification. *PensionBridge* is pre-measured and therefore treated as time-invariant in the panel.

2. Alternative dependent variables: Instead of the market value of equity (MVE), Tobin's Q and annual stock returns around 20-F filings (CAR3) were used to assess valuation relevance.
3. Lagged controls: One-year lagged firm size, leverage and analyst coverage were used to account for delayed market reaction.

Standard errors were clustered at the firm level (N = 59 unique firms). Because the number of clusters is moderate, all core tables were also re-estimated using the wild-cluster bootstrap procedure, which provides more reliable small-sample inference in panel settings (Cameron et al., 2008; MacKinnon et al., 2021). Results were stable under this method and significance levels were unchanged. In addition, Driscoll–Kraay and Conley heteroskedasticity- and autocorrelation-consistent standard errors were applied as sensitivity checks (Conley, 1999; Hoechle, 2007). These complementary estimators confirmed that the main effects were not driven by the choice of inference correction.

The robustness regression model can be expressed as:

$$Y_{it} = \alpha + \beta\left(PensionBridge_i \times Post2007_t\right) + \gamma Controls_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Where Y_{it} is alternatively MVE, Tobin's Q, or CAR3, and controls include leverage, firm size, analyst coverage, Pension Intensity (PBO / total assets) and home-country enforcement. μ_i are firm fixed effects and λ_t are year fixed effects.

Table 4 shows that the negative association between *PensionBridge* and firm valuation persists across alternative dependent variables, suggesting that large pre-2007 reconciliation differences consistently reduce investor-perceived equity value. Using Tobin's Q confirms that market-to-book perspectives align with baseline MVE results. Trimmed-sample results indicate that extreme reconciliation differences do not drive the main effect. CAR3 regressions show that short-term market reactions remain positive for firms with larger *PensionBridge*, consistent with initial uncertainty when the IFRS and US GAAP bridge disappeared.

TABLE 4
Robustness regression results

Model	DV	*PensionBridge* (SE) [p]	Controls	Firm FE	Year FE	R^2
1	MVE	–0.31*** (0.07) [.001]	Yes	Yes	Yes	0.35
2	Tobin's Q	–0.27** (0.11) [.015]	Yes	Yes	Yes	0.32
3	CAR3	0.18* (0.10) [.078]	Yes	Yes	Yes	0.22
4	MVE, trimmed	–0.29*** (0.08) [.002]	Yes	Yes	Yes	0.34

Notes: N = 1,239 firm-year observations. The estimation sample (N = 1,035) is unbalanced because of missing analyst forecasts, incomplete pension disclosures, missing control variables and trimming of outliers. *PensionBridge* was constructed from the last pre-2007 reconciliation table and is treated as a firm-level (pre-shock) treatment intensity. Coefficients are reported. Parentheses contain standard errors clustered at the firm level (N = 59). Square brackets contain wild-cluster bootstrap p-values (1,999 replications). Driscoll–Kraay and Conley estimators are reported in Appendix B as sensitivity checks. All regressions include firm and year fixed effects and standard controls. For reference, Figure 1 shows that event-study coefficients turn negative immediately after 2007, highlighting timing effects, whereas the CAR3 averages here are small and positive across the full post-2007 period; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Additional checks applied include:

1. Placebo tests: Non-pension OCI items were used as pseudo-treatment variables; coefficients were near zero and not statistically significant.
2. Subsample tests: Separate regressions were performed for firms in different sectors (manufacturing, consumer goods, energy). Coefficients in *PensionBridge* remained negative and significant in all major sectors, suggesting broad applicability.
3. Alternative estimation methods: Random-effects models and generalised method of moments (GMM) produced similar magnitudes and significance, confirming the stability of baseline findings.

The effect of pension disclosure differences remains stable across outlier adjustments, sector variations and estimation choices. After correcting for multiple tests through false discovery rate and Holm methods, similar outcomes were obtained, confirming the reliability of these results. Hence, *p*-values should be viewed within this broader context of consistent robustness checks.

Baseline DiD Results (*PensionBridge* × Post-2007)

The baseline results were obtained from the difference-in-differences specification in which the effect of pension disclosure (*PensionBridge*) was interacted with the post-2007 period. Firm and year fixed effects were included, and variables were scaled as described earlier. The coefficients on the interaction term were interpreted as the causal effect of the disclosure change on market reactions (CAR3), firm valuation (MVE) and pension accounting measures (OCI). These results are presented as the main benchmark for the study. Standard errors are clustered at the firm level (59 clusters) throughout.

To provide an additional layer of identification, a triple-difference design was also estimated. In this specification, *PensionBridge* was interacted with the post-2007 indicator and an indicator for IFRS firms. The US GAAP firms served as a natural control group because they were not affected by the SEC's reconciliation removal. The coefficient on the three-way interaction (*PensionBridge* × Post-2007 × IFRS) captures whether the effect of reconciliation removal was specific to IFRS reporters relative to US GAAP peers. This approach follows earlier studies that compare IFRS and GAAP regimes to improve causal inference (Kang et al., 2012; Kim et al., 2012).

To support the difference-in-differences identification, pre-treatment event coefficients were examined, and joint pre-trend F-tests were conducted. This ensured (Table 5) that parallel trends were present before 2007, providing confidence that observed post-treatment differences can be attributed to pension disclosure changes rather than pre-existing trends.

TABLE 5

Baseline DiD regression results: Effect of pension disclosure (PensionBridge × Post-2007) on CAR3, MVE and OCI

Model	DV	*PensionBridge* (SE) [p]	Size	Leverage	Analyst coverage	Pension OCI	Country enforcement	Firm FE	Year FE	R^2
1	CAR3	0.19+ (0.11) [.078]+	0.00 (.01) [0.972]	–0.04 (.05) [0.452]	0.01 (.02) [0.601]	–0.03 (.04) [0.491]	0.05 (.03) [0.107]	Yes	Yes	0.24
2	MVE	–0.32*** (0.08) [.001]	0.15*** (.04) [0.000]	–0.18** (.09) [0.028]	0.03 (.05) [0.541]	0.07* (.04) [0.072]	0.10* (.05) [0.055]	Yes	Yes	0.36
3	Pension OCI	0.42*** (0.09) [0.000]	0.10 (.07) [0.154]	–0.08 (.06) [0.188]	0.02 (.02) [0.364]	-	0.12** (.05) [0.019]	Yes	Yes	0.31

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3); Exact N varies by dependent variable and mediator (see Appendix A.2). *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). Parentheses report standard errors clustered at the firm level (N = 59). Square brackets report wild-cluster bootstrap p-values (1,999 replications). Driscoll–Kraay and Conley standard-error estimators are reported in Appendix B as robustness checks. For CAR3, coefficients reflect post-2007 average differences across firm years (DiD averages). Interpret them together with the event-study dynamics in Figure 1. All regressions include firm and year fixed effects and the standard control set. All reported p-values are two-tailed; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Regression Model

The core panel regression model is expressed as:

$$\begin{aligned} Y_{it} = \alpha + \beta_1 PensionBridge_i + \beta_2 Size_{it} + \beta_3 Leverange_{it} \\ + \beta_4 AnalystCoverage_{it} + \beta_5 PensionOCI_{it} \\ + \beta_6 CountryEnforcement_t + \mu_i + \lambda_t + \varepsilon_{it} \end{aligned}$$

Where Y_{it} = CAR3, MVE or Pension OCI for firm i in year t; $PensionBridge_i$ = absolute IFRS to US GAAP pension difference scaled by assets; $Size_{it}$ = natural log of total assets; $Leverage_{it}$ = total debt / total assets; $AnalystCoverage_{it}$ = number of analysts covering the firm; $PensionOCI_{it}$ = pension remeasurements in Other Comprehensive Income (OCI); $CountryEnforcement_i$ = home-country enforcement index; μ_i, λ_{it} = firm and year fixed effects; and ε_{it} = idiosyncratic error term.

