Corporate Risk Management – New Empirical Evidence from Foreign Exchange and Interest Rate Risk

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Vorwort

Empirische Untersuchungen zum Financial Risk Management leiden trotz umfangreicher Offenlegungen beispielsweise nach IFRS 7 immer noch unter Datenproblemen, weil diese weitgehend auf Nominalwerte (notional amount), nicht Marktwerte beschränkt sind oder nur saldiert ausgewiesen. Daher kann die entscheidende Frage, ob Unternehmen Derivate einsetzen, um das Risiko zu mindern oder zusätzliche Erträge zu generieren, mit den Daten im Jahresabschluss i.d.R. nicht untersucht werden. Die Mehrzahl empirischer Arbeiten konzentriert sich daher auf anonyme Befragungen über den Einsatz von Derivaten, Fallstudien oder arbeiten mit einem über 20 Jahren alten Datensatz, der sich mit den Hedging-Aktivitäten von Goldminen beschäftigt. Der Arbeit von Dr. Andreas Hecht kommt daher eine besondere Bedeutung zu.

Im Rahmen der Vorschriften der französischen Kapitalmarktaufsicht wird das sogenannte 'registration document' als optionale Beilage, ergänzend zu den vorgeschriebenen Dokumenten, erwähnt, in dem Unternehmen, die an französischen Börsen notiert sind, umfassendere Informationen offenlegen als in anderen Ländern der EU. Anhand eines individuellen Datensatzes der größten Unternehmen an der Pariser Börse (CAC Index) ist Andreas Hecht in der Lage, die bisher nur anhand von Befragungen oder Fallstudien untersuchten Fragen zum Financial Risk Management von Foreign Exchange (FX) und Interest Rate (IR) Risiken zu untersuchen.

Die einzelnen Fragestellungen der drei Arbeiten zeigen eine hohe Praxisrelevanz, weil auch die Frage untersucht wird, inwieweit Unternehmen durch den Einsatz von Derivaten Risiken vermindern oder eventuell steigern. Die Ergebnisse zeigen aber auch, die Schwierigkeit der Einordung von selektivem Hedging, Market Timing und Spekulation in der praktischen Analyse. Die Ergebnisse können aber auch überzeugen, weil sie einem Regulierer sinnvolle Hinweise geben, welche Informationen der Kapitalmarkt mindestens braucht, wenn er angemessen die Risikoposition der Unternehmen aus den Offenlegungen beurteilen will. Es geht hier aber nicht um mehr Offenlegung, sondern vielmehr um die Offenlegung von wichtigen und relevanten Informationen für Analysten.

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Finally, but by no means least, my special appreciation goes to Lucie, my parents and my brother. With their unconditional support and patience, they contributed to the success of this work. I dedicate this thesis to them.

Andreas Hecht
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Contents

List of Abbreviations

Abbreviation	Full term
AMF	Autorité des Marchés Financiers
BGL	Benchmark gains and losses
CAC	Cotation assistée en continu
Capex	Capital expenditures
CARF	Controlling Accounting Risiko Finanzen
DALAHO	Datenlabor Hohenheim (Data laboratory Hohenheim)
DAX	Deutscher Aktienindex (German stock index)
EURIBOR	Euro Interbank Offered Rate
FS	Frequent speculator
FX	Foreign exchange
H	Hedging instruments
HA	Hedge accounting
HR	Hedge ratio
IAS	International Accounting Standards
IFRS	International Financial Reporting Standards
IR	Interest rate
MS	Marginal speculator
OLS	Ordinary least squares
PSB	Paris School of Business
R&D	Research and development
RD	Risk-decreasing
RI	Risk-increasing
SD	Standard deviation
SIC	Standard Industrial Classification

SME	Small and medium sized enterprise
TS	Temporary speculator
U.S.	United States

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1 Introduction

"Academics know remarkably little about corporate risk management practices, even though almost three-fourths of corporations have adopted at least some financial engineering techniques to control their exposures to interest rates, foreign exchange rates, and commodity prices." [1]

In 1996, Tufano expressed concern about the state of knowledge of how firms manage their risk exposures. Since then, a lot of academic research has been dedicated to corporate risk management that documents the relevance of derivative instruments (e.g., Bodnar, Giambona, Graham, Harvey, & Marston, 2011; Brown, 2001; Brown & Toft, 2002; Guay & Kothari, 2003). The majority (64%) of firms use derivative instruments in their risk management programs (Bodnar et al., 2011), with the most material risk categories of non-financial firms being foreign exchange (FX) and interest rate (IR) risk. As the survey of Bodnar et al. (2011) further illustrates, FX is the only category that is more commonly managed with financial contracts than operational structures and decisions. The second category in this respect is IR risk, for which the derivative contracts are almost equally important as operational risk measures.

Although FX and IR risks are identified as the most important categories, the majority of the recent empirical literature on corporate risk management focuses on commodity risks using the famous 'gold data set' based on a confidential survey[2] (e.g., Adam & Fernando, 2006; Adam, Fernando, & Golubeva, 2015; Adam, Fernando, & Salas, 2017; Brown, Crabb, & Haushalter, 2006; Tufano, 1996). The limited data availability for IR and FX risk contributes to this fact: In the case of interest rate risk, the complexity of IR risk[3] makes it difficult to identify a firm's interest rate exposure (Faulkender, 2005) and most "studies rely on survey data and/or alternative indicators of derivative usage" (Oberoi, 2018, p. 71). Similarly, investigations of foreign exchange risk are predominantly based on anonymous insider information from surveys (e.g., Glaum, 2002; Géczy, Minton, & Schrand, 2007) or case studies (e.g., Brown, 2001; Brown & Toft, 2002) due to a lack of publicly reported empirical data. One of the rare studies that

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1 As appeared in the *Journal of Finance* article "Who manages risk? An empirical examination of risk management practices in the gold mining industry" by Tufano (1996, p. 1097).

2 The equity analyst Ted Reeve compiled the comprehensive, private survey in the North American gold mining industry in the 1990s. Tufano (1996) was, to our knowledge, the first user of this dataset.

3 Interest rate risk consists of two types of risk: While the cash flow risk describes the direct impact of interest rate changes on payments for floating-rate financial assets and liabilities, the fair value risk represents the effect of interest rate fluctuations on the market value of fixed-rate financial assets and liabilities.

examines corporate FX risk management based on openly available empirical data is Beber & Fabbri (2012), who rely on disclosed notional values of currency derivatives. However, Beber & Fabbri (2012) note that the use of notional values has limited utility since the net position (short or long) and the concerned currency remain unknown. This thesis addresses the problem of data limitation and the use of proxy variables for derivative usage in corporate FX and IR risk management by exploiting a unique regulatory setting with publicly reported FX and IR accounting information of unprecedented data granularity.

In the extant literature on corporate risk management, two overriding research questions emerge: First, whether firms hedge or speculate with derivative instruments, i.e., if firms decrease or increase their risk exposure, respectively.[4] The stated data limitation in terms of FX and IR risk is illustrated by e.g., Hentschel & Kothari (2001) and Allayannis & Ofek (2001), who both analyze whether non-financial firms reduce or take risk with derivatives with conflicting results. While Hentschel & Kothari (2001) base their analysis on stock-return volatility as proxy for *FX, IR* and commodity risk exposure, Allayannis & Ofek (2001) use the sensitivity of a firm's stock return to unanticipated FX rate changes as alternative indicator for FX exposure. Second, the literature is particularly interested in the determinants of speculative behavior (e.g., Adam et al., 2015, 2017; Brown et al., 2006; Géczy et al., 2007; Glaum, 2002), where the lack of public data is once more visible. To our knowledge, almost all studies rely on insider information from survey outcomes, whereby most examinations again analyze commodity risks using the aforementioned 'gold data set' (Adam et al., 2015, 2017; Brown et al., 2006). Similarly, the data for FX and IR risk rely on access to the Bodnar et al. (1998)-Wharton survey (Géczy et al., 2007) or they are based on an own survey study on the risk management of German non-financial firms (Glaum, 2002).[5] As only conflicting evidence emerges, Adam et al. (2017) conclude that the empirical evidence on why firms engage in speculative activities "remains a puzzle" (Adam et al., 2017, p. 269) and Géczy et al. (2007) deduce that investors are *not* able to identify speculation based on public corporate disclosures.

We are able to tackle these two research questions as to whether firms hedge or speculate with derivative instruments and what the potential determinants and identifiers of speculation might

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4 The relevant literature defines hedging as activity that reduces risk (e.g., Allayannis & Ofek, 2001; Géczy et al., 2007; Hentschel & Kothari, 2001), while selective hedging refers to the incorporation of individual market views in risk management decisions that leads to sizing and timing of derivative transactions (e.g., Glaum, 2002; Stulz, 1996). Speculation, as opposed to hedging, denotes risk-increasing activities, or following Zhang (2009) derivative activities that fails to reduce a firm's risk exposure.

5 Only the study of Chernenko & Faulkender (2011) examines exclusively IR risk. To do so, they only analyze debt positions and assume an optimal stable hedge ratio of their sample firms.

be by means of two new, innovative and public datasets – one for FX and one for IR risk – that contain advanced disclosures on risk management activities. In the unique and unexplored regulatory environment of France, the Autorité des Marchés Financiers (AMF), supervisor of the French financial markets, recommends additional FX and IR disclosures in excess of the prevailing International Financial Reporting Standards (IFRS). In form of an optional supplement to annual disclosures, the so-called 'registration document', the regulating authority advises firms to state actual exposure data before and after hedging together with corresponding hedged amounts from derivative instruments. This, to our knowledge unprecedented data granularity, allows us to overcome the data limitation in corporate FX and IR risk management and to avoid using alternative indicators for derivative usage with potential estimation errors. We address the two research questions on the relevance and the determinants (together with the identification) of speculative elements in corporate FX and IR risk management in three chapters, where every chapter refers to an empirical paper.[6]

Following the importance of financial contracts for FX risk management, we first concentrate on how firms use derivative transactions to handle their FX risk. Using the additional information reported in the registration documents, we are able to investigate the unexamined composition of FX exposure, i.e., whether it is mainly long or short, and how the exposure is managed. We then focus on the relevance of speculative elements with the central question of whether firms use derivatives to decrease, increase or keep their FX risk exposure constant by analyzing the actually reported exposure before and after hedging instead of using proxy variables. Further, the extant literature provides substantial evidence that firms consider previous derivative cash flows when managing their current exposure (Adam et al., 2015; Beber & Fabbri, 2012; Thaler & Johnson, 1990; Weber & Zuchel, 2005). Using our unique FX-dataset, we address the documented impact of prior hedging outcomes on present hedge decisions and complement the literature when testing whether this impact differs for risk-decreasing and risk-increasing strategies. **Chapter 2** *"How do Firms Manage Their Foreign Exchange Exposure?"*[7] summarizes the findings of this examination.

Following the relevance of speculative elements, we turn our focus to the identification and the determinants of speculation in FX risk management. We build upon chapter 2 to define

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6 The content of each paper coincides with the papers, but they are formally revised for the thesis.

7 This paper is joint work with Niklas Lampenius. I identified the regulatory environment with the advanced disclosures on FX risk management as prerequisite for this paper. Further, I suggested the initial idea and I was responsible for data collection, preparation and analysis. Moreover, I contributed to this paper by co-writing every chapter.

speculation as risk-increasing/-constant strategy and separate it clearly from hedging. We then examine whether – in contrast to the existing literature – the unique regulatory environment in France allows investors and further stakeholders to quantitatively or qualitatively identify speculative activities reading public corporate disclosures. In the following, we investigate the determinants of speculation, where we test if the relevant theories for speculative behavior are empirically supported in FX risk management. We note that the extant empirical evidence is at variance and see the varying assumptions and definitions for speculation as major reason. Instead of employing proxy variables for derivative usage or relying on survey data, we use the informational advantage of our dataset to separate hedgers from speculators according to their share of risk-decreasing vs. risk-increasing/-constant strategies and examine whether certain firm characteristics are critical to speculative behavior. **Chapter 3** *"Identifying Corporate Speculation Reading Public Disclosures – Why Firms Increase Risk"* presents the outcome of this analysis.

Subsequent to an isolated FX risk contemplation, we concentrate on corporate IR risk management as well as its combination with FX risk to analyze potential interdependencies. Interest rate risk is more complex compared to foreign exchange risk (Faulkender, 2005). A major reason for this is that interest rate risk comprises two different types of risk – the cash flow and the fair value risk. The extant literature addresses this complexity by assuming a target fixed/floating ratio and analyzing the mix of fixed- and floating-rate debt. Anecdotal evidence from interviewed treasury executives, however, indicates that non-financial firms concentrate on the cash flow risk (Backhaus, 2018) instead of working with a target fixed/floating mix. In terms of IR risk reporting, the additional disclosures advocated by the French's financial markets authority (AMF) provide the information of the IR exposure before and after hedging separately for fixed- and floating-rate positions. This unprecedented data granularity allows us to put the emphasis on the cash flow risk and to analyze how non-financial firms manage their IR risk from new analytical perspectives. Besides the composition and the maturity structure of IR exposure, we are particularly interested in the relevance and determinants of speculative, i.e., risk-increasing/-constant, elements in IR risk management. To round off the thesis as a final step, we combine the FX and IR dataset to explore potential interrelations between speculative activities in both fields. **Chapter 4** *"How Do Firms Manage Their Interest Rate Exposure?"* reports the results of this investigation.

Finally, we summarize our key findings in **chapter 5** to illustrate how the new empirical findings of this thesis contribute to the discussion and literature on corporate risk management.

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2 How Do Firms Manage Their Foreign Exchange Exposure?[8]

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We examine how firms manage their foreign exchange (FX) exposure using publicly reported data on FX exposure before and after hedging with corresponding hedging instruments. Based on calculated firm-, year-, and currency-specific hedge ratios, we find that about 80 [20] percent of FX firm exposure are managed using risk-decreasing [risk-increasing/-constant] strategies. Further, we find that prior hedging outcomes affect the management of current FX exposure, where the exposure is reduced and management adjusts the hedge ratio closer to its benchmark average hedge ratio following prior benchmark losses. When separately evaluating risk-decreasing and risk-increasing positions, we find that prior benchmark losses are only relevant for risk-increasing but not for risk-decreasing positions, i.e., hedging decisions are independent of prior benchmark losses if the intention is to reduce FX exposure.

Keywords: Foreign Exchange; Corporate Risk Management; Selective Hedging; Speculation

JEL: G11, G32, G39

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2.1 Introduction

The literature provides substantial evidence on the relevance of foreign exchange (FX) derivative instruments for the management of corporate FX exposure, either related to the structure of a FX risk management program (Brown, 2001), the optimal derivative hedging strategies (Brown & Toft, 2002), or generally the importance of derivative instruments (Guay & Kothari, 2003). Further, the survey of Bodnar, Giambona, Graham, Harvey, and Marston (2011) illustrates that FX risk is commonly managed with financial contracts.[9] In general, the purpose of risk management or hedging is the reduction of risk that results from future movements in market variables, where Hentschel and Kothari (2001) investigate, based on stock returns as central risk measure, whether corporations reduce or take risks with derivative instruments. Similarly, Allayannis and Ofek (2001) evaluate whether non-financial firms use FX derivatives for hedging or speculative purposes, i.e., reduce or increase FX exposure, based on the sensitivity of a firm's stock return to unanticipated FX rate changes as proxy of FX exposure.

Using a new dataset that contains actual firm-, year- and currency-specific exposure before and after hedging of a firm, we relate to the latter topic and evaluate how firms manage FX exposure and weather firms decrease or increase FX exposure using derivatives. The latter question is of particular interest given that a line of research illustrates that individual views on future market developments influence corporate risk management activities (Adam et al., 2015; Beber & Fabbri, 2012; Bodnar et al., 1998; Brown et al., 2006; Faulkender, 2005; Glaum, 2002; Tufano, 1996), where the terms selective hedging, market timing, and speculation are used interchangeably (Adam et al., 2017). In this context, the selective hedging literature also documents the relevance of previous hedging outcomes and indicates that management refers to prior outcomes in present hedge decisions when managing FX exposure (Adam et al., 2015; Beber & Fabbri, 2012).

