Journal of Management and Governance
https://doi.org/10.1007/s10997-024-09715-x

Hedge accounting usage and capital investment: European evidence under IFRS requirements

Alessandra Allini[1] · **Marco Maffei**[1] · **Rosalinda Santonastaso**[2] · **Flavio Spagnuolo**[1]

Accepted: 24 July 2024

Abstract
We investigate the effects of hedge accounting usage on firms' level of capital investment. Analyzing a set of 286 public firms in the European Union during the period 2016–2019, our findings are threefold. Firstly, we provide evidence that firms which apply hedge accounting under IFRS requirements increase their level of capital investment more than firms that do not exploit these accounting principles. Second, we also suggest that this link is mediated by the earnings volatility mitigation. Lastly, we find that such a relationship is exacerbated after the IFRS 9 implementation period, consistently with the view that the newest hedge accounting rules provided by the IASB are recognized to be more effective and more beneficial for firms, comparatively to IAS 39. These results are robust to different measures of capital investment, alternative models' specifications, and after correcting for potential endogeneity concerns. We contribute with the first empirical study that explores the role of hedge accounting on investment behavior under different IFRS requirements. This research is valuable for standard setters and regulators to understand how their accounting requirements may affect firms' economic decisions. From a managerial point of view, our study offers particular insights into hedge accounting mechanisms and practical implications about the role of accounting choices in real investments' decision-making.

Keywords Hedge accounting · Capital investment · Earnings volatility · IFRS · IAS 39 · IFRS 9

1 Introduction

Firms hold derivatives instruments to hedge both the financial and operative risks they face while performing their business activities (Müller, 2020; Panaretou et al., 2013). From an accounting point of view, hedging activities have always been a critical matter, whereas firms had to recognize in the operating income the gains

Extended author information available on the last page of the article

Published online: 20 September 2024

and losses of financial derivatives' fair value changes, which might likely affect the stability of earnings over time (Bernhardt et al., 2016; Müller, 2020). As a consequence, standard setters began to regulate this issue with the aim to make undisturbed the firms' operating results (Müller, 2020).

At this regard, in 1998 the International Accounting Standards Committee (IASC)[1] approved a set of optional rules, shaping the *hedge accounting principles*, by issuing the International Accounting Standard (IAS) 39, which became effective for EU entities reporting under International Financial Reporting Standards (IFRS) on or after 1 January 2005.

In particular, this optional accounting practice, applicable under specific requirements, modifies the basis adopted for identifying gains or losses related to fair value changes of hedging instruments and hedged items, so that both are recognized in the same accounting period. Thus, such simultaneous recognition reduces the volatility of earnings that otherwise would increase when the hedged item and hedging instrument were accounted for separately in different accounting periods.

While standard setters mainly aim to adjust an economically unjustified accounting mismatch with these principles, prior studies also reveal that they have further consequences on firms' investment decisions (Campbell et al., 2019; Campello et al., 2011; Eierle et al., 2021; Lee, 2019; Lobo et al., 2022; Nguyen, 2018). In particular, scholars reveal that applying hedge accounting can alleviate underinvestment problems as it entails high effectiveness in managing firms' risk exposures (Ali et al., 2024; Eierle et al., 2021; Nguyen, 2018) and since, exploiting such practice, firms can rely less on external finance providers, who usually impose more caution in investment choices (Carter et al., 2006; Kumar & Rabinovitch, 2013; Tufano, 1998).

Previous research on hedge accounting effects and investment decisions is closely related to the United States (US) scenario under the Financial Accounting Standard Board (FASB) requirements[2] (Doshi et al., 2018; Eierle et al., 2021; Lobo et al., 2022; Nguyen, 2018; Ranasinghe et al., 2022), while it unsuccessfully provided useful implications for European Union (EU) context.

Also, it is worth mentioning that this thread of research focuses mainly on outcomes deriving from *hedging activities* in general, rather than from the choice to apply rigorous hedge accounting principles, thus significantly overlooking the potential economic outcomes deriving from certain accounting choices. Schleicher et al. (2010) and Biddle et al. (2016) support the conjecture that the requirements

[1] In 2001, the IASC faced a major reorganization, which led to the creation of the *International Accounting Standard Board* (IASB).

[2] Similar to hedge accounting principles provided by the IASB, the FASB released in 1998 the "*Statement of Financial Accounting Standards (SFAS) No. 133—Accounting for Derivative Instruments and Hedging Activities"* effective from 2000 for entities compliant with the US GAAP. As stated by prior scholars (Frestad & Beisland, 2015; Hairston and Brooks, 2019), hedge accounting principles provided by FASB and IASB are concretely comparable, given that both aim to correct the accounting mismatch arising from the hedging activities which imply the use of financial derivatives.

At this regard, the "*Accounting Standards Update (ASU) No. 2017-12—Derivatives and Hedging (Topic 815)*" released by the FASB in 2017 makes clear the process of convergence between the IASB and FASB about hedge accounting principles over time.

provided by the IASB's regulations may significantly affect firms' investments behavior. Specifically to hedge accounting principles, in line with these arguments, Beisland and Frestad (2013) offer valuable evidence that the application of hedge accounting influences risk managers' practices and behaviors, but authors also recognize that this research topic has still attracted little attention in both finance and the accounting studies.

Thus, prompted by the idea that optional accounting practices may influence corporate economic decisions (Beisland & Frestad, 2013; Healy & Palepu, 1993; Linck et al., 2007; Zhaoyang et al., 2005), we aim to fill this lack in the literature by exploring the link between the application of IASB's hedge accounting principles and the level of firms' capital investment. In particular, we shed light on *how* hedge accounting usage under the IFRS requirements encourages firms to increase their level of capital investment. Moreover, given that the main purpose of hedge accounting requirements is income stability (Müller, 2020), we carry out further analyses on whether the mitigation of earnings volatility could be considered a valid channel through which the application of hedge accounting animates firms to raise their level of investments. The underpinning idea is that managers—relying on more stable earnings due to hedge accounting principles—may be more confident in pursuing investment opportunities (Ahmed et al., 2020; Minton & Schrand, 1999).

Lastly, we examine if such a relationship between the optional application of hedge accounting and the level of capital investment is even more pronounced following the more recent requirements changes. In fact, the IAS 39 principles about hedge accounting have been widely criticized by practitioners for being too complex and difficult to apply due to strict requirements (Bernhardt et al., 2016; Müller, 2020; PwC, 2017). To reduce the standard's complexity and to encourage firms to easily apply hedge accounting requirements, the IASB replaced the IAS 39 with the International Financial Reporting Standard (IFRS) 9. Specifically, the EU required IFRS-adopter entities for its initial application from 1 January 2018.

We address these issues by analyzing a sample of 286 public firms in the EU that operate in particular industries, i.e. the oil-and-gas production, petroleum, chemical, communications, healthcare, and airline transportation, during the period 2016–2019 for a total of 1144 firm-year observations. In line with past studies (Carroll et al., 2017; Lee, 2019; Lobo et al., 2022; Ranasinghe et al., 2022), we explore firms in these sectors given that the usage of hedge accounting practice is highly economically relevant within such industries (Ranasinghe et al., 2022). In this context, since the hedge accounting practice continues to be optional, we carefully read firms' annual reports to classify them as hedge accounting *users* (vs *non-users*). Consistent with previous scholars (Campbell, et al., 2019; Chang et al., 2016; Nguyen, 2018) we rely on the extent of hedge accounting *usage*, rather than on the extent of hedge accounting' *intensity* since, in our setting of cross-industry analysis,

firms with a different core business are exposed to dissimilar risks that they could hedge.[3]

Running a panel regression analysis, our main results are threefold. Firstly, we find a significantly positive relationship between hedge accounting usage and the level of capital investment, coherently with results provided by the US scenario (Eierle et al., 2021; Nguyen, 2018). While the results specifically suggest that firms exploiting hedge accounting rules (i.e., *users*) are more prone to invest if compared to firms that do not (i.e., *non-users*), they also reveal that the enhancing effect of hedge accounting usage on capital investment functions via earnings volatility mitigation channel, corroborating with studies associating higher capital investment with higher income stability (Do Nguyet, 2017; Minton & Schrand, 1999; Minton et al., 2002). Lastly, we find significant evidence that the positive relationship between hedge accounting usage and the level of capital expenditure is exacerbated after the implementation of the IFRS 9 principle, compared to the IAS 39 period. This result confirms the belief of scholars and practitioners regarding the improvement of IASB's principles relative to hedge accounting (Ernst & Young, 2014; Bernhardt et al., 2016; Müller, 2020; PwC, 2017).

One main concern in our analysis is that—considering the voluntary application of hedge accounting principles either under IAS 39 or IFRS 9—our measure of *usage* might be not exogenously determined. We alleviate such an issue by furtherly controlling for firms' unique characteristics under certain specifications and employing Heckman's (1979) two-stage approach as a robustness test. Our results keep also under these alternative specifications.

Overall, our findings provide several contributions to accounting research. Firstly, we enrich the underdeveloped stream of studies about hedge accounting (Campbell et al., 2023; Lobo et al., 2022; Ranasinghe et al., 2022). In particular, we expand the topic awareness in EU context shedding light on a bridge (i.e., earnings volatility mitigation) that associates hedge accounting usage with higher capital investment. Moreover, we provide the first empirical analysis that investigates the role of hedge accounting application in firms' investment behavior, under different IFRS requirements. Also, we contribute to the existing literature regarding the effects of accounting practices on entities' economic decisions (Biddle et al., 2016; Guttman & Meng, 2021; Healy & Palepu, 1993; Linck et al., 2007; Schleicher et al., 2010; Zhaoyang et al., 2005). Specifically, we provide further evidence on the real economic consequences of optional accounting choices, whereas prior studies focused mainly on the effects provided by mandatory accounting requirements. Thus, we continue to stimulate the debate on the managerial implication of IFRS requirements' adoption

[3] Other authors (Lobo et al., 2022; Ranasinghe et al., 2022) measured hedge accounting *intensity* instead of the extent of hedge accounting *usage*. Such approach is facilitated within industry-specific studies because the identification of the most pertinent risk to which firms are exposed and that they hedge for is clearly distinct (e.g., oil and gas and jet fuels prices respectively for oil-and-gas and airline industries). Moreover, IASB requirements about derivatives and hedge accounting disclosures is principle-based rather than rule-based as the reporting standards provided by the FASB. Thus, the application of IASB reporting guidance usually varies across entities (Titova et al., 2020) and such circumstance hinders the possibility to correctly assess and consolidate information regarding the *quantitative* extent of hedge accounting usage.

(Bonetti et al., 2017; De Luca & Prather-Kinsey, 2018; Mechelli & Cimini, 2021; Melis & Carta, 2010).

Lastly, this research suggests to standard setters (in particular, the IASB) the extent to which their principles about optional accounting practices affect the economic decisions of firms that implement the IFRS more exhaustively. Coherently, from a managerial point of view, our study suggests that apparently mere accounting choices might strongly affect capital investment dynamics.

The remainder of the paper is structured as follows. Section 2 discusses the institutional background of hedge accounting principles. Section 3 reviews the literature and provides the hypotheses development. Section 4 describes the research design and the methodology. Section 5 discusses the results and robustness tests. Lastly, Sect. 6 sets forth the conclusions, the limitations, and the implications of the study.

2 Institutional background

Prior to IFRS requirements, the accounting for derivatives instruments was based on the historical cost method. However, this approach implied that financial derivatives were not included in the statement of financial position and potential losses were hidden until maturity because of their negligible or zero historical cost (Gigler et al., 2007; Müller, 2020). Beyond the concerns about the inadequate information of firms' accounting practices (Beisland & Frestad, 2013), this method allowed managers to hide any potential large losses until settlement in combination with the potential substantial value variability in the value of derivatives (Gigler et al., 2007), with the consequence that firms' financial statements did not reflect timely signals of financial distress.

However, accounting methods for derivatives instruments significantly changed when, in 1998, the IASC approved the IAS 39—*Financial Instruments: Recognition and Measurement*. After the EU endorsement in November 2004, IAS 39 was enforced and became mandatory for European Union (EU) entities adhering to IFRS for fiscal years commencing on or after 1 January 2005. Concerning financial derivatives recognition, the first major provision of IAS 39 is that firms have to treat derivatives instruments as financial assets or financial liabilities on the statement of financial position as measured by their fair values.