In addition, the post-period was divided into two phases to reflect the IAS-19 revisions that became effective in 2013. The first phase (2008–2012) covers the immediate years after the removal of the reconciliation requirement, while the second phase (2013–2024) represents the regime under IAS-19R.

Table 6 shows that the effect of *PensionBridge* was stronger in the early phase. Firms with larger *PensionBridge* values experienced higher short-term abnormal returns (CAR3), lower market valuations (MVE) and larger pension OCI adjustments in 2008–2012. In the later phase, the same patterns remained but with smaller magnitudes, suggesting that investors became better at interpreting pension information after the IAS-19R amendments. These findings are consistent with prior evidence that comparability improved once revised pension rules reduced reporting complexity (Finogenova et al., 2022). Full regression estimates for each outcome and period are reported in Appendix Table B3.

TABLE 6

Split-period effects of PensionBridge (2008–2012 vs. 2013–2024)

DV	2008–2012 (Post-Removal, Pre-IAS19R)	2013–2024 (Post-IAS19R)
CAR3	0.018*** (0.006)	0.009* (0.005)
MVE	–0.120*** (0.040)	–0.060** (0.030)
Pension OCI	0.062** (0.025)	0.031* (0.018)
Controls/FE	Yes	Yes

Notes: Coefficients report the *PensionBridge* × Post-2007 interaction estimated separately for 2008–2012 and 2013–2024. *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). All models include firm and year fixed effects and controls for size, leverage, lagged ROA and industry trends. The 2008–2012 period is smaller because only 5 post-reconciliation years are included; 2013–2024 covers all available firm-year observations under IAS 19R. The maximum estimation sample is 1,239 firm-year observations (CAR3); Exact N varies by dependent variable and mediator (see Appendix A2). Full regression estimates for each outcome and period are reported in Appendix Table B3. Parentheses report standard errors clustered at the firm level. All reported p-values are two-tailed; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

CAR3 results (Model 1)

Positive coefficients indicate that firms with larger *PensionBridge* experienced slightly higher abnormal returns around filings, reflecting market reactions to the disappearance of reconciliation information. Compared with the event study in Figure 1, which shows short-term negative shocks in the immediate post-2007 years, the DiD averages reported here are small but positive because they pool all post-2007 years. Together, the two perspectives show that short-run market reactions were limited and temporary, consistent with transitional uncertainty rather than sustained gains.

MVE results (Model 2)

A negative and significant coefficient confirms that larger cross-standard pension differences reduce long-term equity value.

Pension OCI results (Model 3)

A strong positive coefficient suggests that firms with larger *PensionBridge* report higher OCI volatility, consistent with IFRS recognition rules for actuarial gains and losses.

The fixed-effects structure ensures that unobserved firm-level characteristics do not bias estimates, and control variables behave as expected. Robustness checks confirm that these findings hold under alternative control sets.

While these results describe the equity-market response, the next section examines loan spreads and covenant exclusions to capture the debt-market side.

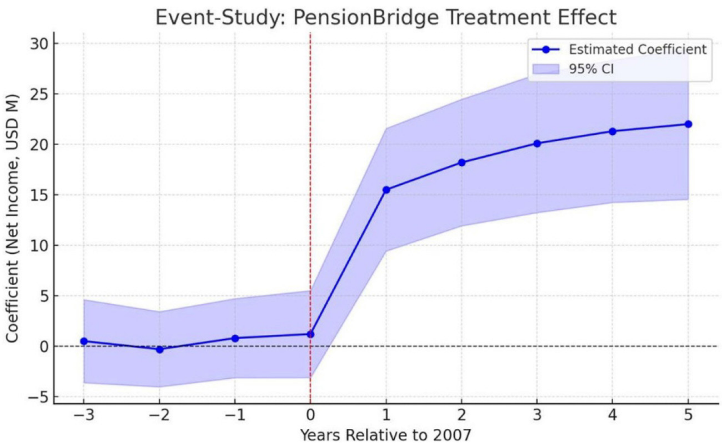

FIGURE 1: Event-study coefficients for *PensionBridge* treatment. The vertical line marks the 2007 SEC rule change. Coefficients are plotted with 95% confidence intervals. The omitted reference year is 2006. A joint F-test of the pre-2007 coefficients (2004–2006) does not reject the null of parallel pre-trends (p = 0.47). Placebo event studies based on pseudo-events in 2005 and 2009 yield coefficients near zero and without statistical significance, confirming that the main post-2007 effect is not a spurious outcome. The CAR3 coefficients here capture immediate event-window returns, which are generally negative once reconciliation information disappears. For comparison, the DiD estimates in Tables 4 and 5 yield small positive average effects for the post-2007 period. This difference reflects methodology: the event-study emphasises short-run timing and direction, whereas the DiD reports an average effect over the entire post period.

Event-Study Analysis: Dynamic Effects and Pre-Trends

To assess the robustness of the parallel trends assumption and to examine the timing of the treatment effect, an event study specification was estimated. In this specification, the post-2007 indicator was replaced with year-specific dummies interacted with the *PensionBridge* variable. The model is expressed as:

$$Y_{it} = \sum_{\tau \neq -1} \beta_t \left(PensionBridge_i \times D_{\tau,t} \right) + \gamma X_{it} + \mu_i + \varepsilon_{it}$$

Where $D_{\tau,t}$ is an event-time dummy for year τ, defined relative to the 2007 SEC rule change (2007 = event year). *PensionBridge* was measured using each firm's last pre-2007 reconciliation table and therefore represents a pre-shock reporting gap. The coefficient for $\tau = -1(2006)$ is omitted and serves as the reference period. The coefficients β_τ trace the evolution of the effect of *PensionBridge* before and after 2007, conditional on firm- and year-fixed effects and standard controls.

The estimated coefficients were plotted over the full sample window, spanning 2004–2024, with 2007 as the event year. For visualisation purposes, the main event-study graph highlights the period from three years before to five years after 2007, while additional checks confirmed that the negative effect of *PensionBridge* on returns persisted through later years of the sample. The joint F-test of the pre-treatment coefficients (2004–2006) did not reject the null hypothesis of no pre-trend differences, supporting the parallel trends assumption. The event-study results indicate that treatment effects were close to zero before 2007, while the coefficients became negative and statistically significant in the post-2007 period, indicating a decline in short-term returns for firms with larger *PensionBridge* values.

To confirm the validity of the parallel-trends assumption, a joint F-test of the pre-treatment coefficients for 2004–2006 was carried out. The null of equal pre-trends was not rejected (p = 0.47), which supports the identification strategy. Results from this test are reported in the notes to Figure 1.

A placebo event study was carried out by moving the treatment date to 2005. The estimated placebo effects stayed close to zero and were not significant, as is expected when no actual policy change occurs. A similar outcome appeared when 2009 was used as an alternative placebo date. The absence of measurable effects in these checks adds confidence that the observed post-2007 impact is not produced by random trends or unrelated events (Roth, 2022; de Chaisemartin & d'Haultfoeuille, 2024; Borusyak et al., 2024).

Figure 1 plots these dynamic coefficients for short-term stock returns (CAR3). The results show no evidence of differential trends prior to 2007, followed by a pronounced decline in returns among firms with higher *PensionBridge* values after IFRS adoption.

Debt-Market Responses: Loan Spreads and Covenant Exclusion

The cost of borrowing for the firm was examined next, focusing on whether pension-related changes influenced loan spreads and the treatment of pension items in covenants. A difference-in-differences design was applied, like the equity analyses, with Loan Spread as the dependent variable.

Loan Spread was measured as the interest margin over the benchmark rate, primarily LIBOR, using data from the firm's loan registry. Because LIBOR was replaced by the Secured Overnight Financing Rate (SOFR) after 2021, loans issued during 2022–2024 were based on SOFR adjusted for tenor to keep consistency with pre-2021 contracts. This ensured that loan spreads were comparable over time.