In this paper we evaluate a hand-collected dataset from publicly available sources containing data from French firms with unprecedented FX-data granularity. The reported data provides information on the composition of the firms' exposure before hedging, the utilized hedging instruments, as well as, the resulting exposure after hedging. This granularity allows us to determine firm-, year-, and currency-specific hedge ratios and to classify currency positions as risk-decreasing [risk-increasing] {risk-constant} if they reduce [increase] {keep constant} the firm's FX exposure per year and currency. This differentiation is in line with the recent survey in

[9] Following Bodnar et al. (2011), all other examined risk categories, such as interest rates, commodities, or energy, are more commonly managed with operational risk measures as opposed to derivatives/financial contracts.

France of Gumb, Dupuy, Baker, and Blum (2018) that indicates that corporate treasurers differ in risk appetite: some are willing to increase volatility, while others refuse to do so. Further, this differentiation allows for an in-depth analysis of the influence of prior hedging outcomes when managing FX exposure, and enables us to provide unique new evidence on the management of the FX exposure of non-financial firms.

We find that the FX exposure of our sample firms before hedging is mainly long and driven by FX-receivables and forecasted FX-sales. This long exposure is on average [median] hedged to about 90 [49] percent with predominantly short derivative instruments. Further, our findings reveal that about 61 percent of the taken currency positions can be classified as risk-decreasing and about 39 percent as risk-increasing/-constant positions. However, a position with an exposure of 0.1 million Euros should not be equally important as a position with an exposure of 100 million Euros. When relating the exposure before hedging per position to overall firm exposure, we find that approximately 20 percent of total firm exposure are managed using risk-increasing/-constant strategies and 80 percent of total FX exposure are managed using risk-decreasing strategies. Further, we address the documented impact of prior outcomes on hedging decisions and test whether management considers prior hedging outcomes when managing its current exposure. Following Brown et al. (2006), we evaluate past performance relative to a benchmark scenario defined as the firm- and currency-specific average hedge ratio and denominate positive [negative] deviations as benchmark gains [losses]. This approach is in line with the methodology used in the selective hedging literature, who attribute deviations from a benchmark scenario to selective hedging (Adam et al., 2015; Brown et al., 2006). We find evidence that supports the hypothesis that management is impacted by prior outcomes when managing FX exposure. In particular we observe a significant exposure reduction following prior benchmark losses, where the adjustment results in a hedge ratio that is closer to the benchmark of the average hedge ratio. Further, we complement the literature by analyzing the impact of prior outcomes separately for risk-decreasing and risk-increasing strategies. We find that prior benchmark losses are only relevant for risk-increasing strategies, where the exposure is decreased in response to previous benchmark losses, but not for risk-decreasing strategies. Thus, if the managerial focus is on decreasing risk, we find that prior hedging outcomes are not incorporated in current hedge decisions.

We contribute to the literature on corporate risk management in three ways. First, based on the granularity of the dataset we contribute to the understanding of how firms manage their FX exposures. Second, the data allows for the calculation of a hedge ratio that captures FX exposures before hedging and the corresponding hedging instruments per firm, year, and

currency. The hedge ratio allows for a classification of derivative positions into risk-decreasing, risk-increasing, and risk-constant strategies, where we illustrate their respective relevance in FX risk management. Third, we complement the literature with our analysis of the impact of prior hedging outcomes on present hedge decisions. We first confirm the findings from extant literature that management is impacted by prior outcomes when managing FX exposure, where we show that management adjust the hedge ratio closer to the benchmark of the average hedge ratio in response to prior benchmark losses. Further, when risk-decreasing and risk-increasing positions are evaluated separately we find that prior benchmark losses are only relevant for risk-increasing but not for risk-decreasing strategies.

The paper is organized as follows. Section 2.2 presents the structure and format of the reported data on FX exposure and corresponding hedging instruments and introduces the hedge ratio measure. Section 2.3 describes our sample, discusses descriptive statistics, and provides an analysis of the hedge ratio. Section 2.4 investigates the influence of prior outcomes on hedging decisions and section 2.5 concludes.

2.2 Information Provided in the Registration Document

2.2.1 Registration Document

We utilize a sample of French firms, since the unique regulatory recommendations in France facilitate the publication of detailed information regarding risk management of foreign exchange exposure. Here the Autorité des Marchés Financiers (AMF), supervisor of the French financial markets, has established a so-called 'registration document'.[10] As optional supplement, this registration document provides additional information for various stakeholders. In position paper n°2009-16 the AMF supplies detailed guidelines regarding corporate disclosures on the management of FX risks. These guidelines by far exceed the requirements of IFRS 7, §33 and 34 (AMF, 2009), as they advice firms to state their actual FX exposure before and after management by year and currency at the reporting date, however, at this point in time the provision of data is voluntary. Table 1 provides a template of the recommended format of the data with regard to FX exposure and its management provided by the AMF with a proxy currency to illustrate a potential outcome.

[10] For details on the registration document refer to http://www.amf-france.org/en_US/Acteurs-et-produits/Societes-cotees-et-operations-financieres/Document-de-reference.html.

Table 1: Template of Information Requested in the Registration Document

This table presents the recommendation detailed by the supervisor of the French financial markets, Autorité des Marchés Financiers (AMF), in position paper n°2009-16, including a numerical example currency position. In this guideline document, the AMF has established a so-called 'registration document', which as optional supplement, is intended to provide additional information regarding risk management of foreign exchange exposure for various stakeholders. The original document is in French language and not available in English.

Year	Assets* [a]	Liabilities* [b]	Forecasted Exposure (Sales (+) and Purchases (-)) [c]	Exposure Before Hedging [d] = [a] - [b] + [c]	Hedging Instruments (Long (+) and Short (-)) [e]	Exposure After Hedging [f] = [d] + [e]
Currency 1	120	30	10	100	-50	50
Currency 2						
Currency n						
…						
Total	…	…	…	…	…	…

* Mostly in form of FX-trade receivables and FX-trade payable, respectively

In the registration document firms typically specify their FX exposure of assets (column [a]) and liabilities (column [b]), mostly in form of FX-receivables and FX-payables, together with the forecasted FX exposures (column [c]), which some firms further divide into forecasts of FX-sales and FX-purchases, as illustrated in Table 1. In the aggregate, these figures add up to the net position of exposure before hedging (column [d]), where all data is firm-, year-, and currency-specific and also includes information on outstanding FX debt as well as the data of the exposure of foreign subsidiaries.[11] In addition, the registration document provides information on the employed hedging instruments (column [e]) and the resulting exposure after hedging (column [f]). To illustrate the level of detail provided, assume the following reported information: A firm reports, for instance, 120 units of FX-receivables and 30 units of FX-payables at a particular reporting date for a respective currency. The netted figure of 90 units is amended with forecasted FX-sales of 20 units and forecasted FX-purchases of 10 units. Overall, the firm then reports an exposure before hedging (E_t^b) of 100 units ($E_t^b = 120 - 30 + 20 - 10 = 100$), as well as a corresponding net amount of hedging instruments (H_t) of –50 units in the respective currency. The exposure after hedging (E_t^a) is then specified with 50 units, i.e., $\mathrm{E}_t^a = 100 - 50$. Appendix 1 provides examples of the reported FX information from the registration documents. In general and given its voluntary nature, firms mainly specify the net amount of hedging instruments, however, in some instances firms also specify the utilized hedging instruments, such as forwards/futures, options, or swaps, either separately in tabulated form or verbally in the accompanying notes. Overall, the reported data in the

11 Appendix 2 provides examples of FX debt and foreign subsidiaries included in exposure.

registration document covers existing and estimated FX exposure and associated hedging positions at the reporting date and, thus, provides a new level of granularity so far unrevealed to the public, which allows for a novel evaluation of how firms manage their FX exposure.

2.2.2 Hedge Ratio Definition

To evaluate how firms manage their FX exposure we are interested in whether firms decrease or increase their FX risk when employing FX hedging strategies, where we utilize the information on positions before and after hedging provided in the registration document. In line with Zhang (2009), who analyzes firms that reduce their risk exposure with derivative instruments and those who fail to do so, a hedge ratio allows to separate strategies that are risk-decreasing from those that are risk-increasing or from those that do not affect risk exposure. Similarly, others have evaluated this distinction in the context of corporate risk management activities (Allayannis & Ofek, 2001; Hentschel & Kothari, 2001; Zhang, 2009), where Allayannis and Ofek (2001) and Hentschel and Kothari (2001) use the term 'hedging' and 'speculation' for risk-decreasing and risk-increasing strategies, respectively. Zhang (2009) employs similar expressions, given that firms that reduce their risk exposure compared to an expected level are classified as 'effective hedgers' and firms that increase their risk exposure as 'ineffective hedgers/speculators'.

Based on the new level of granularity, we can evaluate FX activities using firm-, year- and currency-specific hedge ratios (HR) that denote the percentage of FX exposure covered by derivative instruments. Thus, a hedge ratio in t (HR_t) is defined as $HR_t = H_t \,/\, \mathrm{E}_t^b$, where H_t denotes the hedging instruments and E_t^b the exposure before hedging in t. In general, the exposure before hedging, as reported in the registration document, can be either long (positive), or short (negative). For the utilized hedging instruments we identify a long [short] position through a positive [negative] sign. Consequently, the hedge ratio is either positive or negative, in dependence on the FX exposure and utilized hedging instruments, where a positive [negative] FX exposure combined with a short position in a FX hedging instrument results in a negative [positive] hedge ratio. On the other hand, a long position in a FX hedging instrument in combination with a positive [negative] exposure defines a positive [negative] hedge ratio. To illustrate the concept we include the following numerical example that demonstrates the combination of FX exposure before hedging (denominator) and the hedging instruments (numerator) in the hedge ratio. Imagine a firm with an assumed exposure before hedging in a particular currency of 100 units, i.e., $E^b = 100$. That firm can now take one out of six exemplarily, fundamentally different positions, as illustrated numerically in Table 2, that differ in

the amount of hedging instruments (H) utilized and the resulting exposure after hedging (E^a). Here two of the six positions result in a decrease in risk: Hedging short e.g., 50 units with derivative instruments ($H = -50$, $HR = -0.5$) implies that the hedging instruments lower the firm's FX exposure from 100 to 50 units[12], and hedging short e.g., 150 units ($H = -150$, $HR = -1.5$) implies that the hedging instruments lower the firm's FX exposure from 100 to –50 units, which is now a short exposure.[13] Further, two positions result in an increase in risk: Hedging short e.g., 250 units using derivative instruments ($H = -250$, $HR = -2.5$) indicates that the hedging instruments 'increase' the firm's FX exposure from 100 to –150 units and hedging long e.g., 50 units ($H = 50$, $HR = 0.5$) indicates that the hedging instruments increase the firm's FX exposure from 100 to 150 units. Finally, two positions change the direction of the exposure, while the size of the risk position of the firm remains constant: Doing nothing ($H = 0$, $HR = 0.0$) and hedging short e.g., 200 units using derivative instruments ($H = -200$, $HR = -2.0$). Overall, Table 2 demonstrates the different positions, including the discontinuous nature of the hedge ratio when interpreted according to the categories of risk-increasing and risk-decreasing. Consequently, the hedge ratio has to be interpreted with care, given that the interpretation is range-dependent.

Table 2: Hedge Ratio Properties

This table illustrates properties of the hedge ratio (HR) and contains a numerical illustration to demonstrate the combination of FX exposure before hedging (denominator) and the hedging instruments (numerator) in the hedge ratio using the column references introduced in Table 1. For illustrative purposes we assume as base scenario a firm with an exposure before hedging in a particular currency of 100 units, i.e., $E^b = 100$. That firm can now take one out of six fundamentally different positions that differ in the amount of hedging instruments (H) and the resulting exposure after hedging (E^a), where two of the six positions result in a decrease in risk, two in an increase in risk and two keep the risk at a constant level. Further, it illustrates the hedge ratio range given the six fundamentally different positions.

	Hedge Ratio Range:					
	Risk-increasing strategy	Risk-decreasing strategy	Risk-decreasing strategy	Risk-increasing strategy	Risk-constant strategy	Risk-constant strategy
Exposure Before Hedging [d]	100	100	100	100	100	100
Hedging Instruments [e]	-250	-150	-50	50	-200	0
Exposure After Hedging [f]	-150	-50	50	150	-100	100
Hedge Ratio (HR = [e] / [d])	-2.5	-1.5	-0.5	0.5	**-2**	**0**
HR:	◄					
	-∞	**-2**	**-1**	**0**	∞	

[12] Similarly, if a firm reports a short (negative sign) exposure of -100 units that is hedged long (positive sign) with 50 units, the hedge ratio also equals 50/-100 = -0.5 and indicates a risk-decreasing strategy.

[13] In the latter case, the overhedging changes the sign of the exposure, which could indicate underlying speculative intentions. However, the descriptive statistics in Table 3 Panel B show that firms are only slightly overhedging with a HR mean of -1.18, which can rather be attributed to imperfect hedge conditions in the real world (Hull, 2015), and hence we can classify such positions as risk-decreasing.

In summary, a hedge ratio of –1.5 decreases the exposure (risk-decreasing strategy), while a hedge ratio of –2.5 increases the exposure (risk-increasing strategy), where the hedge ratio of –2 marks the lower limit between the strategies and the hedge ratio of 0 marks the upper limit. Thus, all positive hedge ratios ($HR > 0$) as well as hedge ratios below –2 ($HR < -2$) increase risk, while negative hedge ratios bigger than –2 and smaller than 0 ($-2 < HR < 0$) decrease risk. Finally, within the thresholds of $-2 < HR < 0$ market views in the context of selective hedging (e.g., Adam et al., 2015, Beber & Fabbri, 2012, or Glaum, 2002) may also be incorporated in the hedging decision, but due to the overall exposure reduction, we categorize this strategy as risk-decreasing and, hence, clearly differentiate it from a risk-increasing or a risk-constant strategy. Overall, the utilized classification scheme of risk-increasing, risk-decreasing, and risk-constant positions sets us apart from prior studies.

2.3 Sample Description and Analysis

2.3.1 Sample Selection

Our dataset contains panel data of listed firms in France for the period 2010 to 2015. The initial sample contains all 333 French firms quoted in the CAC All-Tradable index as of April 2016. Given that the position paper on the preparation of the registration document was made public in December 10th, 2009, the initial year of our sample is 2010. We drop 18 firms from the financial industry, provided their unique business model. For the remaining 315 firms we hand-collect the reported annual disclosures on FX exposure and hedging activities from the registration document separately for year, currency, exposure, and hedging activity. 183 firms voluntary report that they are not facing any (or no significant) FX exposure; a plausible number of firms since the CAC-All-Tradable index consists of a significant amount of small and medium sized enterprises (SME) that might not be exposed to FX risks. 70 firms do not follow the recommendations of the AMF and do not voluntary disclose information on FX exposure. Thus, we are not able to collect the relevant data, and our results are subject to a potential selection bias due to the voluntary disclosure of these items. However, as the direct cost of compliance with the guidelines of the registration document of the French financial markets' supervisor seem to be high[14], we believe that some firms are not willing to bear this high cost of reporting even if they manage exposures similarly. In line with Adam, Fernando, and Golubeva (2015) we

[14] In accordance with French regulations, the registration document is an additional document to be filed with the AMF. Exemplary, one group illustrates as difference between its annual report and registration document that the registration document provides further details on the activity, financial situation and prospects of the company (see section 2.2.1).

include only active hedgers in the analysis to avoid a bias towards firms that simply 'do nothing' about their FX risks, i.e., we exclude firms that are exposed to FX risk but do not use FX derivatives. Our final sample consists of 1,814 firm-year observations across 62 firms from 53 industries (according to the four digit SIC code) that voluntarily disclose information on FX risks. Each year a firm has an average FX exposure in approximately 4.9 currencies, where we in total observe 48 different foreign currencies in the sample.