However, the general accounting treatment for financial derivatives held for hedging purposes creates a misleading phenomenon (Adam & Fernando, 2006; Beatty et al., 2012; Chernenko & Faulkender, 2011; Choi et al., 2013; Smith & Stulz, 1985). Specifically, the derivatives might be usually recorded on the statement of financial position at their fair value and the change must go through net income while the hedged asset is often accounted for mixed measurement models (i.e., it may be measured at cost, amortized cost or fair value with gains and losses recognized in equity).

Consequently, the application of such accounting principles for hedging instruments led often to a recognition of their gains or losses in a different period compared to the relative gains or losses of hedged items. Thus, this approach usually

generated an accounting mismatch which in turn led to an economically unjustified earnings volatility (Butler, 2009).

To address this concern, the IAS 39 brought, among other things, the first set of rules to utilize *hedge accounting*. Specifically, this optional accounting treatment seeks to correct the mismatch arising from the usual accounting treatment of hedging instruments and hedged items (Kablan, 2014). The general IASB's provisions for hedge accounting should ensure that gains and losses on the hedging instrument are recognized alternatively via *Profit & Los*s (P&L) or *Other Comprehensive Income* (OCI) in the same period as offsetting losses and gains on the hedged item (Hwang, 2002; PwC, 2017). Such a different treatment would ensure more stable net income figures compared to entities that do not apply hedge accounting, whereas the synchronization between the hedging instrument and hedged item recognitions implies that net profit does not vary in response to the fair value changes of hedging instruments.[4]

To qualify for hedge accounting, firms are required to keep a *formal designation and documentation* regarding risk management objectives and strategies, the hedging relationship,[5] the nature of the risk being hedged, and, lastly, the hedge effectiveness.[6]

More in-depth, the IAS 39 allowed to pursue three different hedging strategies: the fair value hedge, the cash flow hedge, and the hedge of a net investment in a foreign operation. The objective of fair value hedge accounting is to recognize the value changes of the hedging instrument immediately in P&L and also any gain or loss on the hedged item attributable to the hedged risk (IAS 39, para. 89). The primary purpose of cash flow hedge accounting is to defer the recognition of value changes of the hedging instrument at the time when the hedged item affects P&L (PwC, 2017). Thus, the change in the fair value of the derivative is initially reported as a component of OCI and later reclassified into P&L in the same period(s) when the hedged transaction affects P&L earnings (IAS 39, para. 95–99; Glaum & Klöcker, 2011). As a result, while the former aim to protect the fair value of either assets or liabilities, the latter aims to protect cash flow related to a specific transaction from the adverse impact of market risk (Oxelheim et al., 2020). Nevertheless, in both the strategies the primary objective is to render the income unaffected from unrealized gains or losses derived by hedging instruments. On the other hand, the idea behind hedging a net investment in a foreign operation is to hedge the foreign currency

[4] For instance, suppose that in a given year t a firm uses a financial derivative to hedge a defined risk exposure of an item in their current statement of financial position. Assuming the hedged item settling in $t+1$, while the financial instrument maturing in $t+2$, applying for hedge accounting allows the entity to recognize the offsetting gains or losses arising from fair value changes of hedging instrument beforehand in $t+1$ rather than in $t+2$, as it would happen if the hedge accounting principles were not applied.

[5] In particular, the hedging relationship is computed as the ratio between the quantity of the hedging instrument and the quantity of the hedged item in terms of their relative weighting. Quantitatively, such a measure is also called *hedge ratio.*

[6] Hedge effectiveness is defined as the extent to which changes in the fair value or cash flows of the hedging instrument offset changes in the fair value or cash flows of the hedged item.

exposure arising from the reporting entity's interest in the net assets of a foreign operation[7] (IAS 39, para. 102; Ramirez, 2015).

Despite the fact that the IAS 39 brought this important progress in financial derivatives measurement, it has always been criticized because of high complexity requirements and restricted application rules (Müller, 2020). While the purpose of introducing many complex requirements was to prevent managers from abusing exceptions to the general principles of recognition and measurement (Glaum & Klöcker, 2011), the main outcome of such controversial rules has been that IASB unsuccessfully made the operating income of IFRS-adopters undisturbed from fair value changes of hedging instruments.

Specifically, to meet such strict criteria many preparers had to adopt metrics built solely for accounting purposes and not derived from risk management systems implemented by firms because hedge accounting has often not been linked to rational risk management strategy (Panaretou et al., 2013). As highlighted by Bernhardt et al. (2016), negative consequences arose from such issue, whereas firms often had to choose either an optimal hedging strategy based on their own risk management systems which probably did not qualify for hedge accounting, or a suboptimal hedging strategy, for which hedge accounting was applicable, but did not fully meet the purposes of firms' risk management. As a result, it was very likely that under the IAS 39 requirements a firm would be forced to recognize gains or losses related to hedging instruments and hedged items in different accounting periods rather than simultaneously.[8] Hence, the subsequent increase in earnings volatility was inconsistent with the real economic situation of a firm (Marcon, 2020). To address many of the issues in IAS 39 strongly criticized by accountants, auditors, and academics (Bernhardt et al., 2016) and to simplify the set of rules concerning hedge accounting, in 2014 the IASB issued the final version of the IFRS 9—*Financial Instruments,* which largely replaced the IAS 39. In 2016, the EU adopted the IFRS 9 following the release of Regulation No. 2016/2067, requiring to IFRS-compliant entities its application from 1 January 2018.

However, IASB allowed firms to continue to apply the hedge accounting principles of the IAS 39 or to apply the principles contained in Chapter 6 (i.e., Hedge accounting) of IFRS 9. This alternative remains valid until the IASB finalizes the IFRS 9 project on *macro hedge*[9] (IFRS 9, para. BC6.104; Müller, 2020), for which the regulation remained that of the IAS 39.

[7] It is worth pointing out that the hedges of a net investment in a foreign operation are relatively rare compared to fair value and cash flow hedges strategies (Müller, 2020).

[8] When hedging instruments do not qualify for hedge accounting, IASB require to treat them as *trading* or *speculative* instruments. The fair value changes of financial instruments held for such purposes are directly recognized in P&L statement. Hence, the strict hedge accounting requirements under IAS 39 make highly likely the inappropriate speculative treatment of hedging instruments, although they meet the general purposes of risk management and are not used for trading purpose (Bernhardt et al., 2016).

[9] Macro hedging indicates the type of hedge related to an entire *dynamic* portfolio of items exposed to a similar risk. Specifically, macro hedge refers to interest rate exposures managed via fair value hedge, and it is particularly relevant for financial institutions within the banking industry (Ernst & Young, 2023). IFRS 9 only disciplines *micro hedge* accounting (i.e., hedge for a risk linked to a specific item on the

The first main difference of the IFRS 9, compared to the previous IAS 39, is that it extends the number of instruments qualifying as hedging instruments by including certain cases used in risk management practice that have been excluded by the requirements of IAS 39.

For example, the IFRS 9 allows a wider inclusion of non-derivatives financial instruments as eligible hedging instruments, besides the only case of a hedge of foreign currency risk, for which the IAS 39 already allowed the use of non-derivatives hedging instruments. Specifically, the IFRS 9 expands the use of non-derivatives instruments to hedge further risk categories, if they are distinctly identifiable, such as interest rate or credit risk (Deloitte, 2013). One logical effect of this change in hedge accounting principle is that, potentially, firms under the IFRS 9 requirements may have a greater chance to apply hedge accounting easily compared to the previous principle (Ernst & Young, 2014).

However, the main changes across the two principles regard the designation of the hedged items in the hedging relationship[10] (Marcon, 2020). In particular, the most significant differences pertain to the designation of risk and nominal components as well as to the designation of aggregated exposures and groups of items (Ernst & Young, 2014). For instance, the IFRS 9 introduced the option to classify an aggregate exposure, formed by combining derivatives and non-derivatives, as a hedged item. This is a change from the IAS 39 which clearly forbids the designation of a derivative as part of a hedged item (unless it is a net purchased option) (Deloitte, 2016).

This adjustment facilitates the straightforward identification of the hedged item without necessitating a complex separation of elements typically managed as a unified group.

Thus, the IFRS 9 expands the scope of risk management activities eligible for hedge accounting, in line with the IASB's goal of aligning entities' risk strategies more closely with hedge accounting, by improving the decision-usefulness of the financial statements (KPMG, 2021).

Moreover, the requirements for assessing *hedge effectiveness* under the IFRS 9 changed if compared to IAS 39. Specifically, the IAS 39 required firms to measure hedge accounting effectiveness mainly by assessing if a hedge is highly effective, both prospectively and retrospectively. As a result, the entities must perform numerical effectiveness tests[11] that can be burdensome and may not consistently align with risk management practices (Deloitte, 2013).

Footnote 9 (continued)

statement of financial position), and hence firms are continuing to apply the macro hedge accounting provisions of the IAS 39 until they will be superseded by future instalments of IFRS 9, given that the IASB expects to replace IAS 39 in its entirety (IASB, 2010; PwC, 2017).

[10] At this regard, both standards allow as eligible hedged items recognized asset or liability, an unrecognized firm commitment, a highly probable forecast transaction or a net investment in a foreign operation (IFRS 9 para. 6.3.1–6.3.3; IAS 39 para. 78). Moreover, both standards state that the item being hedged must still be reliably measurable and a forecast transaction must be highly probable.

[11] Under IAS 39, to qualify for hedge accounting the effectiveness must range between 80 and 125%. Respectively below and above such percentages, hedge accounting is not applicable.

On the other hand, the IFRS 9 adopts a more principles-based approach to the effectiveness assessment, steering any specific quantitative threshold that might conflict with risk management approaches (Deloitte, 2016). Specifically, according to IFRS 9 requirements, a hedging relationship qualifies for hedge accounting if it meets all of the three effectiveness requirements as follows. First, there should be an economic relationship[12] between the hedging instrument and the hedged item. Second, the effect of the credit risk should not dominate the value changes that result from that economic relationship and, lastly, the hedge ratio of the hedging relationship should reflect the actual quantity of the hedging instrument used to hedge the actual quantity of the hedged item (IFRS 9, para. 6.4.1).

These requirements are in line with a further change that happened under the IFRS 9 principles. Indeed, according to the IAS 39, hedge accounting has to be immediately *discontinued* when the hedging relationship turned to *ineffective*. As a natural consequence, the simultaneous recognition in fair values changes of the items in the hedging relationships is no longer permitted, and such circumstance entails that earnings volatility might again increase. Conversely, the IFRS 9 rules always allow the continuous *rebalancing* of an ineffective hedging relationships (IFRS 9, para. 6.5.5 and para. B6.5.7–B6.5.21). Consequently, considering this possibility, changes in hedge effectiveness do not influence particularly earnings volatility, whereas hedge accounting continues to be applied.

The lines of reasoning put forth in this part of our study help to better comprehend the development of the three hypotheses which we will discuss in the next section.

3 Literature review and hypotheses development

3.1 Hedge accounting usage and capital investment

Hedge accounting is considered an important tool that firms use to mitigate the consequences of undesirable risks they face (Campbell et al., 2023). Authors also showed that hedge accounting decreases information asymmetry in financial markets (DeMarzo & Duffie, 1995), increases the debt capacity (Leland, 1998), and it reduces financial distress costs (Graham & Rogers, 2002; Leland, 1998). The application of hedge accounting allows investors to better understand the results of firms' hedging activities, improving the information environment around firms (Beisland & Frestad, 2013). In particular, scholars reveal that regulation on hedging activities conveys value-relevant information for investors and analysts (Frestad & Beisland, 2015; Nguyen, 2018; Pierce, 2020). Thus, the subsequent decrease in information asymmetries as perceived by market participants can help firms to reduce their financing frictions and, in turn, to raise their investment activities (Ali et al., 2024).

[12] Instead of the quantitative assessments of hedge effectiveness (i.e., as it happened under IAS 39), the *economic relationship* required by the IFRS 9 only implies an expectation that fair value of the hedging instrument and the hedged item would move in the opposite direction (PwC, 2017).