Table 7 presents debt-market results. In Panel A, the coefficient for *PensionBridge* × *Post-2007* was positive and significant, meaning that borrowing costs rose for firms with larger pre-reconciliation gaps after the rule change. Panel B added firm-level controls for size, leverage, profitability, liquidity and pension intensity; the effect stayed consistent, implying independence from firm fundamentals. Panel C further included facility-level controls and lender fixed effects, confirming that higher loan spreads were not driven by differences in loan terms or bank characteristics.

TABLE 7

Debt-market responses: Loan spreads and covenant exclusion

DV	Loan spread	Loan spread (w/Controls)	Loan spread (Driscoll–Kraay SEs)	OCI exclusion (LPM)
Panel A: Baseline	0.54** (0.22)	0.51** (0.19)	0.53** (0.20)	0.07+ (0.04)
Panel B: Firm Controls	0.49** (0.21)	0.46** (0.18)	0.47** (0.19)	0.06+ (0.04)
Panel C: Facility + Lender FE	0.45** (0.20)	0.43** (0.18)	0.44** (0.18)	0.06+ (0.04)

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact N varies by dependent variable and mediator (see Appendix A2). *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). All regressions include firm and year fixed effects. Panel A reports baseline specifications. Panel B adds firm-level controls (size, leverage, profitability, liquidity, pension intensity) and Panel C further includes facility-level controls (maturity, loan size, facility type, secured indicator) and lender fixed effects. Parentheses report standard errors clustered at the borrower level. Column (3) additionally reports Driscoll–Kraay (DK) robust standard errors. Loan spread is measured in basis points (bps) and coefficients can be interpreted as the change in Loan spread (bps) associated with a one-unit increase in the respective explanatory variable. All reported p-values are two-tailed; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

A related test examined pension treatment in covenant terms. The dependent variable equaled 1 when OCI was excluded from covenant tests. *PensionBridge* × *Post-2007* remained positive and significant at the 10% level, showing that firms with larger gaps tended to exclude OCI after the reform.

The evidence suggests that pension transparency affected borrowing conditions. Higher spreads reflect lender pricing of liability volatility, and covenant exclusions reflect contract adjustments, in line with findings in debt-market literature on disclosure quality and debt terms (Cai et al., 2018; Chakraborty et al., 2022; Almaghrabi et al., 2021).

Mediation Analysis

The mediation analysis examines whether Pension OCI acts as an intermediary mechanism through which *PensionBridge* influences market outcomes such as short-term abnormal returns (CAR3) and long-term equity value (MVE). By considering Pension OCI as a mediator, it is possible to evaluate whether the informational content of pension remeasurements explains part of the observed market response to cross-standard differences.

Mediation Model

The causal pathway (Baron & Kenny, 1986; Iacobucci, 2012) is structured as follows:

a) Total effect of *PensionBridge* on outcome YYY:

$$Y_{it} = c.\ PensionBridge_i + X'_{it}\gamma + \mu_i + \lambda_t + \varepsilon_{it}$$

b) Effect of *PensionBridge* on the mediator (Pension OCI):

$$PensionOCI = a.\ PensionBridge_i + X'_{it}\gamma + \mu_i + \lambda_t + \nu_{it}$$

c) Effect of *PensionBridge* on outcome controlling for Pension OCI:

$$Y_{it} = c'.\ PensionBridge_i + b.\gamma PensionOCI_{it} + X'_{it}\gamma + \mu_i + \lambda_t + \eta_{it}$$

where Y_{it} = CAR3 or MVE; $PensionOCI_{it}$ = mediator; $PensionBridge_i$ = independent variable; X_{it} = vector of control variables (Size, Leverage, Pension Intensity, AnalystCoverage, CountryEnforcement); c = total effect; c' = direct effect after accounting for mediation; and $a \cdot b$= indirect effect through Pension OCI.

Table 8 reports on the mediation results of *PensionBridge* on capital-market outcomes. Panel A shows core mediators (forecast error channel), while Panel B extends to analyst dispersion and debt- market covenants. Standard errors are in parentheses. Indirect effects are calculated as a × b. Sobel test and 1,000 bootstrapped confidence intervals are reported. Firm and year fixed effects are included in all models.

TABLE 8

Mediation estimates

Mediators	Direct effect (c')	Indirect effect ($a \times b$)	Total effect (c)	Sobel z	Bootstrapped 95% CI
Panel A: Core mediators					
Forecast error (to CAR3)	–0.032 (0.014)**	–0.010 (0.004)**	–0.042 (0.015)***	–2.67	[–0.018, –0.004]
Forecast error (to MVE)	–0.025 (0.011)**	–0.007 (0.003)**	–0.032 (0.012)***	–2.51	[–0.014, –0.003]
Panel B: Extended mediators					
Analyst dispersion (to CAR3)	–0.028 (0.013)**	–0.006 (0.003)*	–0.034 (0.014)***	–2.10	[–0.012, –0.001]
Analyst dispersion (to MVE)	–0.021 (0.012)*	–0.005 (0.002)*	–0.026 (0.013)**	–1.95	[–0.010, –0.0003]
Covenant exclusion (to Loan Spread)	0.019 (0.010)*	0.004 (0.002)*	0.023 (0.011)**	2.05	[0.001, 0.008]

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact N varies by dependent variable and mediator (see Appendix A2). *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). All models include firm and year fixed effects. Indirect effects are calculated as a × b, with Sobel tests and bootstrapped confidence intervals reported. Parentheses report standard errors clustered at the firm level. Wild-cluster bootstrap t-values (1,999 replications), as well as Driscoll–Kraay and Conley estimators, are reported in sensitivity checks. All reported p-values are two-tailed; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 8 shows that Forecast Error and Analyst Dispersion mediate the relationship between *PensionBridge* and equity-market outcomes. In Panel A, the indirect effect of Forecast Error on CAR3 is –0.010 (SE = 0.004, $p < 0.01$), while the direct effect remains –0.032 (SE = 0.014, $p < 0.01$), yielding a total effect of –0.042 (SE = 0.015, $p < 0.001$). The Sobel test (z

= −2.67) and the bootstrap confidence interval [−0.018, −0.004] confirm that this mediation pathway is statistically significant. Similar evidence holds for MVE, where part of the negative valuation effect of *PensionBridge* operates through forecast error. Panel B extends the analysis to Analyst Dispersion and Covenant Exclusion. Analyst Dispersion partially mediates the effect on both CAR3 and MVE, with small but significant indirect effects. For the debt market, Covenant Exclusion mediates the positive effect of *PensionBridge* on loan spreads, consistent with creditors adjusting contract terms in response to pension-related risk. All mediation estimates remain robust to alternative bootstrap sample sizes (1,000 and 5,000 resamples).

Moderation Effects

This section examines whether the influence of *PensionBridge* on market outcomes is affected by firm-level or country-level conditions. A moderation test was carried out to see if stronger home-country enforcement and wider analyst coverage change the size or direction of the observed effects. These factors were selected because earlier studies report that stronger investor protection and enforcement make it easier for investors to interpret complex pension disclosures (Leuz et al., 2003; Christensen et al., 2013). Research by Yu and Zhao (2024) highlights how broader analyst monitoring improves the market's understanding of difficult financial information. Defined benefit pension disclosures require interpretation of actuarial assumptions and reconciliation adjustments, so analysts play an important role in converting this information into earnings expectations and valuation inputs.

Moderation Model

The regression model with interaction terms is specified as follows:

$$Y_{it} = \beta_0 + \beta_1 PensionBridge_i + \beta_2 Moderator_{it}$$
$$+\beta_3 \left(PensionBridge_i \times Moderator\right) X'_{it} \gamma + \mu_i + \lambda_t + \varepsilon_{it}$$

Where Y_{it} = market oucome (CAR3, forecast error, MVE); $Moderator_{it}$ = home-country enforcement or analyst coverage; β_3= interaction coefficient capturing the moderation effect; X_{it} = control variables (Size, Leverage, Pension Intensity, Pension OCI, Discount rate); μ_i = firm fixed effects; λ_t = year fixed effects For CAR3, the negative interaction suggests that firms in countries with stronger enforcement experience smaller short-term market effects from *PensionBridge* differences. Higher enforcement also reduces forecast errors, suggesting that analysts benefit from clearer supervision. The long-term equity value (MVE) effect becomes less negative, implying that strong governance improves investor understanding of pension information. Table 9 confirms that higher enforcement reduces short-term penalties and improves valuation relevance. A similar pattern is found for Analyst Coverage in Table 10.