In terms of financial instruments, firms mainly report the utilization of forward or future contracts; options and swaps are mentioned less frequently. In line with Allayannis and Ofek (2001) and Beber and Fabbri (2012), we exclude foreign currency swap positions whenever their utilization is explicitly mentioned in the context of a particular FX exposure in the registration document. We include firms if they, amongst forward, future, or option contracts, also mention the utilization of swaps but the hedged amount and information stated in the registration document does not allow for a separation of swap positions. Overall, the inclusion of firms that utilize swaps in hedging FX exposure should not lead to a large bias, since FX forward contracts are by far the most important hedging instrument (Bodnar et al., 1998; Giambona, Graham, Harvey, & Bodnar, 2018), which also holds for French firms, as the survey of Albouy and Dupuy (2017) confirms. We ignore all transaction costs related to hedging activities and assume that FX markets are efficient in the weak sense of informational efficiency (Fama, 1970).

2.3.2 Description of the Reported Data on FX Exposure and its Management

To answer the question how firms manage their FX exposure, we first evaluate the composition of exposures and then analyze the associated hedging activities. Table 3 Panel A presents descriptive statistics of the FX exposure before and after hedging, the utilized hedging instruments, and the resulting hedge ratio, where the number of observations captures the frequencies of occurrences in the registration document.

Table 3: Descriptive Statistics of FX Exposure, Hedging Instruments, and Hedge Ratio

This table presents descriptive statistics of the FX exposure before and after hedging and the corresponding hedging instruments in Panel A and the resulting hedge ratios (HR), defined as the percentage of FX exposure before hedging covered by hedging instruments, in Panel B. The entries in Panel A correspond to the information requested in the registration document as illustrated in Table 1. In addition, we separate hedging instruments into long and short positions if identifiable in the registration document. Descriptive statistics on HR in Panel B are presented separately based on risk-decreasing, risk-increasing, and risk-constant strategies.

Panel A: Descriptive Statistics of FX Exposure and Hedging Instruments

	No. Obs.	Mean	SD	Min	Max
Assets	1,316	260.220	852.425	-282.200	15,554
Liabilities	1,225	238.961	675.692	-7.000	10,157
Forecasted Exposure	441	30.003	111.585	-570.300	629
Exposure Before Hedging	1,814	44.353	402.824	-3,992	5,937
Hedging Instruments Long	265	174.025	432.049	-13.586	2873
Hedging Instruments Short	575	-118.331	492.460	-29.092	4908
Hedging Instruments Net	1,328	-39.873	322.901	-3,186	2,873
Exposure After Hedging	1,814	15.162	241.030	-2,015	2,606

Panel B: Descriptive Statistics of Hedge Ratio

Strategy	Hedge Ratio	No. Obs.	Cum. Obs.	Mean	SD	Min	P25	P50	P75	Max
Risk-decreasing	$-2 < HR < -1$	260	260	-1.188	0.250	-1.956	-1.270	-1.075	-1.016	-1.000
	$HR = -1$	82	342	-1.000	0.000	-1.000	-1.000	-1.000	-1.000	-1.000
	$-1 < HR < 0$	759	1101	-0.626	0.314	-1.000	-0.919	-0.714	-0.365	-0.001
Risk-increasing [a]	$HR < -2$	65	1166	-16.320	65.960	-521.000	-5.551	-3.680	-2.924	-2.007
	$0 < HR$	159	1325	1.796	4.856	0.000	0.083	0.358	1.200	42.000
Risk-constant	$HR = -2$	3	1328	-2.000	0.000	-2.000	-2.000	-2.000	-2.000	-2.000
	$HR = 0$	486	1814	0.000	0.000	0.000	0.000	0.000	0.000	0.000

[a] The descriptive statistics, particularly the standard deviation of risk-increasing strategies, are driven by few very extreme outliers that are predominantly excluded in the reduced sample of 880 observations utilized in the regression analysis, as these outliers are denoted in Euro or unspecified 'Other Currencies', thus, benchmark gains or losses cannot be determined (see section 2.4.2).

Overall, 62 firms provide the voluntary FX-data according to the recommended format of the registration document, as detailed in Table 1. Our dataset contains 1,814 firm-year observations, i.e., 1,814 observations for the exposure before hedging. Firms mainly report the information in the registration document in Euros, if not we converted the values to Euros using the relevant spot rates stated in the registration document. The exposure before hedging consists of assets minus liabilities plus the amount of forecasted positions. FX-assets (column [a]) and FX-liabilities (column [b]) are specified in about 73 percent and 68 percent of the observations and average at 260.22 and 238.96 million Euros, respectively. Further, with an average of the forecasted positions of 30.00 million Euros, firms also report forecasted exposure (column [c]) as separate item in about 24 percent of the observations, of which 66 [34] percent are positive [negative], i.e., forecasted FX-sales [FX-purchases]. Instead of indicating forecasted exposure separately, firms often specify assets together with projected assets or firms only state the values for net exposure before hedging, which are then often elaborated on in the accompanying notes

to include forecast net exposure as well. Hence, we cannot retrieve the forecasted exposure separately at all times. As Table 3 Panel A further illustrates, the average exposure before hedging equals 44.35 million Euros, with a minimum of -3,992 and a maximum of 5,937 million Euros.[15] Overall, the exposure before hedging is positive (long) in 70 percent of the observations, i.e., FX exposure is mainly driven by FX-receivables and forecasted FX-sales. On firm level, we also find that 45 of our 62 sample firms (73 percent) have a positive average exposure before hedging, which confirms that the exposure is predominantly long. A breakdown of the exposure before hedging by year reveals that it grows constantly from 33.80 million Euros in 2010 to 55.09 million Euros in 2014 and then slightly decreases to 52.75 million Euros in 2015. Further, our dataset allows for a currency-specific analysis of FX positions, where we observe for the exposure before hedging 36 positive and 12 negative balances for the 48 currencies in our sample. The top-5 currencies of the exposure before hedging of on average 44.35 million Euros are in decreasing order the SEK, CNY, USD, ARS and GBP with the biggest positive (long) balances, and the EUR[16], PGK, CZK, UAH, and AED with the biggest negative (short) balances.[17]

How do our sample firms manage this – on average – long FX-exposure? Conventional theory on risk management would imply the usage of short derivative instruments, i.e., hedging in the opposite direction to the long exposure. The average amount of net hedging instruments does indeed account for -39.87 million Euros, ranging from -3,186 to 2,873 million Euros, where in 68 percent of the observations the net value of hedging instruments is negative, i.e., short positions dominate. On firm level, 45 of our 62 sample firms (73 percent) have a negative average amount of hedging instruments, thus, also on firm level short hedges dominate. In addition to supplying the net amount of hedging instruments, some firms also separate their hedging activities into long and short positions. In around 15 percent [32 percent] of the observations, firms report long [short] FX hedging positions separately, with an average value of 174.03 [-118.33] million Euros. These values do not add up to the average amount of net hedging instruments of -39.87 million Euros, since most firms only state the net amount of utilized hedging instruments, but the number of observations illustrates once more that our sample of French firms take more short than long hedging positions. During the sample period,

15 Determining the average exposure before hedging based on the averages (260.22 – 238.96 + 30.00) does not lead to 44.35 million Euros, provided some firms only specify the exposure before hedging directly without stating assets, liabilities, or forecasted positions separately.

16 In general, the functional currency of our sample firms is the EUR, however, a few firms also report the EUR exposure of subsidiaries with a different functional currency (72 observations).

17 Appendix 4 explains all currency codes.

the average net position of hedging instruments, in analogy to the exposure before hedging, decreases constantly from -24.63 million Euros in 2010 to -36.52 million Euros in 2014 and then slightly increases to -34.88 million Euros in 2015. Here, the top-5 hedging instruments in decreasing order are mainly driven by the negative balances of the USD, CNY, ARS, JPY, and SEK, and for positive balances of the EUR, CZK, DKK, AED and BHD. In total, for the 48 currencies in our sample, we observe balances of hedging instruments that are positive in 9 instances, negative in 31 instances, and zero in 8 instances, where the latter illustrates that the exposure in some currencies is not hedged.

The average exposure after hedging of 15.16 million Euros, with a minimum of -2,015 and a maximum of 2,606 million Euros, illustrates that the long exposure before hedging has been significantly reduced with hedging instruments.[18] While the exposure after hedging is positive [negative] in 59 [36] percent of the 1,814 observations, in 5 percent we observe an exposure after hedging equal to zero, i.e., firms fully hedged their initial FX exposure. On firm level, we also find that 37 of our 62 (60 percent) sample firms have a positive average exposure after hedging. Overall, the exposure after hedging increases constantly from 9.25 million Euros in 2010 to a peak value in 2013 of 21.38 million Euros and decreases subsequently to 17.87 million Euros in 2015. A breakdown according to currencies shows that we have 18 negative, 1 zero, and 29 positive balances of exposure after hedging. The top-10 currencies that drive the exposure after hedging differ from the currencies that are identified in the context of exposure before hedging, where now top-5 currencies in the context of exposure after hedging are the SEK, DKK, COP, GBP, and CNY with the greatest positive balance and the PGK, UAH, CZK, CHF and CLP with the greatest negative balance. Thus, firms seem to hedge the exposure in particular currencies to eliminate FX risk while the exposure in other currencies seems to be acceptable, i.e., is not hedged.

2.3.3 Hedge Ratio Analysis

To further analyze how firms manage their FX exposure, we summarize descriptive statistics of the hedge ratios in Panel B of Table 3. According to the six fundamental and empirically observed positions, the hedge ratio captures (a) risk-decreasing strategies that lower the FX exposure with $-2 < HR < 0$; (b) risk-increasing strategies that increase the FX exposure with

[18] Due to the fact that not all positions of the exposure before hedging (1,814) are covered with hedging instruments (1,328), the average exposure after hedging of 15.16 million Euros is not simply the sum of the exposure before hedging (44.35 million Euros containing 1,814 non-zero positions) and hedging instruments net (-39.87 million Euros containing 1,328 non-zero derivative positions).

$HR < -2$ or $HR > 0$; and (c) risk-constant strategies that keep the FX exposure on a constant level with $HR = -2$ or $HR = 0$. Further, a position with $HR = -1$ is not necessarily identical to a full hedge position as known from the literature, e.g., Hull (2015), given that we do not exactly know time-to-maturity of the derivatives. When evaluating the data in Panel B of Table 3 we find that in approximately 61 percent (1,101 observations) of all aggregate currency positions (1,814 observations) firms pursue a risk-decreasing strategy, of which less than 5 percent (82 observations) represent a full hedge. These 5 percent of observations correspond to the cases where the exposure after hedging equals zero as described in section 2.3.2. Further, a risk-increasing strategy accounts for approximately 12 percent (224 observations) of the sample and a risk-constant strategy accounts for approximately 27 percent (489 observations) of the sample.

Overall, these findings are in line with the survey outcome of Gumb, Dupuy, Baker, and Blum (2018), who indicate that some treasury officials are willing to increase volatility, while other refuse to do so. Further, our findings relate to Zhang (2009), who distinguishes between effective hedgers and ineffective hedgers/speculators according to the development of their risk exposures compared to an expected level in the area of interest rate, foreign exchange rate, and commodity risk management. Out of 225 sample firms, Zhang (2009) classifies 125 firms (55 percent) as effective hedgers and 87 firms (39 percent) as ineffective hedgers/speculators. The remaining 13 firms (6 percent) are categorized as neutral due to ambiguity, which leads to an overall 55 percent to 39 percent proportion of risk-decreasing vs. risk-increasing/neutral. Evaluating our sample with exclusively FX risk based on hedge ratios, we find that about 61 percent of all currency positions can be classified as risk-decreasing and around 39 percent as risk-increasing/-constant. To account for the possibility that various risk-increasing positions in different currencies could aggregate to an overall hedged position we combine all risk-increasing positions per firm and year. We find no evidence of the existence of an overall hedged position. Further, solely evaluating the number of occurrences of risk-increasing or decreasing positions does not provide a detailed picture of the FX exposure of a firm given that a position with an exposure of 0.1 million Euros should not be treated as equally important as a position with an exposure of 100 million Euros. Thus, we evaluate the exposure before hedging per position to overall firm exposure and find that approximately 20 percent of firm exposure relate to risk-increasing/-constant and 80 percent relate to risk-decreasing strategies.

The fact that we find an increase in risk in 224 observations (12 percent) and that in 260 observations (14 percent) firms take positions where the hedged FX amount is above the FX exposure but with an overall decrease in risk, i.e., where the hedge ratio is within the range of $-2 < HR < -1$, deserves further scrutiny. First, we evaluate whether the data extracted from the

registration documents contain the relevant information, given that anecdotal evidence from indicative interviews with treasury executives suggests that hedge ratios that indicate an increase in risk could stem from missing forecasted transactions.[19] In this context, the AMF requests firms to include forecasted exposure in the registration document, as illustrated in Table 1. While some firms specify assets together with projected assets or state the net before hedging, which is then often elaborated on in the accompanying notes to include forecast net exposure as well, others even state the forecasted exposure separately. Since the exposure before hedging also contains information on outstanding FX debt and the data on the exposure of foreign subsidiaries, the bias generated from an incomplete exposure before hedging should be limited. Second, the recent study of Gumb et al. (2018) provides interesting insights on the topic of risk-increasing positions. In their survey, that covers the same time period and about 30 percent of the sample firms overlap with our sample, they interviewed 48 corporate treasurers and find that the behavior of treasurers is not uniform: while some managers refuse to increase volatility, others accept to do so. This evidence might explain the surprisingly high number of risk-increasing observations.

Across all observations, we find an average hedge ratio of about -0.90, that indicates that on average 90 percent of the FX exposure is hedged using a risk-decreasing strategy.[20] The median hedge ratio of -0.49 indicates that in the median about 50 percent of the exposure are hedged. Further, we examine hedge ratios by firms where the average [median] hedge ratio of our 62 sample firms is -0.77 [-0.42], i.e., on average [median] firms follow a risk-decreasing strategy in their positions and on average [median] firms do not hedge the entire exposure, but about 77 [42] percent of it.[21] When evaluating the descriptive statistics, we find that few very extreme outliers across our 1,814 hedge ratio observations affect particularly the standard deviation of the hedge ratio, i.e., lead to an overall standard deviation of 12.85, while for the subsample of risk-decreasing positions the standard deviation ranges from 0.25 to 0.31. In general, the standard deviation for risk-increasing positions is by definition higher than for risk-decreasing positions, given that the range for risk-increasing positons potentially covers +/- infinity whereas the range for risk-decreasing positions is limited to a range of $-2 < HR < 0$. However, when evaluating the

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19 We interviewed four treasury executives of major German corporations, including two DAX-30 firms, to include professional opinions to validate our results. The main concern stated by the executives related to whether forecasted transactions were included in the reported information.

20 This average hedge ratio of about 90 percent also corresponds to the observed average amount of exposure before hedging of 44.35 and average net hedging instruments of -39.87.

21 The differing number of observations per company explains why the overall average hedge ratio (-0.90) is not equal to average hedge ratio per company (-0.77).

25th and 75th percentile it is visible that the majority of hedge ratios are within plausible ranges. Further, it should be noted that the few very extreme outliers are predominantly denoted in Euro or unspecified 'Other Currencies'. Thus, they are excluded in the reduced sample of 880 observations for the regression analysis as benchmark gains or losses cannot be determined (see section 2.4.2 for details and Table 4 for descriptive statistics related to the dependent variable in the regressions).