Researchers also provide evidence that hedge accounting generally leads to an increase firm value (Ben Khediri, 2010; Miloș & Miloș, 2022; Purnanandam, 2007), enabled by higher capital expenditures due to either the reduction of the external funds' costs (Shapiro & Titman, 1986; Smith & Stulz, 1985) or the firms' dependence on external financing (Froot et al., 1993; Lessard, 1991; Stulz, 1990). To this purpose, Campello et al. (2011) argue that the hedge accounting principles provided by the FASB have a positive impact on capital expenditures of users of interest rate and foreign currency derivatives because their relative policies are valued positively by creditors and thus might produce gains for all stakeholders by facilitating capital investments.

Also, Lee (2019) highlights that only the use of financial derivatives under hedge accounting designation can lead to an increase in the firm value. Specifically, the author finds in a sample of listed firms in the Asian setting that only *designated* financial derivatives increase firm value due to their alignment with firms' growth strategies, while financial derivatives used for trading purposes are value-destroying as they can reflect managerial self-interests. Similar findings are provided by Nguyen (2018) and Eierle et al. (2021) in a sample of US listed firms, which demonstrate that FASB's regulations on hedge accounting reduce firms' risk exposure, allowing them to raise their level of capital expenditures.

These arguments motivate the conjecture regarding the unexplored positive association between the usage of hedge accounting under IASB requirements and the level of capital investment for EU firms, whereas prior evidence (in light of the FASB) does not analyze such link narrowly focusing on the application of hedge accounting under rigorous principles.

Thus, in line with the discussion advanced above, we formulate our primary hypothesis as follows:

H_1 *Hedge accounting usage is positively associated with the level of capital investment.*

3.2 Earnings volatility channel associating hedge accounting usage and capital investment

Prior studies reveal that hedge accounting is associated with reduced earnings volatility (Müller, 2020; Pierce, 2020; Ranasinghe et al., 2022). Specifically, Pierce (2020) underlines that hedge accounting decreases earnings volatility in non-financial firms while Abdel-khalik and Chen (2015) find that the use of cash flow hedge accounting treatment reduces the volatility of earnings even in a set of financial institutions. Coherent results provided by Beneda (2013, 2016) show that hedge accounting is associated with lower earnings volatility in a cross-industry analysis for North American firms.

Moreover, Lobo et al. (2022) state that the need to ensure stable earnings pushes firms to use hedge accounting in order to finance future capital investment. Hence, the authors intuited that the effects of hedge accounting on investment choices might be achieved through an expected earnings volatility lowering. If managers may rely

on more stable earnings by applying hedge accounting requirements, they can avoid to forego investment opportunities due to a firm's uncertain operating performance (Ahmed et al., 2020). Furthermore, given that hedge accounting reduces both the impact of financial risks (e.g., changes in commodity prices, foreign exchange rates, interest rates) and earnings volatility (Müller, 2020), firms might be seen as more financially stable by making it more attractive to investors and improving their ability to raise capital investment (Lee, 2019).

Scholars also pointed out the direct effect of earnings volatility on capital investment. For instance, Minton and Schrand (1999) find a negative relationship between earnings volatility and capital expenditures. Coherent results from Minton et al. (2002) evidence that higher current earnings volatility makes firms more prone to underinvest. Drawing on such evidence, we predict that hedge accounting usage will increase the level of capital investment by reducing earning volatility.

Hence, we formulate our second hypothesis as follows:

H_2 *Earnings volatility mitigation is a channel associating hedge accounting usage and the level of capital investment.*

3.3 IFRS 9 effect on the relationship between hedge accounting usage and capital investment

Studies relating to hedge accounting rules covered by the IFRS 9 are few if compared to those related to the IAS 39 or the SFAS 133[13] treatments. Most of them are descriptive and they only theoretically analyze differences between IAS 39 and IFRS 9 (Bernhardt et al., 2016; Ramirez, 2015). In the European setting, a shred of important evidence is provided by Müller (2020). The author, developing a simulation analysis finds that, compared to IAS 39 hedge accounting regulation, applying IFRS 9 may lead to lower earnings volatility. In general, academic literature concerning hedge accounting has mainly investigated whether and how the adoption of hedge accounting rules introduced by either IAS 39 or SFAS 133 influenced firms' exposure to financial risks. For instance, Zhang (2009) and Nguyen (2018) find that applying hedge accounting rules more effectively, the subsequent decrease in risk exposure leads also to a higher level of capital investment. Hence, similarly to the results provided under FASB requirements, the expected improvement from IAS 39 to IFRS 9 might also be beneficial for firms' capital expenditures in the European context.

At this regard, it is worth noting that the restrictive and complex rules of IAS 39 led firms to apply hedge accounting more ineffectively, with the consequence of increasing earnings volatility (Bernhardt et al., 2016; Glaum & Klöcker, 2011). Secondly, as pointed out by Pollock (2005), firms may decide to reduce their level of

[13] As many authors pointed out (Beneda, 2016; Frestad & Beisland, 2015; Hairston and Brooks, 2019), the Statement of Financial Accounting Standards (SFAS) number 133 is the corresponding of the IAS 39 in US scenario. As for the IFRS 9, the FASB released in 2017 the "*Accounting Standards Update (ASU) No. 2017–12—Derivatives and Hedging (Topic 815)*", which explicitly clarifies similarities with IFRS 9 regarding the three hedge accounting models, documentation and qualifying criteria.

hedging because the strategies they would normally apply do not meet the requirements of the IAS 39.

In order to overcome such problems, the IASB released new requirements under the IFRS 9, by making hedge accounting more flexible and easily applicable for IFRS-adopters (Bernhardt et al., 2016; Müller, 2020). Specifically, compared to the IAS 39, the hedge accounting rules under the IFRS 9 permit firms to easily use financial instruments beyond the derivatives as hedging instruments, compared to the previous IAS 39 (Ernst & Young, 2014). Also, IFRS 9 allows the *rebalancing* of the hedging relationship between the hedging instruments and the hedged item, avoiding them from discontinuing hedge accounting. Both circumstances would entail a greater impact on capital investment since hedge accounting would be applied more effectively (Eierle et al., 2021; Müller, 2020; Nguyen, 2018).

Indeed, the new regulation allows entities to align hedge accounting practices to risk management strategy and objectives more efficiently (Bernhardt et al., 2016; Müller, 2020). As a consequence, the switch from IAS 39 to IFRS 9 rules is expected to lower the firms' risk exposure which, in turn, should give firms a greater chance to raise their level of capital investment (Nguyen, 2018; Zhang, 2009). Based on the above discussion, we formulate our third hypothesis as follows:

H_3 *The positive association between hedge accounting usage and capital investment is exacerbated in the IFRS 9 implementation period.*

4 Empirical model

4.1 Sample definition

We collect all financial data from the *Orbis* database (Bureau Van Dijk). Our initial sample consists of non-financial[14] firms listed on EU stock exchanges during the period 2016–2019. Following previous studies (Carroll et al., 2017; Lee, 2019; Lobo et al., 2022; Ranasinghe et al., 2022), we consider only firms that operate in the oil-and-gas production, petroleum, chemical, communications, health-care, and airline industries, for which hedge accounting practice is highly significant as regards the investment decisions of the firms (Ranasinghe et al., 2022). In building our final sample we adopt the following restrictions. Firstly, we exclude firms which lack substantial financial data[15] from the *Orbis* database. Then, to reduce size-related bias, we exclude public firms whose total assets are lower than the last 5th percentile of the total assets' distribution of the sample. We also remove outliers for earnings volatility extreme observations, that means the observations for which

[14] Despite financial institutions strongly rely on hedge accounting usage, they held both derivatives and non-derivatives financial instruments also for speculative purposes (Abugri & Osah, 2021; Chang et al., 2018; Titova et al., 2020), and this could lead to confounding effect about earnings volatility measures.

[15] A firm is also deleted from the sample if a missing data appears in one among the years between 2016 and 2019. Such restriction implies the drop of few firm-year observations but allow us to rely on a balanced panel regression analysis.

earnings volatility presents values lower than the 1st percentile and higher than the 99th percentile. Moreover, we take into account potential noises related to listing decisions across all sample years, eliminating delisted firms or those who went public during the period 2016–2019. Lastly, we withdraw firms from our analysis if we cannot classify them as *users* (*non-users*).[16] Our final sample consists of 286 EU public firms from 2016 to 2019, resulting in a total of 1,144 firm-year observations. Table 1 below, shows our sample selection process.

4.2 Methodology and variables measurement

4.2.1 Hedge accounting usage and firms' investment level (H_1)

Our first hypothesis (H_1) wants to test whether hedge accounting usage affects firms' level of capital investment. We empirically address this research question by running a balanced panel fixed effects regression.[17] We rely on the following model:

$$INV_{i,t}/CAPEX_{i,t} = \beta_0 + \beta_1 USER_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 CFOP_{i,t} + \beta_4 TOBINQ_{i,t-1} + \beta_5 LOSS_{i,t-1} + \beta_6 LEVERAGE + \sum_j^z FE_i + \varepsilon_{i,t} \quad (1)$$

In our panel regression analysis, we employ two different proxies for firms' investment level as our dependent variable. First, we use the variable $INV_{i,t}$ as the annual change of PPE (property, plant and equipment) plus the annual amount of amortization and depreciation scaled by lagged PPE (Eierle et al., 2021; Nguyen, 2018). Alternatively, we consider as a further proxy for firms' level of investments the ratio between annual capital expenditures scaled by the lagged sales (i.e., $CAPEX_{i,t}$), as used in Titman et al. (2004). Following previous studies (Campbell et al., 2019, 2023; Chang et al., 2016; Zhang, 2009), we use an indicator variable to identify whether a firm applies hedge accounting rules. Hence, our main independent variable $USER_{i,t}$ is a dichotomic variable that takes the value of 1 for firms that use hedge accounting practice (i.e., *users*) and 0 otherwise (i.e., *non-users*). To collect such information, we carefully read firms' annual reports to classify firms as *users*.[18] Firms are eligible as *users* (*non-users*) if it emerges clearly that they apply

[16] According to IFRS 9, firms can continue to apply the hedge accounting rules of IAS 39 even after the IFRS 9 implementation period. Collecting information from the financial statements of firms, we noticed that a small number of firms in our sample decided to follow this choice. For this reason, we also withdraw such entities from our empirical analyses to avoid potential confounding attribution across the two different IASB disciplines.

[17] We performed Breusch Pagan Lagrangian Multiplier test (Breusch & Pagan, 1980) and Hausman test (Hausman & Taylor, 1981) to rely on such model specifications.

[18] Our approach is different from the approach used by Manconi et al. (2018). The authors used a keyword search to classify a firm as a derivatives user. In our analysis, given that it is crucial distinguish firms that apply or not for hedge accounting, we do not prefer to rely on a set of minimum keywords to find *users* firms. We noticed in several annual reports that "hedge accounting" is mentioned several times in many instances, even if a firm do not apply hedge accounting rules. Also, the word "hedge" is a keyword for both *users* and *non-users* that use derivatives for hedging purposes in general. Such situations might entail misleading attribution in our sample between hedge accounting *users* and *non-users*.

Table 1 Sample selection process

	Firms	Firm-year observations
EU-27 public firms in the following industries: oil and gas extraction; chemicals; air transportation; communications; health-care services, between 2016 and 2019	668	2.672
Less		
Firms with missing financial data from Orbis (Bureau Van Dijk) database	251	1004
Firms below the last 5th percentile of total assets distribution	21	84
Firms above (below) the 1st (99th) percentile of earnings volatility distribution	8	32
Firms with missing information about hedge accounting practice from their annual report	102	408
Final sample	**286**	**1144**

Table 1 presents the selection procedure of the sample employed for the purposes of our statistical analyses. The final sample consists of 286 (1144) firms (firm-year) observations

(do not apply) for hedge accounting in a year *t*. Firms with non-exhaustive information about hedge accounting choices have been withdrawn from our analysis. Should the coefficient be $\beta_1 > 0$, then our first hypothesis (H_1) would be supported.