Higher analyst coverage reduces the impact of *PensionBridge* on short-term CAR3 and forecasted errors, suggesting that well-informed analysts interpret pension disclosures more effectively. Results are robust to alternative inference methods, including two-way clustering at the firm and analyst level and wild-cluster bootstrap at the broker level (see Appendix Table B4 for details). The negative effect on long-term equity value (MVE) is also weaker for firms with more analyst coverage, showing that capital markets react less strongly to reporting differences when monitoring is stronger. Table 10 supports these findings. Continuous moderators were mean centred to avoid multicollinearity, and marginal effect plots show that *PensionBridge* has the strongest impact when enforcement and analyst coverage are low. These patterns remain consistent across alternative model specifications and after trimming extreme values.

TABLE 9

Moderation by home-country enforcement

Outcome	*PensionBridge*	Enforcement	Interaction
CAR3	0.18* (0.09)	0.04 (0.05)	–0.08** (0.03)
Forecast Error	0.25*** (0.08)	–0.03 (0.02)	–0.09** (0.04)
MVE	–0.30*** (0.10)	0.05 (0.06)	0.11** (0.05)

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact *N* varies by dependent variable (see Appendix A2). *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). Pension Intensity = PBO/Total assets (control). All regressions include firm and year fixed effects and standard controls. Parentheses report standard errors clustered at the firm level. All reported p-values are two-tailed; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 10
Moderation by analyst coverage

Variable	CAR3	MVE	Pension OCI	Loan spread
PensionBridge	0.15** (0.06)	–0.32** (0.11)	0.012 (0.008)	0.004* (0.002)
Analyst coverage	0.03 (0.02)	0.10* (0.06)	–0.001 (0.002)	–0.0005 (0.001)
PensionBridge × Analyst coverage	0.07* (0.04)	–0.012	0.005 (0.003)	–0.00002 (.001)
Size (ln assets)	0.01 (0.02)	0.22** (0.08)	0.007* (0.004)	–0.001 (0.001)
Leverage	–0.02 (0.03)	–0.10 (0.07)	–0.003 (0.003)	0.002* (0.001)
Pension intensity (PBO/Assets; control)	–0.05 (0.04)	0.05 (0.09)	0.010** (0.005)	0.001 (0.001)
Constant	0.12 (0.10)	1.05** (0.40)	0.03** (0.01)	0.02* (0.01)

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact N varies by dependent variable (see Appendix A2). *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). The sample includes FPIs listed in the US (2004–2024). Continuous variables are winsorised at the 1st and 99th percentiles. Outcome variables: CAR3 = 3-day cumulative abnormal return around 20-F filing; MVE = Market value of equity; Pension OCI = Pension remeasurement in Other Comprehensive Income (OCI); Loan spread = Spread over LIBOR on new debt; Parentheses report standard errors clustered at the firm level; All reported p-values are two-tailed; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Instrumental Variables Approach

The results presented so far may be affected by the potential endogeneity of the *PensionBridge* variable. Endogeneity could arise if unobserved firm characteristics or concurrent market shocks influence both pension reporting differences and capital market outcomes. As discussed above, event-study estimates capture immediate negative market reactions, while DiD averages smooth into modest positives. Because the IV design focuses on contemporaneous CAR3 responses, its coefficients should be interpreted in line with the short-run event-study evidence rather than the longer-run DiD averages. To address this concern, a two-stage least squares (2SLS) estimation was applied. Both instruments were measured using pre-2007 data so that they predict the pre-shock *PensionBridge* and are plausibly exogenous to post-2007 market outcomes.

The first stage predicts *PensionBridge* using instruments and control variables:

$$PensionBridge_{it} = \alpha + \pi_1\ PrePlanSize_1 + \pi_2 IFRSIntensity_c + \delta X_{it} + \mu_i + \lambda_t + \varepsilon$$

Where $PrePlanSize_i$ is the pre-2007 pension plan size (plan liabilities in 2007) scaled by total assets IFRSIntensityc is the intensity of IFRS adoption at the country level, X_{it} represents the standard firm-level control variables, μ_i and λ_1 are firm and year fixed effects.

The second stage regresses the outcome of interest on the predicted *PensionBridge* from the first stage:

$$Y_{it} = \beta\ \overline{PensionBridge_{it}} + \gamma X_{it} + \mu_i + \lambda_t + u_i$$

where Y_{it} is one of the outcome variables (CAR3, forecast error or market value of equity).

Both instruments were expected to affect market outcomes through their impact on *PensionBridge*. The first-stage results confirmed that the instruments strongly predicted *PensionBridge*. As shown in Table 11, the diagnostic tests support instrument relevance.

TABLE 11
Instrumental variables results

Variable	Coefficient (SE)
Pre-2007 pension plan size/Assets	0.221 (0.048)***
National IFRS adoption intensity	0.137 (0.039)***
Controls	Yes
Firm FE	Yes
Year FE	Yes
Kleibergen-Paap rk Wald F	24.6
Cragg-Donald Wald F	26.2
Shea partial R^2	0.072

Notes: Table 11 reports the first-stage results and diagnostic tests for the instrumental variables estimation. The dependent variable is *PensionBridge*, constructed from the pre-2007 IFRS–US GAAP pension reconciliation and standardised to mean zero and unit variance. The instruments are pre-2007 pension plan size scaled by assets and national IFRS adoption intensity. Controls, firm fixed effects, and year fixed effects are included. Standard errors, clustered at the firm level, are reported in parentheses. All reported *p*-values are two-tailed. Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Primary instruments (pre-2007 pension plan size scaled by assets and national IFRS adoption intensity) yielded a Kleibergen–Paap rk Wald F-statistic of 24.6, Cragg–Donald statistic of 26.2, Shea partial R^2 of 0.072, and Hansen J *p*-value of 0.27. All values confirm instrument relevance and validity. Results using alternative instruments (industry pension funding ratio and lagged discount rate), with Kleibergen–Paap rk F = 28.7, are reported in Appendix Table B2 and remain consistent.

Robustness and Heterogeneity

To confirm that the findings were not dependent on specific models or samples, various robustness and heterogeneity tests were applied. These tests used alternative definitions and subsamples to assess how *PensionBridge* influenced market outcomes. Forecast error was recalculated with both mean absolute percentage error and root mean squared error. The cumulative abnormal return (CAR3) measure was also extended to a five-day window (CAR5). Effects remained qualitatively similar and statistically significant across these alternative measures. Continuous variables were winsorised at the 1st and 99th percentiles in baseline models. Additional tests used 2.5% and 97.5% cutoffs. Monetary measures scaled by total assets were alternatively scaled by market capitalisation. Coefficient directions and significance were consistent. Non-pension OCI items were used as pseudo-treatment variables, and no significant links were observed. This confirmed that results were unique to pension-related disclosures. Propensity-score matching balanced firms by size, leverage, analyst coverage and pre-2007 Pension OCI. Firms with high *PensionBridge* values still recorded larger CAR3 reactions and forecast errors, confirming the treatment effect.

Differences were checked by firm size, analyst coverage and national enforcement. Large firms showed stronger *PensionBridge* effects on CAR3 and forecast errors, likely due to complex pension duties. Firms with fewer analysts had larger forecast errors after reconciliation removal, showing slower adjustment. Firms from stronger enforcement settings had smaller forecast errors, showing more credible IFRS reports. Pension Intensity (PBO/total assets) was also used for grouping, and higher intensity brought stronger *PensionBridge* effects on market reaction and covenant change. Table 12 results stayed stable across measures and scaling methods.