Further, we evaluate whether firms hedge differently in specific years or in specific currencies. When breaking down the hedge ratio on a year-by-year basis, we find that, with the exception of the average hedge ratio in 2014, the average and median hedge ratios imply risk-decreasing strategies each year. Similarly, in terms of currencies, we note that the average and median hedge ratios per currency during the entire sample period display risk-decreasing strategies, with minor exceptions for a few currency averages. On firm level, we observe that overall 47 of our 62 sample firms (76 percent) are responsible for the risk-increasing positions. Further, we find that 11 of our 62 (18 percent) sample firms have an average hedge ratio that indicates a risk-increasing strategy, i.e., these firms – on average – increase their exposure using derivative instruments. These 11 firms account for almost 16 percent of our total observations, but for 41 percent of the total risk-increasing positions. In terms of industry classification, we find that the 11 firms belong mainly to business service (4 firms, two digit SIC Code 73) and manufacturing (4 firms, two digit SIC Code 23 and 36-38).

In summary, we identify that the predominantly long FX exposure is hedged – on average [median] – to 90 [49] percent using predominately short derivative instruments. Further, we find that the majority of the taken positions decrease FX exposure with derivative instruments, but a non-negligible part of positions lead to an increase in FX exposure, with a very few extreme positions. We do not observe that firms hedge their FX exposure differently in specific years or in specific currencies.

2.4 Influence of Prior Outcomes on Hedging Decisions

2.4.1 Hypothesis

Thus far, the paper has evaluated the FX exposure of our sample firms and how firms employ hedging instruments to manage the FX exposure. In addition, we provided evidence that firms pursue both risk-decreasing and risk-increasing strategies with derivative instruments. When evaluating extant literature, it has been documented that individual market views are incorporated into corporate risk management activities in the context of selective hedging (Adam

et al., 2015; Beber & Fabbri, 2012; Bodnar et al., 1998; Brown et al., 2006; Faulkender, 2005; Glaum, 2002; Tufano, 1996), where Adam and Fernando (2006) and Brown et al. (2006) compare cash flows from derivative transactions with benchmark cash flows to investigate whether firms gain or lose money from selective hedging. Moreover, the literature also documents the relevance of these prior outcomes on risk attitudes and decision-making. While Thaler and Johnson (1990) as well as Weber and Zuchel (2005) provide evidence from experimental settings, Adam et al. (2015) and Beber and Fabbri (2012) substantiate this evidence with empirical analyses on the impact of prior outcomes in an FX and commodity context. Beber and Fabbri (2012) focus on the influence of prior outcomes on corporate FX risk management practices and find that managers adjust FX derivative holdings in response to prior foreign exchange returns. Adam et al. (2015) evaluate the impact of prior selective hedging gains and losses in the context of commodity (gold) risk management and document that managers alter their FX hedging behavior in response to prior outcomes.

Overall, the above findings suggest that management considers prior hedging outcomes when managing its current exposure. Thus, using our unique FX-dataset, we re-evaluate the hypothesis that prior outcomes influence present FX hedge decisions. Since the data granularity allows for the calculation of firm-, currency-, and year-specific hedge ratios and, hence, the differentiation of risk-decreasing and risk-increasing strategies, we also evaluate the impact of prior outcomes on present FX hedge decisions for risk-decreasing and risk-increasing strategies separately and, thus, complement the work of Adam et al. (2015) and Beber and Fabbri (2012).

2.4.2 Definition of Benchmark Gains and Losses and Methodology

To test whether FX hedging decisions are affected by prior outcomes, we develop a measure to quantify the past performance of hedging activities. In analogy to Brown et al. (2006), we measure past performance relative to a benchmark scenario based on the average hedge ratio, which is interpreted as proxy for a firm's hedging policy. In our case, this benchmark value is calculated using a firm- and currency-specific average hedge ratio for the sample period.[22] Similar to Adam et al. (2015) and Brown et al. (2006), we attribute deviations from the firm's hedging policy to the incorporation of market views, i.e., selective hedging, and determine based on this deviation the benchmark gains and losses. To determine benchmark gains and losses, we rely on

[22] In unreported robustness checks, we replace the benchmark scenario using the firm- and currency-specific average hedge ratio with the respective median hedge ratio. As further alternative, we use the firm-specific average hedge ratio across all currencies. Our results are robust to the different specifications of benchmark scenarios.

the mechanism of currency forwards given that the recent study of Albouy and Dupuy (2017) indicates that for French non-financial firms FX forwards are by far the most utilized hedging instruments. Further, we are not able to determine maturities of the FX derivative contracts and assume an average of one-year maturities, given that most firms report times to maturity that approximately correspond to this time frame in the registration document.[23]

The following numerical illustration describes the calculation of these benchmark gains or losses. Assume, a firm reports its USD exposure before hedging with 100 USD in t and hedges 80 USD short. The corresponding hedge ratio for this USD exposure in t equals $HR_t = H_t \,/\, \mathrm{E}_t^b = 80/100 = 0.8$. Further, assume that the firm's average hedge ratio ($\overline{HR}$) for the USD for the entire sample period is 50 percent ($HR_t = 0.5$), where we attribute the deviation of 30 percentage points (80 percent minus 50 percent) to selective hedging. This difference between the average hedged amount and the actual hedged amount, here 30 USD (100 USD · 0.30), is used to determine benchmark gains or losses. The amount of 30 USD could be converted to EUR by either hedging the entire 30 USD, i.e., an application of the actual hedge ratio of the transaction ($HR_t = 0.8$), or leaving the amount unhedged, i.e., implicitly assuming the application of the average hedge ratio of the firm ($HR_t = 0.5$) and leaving 30 USD unhedged. Thus, if the forward rate of USD to EUR in t is 1.5 and the spot rate in $t+1$ is 1.2, the cash flow resulting from hedging 30 USD equals 20 EUR (30/1.5 = 20), and the cash flow from not hedging the 30 USD results in 25 EUR (30/1.2 = 25). Thus, the decision to deviate from the hedging policy and hedge not only 50 but 80 USD yields a benchmark loss of -5 EUR (20 EUR minus 25 EUR). Generally speaking, benchmark gains and losses depend on the deviation in hedge ratios (actual hedge ratio vs. benchmark hedge ratio) and the currency development. To determine benchmark gains and losses, we match our sample with FX spot and 1-year forward rates corresponding to the particular reporting dates in the appropriate currency, obtained from Bloomberg. Further, we match firm characteristics as controls, obtained from the Compustat Global Vantage database.

To evaluate the impact of prior outcomes, i.e., benchmark gains and losses, on FX hedge decisions we rescale the hedge ratio (HR) according to

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[23] For instance, some firms state that their instruments mature within a year, others state that they hedge over a period not exceeding one year unless a longer period is justified by probable commitments. Other firms also indicate in the registration document that their forward transactions do not exceed maturities of 2 years, or that they are hedging at year-end for the following year. Taken together, we deem the compromise of assuming one-year maturities as appropriate. Appendix 3 provides examples on the maturity of FX derivatives from registration documents.

$$HR_t^* = \left|1 + HR_t\right| \quad . \tag{1}$$

Rescaling converts the discontinuous scale, in terms of risk-increasing and risk-decreasing, to a continuous and interpretable scale with a minimum of zero and a maximum of infinity. Now, an increase [decrease] in HR_t^* implies an unambiguous increase [decrease] in FX risk exposure, unlike for the raw hedge ratio detailed in Table 2. Further, the range between 0 and 1 of HR_t^* is associated with risk-decreasing and the range between 1 and ∞ represents risk-increasing positions. Exemplary, a FX position resulting in $HR_t^* = 0$ relates to a full hedge (according to our definition of full hedge), $HR_t^* = 1$ is equal to a zero hedge, i.e., FX exposure remains constant, and $HR_t^* = 1.5$ denotes a 50 percent increase in the FX exposure.

To evaluate the impact of prior benchmark gains and losses on FX hedging decisions we evaluate the change in HR_t^* according to

$$\Delta HR_t^* = HR_t^* - HR_{t-1}^* \quad . \tag{2}$$

We estimate OLS regression with and without fixed effects on firm and firm-currency level. The regression model is specified according to

$$\Delta HR_t^* = \alpha + \beta_1 \cdot I_1 \cdot BGL_{t-1} + \beta_2 \cdot I_2 \cdot BGL_{t-1} + \beta_3 \cdot FXEvo_t + Controls_t + \varepsilon_t \quad , \tag{3}$$

where t identifies time and we omit firm- and currency-specific identifiers to increase readability. Following Adam et al. (2015), we include dummy variables (I_1 and I_2) to separately evaluate the impact of prior benchmark gains and losses (BGL_{t-1}) in t, where I_1 [I_2] is equal to one if the benchmark gain/loss in the prior period was positive [negative] and zero otherwise. Benchmark gains and losses are scaled with the absolute value of the exposure before hedging to control for size effects and converted to positive values to allow for easy interpretation of the estimated regression coefficients. We include a lagged dummy variable ($FXEvo_t$) that takes the value of 0 [1] if the FX rate developed in favor of [against] the FX position of the firm, where we define a positive [negative] exposure in a currency that depreciates [appreciates] as being against [in] a firm's favor.[24] Further, we include in $Controls_t$ several variables to control for alternative

[24] For example, the spot exchange rate between the USD and the EUR in t is 1.2 and in $t+1$ 1.3. Then, an exposure of 100 USD can be translated into EUR in t with 100/1.2 = 83.33 and in $t+1$ with 100/1.3 = 76.92. Since the value of the FX position in EUR decreased, the FX rate developed against the firm.

explanations. We control for financial distress using the *Debt Ratio*, given that that firms in financial distress are more prone to speculate on financial markets (Campbell & Kracaw, 1999; Stulz, 1996). We define the *Debt Ratio* as total liabilities over total assets, similar to Beber and Fabbri (2012). In addition, firms with less growth opportunities might be inclined to speculate since they are supposed to suffer less from speculative losses, whereas firms with multiple investment opportunities might be better off with hedging to prevent becoming financially constrained and, as a consequence, suffer from underinvestment (Campbell & Kracaw, 1999; Froot, Scharfstein, & Stein, 1993). In line with the arguments of Géczy, Minton, and Schrand (2007) [25] we do not use the book-to-market ratio as measure for growth opportunities but follow Beber and Fabbri (2012) and use the ratio of capital expenditures over total revenues (*Growth*). Finally, financial strength might endow firms with excess cash that could be used for speculative purposes if appropriate control mechanisms are missing (Jensen, 1986). Also, possessing a cash cushion generates higher tolerance for volatility in results (Stulz, 1996). Thus, we control for firm liquidity using the *Quick Ratio*, defined as cash, short-term investments, and total receivables over total current liabilities, similar to other studies (Beber & Fabbri, 2012; Géczy et al., 2007). All variables are defined in Appendix 4. We winsorize *Debt Ratio*, *Quick Ratio*, and *Growth* to the 1st and 99th percentile to eliminate the effect of outliers. All other variables are not winsorized given that that this data is hand-collected and all data points are meaningful. Finally, we drop risk-constant positions to avoid a 'do-nothing' bias and drop all observations where control variables are missing, as well as, all currency positions originally denoted in Euro and unspecified 'Other Currencies', where benchmark gains or losses cannot be determined[26], which leaves a sample of 880 observations across 57 firms and 35 currencies.

2.4.3 Empirical Results

2.4.3.1 Main Regression Findings

Table 4 illustrates descriptive statistics of the variables used in the regression for the reduced sample and the subsamples of risk-increasing (RI-subsample) and risk-decreasing (RD-subsample) positions, where the difference between the means in HR_t^* of the two subsamples is

25 Géczy et al. (2007) state that off-balance sheet correlations with speculation could lead to potential misinterpretations.

26 In general, the functional currency of our sample firms is the Euro, however a few firms also report the Euro exposure of subsidiaries with a different functional currency (72 observations). Similarly, some firms do not specify the currency of their exposure explicitly but label it 'Other Currencies' (82 observations).

highly significant with RD - RI = -5.09 (t-statistic = -10.08). The standard deviation, minimum, and maximum values of HR_t^*, especially for the RI-subsample, indicate that some decision-makers attempt to take advantage of individual market views and that few extreme views exist. Further, we find that average benchmark gains and losses differ between the subsamples. Risk-increasing strategies on average yield a benchmark gain [loss] of 0.10 [0.16], compared to a benchmark gain [loss] of 0.02 [0.02] for risk-decreasing. The maximum benchmark gain [loss] in risk-increasing positions amounts to 1.93 [5.51] and is substantially higher than the maximum benchmark gain [loss] of risk-decreasing positions with 0.83 [1.12]. Further, the standard deviation of both benchmark gains and losses is substantially higher for the risk-increasing than for the risk-decreasing sample.

Table 4: Descriptive Statistics of Regression Variables

This table reports summary statistics for the regression model across our reduced sample with a total of 880 observations for the dependent and independent variables separately for the overall sample (ALL), risk-increasing (RI), and risk-decreasing (RD). *HR* is defined as $HR_t = H_t / E_t^b$, where H_t denotes hedging instruments and E_t^b denotes the exposure before hedging in t.The dependent variable HR^* is the result of the standardization $HR_t^* = |1 + HR_t|$, where now HR_t^* can only take positive values from 0 to ∞ and the range between 0 and 1 is associated with risk-decreasing and range 1 to ∞ represents risk-increasing strategies. Benchmark gains and losses are defined in section 2.4.2. *Debt Ratio* is defined as total liabilities over total assets, *Quick Ratio* is cash, short-term investments, and total receivables over total current liabilities, and *Growth* is capital expenditures over total revenues. *FXEvo* is a dummy variable that takes the value of 0 [1] if the FX rate developed in favor of [against] the FX position of the firm, where a positive [negative] exposure in a currency that depreciates [appreciates] is against [in] a firm's favor. ***, **, and * represent statistical significance at the 1, 5, and 10 percent level, respectively, with t-statistics in parentheses. All variables are defined in Appendix 4.

		No.Obs	Mean	SD	Min	p25	p50	p75	Max
ALL	HR^*	880	0.979	5.424	0.000	0.042	0.247	0.701	128.375
	Benchmark Gains	441	0.030	0.122	0.000	0.001	0.004	0.014	1.926
	Benchmark Losses	439	0.042	0.278	0.000	0.000	0.005	0.023	5.513
	Debt Ratio	880	0.142	0.104	0.000	0.070	0.133	0.214	0.448
	Quick Ratio	880	1.031	0.446	0.349	0.750	0.946	1.216	2.965
	Growth	880	0.045	0.026	0.006	0.026	0.041	0.058	0.124
	FXEvo	880	0.470	0.499	0.000	0.000	0.000	1.000	1.000
RI	HR^*	120	5.374	13.936	1.001	1.169	1.739	3.020	128.375
	Benchmark Gains	60	0.103	0.293	0.000	0.001	0.008	0.053	1.926
	Benchmark Losses	60	0.159	0.723	0.000	0.001	0.014	0.060	5.513
	Debt Ratio	120	0.137	0.087	0.000	0.082	0.120	0.214	0.379
	Quick Ratio	120	0.923	0.320	0.349	0.773	0.879	1.008	1.905
	Growth	120	0.041	0.028	0.006	0.019	0.035	0.058	0.124
	FXEvo	120	0.492	0.502	0.000	0.000	0.000	1.000	1.000
RD	HR^*	760	0.285	0.301	0.000	0.026	0.165	0.500	0.999
	Benchmark Gains	381	0.018	0.055	0.000	0.001	0.003	0.013	0.828
	Benchmark Losses	379	0.023	0.073	0.000	0.000	0.004	0.018	1.119
	Debt Ratio	760	0.143	0.106	0.000	0.058	0.135	0.214	0.448
	Quick Ratio	760	1.048	0.461	0.349	0.746	0.953	1.278	2.965
	Growth	760	0.045	0.026	0.006	0.026	0.041	0.058	0.124
	FXEvo	760	0.467	0.499	0.000	0.000	0.000	1.000	1.000
	Difference HR^* (t-Statistic): RD – RI : -5.089*** (-10.084)								

Following our hypothesis, we test whether management refers to prior hedging outcomes when managing its current exposure, i.e., we examine the relationship between prior hedging outcomes and subsequent hedge ratio variation. Our main findings are detailed in Table 5, where we evaluate our hypothesis based on OLS regression models (models (1) to (3)) with and without firm fixed effects (models (4) to (6)) and firm-currency fixed effects (models (7) to (9)) with cluster-robust standard errors. We focus on the impact of prior benchmark gains and losses on ΔHR_t^*. Model (1), (4), and (7) report the results for the overall sample (ALL-sample), consisting of 880 firm-year-currency observations without a distinction between risk-decreasing and risk-

increasing strategies. For the ALL-sample, we find that ΔHR_t^* decreases, i.e., HR^* decreases, following prior benchmark losses. Thus, after benchmark losses management hedges more of its exposure. Further, when focusing on the RI-subsample, i.e., model (2), (5), and (8), we observe very similar results, where prior benchmark losses decrease ΔHR_t^* and the magnitudes of the estimates for the RI-subsample are similar to the estimates of the ALL-sample. However, when evaluating the RD-subsample, i.e., model (3), (6), and (9), we find that prior benchmark losses have no significant influence on ΔHR_t^*. With regard to prior benchmark gains, we observe weak significant reactions for models (7) to (9) on a 10 percent significance level, where we control for firm-currency fixed effects. Overall, we only find a reaction following prior benchmark losses for the ALL- and RI-subsample.