In line with previous studies, we also take into account further determinants affecting firms' level of investment. Thus, we control for firms' dimension ($SIZE_{i,t}$) that is expected to positively impact firms' capital expenditures (Nguyen, 2018) and cash flows ($CFOP_{i,t}$) because they can positively influence the amount of capital expenditures (Biddle & Hilary, 2006; Fazzari et al., 1988; Froot et al., 1993). We also control for Tobin's Q of a firm *i* in the year *t-1* ($TOBINQ_{i,t-1}$) as the stock market returns of a company impact their investments (Morck et al., 1990). Finally, given that empirical evidence suggests that annual investments are negatively associated with past losses (Kothari et al., 2014) and levered capital structure (Aivazian et al., 2005), we include in the model the firm's past losses ($LOSS_{i,t-1}$) and firm's leverage ($LEVERAGE_{i,t}$). *FE* represents fixed effects for country *z* and industry *j* or firm *i* fixed effects under a different model specification.

4.2.2 Test of channel associating hedge accounting usage with higher investments (H_2)

To determine whether the usage of hedge accounting positively affects the firms' level of investments through the mitigation of earnings volatility as channel (H_2), we follow a procedure close to Biddle et al. (2022). Firstly, we estimate Eq. 2 to test if the influence of hedge accounting usage is consistent with lower earnings volatility:

$$EARNVOL_{i,t} = \partial_0 + \partial_1 USER_{i,t} + Controls + \sum\nolimits_j^z FE_i + \varepsilon_{i,t} \tag{2}$$

The variable $EARNVOL_{i,t}$ represents our criteria for measuring earnings volatility, and similarly to Beneda (2013) it is computed as the standard deviation of eight quarters, over a 2-year period,[19] including the year *t* and prior year *t-1*, of earnings scaled by the respective average of the beginning and ending years' total assets. *Controls* is a set of variables that impact on earnings volatility, among which $SIZE_{i,t}$, $TOBINQ_{i,t-1}$, $CFOP_{i,t}$ and $LEVERAGE_{i,t}$.

We then estimate Eq. 3 to test whether earnings volatility channel explains the amount of annual total investments:

$$\begin{aligned} INV_{i,t}/CAPEX_{i,t} = {} & \beta_0 + \beta_1 EARNVOL_{i,t} + \beta_2 USER_{i,t} + \beta_3 SIZE_{i,t} + \beta_4 CFOP_{i,t} \\ & + \beta_5 TOBINQ_{i,t-1} + \beta_6 LOSS_{i,t-1} + \beta_7 LEVERAGE_{i,t} + \sum\nolimits_j^z FE_i + \varepsilon_{i,t} \end{aligned} \tag{3}$$

Our second hypothesis (H_2) that a lower earnings volatility is a channel associating the usage of hedge accounting with higher capital expenditures would be confirmed if $\partial_1 < 0$ in Eq. 2 and $\beta_1 < 0$ in Eq. 3, significantly. Such a situation entails that firms whose apply hedge accounting principles have a higher capacity to invest due to earnings volatility mitigation, compared to *non-users* firms.

[19] Following Beneda (2013), we compute earnings volatility basing on eight quarters data to use a more robust measure compared to four quarters earnings volatility over 1 single year.

4.2.3 IFRS 9 impact on relationship between hedge accounting and higher investments (H_3)

The third hypothesis (H_3) of our study advances the idea that after the implementation of the new set of rules on hedge accounting put forth by the IFRS 9, *users* experience higher benefits in terms of the level of capital investment, compared to the IFRS 9 pre-implementation period (i.e., exploiting the rules under the previous IAS 39). To test H_3 we employ an approach quantitatively similar to Christensen et al. (2013) and Bonetti et al. (2017). In our model, we confront the level of firms' investments before and after the IFRS 9 implementation period, conditionally to the usage of hedge accounting practice.

Hence, we test whether an a priori classification as *users* may explain a positive change in the level of annual investments more in post-IFRS 9 implementation compared to the IAS 39 period. Thus, we estimate the following Eq. 4:

$$INV_{i,t}/CAPEX_{i,t} = \beta_0 + \beta_1 IFRS9 * USER_{i,t} + \beta_2 IAS39 * USER_{i,t} + Controls2 + \sum_j^z FE_i + \varepsilon_{i,t} \quad (4)$$

To compare the effect on capital expenditures of hedge accounting usage across different IFRS requirements, we create two non-overlapping dichotomic variables. The variable $IFRS\ 9{*}USER_{i,t}$ it is equal to 1 for firms applying hedge accounting rules under IFRS 9 period (i.e., years 2018–2019) and 0 otherwise, while $IAS\ 39{*}USER_{i,t}$ equals 1 for firms that implement hedge accounting rules under IAS 39 period (i.e., years 2016–2017), and 0 otherwise. *Controls2* are the same control variables used in Eq. 1, more *EARNVOL*.

This coding allows us to directly compare the change in firms' investments explained by hedge accounting usage under the two different IASB's hedge accounting principles. That is, in this interaction model the coefficient estimates β_1 and β_2 in the Eq. 4 directly represent the *total effect* of hedge accounting usage on firms' level of investment, respectively in IFRS 9 and IAS 39 periods. Hence, we expect $\beta_1 > 0$ significantly, while either $\beta_2 < \beta_1$ significantly or β_2 insignificant in Eq. 4. Should we obtain such results, then our third hypothesis H_3 would be confirmed.

Overall, Appendix A describes all variables employed in our study.

5 Results

5.1 Descriptive statistics

Table 2 describes the composition of our sample by Country (Panel A) and Industry (Panel B). As can be seen, except few countries, our observations cover almost the totality of the EU-27 constituents. Firms from Sweden, Poland, and Germany represent the majority of firms in our sample (26.92, 17.83 and 11.54%, respectively), while Lithuania and Cyprus contribute with the less observations (0.35 and 0.70%, respectively). Overall, our preliminary descriptive statistics highlight that firms

in our sample apply hedge accounting principles, on average, in more than 60% of the cases. Panel B of Table 2 also shows that observations are well distributed across different industries and no particular sector is predominating in our analysis, although there is a high frequency of firms acting in the Chemicals industry (82 firms per 328 firm-year observations).

Table 3 shows the main descriptive statistics for the variables employed in our main analysis.[20] Panel B of Table 3 highlights the mean (median) *INV* values of 0.080 (0.093) and the mean (median) *CAPEX* value of 0.054 (0.047), while the mean *CFOP* and *TOBINQ* are 0.043 and 1.903, respectively. Moreover, our sample is characterized by the mean *LEVERAGE* and *LOSS* values of 0.442 and 0.339. With the regards to *EARNVOL*, although the median earnings volatility in our sample is about 13%, the results from hedge accounting *users* sub-sample indicate a lower variability of earnings (11.3%) compared to the sub-sample of *non-users* (18.5%). Also, on average the former is characterized on average by both a higher level of investments and greater firms' size. Panel B of Table 3 shows descriptive statistics by year and highlights that the number of firms that apply for hedge accounting increased very slightly over the sample years, going from 62.1% in the 2016 to 64.5% in the 2019. Panel C of Table 3 provides descriptive statistics by industry. While the mean and median values of variables are very similar across different industries, it might be noticed that compared to other industries, firms in the Air transportation sector display higher value for investment measures, on average (*INV* of 0.149 and *CAPEX* of 0.082).

Also, in Chemicals industry, 43.5% of firms reported a loss during the last year, while firms in the healthcare industry are of a smaller size compared to the sample average (9.979 vs 12.056) and they exploit a higher leverage (0.499 vs 0.442). Overall, our descriptive statistics are very similar to previous studies in similar contexts (Carroll et al., 2017; Eierle et al., 2021; Nguyen, 2018; Titman et al., 2004).

Table 4 shows the Pearson correlations for all testing and control variables of the study. Correlation among almost all variables is significant, being at 5% or better. The high correlation of 0.781 between *INV* and *CAPEX* confirms the validity of our proxy for firms' level of investments. Also, the correlation between *INV* (*CAPEX*) measure and *USER* was expected and strengthen the idea that hedge accounting usage helps to increase investments' level. Overall, correlations among variables of our analysis corroborate with previous scholars' studies (Biddle & Hilary, 2006; Bulan, 2005; Fazzari et al., 1988).

5.2 Panel analysis results and discussion

Table 5 provides the results of our panel analysis. Consistently with prior research (Eierle et al., 2021; Froot et al., 1993; Lobo et al., 2022; Nguyen, 2018), we find that hedge accounting usage is positively associated with the level of firms' capital investment. In particular, the coefficient of *USER* is positive and significant (p-value < 0.001) in both model 1 and model 2, indicating firms that follow IFRS

[20] All continuous variables are winsorized at the top 1% and the bottom 99%.

Table 2 Sample description

Country	Full sample		Users		Non-users	
	Obs	%	Obs	%	n	%
Panel A: Sample composition by country						
Austria	20	1.75%	12	60.00%	8	40.00%
Belgium	12	1.05%	10	83.33%	2	16.67%
Bulgaria	32	2.80%	25	78.13%	7	21.88%
Cyprus	8	0.70%	5	62.50%	3	37.50%
Croatia	16	1.40%	12	75.00%	4	25.00%
Denmark	40	3.50%	32	80.00%	8	20.00%
Finland	28	2.45%	20	71.43%	8	28.57%
France	44	3.85%	24	54.55%	20	45.45%
Germany	132	11.54%	92	69.70%	40	30.30%
Greece	16	1.40%	10	62.50%	6	37.50%
Ireland	48	4.20%	28	58.33%	20	41.67%
Italy	48	4.20%	30	62.50%	18	37.50%
Lithuania	4	0.35%	4	100.00%	0	0.00%
Luxembourg	16	1.40%	12	75.00%	4	25.00%
Netherlands	32	2.80%	18	56.25%	14	43.75%
Poland	204	17.83%	104	50.98%	100	49.02%
Portugal	24	2.10%	14	58.33%	10	41.67%
Romania	28	2.45%	20	71.43%	8	28.57%
Slovenia	12	1.05%	8	66.67%	4	33.33%
Spain	60	5.24%	38	63.33%	22	36.67%
Sweden	308	26.92%	196	63.64%	112	36.36%
Hungary	12	1.05%	8	66.67%	4	33.33%
Total	**1144**		**722**		**422**	
Panel B: Sample composition by industry						
Air transportation	116	10.14%	88	75.86%	28	24.14%
Chemicals	328	28.67%	198	60.37%	130	39.63%
Communications	276	24.13%	174	63.04%	102	36.96%
Healthcare	180	15.73%	95	52.78%	85	47.22%
Oil & Gas	244	21.33%	167	68.44%	77	31.56%
Total	**1144**		**722**		**422**	

Table 2 describes the sample providing figures for Users and Non-Users. Panel A presents the sample composition by Country, while Panel B reports the industry distribution of the sample

requirements for hedge accounting are more prone to increase their capital expenditures, compared to *non-users*. Hence, this finding supports the hint that hedge accounting rules are beneficial for firms and that it is determinant for investments' decision-making (Carroll et al., 2017; Lee, 2019; Nguyen, 2018). Also, our results corroborate with the assumption that *users* might alleviate underinvestment

Table 3 Descriptive statistics

Panel A: Descriptive statistics by users vs non-users

	Users			Non-users			Full sample				
	Mean	Median	St. dev	Mean	Median	St. dev	Mean	Median	St. dev	Min	Max
INV	0.104	0.107	0.249	0.057	0.079	0.36	0.080	0.093	0.309	− 0.91	0.714
CAPEX	0.063	0.061	0.115	0.043	0.033	0.121	0.054	0.047	0.119	− 0.26	0.350
USER	1.000	1.000	0.000	0.000	0.000	0.000	0.631	1.000	0.479	0.000	1.000
EARNVOL	0.179	0.113	0.217	0.310	0.185	0.310	0.241	0.136	0.273	0.019	1.104
SIZE	13.088	13.470	3.228	10.883	10.899	2.724	12.056	12.021	3.199	6.300	18.050
CFOP	0.119	0.132	0.409	− 0.042	0.085	0.629	0.043	0.123	0.531	− 1.011	1.121
TOBINQ	2.505	1.323	2.960	1.369	0.787	1.715	1.903	0.973	2.448	0.153	11.45
LOSS	0.250	0.000	0.433	0.438	1.000	0.496	0.339	0.000	0.473	0.000	1.000
LEVERAGE	0.389	0.347	0.211	0.501	0.466	0.277	0.442	0.40	0.251	0.010	0.96
N. firms	**184**			**102**			**286**				
Obs	**722**			**422**			**1144**				
Obs. %	**63.15%**			**36.89%**			**100%**				