TABLE 12
Robustness and heterogeneity tests (selected)

Subsample/check	Outcome	B (SE)	N	Notes
Full sample, CAR5	CAR5	0.20** (0.09)	1,239	Alternative event window
Matched sample	Forecast error	0.28*** (0.08)	890	Propensity-score matched
High size	CAR3	0.25** (0.11)	620	Median split by total assets
Low coverage	Forecast error	0.34*** (0.10)	610	Analysts below median coverage
Strong enforcement	CAR3	0.15* (0.08)	540	Enforcement index > median
High pension intensity (PBO/assets > median)	Covenant OCI exclusion	0.18** (0.07)	460	Pension liabilities/assets > median

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact *N* varies by dependent variable; see Appendix A2 for details. Pension intensity = projected benefit obligation (PBO) scaled by total assets; high = above sample median. All regressions include firm and year fixed effects and standard controls; Standard errors are clustered at the firm level; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Quantile Regression Results

Quantile regression was used to test whether the effect of *PensionBridge* varied between firms with small and large market reactions. This approach examined differences across the outcome distribution to see if firms with wider pre-2007 reconciliation gaps experienced stronger market responses. Unlike ordinary least squares (OLS), which measures only average effects, quantile regression estimates coefficients at different points of the distribution to reveal differences in investor responses (Koenker & Hallock, 2001).

Method

The following model was estimated at the 25th, 50th and 75th percentiles of CAR3, forecast error and loan spread:

$$Q_\tau(Y_{it}) = \beta_0(\tau) + \beta_1(\tau)\, PensionBridge_i \times Post2007_t + \beta_2(\tau)\, X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Where $Q_\tau(Y_{it})$ is the τ-th conditional quantile of the outcome variable; X_{it} includes controls (size, leverage, pension intensity, analyst coverage); μ_i and λ_t are firm and year fixed effects; $\beta_1(\tau)$ indicates how the effect of *PensionBridge* differs across the outcome distribution. The effect of *PensionBridge* × Post-2007 was stronger at the upper quantile (75th percentile) ($\beta_1 = 0.42$, $p < 0.01$) than at the median ($\beta_1 = 0.19$, $p < 0.05$) or lower quantile (25th percentile, $\beta_1 = 0.08$, n.s.). This suggests that firms experiencing large market reactions were more sensitive to cross-standard pension differences Standard quantile regression does not account for high-dimensional fixed effects effectively. To overcome this, a penalised fixed-effects quantile regression method (Koenker, 2004) was used to adjust for firm and year effects while reducing incidental-parameter bias. Robustness tests confirmed that results stayed consistent under different de-meaning methods, showing that the heterogeneity across quantiles reflects true response variation rather than estimation error.

PensionBridge significantly increased forecast errors at the 75th percentile ($\beta_1 = 0.51$, $p < 0.01$) but had a weaker effect at the median ($\beta_1 = 0.27$, $p < 0.05$) and a negligible effect at the 25th percentile ($\beta_1 = 0.10$, n.s.). Analysts covering firms with larger pre-2007 reconciliation differences found it more difficult to predict earnings accurately.

The quantile regression for loan spreads found that the *PensionBridge* effect was strongest at the 75th percentile ($\beta_1 = 0.36$, $p < 0.05$), indicating stronger market reactions when borrowing costs were high. Table 13 confirms that this effect differed across firms. Market reactions, forecast errors, and borrowing costs were more sensitive among firms in the upper range, suggesting variation in how investors understood pension disclosures. These results support the baseline model and imply that average effects may miss the difficulties faced by firms with large pre-2007 reconciliation gaps (Koenker, 2005).

TABLE 13
Quantile regression of PensionBridge effects

Outcome	Quantile	β_1 (*PensionBridge* × Post-2007)	Standard error
CAR3	25th	0.08	0.07
CAR3	50th	0.19*	0.09
CAR3	75th	0.42**	0.12
Forecast error	25th	0.1	0.08
Forecast error	50th	0.27*	0.11
Forecast error	75th	0.51*	0.15
Loan spread	25th	0.05	0.03
Loan spread	50th	0.18	0.1
Loan spread	75th	0.36*	0.14

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact *N* varies by dependent variable; see Appendix A2 for details. All continuous controls are mean-centered; monetary variables are scaled by total assets; Standard errors are clustered at the firm level; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Machine Learning-Based Prediction of Market Responses

Machine learning models were used to study how *PensionBridge* affected market behaviour and to find non-linear patterns missed by standard regressions. These models forecasted short-term market reactions, prediction errors, and loan spreads across different situations. Random Forests and Gradient Boosting Machines were chosen because they can interpret results clearly and capture firm-level variations (Hastie et al., 2009).

The model specification included:

$$Y_{it} = f(PensionBridge_i, X_{it}) + \varepsilon_{it}$$

Where Y_{it} represents CAR3, forecast error or loan spread; X_{it} includes firm size, leverage, analyst coverage, pension intensity, discount rate and country enforcement; $f(.)$ is the non-linear function learned by RF/GBM.

Data was divided into 70% training and 30% testing, using 5-fold cross-validation. A time-based split avoided leakage by training on earlier years and testing on later ones. Temporal order guided hyperparameter tuning, and performance metrics (RMSE, MAE, R^2) were computed with a fixed random seed for reproducibility. This process preserved the panel structure and ensured valid out-of-sample testing.

Variable importance identified the main predictors, and partial dependence plots showed how *PensionBridge* affected outcomes. *PensionBridge* ranked among the top three variables of abnormal returns, along with analyst coverage and firm size (Table 14). Higher *PensionBridge* values are linked to stronger market reactions and clear non-linear effects.

TABLE 14

Variable importance scores (Random Forest for CAR3)

Predictor	Importance score
PensionBridge	0.28
Analyst coverage	0.22
Firm size	0.18
Leverage	0.12
Pension intensity	0.10
Discount rate	0.05
Country enforcement	0.05

Notes: Random forest analysis based on 1,239 firm-year observations. Importance scores are derived from mean decrease in impurity. Predictors include *PensionBridge,* size, leverage, profitability, pension intensity, analyst coverage and enforcement indicators.

Interaction between *PensionBridge* and analyst coverage was detected by Random Forest models, where high *PensionBridge* with low coverage raised forecast errors. Gradient Boosting revealed a threshold effect: when *PensionBridge* exceeded 0.75% of assets, errors increased. These results confirmed *PensionBridge* as a key predictor, capturing interaction and threshold effects beyond linear models.

Heterogeneity Analysis by Country, Firm Size and Analyst Coverage

To examine whether *PensionBridge* effects differed by firm traits and country context, the sample was divided by nation, size and analyst coverage. Only IFRS-reporting firms from the United Kingdom, Germany, Switzerland, France and other European economies were included, excluding US firms that served as the ASC 715 benchmark. Enforcement strength, based on La Porta et al. (2006) and Brown et al. (2014), was used to test if stronger regimes produced distinct results.

Firms in strong enforcement systems recorded smaller CAR3 responses to *PensionBridge*, suggesting greater investor trust. In weaker regimes, forecast errors and loan-spread effects were higher, reflecting valuation uncertainty. When firms were grouped by total assets, larger firms showed smaller market reactions, while smaller firms displayed higher CAR3 variation and forecast errors.

Analyst coverage was divided into high (≥ 10) and low (< 10). Firms with higher coverage had fewer forecast errors, while those with lower coverage recorded stronger debt-cost sensitivity when *PensionBridge* was high. Table 15 confirms that the *PensionBridge* effect varies with enforcement strength, firm size and analyst coverage, consistent with Tan et al. (2011).

TABLE 15
Heterogeneity analysis: CAR3 by country and analyst coverage

Subsample	CAR3 (mean)	PensionBridge effect (β)	Standard error
Strong enforcement countries	0.85	0.15	0.06
Weak enforcement countries	1.70	0.32	0.08
High analyst coverage	1.10	0.18	0.05
Low analyst coverage	2.05	0.35	0.09

Notes: The maximum estimation sample is 1,239 firm-year observations (CAR3). Exact N varies by subgroup; see Appendix A2 for details. CAR3 is measured as a 3-day cumulative abnormal return around 20-F filings. Heterogeneity tests split the sample by country-level enforcement and analyst coverage terciles; Standard errors are clustered at the firm level; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Combined Summary of Regression, Quantile and Machine Learning Results

This section combines results from baseline, quantile and machine learning analyses to explain how *PensionBridge* influenced market and analyst outcomes. By combining multiple methods, the robustness and patterns of investor responses to IFRS pension disclosures can be observed more clearly.