Table 5: Effect of Prior Outcomes on the Hedge Ratio Variation

This table reports the estimation results of the OLS regression (models (1) to (3)) with and without firm fixed effects (models (4) to (6)) and firm-currency fixed effects (models (7) to (9)). The dependent variable is the difference in standardized hedge ratios ($\Delta HR_t^* = HR_t^* - HR_{t-1}^*$) with standardization $HR_t^* = |1 + HR_t|$. As a result of the standardization, HR_t^* can only take positive values from 0 to ∞, where the range between 0 and 1 is associated with risk-decreasing and range 1 to ∞ represents risk-increasing strategies. Independent variables include prior benchmark gains and losses defined in section 2.4.2. *Debt Ratio* is defined as total liabilities over total assets, *Quick Ratio* is cash, short-term investments, and total receivables over total current liabilities, and *Growth* is capital expenditures over total revenues. *FXEvo* is a dummy variable that takes the value of 0 [1] if the FX rate developed in favor of [against] the FX position of the firm, where a positive [negative] exposure in a currency that depreciates [appreciates] is against [in] a firm's favor. Model (1), (4), and (7) refer to the results for the entire sample (ALL), model (2), (5), and (8) and (3), (6), and (9) separately evaluate risk-increasing (RI) and risk-decreasing (RD) strategies. All models are estimated using cluster-robust standard errors, where we cluster on firm level. ***, **, and * represent statistical significance at the 1, 5, and 10 percent level, respectively, with t-statistics in parentheses. All variables are defined in Appendix 4.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ALL	RI	RD	ALL	RI	RD	ALL	RI	RD
VARIABLES	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*
Benchmark Gains	10.159	12.071	-7.507	9.035	12.150	-7.057	-14.436*	-11.474*	-17.588*
	(0.742)	(0.690)	(-1.490)	(0.681)	(0.648)	(-1.446)	(-1.790)	(-1.669)	(-1.786)
Benchmark Losses	-13.273***	-14.357***	-8.550	-13.876***	-15.712***	-7.916	-28.517***	-27.979***	-17.139*
	(-3.526)	(-4.409)	(-1.251)	(-3.773)	(-7.493)	(-1.077)	(-7.268)	(-7.920)	(-1.870)
Debt Ratio	0.525	2.166	0.211	0.741	20.924	2.291	4.286	31.044	3.165
	(0.404)	(0.158)	(0.272)	(0.180)	(1.016)	(0.831)	(1.474)	(1.287)	(1.545)
Quick Ratio	0.366	6.953	0.122	0.048	9.102	0.088	-0.167	9.687	0.175
	(1.292)	(1.665)	(1.227)	(0.063)	(1.257)	(1.054)	(-0.375)	(1.228)	(1.116)
Growth	-5.155	-29.599	-0.239	0.752	-9.646	8.261	0.650	-19.479	8.219
	(-1.056)	(-0.827)	(-0.095)	(0.064)	(-0.186)	(1.304)	(0.073)	(-0.358)	(1.053)
FXEvo	0.073	0.584	-0.004	-0.008	1.683	0.028	0.124	3.777	0.074
	(0.310)	(0.355)	(-0.071)	(-0.031)	(0.951)	(0.675)	(0.375)	(1.530)	(0.725)
No. Obs.	880	120	760	880	120	760	880	120	760
Adjusted R^2	0.197	0.218	0.107	0.207	0.278	0.093	0.513	0.594	0.143
Firm FE	NO	NO	NO	YES	YES	YES	NO	NO	NO
Firm-Currency FE	NO	NO	NO	NO	NO	NO	YES	YES	YES
Number of Groups				57	36	54	246	66	235

In line with the extant literature, our overall results indicate that management is impacted by prior outcomes when managing its FX exposure. In detail, we find that previous benchmark losses induce a subsequent exposure reduction. Further, the granularity of our dataset allows for a differentiation of risk-decreasing and risk-increasing strategies (RD- and RI-subsample). Evaluating these subsamples separately, we provide evidence that prior outcomes are only relevant for risk-increasing, but not for risk-decreasing strategies. While we find that the FX exposure is decreased following prior benchmark losses for risk-increasing strategies, prior benchmark gains and losses have no impact on the hedging decision when evaluating risk-decreasing strategies.

In addition to the evidence that previous benchmark losses induce a subsequent exposure reduction for the ALL- and RI-sample, we evaluate whether management adjusts the hedge ratio closer to the average hedge ratio ($\overline{HR}$) in response to benchmark gains and losses, i.e., reverts back to the hedging policy. We construct a dependent variable that captures the change of the deviation of the absolute difference of the actual hedge ratio to the average hedge ratio per firm and currency from $t-1$ to t according to

$$\Delta Benchmark_t = \left|HR_t - \overline{HR}\right| - \left|HR_{t-1} - \overline{HR}\right| \quad . \tag{4}$$

Thus, an increase in $\Delta Benchmark_t$ implies a larger deviation from the average hedge ratio in the current period than in the prior period, a decrease implies a smaller deviation from the average hedge ratio in the current period than in the prior period. The estimates are presented in Table 6, where we estimate OLS regression models with cluster-robust standard errors in analogy to the main analysis from Table 5. We find that prior benchmark gains and losses are significant for the ALL-sample and RI-subsample and that the estimated coefficients are negative. Our results indicate that after benchmark losses the difference to the average hedge ratio is smaller compared to the previous period. Thus, in response to benchmark losses, management adjusts the hedge ratio to a value closer to the average benchmark hedge ratio for the RI-subsample. When evaluating the risk-decreasing subsample, however, we find that prior benchmark losses have no impact on $\Delta Benchmark_t$ except for model (9), where we find a weak significant impact for prior gains and losses. Overall, we find evidence that in response to benchmark losses management adjusts the hedge ratio to a value closer to the average benchmark hedge ratio for the RI-subsample, this is not the case for the RD-subsample.

Table 6: Effect of Prior Outcomes on the Deviation from the Average Hedge Ratio

This table reports the estimation results of the OLS regression (models (1) to (3)) with and without firm fixed effects (models (4) to (6)) and firm-currency fixed effects (models (7) to (9)). The dependent variable $\Delta Benchmark_t$ captures the absolute deviation of the actual hedge ratio to the average hedge ratio per firm and currency in t minus the absolute deviation in $t-1$ and is defined in (4). Independent variables include prior benchmark gains and losses defined in section 2.4.2. *Debt Ratio* is defined as total liabilities over total assets, *Quick Ratio* is cash, short-term investments, and total receivables over total current liabilities, and *Growth* is capital expenditures over total revenues. *FXEvo* is a dummy variable that takes the value of 0 [1] if the FX rate developed in favor of [against] the FX position of the firm, where a positive [negative] exposure in a currency that depreciates [appreciates] is against [in] a firm's favor. Model (1), (4), and (7) refer to the results for the entire sample (ALL), model (2), (5), and (8) and (3), (6), and (9) separately evaluate risk-increasing (RI) and risk-decreasing (RD) strategies. All models are estimated using cluster-robust standard errors, where we cluster on firm level. ***, **, and * represent statistical significance at the 1, 5, and 10 percent level, respectively, with t-statistics in parentheses. All variables are defined in Appendix 4.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ALL	RI	RD	ALL	RI	RD	ALL	RI	RD
VARIABLES	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$	$\Delta Benchmark_t$
Benchmark Gains	-0.378	-0.756	-3.165	-0.906	-1.184	-2.961	-11.158*	-9.836	-18.488*
	(0.11)	(0.17)	(0.71)	(0.28)	(0.25)	(0.67)	(2.09)	(1.84)	(2.03)
Benchmark Losses	-13.940**	-14.847**	-7.315	-14.194**	-15.475**	-7.290	-20.259**	-19.660**	-19.309*
	(4.81)	(6.60)	(1.17)	(5.01)	(9.90)	(1.05)	(8.19)	(8.18)	(2.40)
Debt Ratio	-0.074	-1.571	0.236	1.573	13.071	2.170	3.597	21.715	2.742
	(0.08)	(0.18)	(0.34)	(0.52)	(1.01)	(0.90)	(1.49)	(1.25)	(1.50)
Quick Ratio	0.127	3.539	0.075	0.017	6.080	0.081	-0.215	5.515	0.202
	(0.66)	(1.28)	(0.88)	(0.03)	(1.18)	(0.98)	(0.61)	(0.99)	(1.40)
Growth	-1.410	1.120	-0.908	1.658	-7.842	8.961	2.206	-12.497	8.753
	(0.50)	(0.04)	(0.44)	(0.21)	(0.23)	(1.88)	(0.39)	(0.36)	(1.46)
FXEvo	-0.027	-0.230	-0.050	-0.081	0.600	-0.045	-0.001	2.620	-0.016
	(0.17)	(0.21)	(0.87)	(0.41)	(0.46)	(0.78)	(0.00)	(1.62)	(0.18)
No. Obs.	880	120	760	880	120	760	880	120	760
Adjusted R^2	0.363	0.427	0.088	0.367	0.478	0.087	0.480	0.586	0.227
Firm FE	NO	NO	NO	YES	YES	YES	NO	NO	NO
Firm-Currency FE	NO	NO	NO	NO	NO	NO	YES	YES	YES
Number of Groups				57	36	54	246	66	235

2.4.3.2 Robustness of Results

Our main finding that management is influenced by prior outcomes when managing its exposure, where these prior outcomes seem to be only relevant for risk-increasing strategies, hinges on two specifications: first on the specification of prior benchmark gains and losses and second on the separation of the sample into the RD-subsample and the RI-subsample. To illustrate the robustness of our main finding we alter the parameters for both specifications.

First, we modify the calculation of prior benchmark gains and losses by adjusting the calculation of the benchmark hedge ratio: it can be argued that the average hedge ratio includes information from $t+1$ at decision time t since the average hedge ratio is defined as the average across all sample periods independent of the period where benchmark gains and losses are calculated. Now benchmark gains and losses are calculated based on an average hedge ratio that is the average of all past hedge ratios, i.e., it is time-dependent and includes only hedge ratios from prior periods in the calculation of the average hedge ratio. The estimations in Table 7 illustrate that this modification of determining prior benchmark gains and losses does not affect our main findings. We still observe statistically significant reactions to prior benchmark losses for the ALL-sample and RI-subsample, whereas estimated coefficients of prior benchmark losses in the RD-subsample are statistically not significant. Thus, results in Table 7 support our main findings and we conclude that our results do not depend on the particular specification of gains and losses.

Table 7: Alternative Specification of Benchmark Gains and Losses

This table reports the estimation results for an alternative specification of prior benchmark gains and losses for OLS regression (models (1) to (3)) with and without firm fixed effects (models (4) to (6)) and firm-currency fixed effects (models (7) to (9)) based on an average hedge ratio that is the average of all past hedge ratios, i.e., the average hedge ratio used to determine benchmark gains and losses only includes past hedge ratios. The dependent variable is the difference in standardized hedge ratios ($\Delta HR_t^* = HR_t^* - HR_{t-1}^*$) with standardization $HR_t^* = |1 + HR_t|$. As a result of the standardization, HR_t^* can only take positive values from 0 to ∞, where the range between 0 and 1 is associated with risk management (0 refers to a full hedge where the entire exposure is hedged) and range 1 to ∞ represents speculation. Independent variables include prior benchmark gains and losses defined in section 2.4.2. *Debt Ratio* is defined as total liabilities over total assets, *Quick Ratio* is cash, short-term investments, and total receivables over total current l liabilities, and *Growth* is capital expenditures over total revenues. *FXEvo* is a dummy variable that takes the value of 0 [1] if the FX rate developed in favor of [against] the FX position of the firm, where a positive [negative] exposure in a currency that depreciates [appreciates] is against [in] a firm's favor. Model (1), (4), and (7) refer to the results for the entire sample (ALL), model (2), (5), and (8) and (3), (6), and (9) separately evaluate risk-increasing (RI) and risk-decreasing (RD) strategies. All models are estimated using cluster-robust standard errors, where we cluster on firm level. ***, **, and * represent statistical significance at the 1, 5, and 10 percent level, respectively, with t-statistics in parentheses. All variables are defined in Appendix 4.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	ALL	RI	RD	ALL	RI	RD	ALL	RI	RD
VARIABLES	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*
Benchmark Gains	-1.074	-0.484	-8.151	-1.127	-0.338	-8.304**	-5.578***	-9.254***	-2.776
	(-0.371)	(-0.110)	(-1.941)	(-0.349)	(-0.063)	(-2.020)	(-4.458)	(-3.355)	(-0.467)
Benchmark Losses	-12.259***	-12.623***	-12.752	-12.227***	-12.289***	-13.564	-15.909***	-15.444***	-13.217
	(-69.899)	(-84.532)	(-1.960)	(-77.478)	(-44.042)	(-1.609)	(-40.431)	(-47.133)	(-1.488)
Debt Ratio	0.476	1.056	0.920	4.084	31.327	3.562	6.114	47.219	2.545
	(0.338)	(0.090)	(1.033)	(0.770)	(1.383)	(1.005)	(1.428)	(1.526)	(0.932)
Quick Ratio	0.273	4.672	0.160	-0.099	8.734	0.316	-0.335	14.708	0.534
	(0.944)	(1.219)	(1.280)	(-0.126)	(0.771)	(1.566)	(-0.661)	(1.087)	(1.664)
Growth	-0.714	-10.931	0.909	-2.812	-81.689	15.532	-5.490	-167.084	18.441
	(-0.238)	(-0.379)	(0.313)	(-0.150)	(-0.562)	(1.334)	(-0.328)	(-1.118)	(1.272)
FXEvo	-0.037	-0.194	-0.011	0.013	2.077	0.043	0.087	6.565	0.076
	(-0.136)	(-0.116)	(-0.125)	(0.039)	(0.816)	(0.606)	(0.214)	(1.597)	(0.602)
No. Obs.	662	92	570	662	92	570	662	92	570
Adjusted R^2	0.479	0.543	0.145	0.476	0.609	0.135	0.491	0.692	0.109
Firm FE	NO	NO	NO	YES	YES	YES	NO	NO	NO
Firm-Currency FE	NO	NO	NO	NO	NO	NO	YES	YES	YES
Number of Groups				56	32	53	204	59	193

Further, the result that prior outcomes are only relevant for risk-increasing strategies may be dependent on the utilized classification strategy when separating the FX positions into risk-increasing or risk-decreasing. To test for robustness, we introduce three alternative approaches. First, we want to ensure that reclassification on a periodical basis does not induce a bias and, hence, eliminate positions that switch classification between two periods, i.e., we eliminate positions that are classified as risk-increasing in t and as risk-decreasing in $t+1$, or vice versa. Second, we introduce two different classification strategies to classify FX positions as RD- and RI-subsample. Here we first assume that extreme benchmark gains or losses (1st and 4th quartile of the distribution of benchmark gains or losses) are the result of risk-increasing strategies while moderate outcomes – within the 25th and 75th percentile of the distribution of benchmark gains or losses – are the result of risk-decreasing strategies. Thus, we calculate for all firms and currencies the benchmark gains or losses using the average hedge ratio per firm and currency. Then, currency positions are classified as RD [RI]-subsample if firm benchmark gains or losses are between [outside] the 25th and 75th percentile of the distribution. Third, we base the classification strategy on the firm-specific standard deviation of hedge ratios per year across all currencies. This classification strategy captures the magnitude of changes to the hedge ratio of each firm. All standard deviation values across all years and firms are then ordered and firms are classified in the RD [RI]-subsample if the standard deviation is in the lower [upper] half of the scale. Based on these three different classification schemes we estimate the OLS-models in analogy to the main findings, where Table 8 reports the results. Estimates from the ALL-sample are omitted given that they are reported in Table 5.