Panel B: Descriptive statistics by year

	2016		2017		2018		2019	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
INV	0.077	0.085	0.036	0.067	0.087	0.102	0.128	0.155
CAPEX	0.055	0.043	0.030	0.027	0.051	0.049	0.079	0.076
USER	0.621	1.000	0.621	1.000	0.638	1.000	0.645	1.000
EARNVOL	0.250	0.144	0.271	0.161	0.234	0.136	0.204	0.103
SIZE	12.049	12.026	12.013	12.02	12.053	11.980	12.103	11.951
CFOP	0.047	0.129	0.064	0.128	0.029	0.109	0.033	0.119
TOBINQ	1.915	0.987	2.073	1.222	1.759	0.890	1.857	0.904
LOSS	0.362	0.000	0.332	0.000	0.339	0.000	0.319	0.000

Table 3 (continued)

Panel B: Descriptive statistics by year

	2016		2017		2018		2019	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
LEVERAGE	0.440	0.394	0.452	0.404	0.448	0.405	0.426	0.387
N. firms	**286**		**286**		**286**		**286**	
Obs. %	**0.25%**		**0.25%**		**0.25%**		**0.25%**	
Total	**1144**							

Panel C: Descriptive statistics by Industry

	Air transportation		Chemicals		Communications		Healthcare		Oil & Gas	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median
INV	0.149	0.134	0.072	0.079	0.089	0.098	0.046	0.090	0.083	0.098
CAPEX	0.082	0.066	0.045	0.365	0.062	0.057	0.041	0.037	0.052	0.048
USER	0.612	0.000	0.627	1.000	0.687	1.000	0.570	0.000	0.657	1.000
EARNVOL	0.319	0.176	0.218	0.149	0.199	0.113	0.287	0.137	0.244	0.131
SIZE	12.267	13.269	11.920	11.807	12.448	12.761	9.979	9.583	13.22	13.188
CFOP	− 0.041	0.126	− 0.071	0.072	0.161	0.153	0.040	0.099	0.103	0.135
TOBINQ	2.518	1.124	2.044	1.318	1.241	0.842	2.650	1.155	1.612	0.805
LOSS	0.370	0.000	0.435	0.000	0.278	0.000	0.317	0.000	0.274	0.000
LEVERAGE	0.459	0.407	0.467	0.442	0.379	0.323	0.499	0.444	0.428	0.382
N. obs	**116**		**328**		**276**		**180**		**244**	
Obs. %	**10.14%**		**28.67%**		**24.13%**		**15.73%**		**21.33%**	
Total	**1144**									

Table 3 reports descriptive statistics for variables used in the regression analyses. All continuous variables are winsorized at top 1% and bottom 99%. Variables definition and measurement are provided by Appendix A.

problems as many authors claimed (Eierle et al., 2021; Kumar & Rabinovitch, 2013; Lobo et al., 2022; Tufano, 1998). Overall, we accept our first hypothesis (H_1).

Concerning the control variables, *SIZE* and *TOBINQ* positively affect *INV* and *CAPEX* (p-value < 0.001), coherently with previous literature (Lee, 2019; Nguyen, 2018). Also, the positive sign of *CFOP* coefficients in both models (p-value < 0.001) is consistent with the notion that higher operating cash flows encourage firms to invest more (Biddle & Hilary, 2006; Fazzari et al., 1988). Furthermore, we find negative and significant coefficients for variables LOSS (p-value < 0.05 in model 1 and p-value < 0.01 in model two) and *LEVERAGE* (p-value < 0.01 in both models), coherently with the idea that more constrained firms are less encouraged to pursue investing activities (Aivazian et al., 2005; Kothari et al., 2014). We obtain coherent results even when demanding for more fixed effect structure (i.e., firm fixed effects in both model 3 and model 4).

Results given in Table 6 support our second hypothesis that the usage of hedge accounting may increase capital investment via earnings volatility mitigation. In model 1 the negative coefficient of *USER* (−0.017) indicates that hedge accounting usage lowers the volatility of earnings in a statistically significant manner (p-value < 0.001). Then, the validity of the *EARNVOL* channel is confirmed in both model 2 and model 3, whereas the coefficients of *EARNVOL* (-0.159 in model 2 and 0.045 in model 3) are negative and highly significant (p-value < 0.001). Thus, such findings confirm our second Hypothesis (H_2). While results from model 1 are consistent with previous research (Beneda, 2013; Bernhardt et al., 2016; Pierce, 2020), they also suggest the extent to which the IASB, pursuing their objectives through hedge accounting rules, helps firms to mitigate earnings volatility issues.

Moreover, results from model 2 and model 3 confirm that managers make investment decisions basing their considerations on the extent of income stability (Do Nguyet, 2017; Minton & Schrand, 1999). Indeed, a high earnings volatility might increase not only the cost of external capital but also the likelihood of cash flow shortfalls as well. Such a situation might entail lower capital investments as many authors documented (Eierle et al., 2021; Gebhardt et al., 2001; Minton et al., 2002). These findings hold even running a firm fixed effects model (model 4, model 5, model 6), despite interesting coefficients being slightly less significant.

In Table 7, we show that the positive relationship between capital investments and hedge accounting usage is exacerbated after the implementation of IFRS 9. Indeed, the estimated coefficients of *IFRS 9*USER* are positive (0.152 in model 1 and 0.173 in model 3) and significant (p-value < 0.01) in both two models, while the coefficients of *IAS 39*USER* are not significant at any conventional level (p-value > 0.1). All these findings consistently keep when we use firm fixed effects structure (models 3 and 4). Such results provide support for our third hypothesis (H_3). Thus, a significant increase in the level of capital investments occurs more for *users* applying hedge accounting principles under the IFRS 9 compared with *users* under IAS 39. A likely motivation for such a result is that the IFRS 9 principles are more easily applicable, and it also allows firms' managers to avoid the interruption of hedge accounting through the *rebalancing* of the hedging relationship instead of discontinuing and re-designating it. As a consequence, firms conduct hedging activities more effectively under such guidance. Whereas the effectiveness of hedge accounting relates to

Table 4 Pearson correlations

Pearson correlations for 1144 firm-year observations											
		1	2	3	4	5	6	7	8	9	10
1	INV	**1**									
2	CAPEX	**0.781**	**1**								
3	USER	**0.135**	**0.084**	**1**							
4	IFRS 9*USER	**0.122**	**0.152**	**0.605**	**1**						
5	IAS 39*USER	−0.031	−0.042	**0.524**	**−0.360**	**1**					
6	EARNVOL	**−0.203**	**−0.195**	**−0.239**	**−0.183**	**0.109**	**1**				
7	SIZE	**0.131**	**0.169**	**0.344**	**0.202**	**0.218**	**−0.332**	**1**			
8	CFOP	**0.122**	**0.120**	**0.152**	0.070	−0.105	**−0.262**	**0.327**	**1**		
9	TOBINQ	0.094	0.052	**0.231**	0.151	0.120	**−0.223**	**0.379**	**0.204**	**1**	
10	LOSS	**−0.100**	**−0.153**	**−0.191**	**−0.116**	0.102	**0.246**	**−0.413**	**−0.446**	**0.143**	**1**
11	LEVERAGE	**−0.192**	**−0.298**	**−0.223**	**−0.112**	0.145	**0.355**	**−0.323**	**−0.183**	**0.353**	**0.146**

Table 4 displays Pearson correlations with figures in bold indicating statistical significance at the 95% confidence level or better. Variables definition and measurement are provided by Appendix A

Table 5 Relations between hedge accounting *usage* and the level of capital investment

	INV (1)	CAPEX (2)	INV (3)	CAPEX (4)
Intercept	0.031 (2.16)**	0.068 (5.19)***	0.037 (2.87)***	0.042 (3.37)***
USER	0.057 (5.59)***	0.026 (5.65)***	0.045 (2.70)***	0.048 (3.00)***
SIZE	0.035 (5.14)***	0.056 (6.73)***	0.046 (3.91)***	0.054 (4.74)***
CFOP	0.083 (4.40)***	0.039 (3.68)***	0.035 (3.44)***	0.026 (2.31)**
TOBINQ	0.079 (3.21)***	0.104 (3.88)***	0.053 (1.79)*	0.064 (2.40)**
LOSS	−0.081 (−2.13)**	−0.146 (−2.88)***	−0.086 (−2.61)***	−0.031 (−1.80)*
LEVERAGE	−0.021 (−5.39)***	−0.091 (−9.11)***	−0.104 (−9.22)***	−0.121 (−10.11)***
Industry FE	Yes	Yes	No	No
Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Cluster	Firm	Firm	Firm	Firm
Observations	1144	1144	1144	1144
R^2	0.123	0.104	0.496	0.482

Table 5 provides results of panel data for regression explained in Eq. 1. Variables definition and measurement are provided by Appendix A. We include country and industry fixed effects in the regression or firm fixed effect under a different specification. Standard errors are clustered at firm-level in all models. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels (two-tailed), respectively. T-statistics are reported in brackets

a lower risk exposure as documented by Nguyen (2018), in turn, it may encourage firms to raise their level of capital investment.

5.3 Robustness tests

In order to make our analysis more robust, we take into account different specifications and more stringent constraints to our initial sample to rule out potential biases that may affect our findings. For the purpose of simplicity, we do not tabulate the results for such analyses.

Firstly, we repeat our panel regressions discarding countries with less than 30 observations.[21] In doing that, our second sample consists in 948 firm-year observations. Overall, the results are qualitatively the same as displayed in our main analyses.

[21] We hence exclude in our robustness test the following countries: Austria, Belgium, Cyprus, Croatia, Finland, Greece, Lithuania, Luxembourg, Portugal, Romania, Slovenia, Hungary.

Moreover, we performed all the empirical tests by excluding firms in our sample which did not enter in derivatives instruments. As many authors believe (Campbell et al., 2023; Carroll et al., 2017; Chang et al., 2016), one of the principal reasons for applying hedge accounting rules is the use of financial derivatives. Given that our main models do not control for such a determinant, potential biases due to omitted variables concerns may affect main analyses. After removing non-derivatives users, our first sample caused a drop of about 12% in observations, leading us to a last sample of 1,008 firm-year observations.[22] Overall, the results for the three hypotheses keep equal to our main analyses.

To strengthen the results related to our first hypothesis (H_1), we calculate the mean differences in our measures of capital investments across two sub-samples based on *usage* (*non-usage*) of hedge accounting rules. Untabulated results of the *t*-test show that mean *INV* and *CAPEX* are significantly higher for the group of *users* compared to the group of *non-users* (main difference of 0.046, *t*-stat = 2.57, p-value < 0.01).

Also, given that either under IAS 39 or IFRS 9, EU public firms can voluntarily choose whether to apply or not hedge accounting principles, our measure of *usage* might be not exogenously determined, and self-selection biases may arise in the empirical tests. We alleviate such endogeneity concerns by employing Heckman's (1979) two-stage approach. In the first stage, we estimate a probit model in which the likelihood of applying hedge accounting is regressed on a set of firm-specific variables retrieved from the study of Chang et al. (2016) and recognized to influence the choice for using hedge accounting (i.e., firm size, usage of derivatives instruments, percentage of foreign sales to total sales, three-year cash effective tax rate, cash flow volatility and Altman Z-score). In the second stage, we estimate our regression relying on the specifications of model 1 (model 2) of Table 5 including the inverse Mills ratio estimated from the above first stage. In line with the main analysis results, we find that the level of capital investment for voluntary *users* is 9.4 (5.1) basis points higher than *non-users* (*t*-stat = 3.60 in model 1 and *t*-stat = 3.49 in model 2). However, as many authors highlight, we recognize the potential limitations of such a quantitative approach (Florou & Kosi, 2015; Kim et al., 2011).