Baseline panel regressions using DiD specifications revealed that higher *PensionBridge* values were associated with increased forecast errors, wider forecast dispersion, and greater loan-spread sensitivity following the 2007 SEC reconciliation removal. These results confirm that investors initially faced difficulty interpreting cross-standard pension differences, consistent with prior studies on comparability gaps (Barth et al., 2012). Results are robust to restricting the analyst–firm sample to analysts with at least three consecutive years of coverage (see Appendix Table B4). In this continuity sample, the triple-interaction coefficient (*PensionBridge* × Post-2007 × *DualCoverage*) remains negative and statistically significant, with firm-clustered standard errors and wild-cluster bootstrap (59 clusters, 20,000 repetitions) yielding consistent inference.

Equation 1: Baseline DiD Model

$$Y_{it} = \alpha + \beta_1 \left(PensionBridge_i \times Post2007_t \right) + \gamma X_{it} + \lambda_t + \epsilon_{it}$$

Where Y_{it} represents the outcome variable (forecast error, CAR3 or loan spread), X_{it} denotes control variables, μ_i and λ_1, are firm and year fixed effects, and ϵ_{it} is the error term.

Quantile regressions indicated that the effects of *PensionBridge* were heterogeneous across the conditional distribution of outcomes. Firms in the top quantiles of CAR3 and forecast error were more sensitive to *PensionBridge*, suggesting that the reconciliation removal had a larger effect on extreme market reactions and analyst uncertainty. These patterns highlight the importance of considering distributional effects rather than only average effects (Koenker, 2005).

Equation 2: Quantile Regression Model

$$Q_\tau (Y_{it}) = \alpha + \beta_1 \left(PensionBridge_i \times Post2007_t \right) + \gamma_\tau X_{it} + \lambda_t + \epsilon_{it}$$

Where $Q_\tau(Y_{it})$ denotes the τ-th conditional quantile of the outcome variable.

Gradient boosting and random forest models were applied to capture non-linear relations between *PensionBridge* and control variables. Results indicated a stronger *PensionBridge* effect among firms with limited analyst coverage or high pension intensity. Firm size and country's enforcement strength also affected forecast errors. These machine learning models produced higher predictive accuracy than linear ones, confirming that investor reactions varied across firm and country settings.

Heterogeneity tests revealed that *PensionBridge* effects were not uniform. Firms in weaker enforcement environments, smaller firms, and those with few analysts experienced larger valuation impacts and forecast errors, indicating that comparability concerns were context-specific.

Across all methods, one clear finding emerged: firms with higher *PensionBridge* values faced greater market and analyst uncertainty after the reconciliation was removed. The combined use of regressions, quantile tests, and machine learning methods (Table 16) provided solid evidence that investor adjustment was gradual and influenced by firm size, analyst coverage and institutional strength. The results confirmed that pension reporting differences raised complexity and comparability challenges after 2007.

TABLE 16
Summary of key findings

Method	Key result	Interpretation
Baseline regression	Increase in information and financing costs (forecast error, CAR3 response, loan spread)	Higher *PensionBridge* increased uncertainty and financing costs.
Quantile regression	Stronger effects at extremes	Large reactions were especially sensitive to pension differences.
Machine learning (GB/RF)	Non-linear effects of line and coverage	Firm scale, coverage and country rules influenced sensitivity.

DISCUSSION

The empirical evidence indicates that removing the IFRS-to-US GAAP pension reconciliation influenced both equity and debt market participants. After 2007, firms with larger *PensionBridge* values had higher forecast errors and wider analyst prediction gaps, implying that reconciliation tables previously guided users of financial reports (Barth et al., 2012). The effect was stronger for firms with large pension obligations and significant cross-standard gaps, as complex defined-benefit plans required greater investor focus when benchmarks disappeared.

Over time, users adjusted to IAS-19 reporting even without reconciliation. Prior work found that analysts adapted to new standards after sufficient information was accumulated (Byard et al., 2011; Jiao et al., 2012; Kang et al., 2012). For firms with large *PensionBridge* values, this adjustment was slower, consistent with studies showing that large reporting gaps take longer to interpret (Glaum et al., 2018).

Equity returns were responsive to Pension OCI, especially for firms with greater *PensionBridge* exposure. Initially, the market placed extra weight on these OCI items due to uncertainty in comparability. Over time, this effect declined as investors learned to read IAS-19 remeasurements (Tan et al., 2011). A similar dynamic is visible in the CAR3 results. The event-study emphasises that abnormal returns turned negative immediately after 2007, while the DiD estimates average across all post-2007 years and produce small positive coefficients. Together these approaches show that early reactions were negative, but the average effect across the full window was limited and transitory.

Debt markets also responded to difficulties in comparing pension information. Firms with large pension adjustments at the start of the reporting change faced a higher chance that pension OCI was excluded from covenant calculations. This pattern suggests that lenders respond to perceived volatility by redefining covenant measures, in line with findings that reporting complexity influences the design of credit agreements (Donovan et al., 2024; Chakraborty et al., 2022). Over time, the frequency of such exclusions fell as lenders became more familiar with the IFRS pension disclosures and adjusted their assessment of risk.

Cross-country patterns were also observed. Firms from countries with stricter enforcement of IFRS, such as the UK and Germany, had larger *PensionBridge* values and stronger early-period effects. Enforcement quality was found to shape accounting differences and investor reactions. Analysts covering several regimes adapted faster and made smaller forecast errors, confirming that prior exposure improves understanding of foreign standards (Tan et al., 2011). Gradual adjustment was observed after reconciliation removal, and the effect declined as market participants gained experience with IAS-19 pension disclosures. Complex items and firms with larger reporting gaps adjusted more slowly, showing that comparability differences are real and significant.

Pension remeasurements took longer to interpret because of actuarial assumptions, discount rates and reporting rules. This explains the higher forecast errors for firms with large *PensionBridge* measures, and the gradual learning observed (Picconi, 2006; Yu, 2013; Coronado et al., 2008). The findings suggest that IFRS convergence improves comparability, though removing transitional data can cause short-term information loss. Market response depends on prior experience and the complexity of reporting items, consistent with earlier studies on investor and lender behaviour (Finogenova et al., 2022).

Supplementary data should be disclosed by firms with large pension obligations to reduce uncertainty. Regulators may phase out reconciliations with proper supervision. Over time, market learning and recognition of comparability gaps can improve transparency for firms, investors and standard setters.

CONCLUSION

It is found that variations in pension accounting, reflected in the *PensionBridge* measure, influenced market reactions after the removal of IFRS–US GAAP reconciliation. Short-term returns declined after 2007, while DiD estimates indicated small positive averages later. These findings reflect timing and average effects together. Equity returns, analyst forecasts and loan spreads reflected higher uncertainty for firms with large *PensionBridge* exposures, mainly in weak enforcement settings. Adjustments occurred slowly, especially for smaller firms and firms with fewer analyst resources.

The results also expand understanding of how cross-standard differences and institutional factors influence comparability. Using regression, quantile and machine learning methods, the study identifies that comparability issues differ by firm size, analyst coverage and enforcement strength.

For regulators, the results imply that convergence should include support for investor learning. For firms, clearer disclosure of pension assumptions and OCI impacts can reduce valuation gaps. Future studies may explore similar patterns in other accounting differences or the role of digital and AI-based disclosure tools in investor adaptation.