Overall, our results are robust to an adjustment of the classification strategy of our subsamples. Dropping aggregate currency positions that switch between the RD- and RI-subsample across time, does not alter our main findings (models (1) to (6) in Table 8). The results, in general, are very similar to those reported in Table 5, where for the RI-subsample (models (1), (3), and (5)) we find a statistically significant effect of prior benchmark losses while for the RD-subsample we do not observe this effect. The adjustment of the classification strategy to relate to benchmark gains or losses (models (7) to (12) in Table 8) and the adjustment of the classification strategy to relate to above-median [below-median] standard deviation of firm hedge ratios (models (13) to (18) in Table 8) both support our main findings, where we find that the reaction to prior benchmark losses is statistically significant for the RI but not for the RD-subsample. Overall, our estimations for modified classification strategies regarding the RD- and RI-subsample support our main findings and we infer that our findings are not the consequence of a specific sample classification strategy.

Table 8: Alternative Specifications of Subsample-Selection into Risk-Increasing and Risk-Decreasing

This table reports the estimation results of the OLS regression with and without firm fixed effects and firm-currency fixed effects for three alternative classification strategies of the risk-decreasing (RD)- and risk-increasing (RI)-subsamples. Models (1) to (6) refer to a specification where a FX position is only classified as RI [RD] if the classification in the prior period was also RI [RD]. Models (7) to (12) refer to a specification where the classification as RD- or RI-subsample is based on resulting prior gains or losses. Here we assume that extreme gains/losses are the result of RI-activities while moderate gains/losses – within the 25th and 75th percentile – are the result of RD activities. Models (13) to (18) refer to a specification where the classification as RD- or RI-subsample is based on the standard deviation of the average firm hedge ratios per year across firm currencies. All standard deviation values across all years and firms are ordered and firms are classified as RD [RI]-subsample if the standard deviation is in the lower [upper] half of the scale. The dependent variable is the difference in standardized hedge ratios ($\Delta HR_t^* = HR_t^* - HR_{t-1}^*$) with standardization $HR_t^* = |1 + HR_t|$. As a result of the standardization, HR_t^* can only take positive values from 0 to ∞, where the range between 0 and 1 is associated with risk-decreasing and range 1 to ∞ represents risk-increasing strategies. Independent variables include prior benchmark gains and losses, defined in section 2.4.2. *Debt Ratio* is defined as total liabilities over total assets, *Quick Ratio* is cash, short-term investments, and total receivables over total current liabilities, and *Growth* is capital expenditures over total revenues. *FXEvo* is a dummy variable that takes the value of 0 [1] if the FX rate developed in favor of [against] the FX position of the firm, where a positive [negative] exposure in a currency that depreciates [appreciates] is against [in] a firm's favor. All models are estimated using cluster-robust standard errors, where we cluster on firm level. ***, **, and * represent statistical significance at the 1, 5, and 10 percent level, respectively, with t-statistics in parentheses. All variables are defined in Appendix 4.

	Only AS [RM] if Prior Period was also AS [RM]						Classification Based on Gains/Losses						Classification Based on Standard Deviation (Firm-Level)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
	RI	RD	RI	RD	RI	RD	RI	RD	RI	RD	RI	RD	RI	RD	RI	RD	RI	RD
VARIABLES	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*	ΔHR_t^*
Benchmark Gains	-2.166	-1.025	-2.115	-1.207	-9.739***	-1.463	10.003	45.103	9.185	55.558	-14.108*	-70.840	9.898	-2.204	9.273	-4.560***	-14.488*	-6.087*
	(-0.462)	(-1.445)	(-0.406)	(-1.462)	(-3.336)	(-1.243)	(0.727)	(0.485)	(0.687)	(0.510)	(-1.716)	(-0.639)	(0.716)	(-0.766)	(0.678)	(-3.118)	(-1.734)	(-1.915)
Benchmark Losses	-16.249***	-0.130	-16.243***	0.296	-20.048***	0.339	-13.370***	-32.413	-14.143***	-19.912	-28.505***	-49.438	-13.524***	-5.160	-13.932***	-5.251	-28.615***	-6.439
	(-83.267)	(-0.163)	(-62.701)	(0.290)	(-42.415)	(0.198)	(-3.574)	(-0.946)	(-3.945)	(-1.016)	(-7.147)	(-1.340)	(-3.642)	(-1.428)	(-3.742)	(-1.624)	(-7.351)	(-1.312)
Debt Ratio	14.760	0.065	100.096	0.230	91.566	0.295	0.967	-0.096	4.050	-1.653	8.523	-1.208	-1.601	-0.020	-0.382	1.259	7.095	1.219
	(1.548)	(0.850)	(0.966)	(0.941)	(1.224)	(0.852)	(0.368)	(-0.310)	(0.576)	(-1.536)	(1.556)	(-1.224)	(-0.613)	(-0.085)	(-0.043)	(1.144)	(1.069)	(1.188)
Quick Ratio	0.405	0.015	-2.134	-0.026	11.189	-0.009	0.600	-0.040	0.122	0.035	-0.156	0.096	2.227**	0.010	0.063	0.016	-0.433	0.014
	(0.292)	(0.949)	(-0.184)	(-0.280)	(0.597)	(-0.114)	(1.258)	(-0.767)	(0.106)	(0.191)	(-0.211)	(0.505)	(2.369)	(0.173)	(0.030)	(0.170)	(-0.356)	(0.149)
Growth	-5.767	-0.090	-42.071	-3.002**	-143.744	-3.485	-8.009	-0.418	-4.019	0.529	5.158	1.919	-19.522**	-0.598	2.139	0.695	2.197	0.204
	(-0.257)	(-0.308)	(-0.547)	(-2.475)	(-1.242)	(-1.936)	(-0.978)	(-0.187)	(-0.120)	(0.364)	(0.166)	(1.213)	(-2.526)	(-0.600)	(0.055)	(0.359)	(0.072)	(0.086)
FXEvo	3.063	0.019	4.939	0.016	6.513	0.011	-0.104	0.240*	-0.419	0.224*	-0.175	0.213	-0.032	0.060	-0.083	0.063	0.177	0.057
	(1.533)	(1.019)	(1.553)	(0.834)	(1.286)	(0.501)	(-0.212)	(1.885)	(-0.698)	(1.701)	(-0.226)	(1.413)	(-0.069)	(1.181)	(-0.147)	(1.277)	(0.245)	(1.017)
No. Obs.	42	506	42	506	42	506	440	440	440	440	440	440	437 *	434 *	437 *	434 *	437 *	434 *
Adjusted R^2	0.852	-0.001	0.869	0.010	0.918	0.012	0.196	-0.000	0.211	0.003	0.518	0.006	0.199	0.050	0.202	0.067	0.512	0.066
Firm FE	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO
Firm-Currency FE	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO	YES	YES
Number of Groups			16	50	23	171			51	49	170	177			27	29	129	114

* For firms with only one aggregate currency position during our sample period, the standard deviation on firm level cannot be calculated.

2.5 Conclusion

Based on a unique hand-collected dataset with unprecedented data granularity, we evaluate how firms manage their FX exposures. Based on publicly reported FX exposures before and after hedging we determine firm-, year-, and currency-specific hedge ratios that allow for a separation of risk-decreasing from risk-increasing/-constant positions. Our findings indicate that about 20 [80] percent of FX firm exposures are managed using risk-increasing/-constant [risk-decreasing] strategies. In addition, we evaluate the impact of prior benchmark outcomes in the context of FX exposure management. We find that prior outcomes have an impact on present hedge decisions, where following prior benchmark losses, the exposure is reduced and the hedge ratio is adjusted closer to the benchmark. Further, when separating risk-decreasing from risk-increasing positions we complement the literature and find that prior benchmark losses are only relevant in the risk-increasing subsample but are irrelevant for the risk-decreasing subsample, thus, hedging decisions are independent of prior benchmark losses if the intention is to reduce FX exposure.

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2.7 Appendix

Appendix 1: Examples of Reported FX Information from Registration Documents

Average rate	2015	2014
US Dollar	1.1096	1.3288
Canadian dollar	1.4176	1.4669
Australian dollar	1.4765	1.4724
Pound sterling	0.7260	0.8064
Brazilian real	3.6916	3.1228
Chinese yuan	6.9730	8.1883

Sensitivity to foreign exchange risk

	2015				
(in thousands of foreign currencies)	US Dollar	Pound sterling	Yen	Canadian dollar	Australian dollar
Trade receivables	204,956	23,954	37,757	8,086	25,210
Trade payables	(184,278)	(14,513)	(786)	(11,607)	(9,105)
Gross balance sheet exposure	**20,678**	**9,441**	**36,971**	**(3,521)**	**16,105**
Estimated forecast sales	458,703	60,781	541,743	30,044	46,381
Estimated forecast purchases	(389,222)	(16,944)	-	-	-
Gross exposure	**90,159**	**53,278**	**578,714**	**26,523**	**62,486**
Foreign exchange derivative instruments	-	-	-	-	-
Forward purchases	11,300	-	-	361	-
Forward sales	(13,200)	(8,482)	(541,743)	(5,974)	(7,600)
Options	-	-	-	-	-
Net exposure	**88,259**	**44,796**	**36,971**	**20,910**	**54,886**

	2014				
(in thousands of foreign currencies)	US Dollar	Pound sterling	Yen	Canadian dollar	Australian dollar
Trade receivables	174,994	29,570	13,477	10,448	15,458
Trade payables	(177,804)	(16,571)	(534)	(11,999)	(4,329)
Gross balance sheet exposure	**(2,810)**	**12,999**	**12,943**	**(1,551)**	**11,129**
Estimated forecast sales	395,492	56,783	555,000	41,524	27,976
Estimated forecast purchases	(342,031)	(23,750)	-	-	-
Gross exposure	**50,651**	**46,032**	**567,943**	**39,973**	**39,105**
Foreign exchange derivative instruments					
Forward purchases	26,300	-	-	463	-
Forward sales	(4,791)	(19,146)	(555,000)	(14,600)	(2,297)
Options	-	-	-	-	-
Net exposure	**72,160**	**26,886**	**12,943**	**25,836**	**36,808**

NOTE 30 HEDGING OF CURRENCY AND INTEREST RATE RISKS

30.1 Transactions in foreign currency and derivatives

Transactions in foreign currency are converted at the exchange rate prevailing on the transaction date. Receivables and payables are converted at the year-end exchange rate. Resulting gain or loss is recorded in the income statement as operating income or expenses for operating receivables and payables, and under "Other financial income and expense" for other receivables and payables.

Faurecia uses derivative instruments traded on organized markets or purchased over-the-counter from first-rate counterparties to hedge currency and interest rate risks.

They are recorded at fair value in the balance sheet.

30.2 Hedging of currency risks

Currency risks relating to the commercial transactions of the Group's subsidiaries are managed centrally by Faurecia using forward purchase and sale contracts and options as well as foreign currency financing. Faurecia manages the hedging of currency risks on a central basis, through the Group Finance and Treasury department, which reports to Group Executive Management. Hedging decisions are made by a Market Risk Committee that meets on a monthly basis.

Currency risks on forecast transactions are hedged on the basis of estimated cash flows determined in forecasts validated by Executive Management; these forecasts are updated on a regular basis. The related derivatives are classified as cash flow hedges when there is a hedging relationship that satisfies the IAS 39 criteria.

Subsidiaries with a functional currency different from the euro are granted inter-company loans in their operating currencies. Although these loans are refinanced in euros and eliminated in consolidation, they contribute to the Group's currency risk exposure and are therefore hedged through swaps.

The effective portion of changes in the fair value of instruments used to hedge future revenues is recorded in equity and taken to operating income when the hedged revenues are received.

Changes in the fair value of instruments used to hedge trade receivables and payables are recorded as operating income or expense.

The portion of the change in fair value of these hedges that is ineffective (time value of the hedges) is recorded under "Other financial income and expense" together with changes in the fair value of instruments used to hedge other receivables and payables.

AS OF DECEMBER 31, 2015

Currency exposure *(in € millions)*	USD	CZK	CAD	RUB	GBP	PLN	MXN	ZAR
Trade receivables (net of payables)	1.0	(6.5)	0.0	0.0	0.0	(13.1)	0.0	11.1
Financial assets (net of liabilities)*	375.9	0.0	(11.2)	11.7	(53.7)	0.0	0.0	26.6
Forecast transactions**	43.2	(56.3)	(9.1)	37.6	1.2	(135.1)	(57.1)	(18.8)
Net position before hedging	**420.1**	**(62.8)**	**(20.3)**	**49.3**	**(52.5)**	**(148.2)**	**(57.1)**	**18.9**
Currency hedges	(418.7)	58.0	21.9	(40.5)	53.7	140.9	52.3	(26.6)
Net position after hedging	1.4	(4.9)	1.6	8.7	1.2	(7.3)	(4.8)	(7.7)

* *Including inter-company financing.*
** *Commercial exposure anticipated over the next six months.*

AS OF DECEMBER 31, 2014

Currency exposure *(in € millions)*	USD	CZK	CAD	RUB	GBP	PLN	ZAR
Trade receivables (net of payables)	17.2	0.0	0.0	0.0	(1.7)	(16.9)	(0.3)
Financial assets (net of liabilities)*	357.1	0.0	115.6	(3.0)	(68.6)	0.0	34.5
Forecast transactions**	41.4	(59.3)	(9.6)	43.0	20.4	(108.1)	(0.8)
Net position before hedging	**415.7**	**(59.3)**	**106.0**	**40.0**	**(49.9)**	**(125.0)**	**33.4**
Currency hedges	(415.6)	50.7	(109.5)	(2.1)	50.4	117.4	(37.8)
Net position after hedging	0.1	(8.6)	(3.6)	37.9	0.5	(7.6)	(4.3)

* *Including inter-company financing.*
** *Commercial exposure anticipated over the next six months.*

(In millions of euros)	2015	2014
Net interest cost on provisions for pensions and other employee benefits	(25)	(27)
Currency gains (losses)	(6)	(15)
Gains (losses) on commodity derivatives (trading and ineffective portion)	(1)	-
Gains (losses) on interest rate derivatives (ineffective portion)	(1)	(1)
Other	(2)	(3)
Other financial income and expenses	**(35)**	**(46)**

8.3 Risk management policy

A detailed description of the Group's risk management policy is set out in Chapter 2, pages 61 to 74.

8.3.1 Market risks

8.3.1.1 Foreign currency risk

A detailed description of the Group's foreign currency risk management policy is set out in Chapter 2, pages 61 to 74.