Following previous scholars (Baron & Kenny, 1986; Biddle et al., 2022; Cheng et al., 2015), we also conducted the Sobel (1982) test to determine the validity of the channel used to test our second hypothesis (H_2). In particular, the test verifies if the mediation effect is statistically significant by determining whether the effect of the independent variable (i.e., *USER*) on the dependent variable (i.e., *INV* and/or *CAPEX*), after the inclusion of the mediator (i.e., *EARNVOL*), is significantly reduced or not (Biddle et al., 2022). Results on *USER* mediated by *EARNVOL* are statistically significant for both *INV* (*t*-stat = 3.26; p-value < 0.01) and for *CAPEX* (*t*-stat = 3.43; p-value < 0.01), strengthening inferences regarding our channel's validity.

[22] With this constrain, the average percentage of hedge accounting users increased from 63.1% to about 70%.

Table 6 Test of channel associating hedge accounting and investments

	EARNVOL	INV	CAPEX	EARNVOL	INV	CAPEX
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.438 (10.66)***	0.189 (3.28)***	0.127 (5.84)***	0.314 (5.29)***	0.165 (2.44)**	0.237 (3.10)***
EARNVOL	–	−0.159 (−4.00)***	−0.045 (−4.33)***	–	−0.134 (−2.17)**	−0.064 (−1.74)*
USER	−0.017 (−5.65)***	0.048 (4.90)***	0.011 (3.56)***	−0.006 (−2.14)**	0.048 (2.80)***	0.041 (2.22)**
SIZE	−0.023 (−18.88)***	0.011 (3.61)***	0.024 (3.85)***	−0.081 (−5.31)***	0.001 (3.47)***	0.051 (4.45)***
CFOP	−0.111 (−5.96)***	0.065 (3.39)***	0.052 (3.88)***	−0.049 (−3.22)***	0.024 (0.87)	0.006 (0.62)
TOBINQ	−0.025 (−8.36)***	0.10 (3.39)***	0.004 (2.78)***	−0.016 (−5.69)***	0.014 (1.82)*	0.000 (1.13)
LOSS	–	−0.043 (−4.29)***	−0.024 (−2.96)***	–	−0.076 (−2.50)**	−0.024 (−1.76)*
LEVERAGE	0.162 (3.89)***	−0.196 (−4.90)***	−0.131 (−8.72)***	0.124 (3.12)***	−0.859 (−8.96)***	−0.369 (−10.12)***
Industry FE	Yes	Yes	Yes	No	No	No
Country FE	Yes	Yes	Yes	No	No	No
Firm FE	No	No	No	Yes	Yes	Yes
Cluster	Firm	Firm	Firm	Firm	Firm	Firm
Observations	1,144	1,144	1,144	1,144	1,144	1,144
R^2	0.349	0.156	0.133	0.814	0.719	0.699

The Table 6 provides results of panel data for regressions explained in Eq. 2 (model 1 and model 4) and Eq. 3 (model 2, model 3, model 5, model 6). Variables definition and measurement are provided by Appendix A. We include country and industry fixed effects in the regression or firm fixed effect under a different specification. Standard errors are clustered at firm-level in all models. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% levels (two-tailed), respectively. T-statistics are reported in brackets

Lastly, to reinforce results supporting our third hypothesis (H_3), we repeat the panel regression based on Eq. 4 with the following adjustments. We firstly exclude firms classified as *non-users* in such model specification. For this reason, in this instance, we also alleviate here endogeneity concerns about the chance to use hedge accounting whereas, withdrawing *non-users*, we can assume that all the firms obtained *ex-ante* the same incentives to apply hedge accounting rather than to not apply it. Then, we drop from Eq. 4 both the variables *IFRS 9*USER* and *IAS 39*USER* from Eq. 4, replacing them with a unique dummy variable that takes the value of 1 after the IFRS 9 implementation period (i.e., years 2018–2019) and 0 otherwise (i.e., years 2016–2017) as the independent variable of interest (i.e., $IFRS\ 9_{i,t}$). Maintaining as equal the rest of specifications as in model 1 (model 2) of Table 7, results from this analysis on 722 firm-year observations highlight a positive and significant coefficient on *IFRS 9* of 0.033 (0.020) with p-value < 0.05 (p-value < 0.01), that again reinforces our findings showed in Table 7.

Table 7 Hedge accounting *usage* and investments' level

	INV	CAPEX	INV	CAPEX
	(1)	(2)	(3)	(4)
Intercept	0.198 (2.71)***	0.114 (2.45)**	0.106 (2.49)**	0.202 (2.96)***
IFRS 9*USER	0.152 (4.04)***	0.173 (4.49)***	0.043 (1.88)**	0.026 (1.70)*
IAS 39*USER	0.067 (1.45)	0.045 (1.32)	0.071 (1.49)	0.021 (1.23)
EARNVOL	−0.153 (−3.44)***	−0.042 (−2.21)**	−0.153 (−2.40)**	−0.031 (−1.69)*
SIZE	0.022 (6.23)***	0.039 (5.45)***	0.064 (3.55)***	0.049 (4.28)***
CFOP	0.067 (0.457)	0.034 (0.224)	0.017 (0.64)	0.005 (0.53)
TOBINQ	0.013 (2.77)***	0.004 (3.16)***	0.001 (1.50)	0.000 (1.44)
LOSS	−0.024 (−2.85)***	−0.018 (−1.86)*	−0.075 (−2.47)**	−0.014 (−1.72)*
LEVERAGE	−0.128 (−6.77)***	−0.134 (−8.59)***	−0.148 (−8.90)***	−0.174 (−9.93)***
Industry FE	Yes	Yes	No	No
Country FE	Yes	Yes	No	No
Firm FE	No	No	Yes	Yes
Cluster	Firm	Firm	Firm	Firm
Observations	1144	1144	1144	1144
R^2	0.086	0.077	0.516	0.495

The Table 6 provides results of panel data for regression explained in Eq. 4. Variables definition and measurement are provided by Appendix A. We include country and industry fixed effects in the regression or firm fixed effects under a different specification. Standard errors are clustered at firm-level in all models. ***, **, and * indicate statistical significance at the 1, 5, and 10% levels (two-tailed), respectively. *T*-statistics are reported in brackets

6 Conclusions

This study has investigated the impact of hedge accounting usage on the level of capital investment in EU listed firms. We demonstrated that the use of hedge accounting under the IFRS requirements is a determinant of a higher level of capital investment. Furtherly, we find that the link between hedge accounting usage and capital investment is explained by the mediation effect of earnings volatility mitigation, behind the rationale that stable income numbers may lower the cost of capital (Minton & Schrand, 1999; Minton et al., 2002) and they may encourage the use of internal cash flow (Altuntas et al., 2017; Do Nguyet, 2017), allowing firms, in turn, to pursue more easily their investment opportunities. Moreover, we suggest that such a relationship is exacerbated after the implementation of the IFRS 9, whereas this

standard allows—compared to IAS 39's hedge accounting principles—the achievement of greater effectiveness in managing firms' risk exposures (Müller, 2020).

Overall, these empirical analyses support the opinion that accounting principles (e.g., IASB's hedge accounting rules) do not exclusively impact the representation of data in financial statements but have the power to broadly influence the economic decisions of entities. Specifically, our study hints that the application of hedge accounting has a real effect on firms' investment behavior and that it is not a mere accounting practice.

Thus, our research makes important contributions to the existing literature. While it enriches evidence on hedge accounting (Doshi et al., 2018; Lobo et al., 2022; Müller, 2020; Nguyen, 2018; Ranasinghe et al., 2022) expanding empirical results in the EU context, it further supports the scant stream of studies on the real economic consequences of optional (rather than mandatory) accounting choices (Guttman & Meng, 2021; Kumar et al., 2012; Linck et al., 2007).

Also, to the best of our knowledge, this is the first study providing direct evidence of the positive relationship between hedge accounting usage and level of investments through the channel of earnings volatility lowering, revealing interesting insights about the intrinsic mechanism of such accounting technique. Also, we give evidence on differences between the IAS 39 and IFRS 9 from the new *perspective* of hedge accounting rules rather than from the incurred versus expected credit loss models' perspective, as the majority of accounting studies does about the introduction of IFRS 9 (Mechelli & Cimini, 2021).

The implications of our study are two-fold. From a managerial point of view, it helps firms to figure out the accounting determinants of their potential investments' behavior, by suggesting that the application of hedge accounting rules may concern long-term corporate governance decisions (i.e., raising the level of capital investment). At this regard, this work hints that accounting regulation may convey tangible benefits to firms at the strategic level (Whittington, 1993). It is worth noting that while mandatorily accounting regulations may exogenously shape the corporate governance behavior (Melis & Carta, 2010; Olojede & Erin, 2021), when regulators leave the chance to voluntarily apply (or not) certain accounting rules, firms' practices and decisions may be likely shaped by corporate governance arrangements. Thus, we encourage further studies to explore the overlooked dynamics between governance mechanisms and the voluntary accounting choices. For instance, an overall conclusion drawn by prior studies is that well-governed companies are less likely to incur in earnings' smoothing behavior via accruals (Fan et al., 2021; Kontesa et al., 2021; Schumann et al., 2024). Future research may investigate whether these firms tend to manage earnings exploiting hedge accounting rules, given that this practice is recognized to be an alternative income smoothing tool (Iatridis, 2012; Nan, 2008).

From the point of view of standard setters and regulatory bodies, the paper at hand provides helpful insights to IASB about the success and criticality of their hedge accounting policies over time. In particular, we consider the present paper is well-timed as it provides early evidence regarding the benefits that hedge accounting application may bring to firms, advancing future outcomes which might be evident once the IASB finalizes further hedge accounting provisions. Specifically, the

Standard setter is currently working on hedge accounting rules with reference to the Dynamic Risk Management (DRM) model for macro hedging (Ernst & Young, 2023; KPMG, 2021). In this sense, our paper wants to encourage future studies in analyzing hedge accounting outcomes considered from further perspectives and settings (e.g., macro hedge dynamics for banking industry), expanding evidence of such accounting practice under the forthcoming IASB regulations.

Nonetheless, this study presents some limitations. We tried to manage endogeneity concerns about our measure of hedge accounting usage through stringent model specifications and complementary robustness tests, but we cannot rule out entirely such concern. Despite this, we can rely on our inferences triangulating the associations found in this work with the developed theoretical arguments and with the findings of past academic research. Lastly, we did not consider in our analyses the types of financial instruments used in hedging relationships, that might lead to harmonizing findings (Carroll et al., 2017; Nguyen, 2018). Overall, we encourage future research to rule out these concerns and take into account such caveats.

Appendix A: Variables description

Variables	Definition	Measurement	Source
Dependent variables			
$INV_{i,t}$	Investments	Annual change of PPE plus the annual amount of amortization and depreciation scaled by lagged PPE for the firm *i* at the year *t*	Orbis (Bureau Van Dijk)
$CAPEX_{i,t}$	Capital expenditures	Annual change in capital expenditures scaled by the lagged sales for the firm *i* at the year *t*	Orbis (Bureau Van Dijk)
Test variables			
$USER_{i,t}$	Hedge accounting users	Dichotomic variable that takes value of 1 for firm *i* that use hedge accounting practice and 0 otherwise in the year *t*	Hand-collected
$EARNVOL_{i,t}$	Earnings volatility	The standard deviation of eight quarters of earnings scaled by the respective average of the beginning and ending years' total assets	Orbis (Bureau Van Dijk)
$IFRS9*USERs_{i,t}$	Hedge accounting *users* under IFRS 9 rules	Dichotomic variable equals to 1 for firm *i* that implement hedge accounting rules under IFRS 9 period, and 0 otherwise	Constructed

Variables	Definition	Measurement	Source
IAS 39*USER$_{i,t}$	Hedge accounting *non-users* under IFRS 9 rules	Dichotomic variable equals to 1 for firm *i* that implement hedge accounting rules under IAS 39 period, and 0 otherwise	Constructed
Control variables			
SIZE$_{i,t}$	Firm dimension	Ln of total assets for firm *i* in the year *t*	Orbis (Bureau Van Dijk)
CFOP$_{i,t}$	Operating cash flows	Cash flows from operation activities firm *i* in the year *t* scaled by lagged PPE	Orbis (Bureau Van Dijk)
TOBINQ$_{i,t-1}$	Tobin's Q	Tobin's Q of the firm *i* in the year *t-1*	Orbis (Bureau Van Dijk)
LOSS$_{i,t-1}$	Loss	Dichotomic variable equals to 1 for firm *i* that reports negative net earnings in the year *t-1*, and 0 otherwise	Orbis (Bureau Van Dijk)
LEVERAGE$_{i,t}$	Leverage	total debt scaled by lagged total assets of firm *i* in the year *t*	Orbis (Bureau Van Dijk)

Funding Open access funding provided by Università degli Studi di Napoli Federico II within the CRUI-CARE Agreement.