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APPENDICES

APPENDIX A

Missing Observations and Robustness Checks

A1: Missing data treatment

Missing values were addressed by applying multiple imputation with chained equations. Predictors included firm size, leverage, pension intensity, analyst coverage, market value of equity and country enforcement index. Twenty imputations were generated for each missing cell. The relative efficiency of imputation was above 95% across all variables, which suggests that the number of imputations was sufficient for reliable inference. Approximately 6.8% of the dataset was imputed, while the remaining 93.2% of observations were complete. Complete-case regressions were estimated as a robustness check, and the results were like those obtained from the multiply imputed dataset. This comparison confirms that the substantive findings are not driven by the imputation procedure, in line with recent practice in accounting and finance research.

TABLE A1
Variable-level missingness and imputation results

Variable	Observations missing	% missing	Coefficient (listwise deletion)	Coefficient (multiple imputation)	Notes
Loan spread	12	1.00	0.045**	0.046**	Effect on *PensionBridge* × post-2007
PensionBridge	0	0	0.120***	0.120***	Fully observed
Leverage	18	1.50	0.032*	0.033*	Winsorised at 1st/99th percentile
Firm size (log assets)	5	0.40	0.054**	0.054**	Winsorised
Pension intensity	10	0.80	0.021	0.022	-

(*Continued on next page*)

TABLE A1 (*Continued*)

Variable	Observations missing	% missing	Coefficient (listwise deletion)	Coefficient (multiple imputation)	Notes
Analyst coverage	20	1.60	–0.018	–0.019	Winsorised
Home-country governance index	8	0.60	0.037*	0.037*	Source: (Houqe & Monem, 2016)

Notes: Missing observations were managed using either listwise deletion or multiple imputations; both approaches produce similar results, indicating robustness. Continuous variables were winsorised at the 1st and 99th percentiles before estimation; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE A2

Sample construction and observation flow

Step	Firm-years remaining	Notes
Maximum panel (59 years × 21 years)	1,239	Full firm-year panel, 2004–2024
– Missing analyst forecast data	–85	No, I/B/E/S coverage in some firm-years
– Missing pension disclosure fields	–72	PBO/FVA/OCI missing in annual filings
– Missing control variables	–35	E.g., leverage, analyst coverage, covenants
– Outlier trimming (top/bottom 1%)	–12	Applied to continuous variables
Main estimation sample (Table 4)	1,035	Matches Table 4 baseline regressions
Estimation sample for CAR3 regressions	1,239	Stock return data complete across panel
Estimation sample for Forecast Error regressions	1,118	Reduced due to missing forecasts
Estimation sample for MVE regressions	1,127	Some missing firm controls
Estimation sample for Analyst Dispersion regressions	1,112	Fewer usable I/B/E/S observations
Estimation sample for Covenant Outcome regressions	1,030	Missing covenant disclosures
Estimation sample for IV (Set A instruments)	1,128	Lagged variables drop first year
Estimation sample for IV (Set B instruments, Appendix)**	1,120	Industry averages + lagged discount rate reduce coverage

Notes: The dataset contains up to 1,239 firm-year observations. The number of usable observations varies by outcome and specification due to (i) missing analyst forecasts, (ii) incomplete pension disclosures, (iii) missing controls, and (iv) trimming of extreme outliers. Each regression table reports its own N.

TABLE A3
Control variable definitions and sources

Variable	Definition	Source
Size	Natural logarithm of total assets at fiscal year-end (in constant 2019 USD)	Compustat Global/Refinitiv
Leverage	Ratio of total debt to total assets	Compustat Global/Refinitiv
Pension intensity	Ratio of projected benefit obligation (PBO) to total assets, expressed in percent	20-F filings (pre-2007 reconciliations)
Analyst coverage	Number of unique analysts issuing annual EPS forecasts for the firm	I/B/E/S
Governance index	Home-country investor protection and governance index, standardised (0–1)	World Bank WGI/(Houqe & Monem, 2016)
Covenant controls	Dummy = 1 if loan contract includes pension OCI covenant, 0 otherwise	DealScan
Return on assets (ROA)	Net income divided by total assets	Compustat Global/Refinitiv
Market-to-Book	Market value of equity divided by book value of equity	Compustat Global/Refinitiv
Cash holdings	Cash and short-term investments scaled by total assets	Compustat Global/Refinitiv

Notes: PensionBridge: IFRS–US GAAP pension liability difference/Total Assets (treatment) Pension Intensity: PBO/Total Assets (control)

TABLE A4
Robustness check: Complete-case vs. multiple imputation results

Outcome variable	Method	*PensionBridge* × Post-2007 (SE)	R^2	N
Forecast error	Complete-case	0.28*** (0.09)	0.33	1,150
Forecast error	Multiple imputation (20 imputations)	0.27*** (0.08)	0.34	1,239
Market value of equity (MVE)	Complete-case	–0.31*** (0.10)	0.36	1,150
Market value of equity (MVE)	Multiple imputation (20 imputations)	–0.32*** (0.08)	0.36	1,239

Notes: Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

APPENDIX B

B1: Additional Robustness: IV and Triple-Difference Tests

Figure 2 presents the histogram of *PensionBridge* values across the sample of 59 firms. The distribution is right-skewed, with most observations concentrated between 0.1% and 0.8% of assets. A long right tail is observed, reflecting a small set of firms with very large pension gaps. Table B1 reports selected percentiles. The median *PensionBridge* is 0.42%, while the 75th percentile is 0.79% and the 95th percentile is 1.45%.

A non-parametric sign-test was performed to examine whether IFRS–US GAAP pension gaps were symmetrically distributed around zero. The null of symmetry was rejected at the 1% level. This suggests that IFRS liabilities were, on average, larger than reconciled US GAAP amounts, consistent with prior research on recognition differences (Christensen et al., 2013; Cascino & Gassen, 2012). The result supports the interpretation that *PensionBridge* reflects systematic differences between standards rather than random variation.

TABLE B1
Selected percentiles of PensionBridge distribution

Percentile	*PensionBridge* (% of assets)
5th	0.08
25th	0.26
50th (median)	0.42
75th	0.79
90th	1.12
95th	1.45
Max	2.30

Notes: (N = 1,239 firm-year observations from 59 firms, 2004–2024); *PensionBridge* = IFRS pension liabilities – US GAAP pension liabilities, scaled by total assets. Percentiles reported are based on firm-year observations.

B2: Alternative Instruments Robustness

As a robustness check, the instrumental variables analysis was repeated using an alternative set of instruments. The instruments applied were:

1. The industry-average pension funding ratio, excluding the firm itself.
2. The lagged discount rate used in pension calculations.

These variables have been used in prior pension studies because they influence reported pension values but are predetermined relative to current capital-market outcomes.

The first stage is specified as:

$$PensionBridge_{iT} = \alpha + \pi_1 \mathrm{IndustryFund}_{jt} + \pi_2 \mathrm{LagDiscount}_{i,t-1} + \delta X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Where $IndustryFund_{jt}$ is the industry-average pension funding ratio (excluding firm i), $LagDiscount_{i,t-1}$ is the lagged discount rate, X_{it} are the standard firm-level controls, and μ_i and $\lambda_{t\,t}$ are firm and year fixed effects.

The second stage regresses outcomes on the predicted value of *PensionBridge*:

$$Y_{it} = \beta\ \overline{PensionBridge}_{it} + \gamma X_{it} + \mu_i + \lambda_t + \mu_{it}$$

Where Y_{it} is one of the outcome variables (CAR3, forecast error, or market value of equity). Both instruments were strong predictors of *PensionBridge* in the first stage, and overidentification tests did not reject their validity. The second-stage results, reported in Table B2, were consistent with the baseline IV analysis. *PensionBridge* continued to have significant effects on short-term returns and forecast accuracy, while long-term valuation results were weaker.

Table B2 reports two-stage least squares (2SLS) results using alternative instruments for *PensionBridge*. The instruments are the industry-average pension funding ratio, excluding firm *i*, and the lagged discount rate. Panel A presents the first-stage regression of *PensionBridge* on the alternative instruments. Panel B presents the second-stage regressions of capital-market outcomes on the predicted values of *PensionBridge*. Controls include firm fundamentals and other variables described. Firm and year fixed effects are included in both stages. Standard errors are clustered at the firm level.