Exposure to foreign currency risk

The Group systematically hedges statement of financial position exposure and three-month commercial transaction forecasts. Subsidiaries principally hedge their transactions with Valeo, the parent company, which then hedges net Group positions with external counterparties (leading banks). The corresponding currency instruments are classified in the trading book in accordance with the standard on financial instruments.

For specific, material transactions, the Group also enters into longer-term hedges (based on a budget or contractual period). In this case, it applies hedge accounting rules as permitted by the standard on financial instruments. The principal currency hedging instruments used by the Group are forward purchases and sales of foreign currencies, as well as swaps and options. The principal instruments used by the Group to hedge its foreign currency risk are generally not eligible for hedge accounting within the meaning of IAS 39. Exceptionally, the Group applies hedge accounting to highly probable future cash flows from the date the derivatives are contracted.

In 2015, an unrealized gain of 7 million euros related to these hedges was recognized directly in other comprehensive income. In 2014, an unrealized gain of 17 million euros related to these hedges was recognized directly in other comprehensive income; a portion of this gain was reclassified to operating income during 2015.

The Group set up a cross currency swap in yen for 237 million euros on inception of its 250 million euro syndicated loan taken out to finance Japanese group Niles. This derivative matched the loan in terms of maturity and was not eligible for hedge accounting within the meaning of IAS 39. Portions of this swap were successively repaid in 2013 (35 million euros), 2014 (69 million euros) and 2015 (133 million euros), in line with the repayments of identical amounts by Valeo Japan.

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The Group's net exposure to foreign currency risk based on notional amounts arises on the following main currencies (excluding entities' functional currencies):

	December 31, 2015				December 31, 2014
(In millions of euros)	USD	JPY	EUR	Total	Total
Accounts and notes receivable	91	12	403	506	442
Other financial assets	62	51	70	183	717
Accounts and notes payable	(165)	(33)	(505)	(703)	(701)
Long-term debt	(128)	(10)	(324)	(462)	(443)
Gross exposure	**(140)**	**20**	**(356)**	**(476)**	**15**
Forward sales	(623)	(115)	(92)	(830)	(1,299)
Forward purchases	1,068	170	88	1,326	1,004
Net exposure	**305**	**75**	**(360)**	**20**	**(280)**

In the table above, the EUR column represents the euro exposure of Group entities whose functional currency is not the euro. Exposure arises chiefly on subsidiaries based in Central and Eastern Europe – mainly the Czech Republic – which are financed in euros by Valeo.

At December 31, 2014, the breakdown by currency of the net exposure in the statement of financial position for a negative amount of 280 million euros is as follows:

- a positive amount of 220 million euros relating to the US dollar;
- a positive amount of 20 million euros relating to the Japanese yen;
- a negative amount of 520 million euros relating to the euro.

Appendix 2: Examples of FX Debt and Foreign Subsidiaries Included in Exposure

/ 4.2.2 Currency risk

Transactional Currency Risk

The following table set forth the Group transactional foreign currency accounting exposures (when a monetary asset or liability is denominated in a currency other than the functional currency) before and after hedging:

	December 31, 2015						December 31, 2014					
(in € million)	USD	AUD	RON	GBP	EUR	Other	USD	AUD	RON	GBP	EUR	Other
Monetary assets	3,635	180	60	56	789	2,427	3,867	164	51	183	971	2,553
Monetary liabilities	(2,691)	(102)	(39)	(111)	(1,878)	(1,204)	(2,471)	(94)	(72)	(346)	(1,752)	(1,240)
Net position before hedging	**944**	**78**	**21**	**(55)**	**(1,089)**	**1,223**	**1,396**	**70**	**(21)**	**(163)**	**(781)**	**1,313**
Hedges	(897)	(70)	(14)	46	1,047	(1,247)	(1,381)	(77)	(5)	162	771	(1,336)
NET POSITION AFTER HEDGING	**47**	**8**	**7**	**(9)**	**(42)**	**(24)**	**15**	**(7)**	**(26)**	**(1)**	**(10)**	**(23)**

The Group's net exposure to foreign currency risk based on notional amounts arises on the following main currencies (excluding entities' functional currencies):

	December 31, 2015				December 31, 2014
(in millions of euros)	USD	JPY	EUR	Total	Total
Accounts and notes receivable	91	12	403	506	442
Other financial assets	62	51	70	183	717
Accounts and notes payable	(165)	(33)	(505)	(703)	(701)
Long-term debt	(128)	(10)	(324)	(462)	(443)
Gross exposure	(140)	20	(356)	(476)	15
Forward sales	(623)	(115)	(92)	(830)	(1,299)
Forward purchases	1,068	170	88	1,326	1,004
Net exposure	305	75	(360)	20	(280)

In the table above, the EUR column represents the euro exposure of Group entities whose functional currency is not the euro. Exposure arises chiefly on subsidiaries based in Central and Eastern Europe – mainly the Czech Republic – which are financed in euros by Valeo.

At December 31, 2014, the breakdown by currency of the net exposure in the statement of financial position for a negative amount of 280 million euros is as follows:

- a positive amount of 220 million euros relating to the US dollar;
- a positive amount of 20 million euros relating to the Japanese yen;
- a negative amount of 520 million euros relating to the euro.

EXPOSURE AND SENSITIVITY TO FOREIGN CURRENCY RISK

The exposure of the Group's financial instruments to EUR/USD foreign currency risk can be summarized as follows:

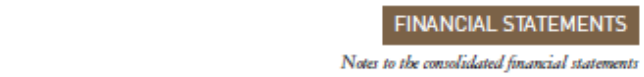
(in USD millions)	Dec. 31, 2014	Dec. 31, 2015
Total assets excluding derivatives	1,655	1,589
Total liabilities excluding derivatives	(2,582)	(2,605)
Derivatives hedging balance sheet positions(1)	(334)	(191)
NET EXPOSURE AFTER THE IMPACT OF DERIVATIVES HEDGING BALANCE SHEET POSITIONS	**(1,261)**	**(1,207)**

(1) Notional amount.

Assets and liabilities excluding derivatives primarily consist of operating receivables and payables denominated in USD in the balance sheets of Group subsidiaries whose functional currency is the euro, and unsecured notes issued by Safran on the US private placement market for USD 1.2 billion.

In addition to this net exposure, the Group has EUR/USD currency derivatives hedging revenue net of future purchases. These had a negative fair value of USD 3,975 million, compared to a total negative fair value of USD 3,994 million for EUR/USD currency derivatives at December 31, 2015 (negative fair value of USD 1,571 million and USD 1,576 million, respectively, at December 31, 2014).

Appendix 3: Examples on Maturity of FX Derivatives from Registration Documents



Future foreign currency-denominated cash flows are broken down as part of the budget preparation process and are hedged progressively over a period not exceeding one year unless a longer period is justified by probable commitments. As such, and according to market trends, identified foreign exchange risks are hedged using forward contracts or options.

1.8.7.2. CURRENCY RISK

Due to its international presence, L'Oréal is naturally exposed to currency variations. The fluctuations between the main currencies may therefore have an impact on the Group's results, at the time of translation into Euro of the non-Euro financial statements of subsidiaries, and may therefore make it difficult to compare performances between two financial years. In addition, commercial flows involving the purchase and sale of items and products are carried out between subsidiaries in different countries. Procurement by subsidiaries is mainly made in the currency of the supplier's country.

In order to limit currency risk, the Group adopts a conservative approach of hedging at year-end a significant portion of annual requirements for the following year through forward purchases or sales contracts or through options. Requirements are established for the following year on the basis of the operating budgets of each subsidiary. These requirements are

23.1 FOREIGN CURRENCY RISK

The Group is exposed to transaction risks and translation risks related to foreign currencies.

The Group hedges the foreign currency risk mainly through spot foreign currency transactions or through forward transactions over maturities generally not exceeding 2 years.

C) FOREIGN CURRENCY RISK

In the course of its operations, the Group's policy is to hedge all material "operational" foreign currency exposures arising from its transactions using derivative instruments as soon as a firm or highly probable commercial and/or financial commitment is entered into or known. These derivative instruments are limited to forward contracts, foreign currency swaps and options, with a term generally less than one year.

Appendix 4: Definition of Variables

Variables	Description of variables
BGL	Benchmark gains and losses, defined in section 2.4.2
Δ*Benchmark*	Deviation of the actual hedge ratio to the average hedge ratio per firm and currency defined in (4)
Debt Ratio	Total Liabilities / Total Assets
I_1	Dummy variable that is equal to one if the benchmark gain/loss in the prior period was positive and zero otherwise
I_2	Dummy variable that is equal to one if the benchmark gain/loss in the prior period was negative and zero otherwise
E_t^a	Net exposure in t after hedging
E_t^b	Net exposure in t before hedging
FXEvo	Dummy variable to measure exchange rate evolution: takes the value of 1[0] if the FX rate develops in favor of [against] the taken position
Growth	Capital Expenditures / Total Revenues
H_t	Hedging instruments in t
HR_t	Hedge ratio in t with $HR_t = H_t / E_t^b$; percentage of FX exposure covered by hedging instruments
$\overline{HR}$	Average of all hedge ratios across years by firm and currency
HR^*	$HR_t^* = \lvert 1 + HR_t \rvert$
ΔHR^*	$\Delta HR_t^* = HR_t^* - HR_{t-1}^*$
Quick Ratio	(Cash + Short-Term Investments + Total Receivables) / Total Current Liabilities

Currency Codes:	
AED	United Arab Emirates dirham
ARS	Argentine peso
BHD	Bahraini dinar
CHF	Swiss franc
CLP	Chilean peso
CNY	Chinese renminbi
COP	Colombian peso
CZK	Czech koruna
DKK	Danish krone
EUR	Euro
GBP	Pound sterling
JPY	Japanese yen
PGK	Papua New Guinean kina
SEK	Swedish krona
UAH	Ukrainian hryvnia
USD	United States dollar

3 Identifying Corporate Speculation Reading Public Disclosures – Why Firms Increase Risk[27]

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To date, readers of financial statements are not able to identify speculation as risk-increasing activity from public corporate disclosures. We examine a unique regulatory environment, in which the regulating authority recommends additional FX-disclosures in excess of prevailing reporting standards and find that these optional publications enable, henceforth, the identification of speculative activities. Further, we help solve the puzzle of the determinants of speculation and find that frequent speculators are smaller, have more growth opportunities and possess lower internal resources, which indicates unprecedented empirical evidence for the convexity theories of Campbell & Kracaw (1999) and Adam, Dasgupta, & Titman (2007). Our findings substantiate the significance of an extended reporting with optional disclosures that might unlock numerous benefits for both share- and stakeholders.

Keywords: Corporate Risk Management, Speculation, Disclosure, Foreign Exchange

JEL: G11, G32, G38, G39

[27] We gratefully acknowledge access to Bloomberg and the Compustat Global Vantage database provided by DALAHO, University of Hohenheim. We especially thank Martin Glaum, Tim Loughran, Mustafa Caglayan, Dirk Hachmeister, Niklas Lampenius and Alina Sigel for extensive discussions and valuable feedback. This paper has further benefited from the precious comments of the participants of the World Finance Conference 2017, the CARF-Conference 2017 in Lucerne as well as the 4th Finance Seminar of the University of Hohenheim in 2017.

3.1 Introduction

"What is a soap company doing in the swap market speculating with hundreds of millions of dollars?" [28]

Speculation with derivative instruments, as the intentional increase of risk to achieve additional profits, is often responsible for countless, endangering corporate losses running into millions and billions (Poitras, 2002). Up to present, speculation as risk-increasing activity can barely if at all be identified retrospectively with insider information (e.g., from surveys or interviews). Literature is in agreement that investors are, most probably, not capable to detect speculation by examining openly accessible data (Géczy, Minton, & Schrand, 2007). This paper is motivated by several advantages that timely disclosing speculative activities in public documents would entail. First, anecdotal evidence from interviewed treasury executives[29] suggests that it could raise the inhibition threshold for speculation and consequently prevent imperiling corporate losses. Further, the interviewed practitioners indicate that such an informational advantage would be beneficial for financial analysts [investors] to provide [use] more meaningful analyses and allow the corporate environment to benchmark and improve their own risk management, including unparalleled competitor analyses given the published FX-data granularity. Beyond that, such data granularity would enable new analytic angles for researchers in order to examine corporate risk management activities from strategy to execution. For these reasons, it is important to investigate the possibility of identifying speculative, risk-increasing strategies based on public corporate disclosures and to examine which firms engage in such activities and why they do so.

Using data from a well-reputed survey and reviewing annual reports as well as relevant footnotes in 10-K filings, Géczy et al. (2007) conclude that the available information is insufficient to detect whether a firm is speculating, where speculation is denoted as the intention of increasing risk and/or making a profit. In this context, we examine the unique regulatory environment of France, in which the French financial markets' authority advocates additional disclosures that exceed existing IFRS requirements and that allow us to avoid using alternative indicators for FX exposure and derivative usage with potential estimation errors. Due to these recommendations by the supervisor of the French financial markets, the publicly available disclosures of listed French companies provide FX risk management information of unique data granularity, i.e., data on firms' FX exposures before and after hedging with corresponding hedged amounts. This

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28 As appeared in *The New York Times* article "Procter & Gamble's Tale of Derivatives Woe" by Malkin (1994).

29 We asked for professional judgement of four treasury executives of major German corporations, including two DAX-30 firms, to endorse our results.

detailed information enables us to determine firm-, currency-, and year-specific hedge ratios, and consequently identify speculation as activity that increases or holds currency-specific FX exposure constant, and separate it from risk-decreasing positions based on public corporate disclosures. This separation of risk-increasing from risk-decreasing behavior follows the ideas of Zhang (2009), who separates firms that reduce their risk exposure ('effective hedgers') from those who fail to do so ('ineffective hedgers/speculators'), and is corroborated by a recent interview study among French firms that indicates that some treasury officials reject to increase volatility for any speculative activity, while others accept to do so (Gumb, Dupuy, Baker, & Blum, 2018)[30]. Besides the quantitative identification of speculation[31], we find in a qualitative analysis that the application of hedge accounting is correlated with a firm's speculative activities. It is a matter of course that this link to the facultative accounting policy of hedge accounting cannot be a necessary or sufficient condition, but only an indication of speculative practices.

In addition to identifying speculation from public corporate disclosures, we focus on the unsolved puzzle of which firms speculate and why they do it. Different theories explain why firms could engage in speculative activities, but the extant evidence on these determinants of corporate speculation is inconsistent (Adam, Fernando, & Salas, 2017; Glaum, 2002). Even when we incorporate most recent publications on this topic (Adam et al., 2017; Brown, Crabb, & Haushalter, 2006; Géczy et al., 2007), the results of the studies remain conflicting. Adam et al. (2017) and Brown et al. (2006) refer to speculation as the sizing and timing of derivative transactions based on individual market views, which is often denoted as 'selective hedging'. In contrast, Géczy et al., (2007) refer to speculation as the intention of increasing risk when testing theoretical explanations for optimal speculation. We assume that the varying definitions of speculative activities trigger the discrepancy in empirical evidence and separate selective hedging from risk-increasing practices in accordance with Stulz (1996). Based on the established firm-, currency-, and year-specific hedge ratios and in line with Géczy et al. (2007) and Zhang (2009), we use the term speculation to describe risk-increasing/-constant strategies and distinguish it from hedging (reducing currency-specific FX exposure). The results show that frequent speculators are lower in size, possess more investment possibilities and dispose of lower internal funds, which taken together indicate unprecedented empirical evidence for the convexity theories of Campbell & Kracaw (1999) and Adam et al. (2007) in an FX environment. This outcome of our quantitative analysis is in line with Albouy & Dupuy (2017), who find, by means

30 Given that almost 30 percent of the sample firms are identical to those of our study, these results are of high relevance for our analysis.

31 We use the terms 'risk-increasing/-constant activity' and 'speculation' interchangeably in the paper.

of an e-mail and interview survey between 2010 and 2015, that smaller and highly leveraged firms tend to take more bets among French non-financial firms[32].