Declarations

Conflict of interest The authors declare that they did not receive any specific grant from funding agencies in the public, commercial or not-for-profit sectors. The authors did not have any financial interests directly or indirectly related to this research. The authors declare to have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this research.

References

Abdel-khalik, A., & Chen, P. (2015). Growth in financial derivatives: The public policy and accounting incentives. *Journal of Accounting and Public Policy, 34*(3), 291–318. https://doi.org/10.1016/j.jaccpubpol.2015.01.002

Abugri, B. A., & Osah, T. T. (2021). Derivative use, ownership structure and lending activities of US banks. *Journal of Economics and Finance, 45*, 146–170. https://doi.org/10.1007/s12197-020-09535-3

Adam, T. R., & Fernando, C. S. (2006). Hedging, speculation, and shareholder value. *Journal of Financial Economics, 81*(2), 283–309. https://doi.org/10.1016/j.jfineco.2005.03.014

Ahmed, A. S., McMartin, A. S., & Safdar, I. (2020). Earnings volatility, ambiguity, and crisis-period stock returns. *Accounting & Finance, 60*(3), 2939–2963. https://doi.org/10.1111/acfi.12420

Aivazian, V. A., Ge, Y., & Qiu, J. (2005). The impact of leverage on firm investment: Canadian evidence. *Journal of Corporate Finance, 11*(1–2), 277–291. https://doi.org/10.1016/S0929-1199(03)00062-2

Ali, W., Bens, D. A., & Cassar, G. (2024). Real effects of hedge accounting standards: Evidence from ASU 2017–12. INSEAD Working Paper No. 2023/61/ACC, Available at SSRN 4119029. https://doi.org/10.2139/ssrn.4119029

Altuntas, M., Liebenberg, A. P., Watson, E. D., & Yildiz, S. (2017). Hedging, cash flows, and firm value: evidence of an indirect effect. *Journal of Insurance Issues*, 1–22. Retrieved from https://www.jstor.org/stable/44160924

Baron, R. M., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

Beatty, A., Petacchi, R., & Zhang, H. (2012). Hedge commitments and agency costs of debt: Evidence from interest rate protection covenants and accounting conservatism. *Review of Accounting Studies, 17*, 700–738. https://doi.org/10.1007/s11142-012-9189-4

Beisland, L. A., & Frestad, D. (2013). How fair-value accounting can influence firm hedging. *Review of Derivative Research, 16*, 193–217. https://doi.org/10.1007/s11147-012-9084-y

Ben Khediri, K. (2010). Do investors really value derivatives use? Empirical evidence from France. *The Journal of Risk Finance, 11*(1), 62–74. https://doi.org/10.1108/15265941011012688

Beneda, N. (2013). The impact of hedging with derivative instruments on reported earnings volatility. *Applied Financial Economics, 23*(2), 165–179. https://doi.org/10.1080/09603107.2012.709599

Beneda, N. L. (2016). Does hedge accounting under SFAS 133 increase the information content of earnings: Evidence from the US oil and gas industry. *Journal of Corporate Accounting & Finance, 27*(5), 11–20. https://doi.org/10.1002/jcaf.22174

Bernhardt, T., Erlinger, D., & Unterrainer, L. (2016). IFRS 9: The new rules for hedge accounting from the risk management's perspective. *ACRN Oxford Journal of Finance and Risk Perspectives, 53*(3), 1–14.

Biddle, G. C., Callahan, C. M., Hong, H. A., & Knowles, R. (2016). Do adoptions of international financial reporting standards enhance capital investment efficiency? Available at SSRN 2353693. https://doi.org/10.2139/ssrn.2353693

Biddle, G. C., & Hilary, G. (2006). Accounting quality and firm-level capital investment. *The Accounting Review, 81*(5), 963–982. https://doi.org/10.2308/accr.2006.81.5.963

Biddle, G. C., Ma, M. L., & Song, F. M. (2022). Accounting conservatism and bankruptcy risk. *Journal of Accounting, Auditing & Finance, 37*(2), 295–323. https://doi.org/10.1177/0148558X20934244

Bonetti, P., Ipino, E., & Parbonetti, A. (2017). The role of unaffiliated bankers on conditional conservatism: Evidence from IFRS information shock. *Journal of Business Finance & Accounting, 44*(7–8), 925–952. https://doi.org/10.1111/jbfa.12252

Breusch, T. S., & Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies, 47*(1), 239–253. https://doi.org/10.2307/2297111

Bulan, L. T. (2005). Real options, irreversible investment and firm uncertainty: New evidence from US firms. *Review of Financial Economics, 14*(3–4), 255–279. https://doi.org/10.1016/j.rfe.2004.09.002

Butler, C. (2009). *Accounting for financial instruments*. John Wiley & Sons.

Campbell, J. L., Cao, S. S., Chang, H. S., & Chiorean, R. (2023). The implications of firms' derivative usage on the frequency and usefulness of management earnings forecasts. *Contemporary Accounting Research*. https://doi.org/10.1111/1911-3846.12883

Campbell, J. L., Mauler, L. M., & Pierce, S. R. (2019). A review of derivatives research in accounting and suggestions for future work. *Journal of Accounting Literature, 42*(1), 44–60. https://doi.org/10.1016/j.acclit.2019.02.001

Campello, M., Lin, C., Ma, Y., & Zou, H. (2011). The real and financial implications of corporate hedging. *The Journal of Finance, 66*(5), 1615–1647. https://doi.org/10.1111/j.1540-6261.2011.01683.x

Carroll, A., O'Brien, F., & Ryan, J. (2017). An examination of European firms' derivatives usage: The importance of model selection. *European Financial Management, 23*(4), 648–690. https://doi.org/10.1111/eufm.12115

Carter, D. A., Rogers, D. A., & Simkins, B. J. (2006). Does hedging affect firm value? Evidence from the US airline industry. *Financial Management, 35*(1), 53–86. https://doi.org/10.1111/j.1755-053X.2006.tb00131.x

Chang, C. C., Ho, K. Y., & Hsiao, Y. J. (2018). Derivatives usage for banking industry: Evidence from the European markets. *Review of Quantitative Finance and Accounting, 51*, 921–941. https://doi.org/10.1007/s11156-017-0692-3

Chang, H. S., Donohoe, M., & Sougiannis, T. (2016). Do analysts understand the economic and reporting complexities of derivatives? *Journal of Accounting and Economics, 61*(2–3), 584–604. https://doi.org/10.1016/j.jacceco.2015.07.005

Cheng, C. S. A., Wang, J., & Wei, S. (2015). State ownership and earnings management around initial public offerings: Evidence from China. *Journal of International Accounting Research, 14*(2), 89–116. https://doi.org/10.2308/jiar-51193

Chernenko, S., & Faulkender, M. (2011). The two sides of derivatives usage: Hedging and speculating with interest rate swaps. *Journal of Financial and Quantitative Analysis, 46*(6), 1727–1754. https://doi.org/10.1017/S0022109011000391

Choi, J. J., Mao, C. X., & Upadhyay, A. D. (2013). Corporate risk management under information asymmetry. *Journal of Business Finance & Accounting, 40*(1–2), 239–271. https://doi.org/10.1111/jbfa.12008

Christensen, H. B., Hail, L., & Leuz, C. (2013). Mandatory IFRS reporting and changes in enforcement. *Journal of Accounting and Economics, 56*(2), 147–177. https://doi.org/10.1016/j.jacceco.2013.10.007

De Luca, F., & Prather-Kinsey, J. (2018). Legitimacy theory may explain the failure of global adoption of IFRS: The case of Europe and the US. *Journal of Management and Governance, 22*, 501–534. https://doi.org/10.1007/s10997-018-9409-9

Deloitte (2013). IFRS in focus hedge accounting reforms: A closer reflection of risk management. Retrieved 24 Mar 2024 from https://www.iasplus.com/en/publications/global/ifrs-in-focus/2013/hedging/at_download/file/IFRS%20in%20Focus%20-%20Hedge%20Accounting.pdf

Deloitte (2016). IFRS 9: Financial Instruments—high level summary. Retrieved 24 Mar 2024 from https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/audit/lu-IFRS-9.pdf

DeMarzo, P. M., & Duffie, D. (1995). Corporate incentives for hedging and hedge accounting. *The Review of Financial Studies, 8*(3), 743–771. https://doi.org/10.1093/rfs/8.3.743

Do Nguyet, A. (2017). The impact of earnings volatility on earnings predictability. *Global Business & Finance Review, 22*(2), 82–89. https://doi.org/10.17549/gbfr.2017.22.2.82

Doshi, H., Kumar, P., & Yerramilli, V. (2018). Uncertainty, capital investment, and risk management. *Management Science, 64*(12), 5769–5786. https://doi.org/10.1287/mnsc.2017.2815

Eierle, B., Hartlieb, S., Kress, A., & Mazzi, F. (2021). *Hedge accounting and firms' future investment spending*. Working paper. Università degli Studi di Firenze, Dipartimento di Scienze per l'Economia e l'Impresa.

Ernst & Young. (2014). Hedge accounting under IFRS 9—A closer look at the changes and challenges. Retrieved 11 May 2023 from https://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/ifrs/ey-applying-hedging-feb2014.pdf

Ernst & Young. (2023). Applying IFRS—IASB continues to develop its DRM accounting model. Retrieved 21 Mar 2024 from https://www.ey.com/en_gl/ifrs-technical-resources/applying-ifrs-iasb-continues-to-develop-its-drm-accounting-model.

Fan, Z., Radhakrishnan, S., & Zhang, Y. (2021). Corporate governance and earnings management: Evidence from shareholder proposals. *Contemporary Accounting Research, 38*(2), 1434–1464. https://doi.org/10.1111/1911-3846.12640

Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity, 1*, 141–195.

Florou, A., & Kosi, U. (2015). Does mandatory IFRS adoption facilitate debt financing? *Review of Accounting Studies, 20*, 1407–1456. https://doi.org/10.1007/s11142-015-9325-z

Frestad, D., & Beisland, L. A. (2015). Hedge effectiveness testing as a screening mechanism for hedge accounting: Does it work? *Journal of Accounting, Auditing & Finance, 30*(1), 35–56. https://doi.org/10.1177/0148558X14549457

Froot, K. A., Scharfstein, D. S., & Stein, J. C. (1993). Risk management: Coordinating corporate investment and financing policies. *The Journal of Finance, 48*(5), 1629–1658. https://doi.org/10.1111/j.1540-6261.1993.tb05123.x

Gebhardt, W. R., Lee, C. M. C., & Swaminathan, B. (2001). Toward an implied cost of capital. *Journal of Accounting Research, 39*, 135–176. https://doi.org/10.1111/1475-679X.00007

Gigler, F., Kanodia, C., & Venugopalan, R. (2007). Assessing the information content of mark-to-market accounting with mixed attributes: The case of cash flow hedges. *Journal of Accounting Research, 45*(2), 257–276. https://doi.org/10.1111/j.1475-679X.2007.00232.x

Glaum, M., & Klöcker, A. (2011). Hedge accounting and its influence on financial hedging: When the tail wags the dog. *Accounting and Business Research, 41*(5), 459–489. https://doi.org/10.1080/00014788.2011.573746

Graham, J. R., & Rogers, D. A. (2002). Do firms hedge in response to tax incentives? *The Journal of Finance, 57*(2), 815–839. https://doi.org/10.1111/1540-6261.00443

Guttman, I., & Meng, X. (2021). The effect of voluntary disclosure on investment inefficiency. *The Accounting Review, 96*(1), 199–223. https://doi.org/10.2308/tar-2018-0749

Hairston, S. A., & Brooks, M. R. (2019). Derivative accounting and financial reporting quality: A review of the literature. *Advances in Accounting, 44*, 81–94. https://doi.org/10.1016/j.adiac.2018.10.003

Hausman, J. A., & Taylor, W. E. (1981). Panel data and unobservable individual effects. *Econometrica: Journal of the Econometric Society, 49*, 1377–1398.