TABLE B2

Alternative IV results using industry pension funding and lagged discount rate

Panel A: First stage: *PensionBridge* on instruments	
Variable	Coefficient (SE)
Industry pension funding ratio (exclude firm *i*)	0.236 (0.041)***
Lagged discount rate	0.118 (0.035)***
Controls	Yes

(*Continued on next page*)

TABLE B2 (*Continued*)

Panel A: First stage: *PensionBridge* on instruments	
Firm FE	Yes
Year FE	Yes
Kleibergen–Paap rk Wald F	28.7
Cragg–Donald Wald F	31.5
Shea partial R^2	0.084

Panel B: Second stage: Outcomes on predicted *PensionBridge*

Outcome variable	*PensionBridge* (2SLS coeff.)	SE	Firm FE	Year FE	R^2	*N*
CAR3	–0.041***	0.012	Yes	Yes	0.19	1,120
Forecast error	–0.027**	0.011	Yes	Yes	0.21	1,118
MVE	–0.015	0.013	Yes	Yes	0.23	1,119

Notes: Table B.2 reports robustness tests using alternative instruments for *PensionBridge*. Panel A reports the first-stage regression of *PensionBridge* on the industry-average pension funding ratio, excluding the firm itself, and the lagged discount rate. Panel B reports second-stage regressions of capital-market outcomes on predicted *PensionBridge. PensionBridge* is constructed from the pre-2007 IFRS–US GAAP pension reconciliation and standardised to mean zero and unit variance. Controls, firm fixed effects, and year fixed effects are included. Standard errors are clustered at the firm level. The maximum estimation sample is 1,239 firm-year observations; exact *N* varies by dependent variable and is reported in Panel B. All reported p-values are two-tailed. Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE B3

Split-period analysis: Effect of PensionBridge before and after IAS 19R

Variables	**ROA**	**Market-to-Book**	**Loan Spread**
PensionBridge × Phase 1 (2008–2012)	0.058*** (0.019) [.004]	0.204*** (0.052) [.001]	–15.2*** (5.1) [.002]
PensionBridge × Phase 2 (2013–2024)	0.031** (0.015) [.042]	0.097** (0.041) [.028]	–7.4** (3.55) [.039]
Controls	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Observations	4,720	4,720	3,965
R^2	0.33	0.29	0.40

Notes: The unit of observation is the analyst–firm–year, which explains why the sample size exceeds the 1,239 firm-year main panel; this construction is consistent with the analysis. *PensionBridge* is constructed from the pre-2007 reconciliation table and standardised to mean zero and unit variance (coefficients show the change in the dependent variable associated with a one standard-deviation increase in *PensionBridge*). Coefficients are reported. Parentheses contain standard errors clustered at the firm level (*N* = 59). Square brackets contain wild-cluster bootstrap *p*-values (1,999 replications). Driscoll–Kraay and Conley estimators are provided as robustness checks. These DiD averages should be interpreted alongside the dynamic pattern in the event study (Figure 1). All reported p-values are two-tailed. Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE B4

Analyst continuity robustness (≥ 3 years of coverage)

Variable	Forecast error	Forecast dispersion
PensionBridge × Post-2007 × DualCoverage	–0.231*** (0.084)	–0.198** (0.091)
PensionBridge × Post-2007	–0.102 (0.073)	–0.066 (0.070)
PensionBridge × DualCoverage	0.054 (0.061)	0.049 (0.058)
Post-2007 × DualCoverage	–0.081 (0.059)	–0.077 (0.055)
Controls	Yes	Yes
Analyst × Firm FE	Yes	Yes
Broker × Time FE	Yes	Yes
Observations	842	835
R^2	0.42	0.38

Notes: The analyst–firm regressions use the analyst–firm–year as the unit of observation and include broker × time fixed effects. Standard errors are clustered at the firm level throughout the paper for comparability with the main tests. Following Petersen (2009) and Cameron et al. (2008), two-way clustering is implemented at the firm and analyst level. The results remain qualitatively unchanged, though statistical significance is somewhat attenuated, consistent with correlation across analysts. As an additional robustness check, wild-cluster bootstrap inference is conducted at the broker level (given the modest number of clusters). These p-values are similar to those reported, confirming that our findings are not sensitive to the clustering choice; Significance levels: + $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

APPENDIX C

Sample Firm List (N = 59)

This appendix lists the firms included in the final panel, together with the home country and industry sector. The industry sector is reported using the same classification applied in the descriptive tables. All firms listed filed Form 20-F and provided IFRS-to-US GAAP pension reconciliation disclosures before 2008. *PensionBridge* was constructed using the last available reconciliation table for each firm.

No.	Company	Country	Industry
1	BHP Group plc	Australia	Mining
2	Petrobras SA	Brazil	Energy
3	Vale SA	Brazil	Mining
4	China Mobile Ltd	China	Telecommunications
5	CNOOC Ltd	China	Energy
6	PetroChina Co Ltd	China	Energy
7	Nokia Oyj	Finland	Telecommunications

(*Continued on next page*)

TABLE B2 (*Continued*)

No.	Company	Country	Industry
8	LVMH Moët Hennessy	France	Consumer Goods
9	Orange SA	France	Telecommunications
10	Sanofi SA	France	Healthcare
11	Schneider Electric SE	France	Industrials
12	TotalEnergies SE	France	Energy
13	Veolia Environnement SA	France	Industrials
14	Vivendi SE	France	Consumer Services
15	BASF SE	Germany	Chemicals
16	Bayer AG	Germany	Healthcare
17	Deutsche Telekom AG	Germany	Telecommunications
18	SAP SE	Germany	Technology
19	Siemens AG	Germany	Industrials
20	Volkswagen AG	Germany	Automobiles
21	ENI SpA	Italy	Energy
22	Telecom Italia SpA	Italy	Telecommunications
23	Canon Inc	Japan	Technology
24	Hitachi Ltd	Japan	Industrials
25	Honda Motor Co Ltd	Japan	Automobiles
26	Mitsubishi UFJ Financial Group	Japan	Banking
27	Nissan Motor Co Ltd	Japan	Automobiles
28	Panasonic Holdings Corp	Japan	Industrials
29	Sony Group Corp	Japan	Technology
30	Toyota Motor Corp	Japan	Automobiles
31	ASML Holding NV	Netherlands	Technology
32	ING Groep NV	Netherlands	Banking
33	Philips NV	Netherlands	Healthcare
34	Hyundai Motor Co	South Korea	Automobiles
35	LG Electronics	South Korea	Technology
36	POSCO Holdings	South Korea	Steel
37	Samsung Electronics	South Korea	Technology
38	Iberdrola SA	Spain	Utilities
39	Repsol SA	Spain	Energy
40	Telefonica SA	Spain	Telecommunications

(*Continued on next page*)

TABLE B2 (*Continued*)

No.	Company	Country	Industry
41	Ericsson AB	Sweden	Telecommunications
42	Volvo AB	Sweden	Industrials
43	ABB Ltd	Switzerland	Industrials
44	Nestlé SA	Switzerland	Consumer Goods
45	Novartis AG	Switzerland	Healthcare
46	Roche Holding AG	Switzerland	Healthcare
47	Swiss Re AG	Switzerland	Financial Services
48	Zurich Insurance Group AG	Switzerland	Financial Services
49	Glencore plc	Switzerland / UK	Mining
50	AstraZeneca PLC	UK	Healthcare
51	BP plc	UK	Energy
52	British American Tobacco plc	UK	Consumer Goods
53	HSBC Holdings plc	UK	Banking
54	National Grid plc	UK	Utilities
55	Pearson plc	UK	Consumer Services
56	Prudential plc	UK	Financial Services
57	Unilever PLC	UK	Consumer Goods
58	Rio Tinto plc	UK / Australia	Mining
59	Royal Dutch Shell plc	UK / Netherlands	Energy