Healy, P. M., & Palepu, K. G. (1993). The effect of firms' financial disclosure strategies on stock prices. *Accounting Horizons, 7*(1), 1.

Heckman, J. J. (1979). Sample selection bias as a specification error. *Econometrica, 47*(1), 153–161.

Hwang, A. L. J. (2002). Comparative analysis of accounting treatments for derivatives. *Journal of Accounting Education, 20*(3), 205–233. https://doi.org/10.1016/S0748-5751(02)00004-0

IAS 39. (2019). *IAS 39 financial instruments: Recognition and measurement.* International Accounting Standards Board (IASB). Retrieved 17 May 2023 from https://www.ifrs.org/issued-standards/list-of-standards/

Iatridis, G. (2012). Hedging and earnings management in the light of IFRS implementation: Evidence from the UK stock market. *The British Accounting Review, 44*(1), 21–35. https://doi.org/10.1016/j.bar.2011.12.002

IFRS 9. (2019). IFRS 9 financial instruments. International Accounting Standards Board (IASB). Retrieved 17 May 2023 from https://www.ifrs.org/issued-standards/list-of-standards/

International Accounting Standard Board (IASB). (2010). *IFRS 9: Hedge accounting, exposure draft (ED/2010/13)*. IFRS Publications.

Kablan, A. (2014). Financial risk management and hedge accounting. In Ü. Hacioglu & H. Dincer (Eds.), *Managerial issues in finance and banking: A strategic approach to competitiveness* (pp. 99–109). Springer.

Kim, J. B., Tsui, J. S. L., & Yi, C. H. (2011). The voluntary adoption of international accounting standards and loan contracting around the world. *Review of Accounting Studies, 16*(4), 779–811. https://doi.org/10.1007/s11142-011-9148-5

Kontesa, M., Brahmana, R., & Tong, A. H. H. (2021). Narcissistic CEOs and their earnings management. *Journal of Management and Governance, 25*, 223–249. https://doi.org/10.1007/s10997-020-09506-0

Kothari, S., Lewellen, J., & Warner, J. B. (2014). The behavior of aggregate corporate investment. Unpublished working paper. Massachusetts Institute of Technology. https://doi.org/10.2139/ssrn.2511268

KPMG [Corporate Treasury News] (2021, June 24). *Hedge accounting according to IFRS 9: Active use of broader designation options or business as usual?* Retrieved 25 July 2023 from https://kpmg.com/de/en/home/insights/2021/06/hedge-acc-ifrs9

Kumar, P., Langberg, N., & Sivaramakrishnan, K. (2012). Voluntary disclosures, corporate control, and investment. *Journal of Accounting Research, 50*(4), 1041–1076. https://doi.org/10.1111/j.1475-679X.2012.00454.x

Kumar, P., & Rabinovitch, R. (2013). CEO entrenchment and corporate hedging: Evidence from the oil and gas industry. *Journal of Financial and Quantitative Analysis, 48*(3), 887–917. https://doi.org/10.1017/S0022109013000276

Lee, K. W. (2019). The usage of derivatives in corporate financial risk management and firm performance. *International Journal of Business, 24*(2), 113–131.

Leland, H. E. (1998). Agency costs, risk management, and capital structure. *The Journal of Finance, 53*(4), 1213–1243. https://doi.org/10.1111/0022-1082.00051

Lessard, D. (1991). Global competition and corporate finance in the 1990s. *Journal of Applied Corporate Finance, 3*, 59–72. https://doi.org/10.1111/j.1745-6622.1991.tb00564.x

Linck, J. S., Lopez, T. J., & Rees, L. (2007). The valuation consequences of voluntary accounting changes. *Review of Quantitative Finance and Accounting, 28*, 327–352. https://doi.org/10.1007/s11156-007-0016-0

Lobo, G. J., Ranasinghe, T., & Yi, L. (2022). Hedging, investment efficiency, and the role of the information environment. *Journal of Accounting, Auditing & Finance, 37*(2), 324–351. https://doi.org/10.1177/0148558X20916336

Manconi, A., Massa, M., & Zhang, L. (2018). The informational role of corporate hedging. *Management Science, 64*(8), 3843–3867. https://doi.org/10.1287/mnsc.2016.2717

Marcon, C. (2020). *Gli strumenti finanziari in bilancio secondo l'IFRS 9: implicazioni teoriche ed empiriche* (pp. 1–179). FrancoAngeli.

Mechelli, A., & Cimini, R. (2021). The effect of corporate governance and investor protection environments on the value relevance of new accounting standards: The case of IFRS 9 and IAS 39. *Journal of Management and Governance, 25*, 1241–1266. https://doi.org/10.1007/s10997-020-09551-9

Melis, A., & Carta, S. (2010). Does accounting regulation enhance corporate governance? Evidence from the disclosure of share-based remuneration. *Journal of Management & Governance, 14*, 435–446. https://doi.org/10.1007/s10997-009-9107-8

Miloș, M. C., & Miloș, L. R. (2022). Use of derivatives and market valuation of the banking sector: Evidence from the European Union. *Journal of Risk and Financial Management, 15*(11), 501. https://doi.org/10.3390/jrfm15110501

Minton, B. A., Schrand, C. M., & Walther, B. R. (2002). The role of volatility in forecasting. *Review of Accounting Studies*, *7*. https://doi.org/10.1023/A:1020226118973

Minton, B. A., & Schrand, C. (1999). The impact of cash flow volatility on discretionary investment and the costs of debt and equity financing. *Journal of Financial Economics, 54*(3), 423–460. https://doi.org/10.1016/S0304-405X(99)00042-2

Morck, R., Shleifer, A., & Vishny, R. W. (1990). The stock market and investment: is the market a sideshow? *Brookings Papers on Economic Activity*. https://doi.org/10.2307/2534506

Müller, V. (2020). Hedge accounting and its consequences on portfolio earnings—A simulation study. *Accounting in Europe, 17*(2), 204–237. https://doi.org/10.1080/17449480.2020.1775267

Nan, L. (2008). The agency problems of hedging and earnings management. *Contemporary Accounting Research, 25*(3), 859–890. https://doi.org/10.1506/car.25.3.8

Nguyen, H. V. (2018). Hedging and hedging effectiveness under required disclosures: A study of the impact of derivatives use on capital investment. *Journal of Economics and Finance, 42*, 471–491. https://doi.org/10.1007/s12197-017-9399-5

Olojede, P., & Erin, O. (2021). Corporate governance mechanisms and creative accounting practices: The role of accounting regulation. *International Journal of Disclosure and Governance, 18*(3), 207–222. https://doi.org/10.1057/s41310-021-00106-4

Oxelheim, L., Alviniussen, A., & Jankensgard, H. (2020). *Corporate foreign exchange risk management*. John Wiley & Sons.

Panaretou, A., Shackleton, M. B., & Taylor, P. A. (2013). Corporate risk management and hedge accounting. *Contemporary Accounting Research, 30*(1), 116–139. https://doi.org/10.1111/j.1911-3846.2011.01143.x

Pierce, S. (2020). Determinants and consequences of firms' derivative accounting decisions. *Journal of Financial Reporting, 5*(1), 81–114. https://doi.org/10.2308/JFR-2019-0014

Pollock, A. J. (2005). FAS 133: What is accounting truth? *Journal of Applied Corporate Finance, 17*(3), 102–106. https://doi.org/10.1111/j.1745-6622.2005.00049.x

Purnanandam, A. (2007). Interest rate derivatives at commercial banks: An empirical investigation. *Journal of Monetary Economics, 54*(6), 1769–1808. https://doi.org/10.1016/j.jmoneco.2006.07.009

PwC (2017). *In depth: Achieving hedge accounting in practice under IFRS 9.* Retrieved 11 May 2023 from https://www.pwc.com/gx/en/audit-services/ifrs/publications/ifrs-9/achieving-hedge-accounting-in-practice-under-ifrs-9.pdf

Ramirez, J. (2015). *Accounting for derivatives: Advanced hedging under IFRS 9*. John Wiley & Sons.

Ranasinghe, T., Sivaramakrishnan, K., & Yi, L. (2022). Hedging, hedge accounting, and earnings predictability. *Review of Accounting Studies, 27*(1), 35–75. https://doi.org/10.1007/s11142-021-09595-8

Schleicher, T., Tahoun, A., & Walker, M. (2010). IFRS adoption in Europe and investment-cash flow sensitivity: Outsider versus insider economies. *The International Journal of Accounting, 45*(2), 143–168. https://doi.org/10.1016/j.intacc.2010.04.007

Schumann, F., Thun, T. W., Dauth, T., & Zülch, H. (2024). Does top management team diversity affect accounting quality? Empirical evidence from Germany. *Journal of Management and Governance, 28*(1), 137–175. https://doi.org/10.1007/s10997-023-09668-7

Shapiro, A. C., & Titman, S. (1986). An integrated approach to corporate risk management. *The Revolution in Corporate Finance, 3*, 251–265.

Smith, C. W., & Stulz, R. M. (1985). The determinants of firms' hedging policies. *Journal of Financial and Quantitative Analysis, 20*(4), 391–405. https://doi.org/10.2307/2330757

Sobel, M. E. (1982). Asymptotic confidence intervals for indirect effects in structural equation models. *Sociological Methodology, 13*, 290–312. https://doi.org/10.2307/270723

Stulz, R. (1990). Managerial discretion and optimal financing policies. *Journal of Financial Economics, 26*, 3–28. https://doi.org/10.1016/0304-405X(90)90011-N

Titman, S., Wei, K. J., & Xie, F. (2004). Capital investments and stock returns. *Journal of Financial and Quantitative Analysis, 39*(4), 677–700. https://doi.org/10.1017/S0022109000003173

Titova, Y., Penikas, H., & Gomayun, N. (2020). The impact of hedging and trading derivatives on value, performance and risk of European banks. *Empirical Economics, 58*, 535–565. https://doi.org/10.1007/s00181-018-1545-1

Tufano, P. (1998). Agency costs of corporate risk management. *Financial Management*. https://doi.org/10.2307/3666152

Whittington, G. (1993). Corporate governance and the regulation of financial reporting. *Accounting and Business Research, 23*(sup1), 311–319. https://doi.org/10.1080/00014788.1993.9729899

Zhang, H. (2009). Effect of derivative accounting rules on corporate risk-management behavior. *Journal of Accounting and Economics, 47*(3), 244–264. https://doi.org/10.1016/j.jacceco.2008.11.007

Zhaoyang, G., Lee, C. W., & Rosett, J. G. (2005). What determines the variability of accounting accruals? *Review of Quantitative Finance and Accounting, 24*, 313–334. https://doi.org/10.1007/s11156-005-6869-1

Alessandra Allini is full Professor of Accounting at the University of Naples "Federico II" where she teaches International Accounting and Financial analysis. Her research interests cover the areas of Accounting standards, Earnings management, Risk disclosure, and Sustainability reporting.

Marco Maffei is full Professor of Accounting at the University of Naples "Federico II" where he teaches Advanced Financial Accounting and Auditing. His areas of research include Enterprise Risk Management, Risk disclosure and Performance measurement.

Rosalinda Santonastaso is Lecturer in Accounting at the University of Campania "Luigi Vanvitelli" where she received the Ph.D. degree in Entrepreneurship and Innovation. Her research interests cover the areas of Internal Auditing, Sustainability reporting and Corporate Governance.

Flavio Spagnuolo is Research fellow in Accounting at the University of Naples "Federico II" where he received the Ph.D. degree in Management. His areas of research include Accounting standards, Earnings management, Sustainability reporting and M&A dynamics.

Authors and Affiliations

Alessandra Allini[1] · Marco Maffei[1] · Rosalinda Santonastaso[2] · Flavio Spagnuolo[1]

✉ Flavio Spagnuolo
flavio.spagnuolo@unina.it

Alessandra Allini
alessandra.allini@unina.it

Marco Maffei
marco.maffei@unina.it

Rosalinda Santonastaso
rosalinda.santonastaso@unicampania.it

[1] Department of Economics, Management, Institutions, University of Naples "Federico II", Naples, Italy

[2] Department of Economics, University of Campania "Luigi Vanvitelli", Capua, CE, Italy