We contribute to the literature on corporate speculation in two ways. First, the granularity of our publicly available dataset allows for the calculation of firm-, year- and currency-specific hedge ratios and the classification into risk-decreasing, risk-increasing and risk-constant positions. Based on this measure, it is, henceforth, possible to identify speculation as risk-increasing/-constant strategy reading public corporate disclosures. Second, our study adds to the growing literature on the determinants of speculation. We help answer the question of who these speculators are and provide, to our knowledge, unprecedented empirical evidence for the convexity theories in corporate FX risk management. Our results underline the significance of an advanced reporting with optional disclosures that might entail various advantages for both share- and stakeholders, as the interviewed treasury executives indicate.[33]

The paper is structured as follows. Section 3.2 introduces the new regulatory environment together with the sample description. Section 3.3 deals with the identification of speculation in quantitative and qualitative respects. Section 3.4 is dedicated to the determinants of corporate speculation: We review the relevant literature and develop the hypotheses before we present the results of the empirical analysis. Section 3.5 concludes.

3.2 Data and Sample Description

3.2.1 Data Description

To challenge the current restriction that speculation cannot be derived from public corporate disclosures, we use openly available accounting data from France for the period of 2010 to 2015 that enable us to employ actually reported FX exposure and derivative usage information instead of relying on proxy variables with potential estimation errors. This dataset is the result of a unique regulatory environment that supports enhanced disclosures via an optional supplement, the so-called 'registration document'. This facultative addition to annual reports is endorsed by the Autorité des Marchés Financiers (AMF), supervisor of the French financial markets, and is

32 Using the same dataset as Gumb et al. (2017), almost 30 percent of the sample firms are equal to those of our analysis. Albouy & Dupuy (2017) do not incorporate the role of growth opportunities in their analysis.

33 Hecht & Lampenius (2018) further document the importance of such extended disclosures: Using the same dataset, they provide evidence that prior hedging outcomes are only relevant for risk-increasing but not for risk-decreasing positions.

becoming a standard publication by listed French firms.[34] Going far beyond the specifications of IFRS 7 §33 and 34, the AMF advocates in the position paper n°2009-16 (Autorité des Marchés Financiers, 2009) advanced and extended corporate disclosures concerning the management of foreign currency risks, where Appendix 5, in analogy to Hecht & Lampenius (2018) illustrates the recommended format by the AMF.

In detail, the registration document provides information about firm-, currency-, and year-specific FX exposure before and after hedging. Following the proposal of the AMF, firms commonly specify their exposed assets and liabilities (column [a] and [b] in Appendix 5, mostly in form of FX-receivables and FX-payables), combined with estimated forecasted exposure (column [c]), i.e., which might be divided into forecasted FX-sales and FX-purchases. Taken together, these figures result in the firm-, year-, and currency-specific exposure before hedging (column [d]) In addition, firms state in the registration document the corresponding hedged amounts (column [e]) as well as the resulting net exposure after hedging (column [f]). To demonstrate the structure of the data, assume the following example: At point t and for a respective currency, a firm possesses 120 units of FX-assets and 30 units of FX-liabilities. These are completed with forecasted FX-sales of 20 units and forecasted FX-purchases of 10 units, which lead to an exposure before hedging of 100 (120 – 30 + 20 – 10 = 100) units. Exemplarily, the firm hedges 50 units of this exposure, and hence reports an exposure after hedging of 50 units. Appendix 6 provides examples of the reported FX information from the registration documents. Hecht & Lampenius (2018) provide further details about this dataset.

To analyze a firm's FX activities using the information on exposure before and after hedging, we calculate firm-, year- and currency-specific hedge ratios (HR), defined as the percentage of FX exposure covered by hedging instruments. Similar to Hecht & Lampenius (2018), the hedge ratio in t (HR_t) is defined as $HR_t = H_t \,/\, \mathrm{E}_t^b$, where H_t denotes the hedging instruments and E_t^b the exposure before hedging in t. Given that our data record contains aggregate FX exposure that can be positive or negative, which is combined with short (negative) or long (positive) hedged amounts, HR can be both positive and negative. Note that a short [long] derivative position is identified through a negative [positive] sign. In analogy to Hecht & Lampenius (2018), Appendix 7 illustrates the combination of the hedging instruments (numerator) and the FX exposure before hedging (denominator) in the hedge ratio, as well as six exemplary, fundamentally different positions and the resulting hedge ratio range. It emerges that the firm-,

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34 For details on the 'registration document' please refer to http://www.amf-france.org/en_US/Acteurs-et-produits/Societes-cotees-et-operations-financieres/Document-de-reference.html.

year- and currency-specific hedge ratios enable the separation into risk-decreasing, risk-increasing and risk-constant strategies. Table 9 summarizes the hedge ratio ranges and classifies the currency positions as risk-decreasing, risk-increasing and risk-constant, where risk-decreasing positions reduce the exposure with $-2 < HR < 0$, risk-increasing positions increase the exposure with $HR < -2$ or $HR > 0$, and risk-constant positions keep the exposure stable with $HR = -2$[35] or $HR = 0$. Thus, the hedge ratios of –2 and 0 keep the exposure constant and mark the lower and upper limit between risk-decreasing and risk-increasing strategies, where hedge ratios between –2 and 0 decrease the exposure and hedge ratios greater than zero and below –2 increase the exposure. Within the hedge ratio range of $-2 < HR < -1$, the overhedging flips the sign of the exposure, which might indicate speculative purposes. However, we can classify these positions as risk-decreasing, since Hecht & Lampenius (2018) show that the positions in this hedge ratio range with a mean of HR -1.18 can be attributed to imperfect hedge conditions in the real world (Hull, 2015).

Table 9: Hedge Ratio Classification

This table reports the hedge ratio classification, defined as the percentage of FX exposure covered by hedging instruments ($HR_t = H_t / E_t^b$), where H_t and E_t^b denote the hedging instruments and the exposure before hedging in t, respectively. HR captures risk-decreasing, risk-increasing and risk-constant strategies where technically (a) risk-decreasing strategies lower a firm's FX exposure with $-2 < HR < 0$; (b) risk-increasing strategies raise a firm's FX exposure with $HR < -2$ or $HR > 0$; (c) risk-constant strategies keep a firm's FX exposure stable with $HR = -2$ or $HR = 0$.

Strategy	Hedge Ratio	Impact on Exposure	No. Obs	Cum. Obs.
Risk-decreasing	$-2 < HR < -1$	Decrease	260	260
	$HR = -1$	Decrease	82	342
	$-1 < HR < 0$	Decrease	759	1101
Risk-increasing	$HR < -2$	Increase	65	1166
	$0 < HR$	Increase	159	1325
Risk-constant	$HR = -2$	Constant	3	1328
	$HR = 0$	Constant	486	1814

In the literature, others have assessed whether derivative instruments increase or decrease a firm's risk exposure in the context of corporate risk management activities (Allayannis & Ofek, 2001; Hentschel & Kothari, 2001; Zhang, 2009). While Allayannis & Ofek (2001) and Hentschel & Kothari (2001) use the term 'hedging' and 'speculation' for risk-decreasing and risk-increasing strategies[36], Zhang (2009) classifies firms that reduce their risk exposure as 'effective hedgers' and

35 For $HR = -2$, the size of the risk exposure remains stable, but the direction of exposure changes.

36 Hentschel & Kothari (2001) refer to overall stock return risk, and Allayannis & Ofek (2001) measure FX exposure as the sensitivity of a firm's stock return to unanticipated FX rate changes.

firms that fail to reduce their risk exposure compared to an expected level as 'ineffective hedgers/speculators'. Similar to the literature, we label positions in which firms do not manage to decrease their risk with derivate instruments as speculative, i.e., we denote risk-decreasing [risk-increasing/-constant] strategies as hedging [speculation]. Hecht & Lampenius (2018) evaluate the number of occurrences of risk-decreasing, -increasing and -constant positions and find that in about 61 [39] percent firms pursue risk-decreasing [risk-increasing/-constant] strategies.[37] Moreover, in their analysis that includes the value of FX positions so that a position with an exposure of 0.1 million Euros is not treated as equally important as a position with an exposure of 100 million Euros, they find that 20 percent of firm exposure relate to risk-increasing/-constant and 80 percent relate to risk-decreasing strategies. Hecht & Lampenius (2018) provide further details on how firms manage their FX exposure.

3.2.2 Sample Description

As the position paper of the AMF with the recommendations and the details on the preparation of the registration document dates from December 2009, we start our analysis with the year 2010. Starting with all 333 French firms listed in the CAC All-Tradable index as of April 2016, we drop financial firms (18) due to their differing business model, firms without (significant) FX exposure that does not justify risk management measures (183) and firms that do not follow the recommendations of the AMF (70). The latter implies a potential selection bias due to the voluntary disclosure. We see the high direct cost of compliance[38] with the guidelines of the AMF as a reason that some firms are unwilling to provide the additional information even if they handle their exposures similarly and hence consider the selection bias as not significant. For the sample of 62 firms, we hand-collect the reported FX-risk management information, with on average a FX-exposure in 4.9 currencies, and match it with firm characteristics obtained from the Compustat Global Vantage database. The resulting 1,814 firm-year-currency observations are the basis for the regression models detailed in sections 3.3 and 3.4. Further, we winsorize all firm characteristics to the 1st and 99th percentile to eliminate data outliers. The firm-specific FX data is not winsorized, given that this data is hand-collected and all data points are meaningful.

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37 Hecht & Lampenius (2018) also discuss the number of risk-increasing observations to ensure that this is not an artifact of some error in reporting.

38 In accordance with French regulations, the registration document is an additional document to be filed with the AMF. Exemplary, one firm illustrates, as difference between its annual report and registration document, that the registration document provides further details on the activity, financial situation and prospects of the firm (see section 3.2.1)

Consistent with the general literature on FX risk management, forward contracts are the most important hedging instrument (Bodnar et al., 1998; Giambona et al., 2018) and our French sample firms mainly report the utilization of forward or future contracts; options and swaps are mentioned less frequently. This observation is also in agreement with Albouy & Dupuy (2017), who provide recent survey evidence from France that forward contracts are by far the leading category to hedge FX risk. In line with Allayannis & Ofek (2001) and Beber and Fabbri (2012) we exclude foreign currency swaps from the analysis whenever explicitly referred to in the registration document, since swaps are often not used to hedge foreign sales. If a differentiation of FX instruments is not undertaken and hence swaps cannot be separated from other FX instruments, we rely on the combined figure. The inclusion of swaps with forward or future contracts of a few firms should not lead to a systematic bias, since FX forward contracts, as indicated above, are the most important FX hedging instruments. We ignore all transaction costs related to hedging activities and assume that FX markets are efficient in the weak sense of informational efficiency (Fama, 1970).

Following the classification according to the convexity theories of Campbell & Kracaw (1999) and Adam et al. (2007) (see section 3.4.2) and in line with Géczy et al. (2007), we group the firm characteristics into three categories *firm size*, *growth opportunities* and *liquidity (short- and long-term)*. Similar to Adam, Fernando, & Salas (2017) and Géczy, Minton, & Schrand (2007), we measure firm size by the logarithm of total assets (log (total assets)) and alternatively by the logarithm of market capitalization (log (mkt value)). Following Géczy, Minton, & Schrand (2007), growth opportunities are approximated by the ratio of research and development expenses over total revenue (R&D ratio) and as secondary proxy, in line with Beber & Fabbri (2012) by capital expenditures to total revenues (capex ratio).[39] Our approach to model the corporate liquidity situation is twofold. Following Géczy et al. (2007) we first calculate a short- and long-term liquidity indicator, i.e., the quick ratio (cash and short-term investments to total current liabilities) and interest coverage ((pretax income + interest expense) / interest expense), respectively. Since these ratios represent static balance sheet information, we further use the operating cash flow standardized by total revenues as dynamic flow figure that is less vulnerable to accounting policy. Second, we investigate the levels of indebtedness. Similar to Beber & Fabbri (2012), we use the debt ratio (total liabilities to total assets) to approximate leverage and since we are particularly interested in near-term settings, where profitable investments can only be realized due to positive outcomes of speculative activities (for details, see section 3.4.2), we further utilize the short-term

[39] Please note that we do not employ the book-to-market-ratio due to potential misinterpretations, e.g., off-balance sheet correlations with speculation, as stated by Géczy et al. (2007).

debt ratio with total current liabilities to total assets. All variables are defined in Appendix 8. Table 10 presents descriptive statistics of the firm characteristics, where data availability in the Compustat Global Vantage database explains the different observation numbers.

Table 10: Descriptive Statistics of Firm Characteristics

This table reports summary statistics of the firm characteristics. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D Expense [capital expenditures] by total revenues and the quick ratio captures the sum of cash plus short-term investments divided by total current liabilities. Interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The operating cash flow is standardized by total revenues and the [short-term] debt ratio captures total [current] liabilities in relation to total assets. All variables are defined in Appendix 8.

	No. Obs	Mean	SD	Min	p25	p50	p75	Max
Firm size								
Log (total assets)	1764	7.876	1.598	4.094	6.927	8.020	8.852	11.130
Log (mkt value)	1738	7.520	1.684	3.183	6.267	7.679	8.810	10.390
Growth opportunities								
R&D ratio	1097	0.085	0.122	0.002	0.020	0.044	0.093	0.643
Capex ratio	1763	0.045	0.037	0.005	0.021	0.037	0.058	0.276
Liquidity (short-/long-term)								
Quick ratio	1764	0.421	0.039	0.026	0.172	0.298	0.469	2.214
Interest coverage	1752	128.900	421.200	-15.060	4.193	8.361	18.310	2234.250
Operating CF	1764	0.115	0.077	-0.069	0.060	0.105	0.159	0.388
Debt ratio	1764	0.572	0.169	0.257	0.455	0.574	0.702	1.022
Debt ratio short-term	1764	0.356	0.142	0.147	0.246	0.303	0.473	0.727

3.3 The Identification of Speculation

3.3.1 Quantitative Analysis

"However, the disclosure of notional values limits the information that can be extracted from the data, since we do not know in general whether the net position of foreign currency derivatives was short or long, and in which currency." [40]

Beber & Fabbri (2012) well-describe the problem of detecting corporate speculation and point out that the informative value of U.S.-company data from publicly available disclosures is limited. Further, Géczy, Minton, & Schrand (2007) find that investors are not able to identify speculation on the basis of openly accessible U.S.-company data. Examining a new regulatory environment that provides exactly the cited missing information, we test whether the additional data allows deducing corporate speculative activities.

[40] As appeared in the *Journal of Corporate Finance* article "Who times the foreign exchange market? Corporate speculation and CEO characteristics" by Beber & Fabbri (2012, p. 1069).

Identifying speculation in annual financial statements may happen based on reported quantitative indicators. In contrast to the financial statement disclosures from the U.S., the publicly available data of listed French firms contains actual firm-, year- and currency-specific FX exposure together with corresponding hedging instruments, both with the specification of being short or long. As illustrated in section 3.2, the resulting firm-, year- and currency-specific hedge ratios allow for a classification of FX positions as risk-decreasing, risk-increasing and risk-constant. Hence, the reader of these public corporate disclosures is able to identify speculation as practice that increases or holds currency-specific FX exposure constant and separate it from hedging (reducing currency-specific FX exposure) per reported currency positions. As illustrated by Hecht & Lampenius (2018), 39 percent of the currency positions in our sample are classified as speculative (risk-increasing/-constant), and the remaining 61 percent as hedging (risk-decreasing). Measured in relative terms, i.e., when the exposure before hedging per position is related to total firm exposure, they find that 20 [80] of FX firm exposure are managed using speculative [hedging] strategies.

3.3.2 Qualitative Analysis

Another possibility to identify corporate speculation involves qualitative statements in annual disclosures. Further to the quantitative FX-risk management information from the annual reports, we examine whether qualitative statements in the financial statement – especially the notes concerning FX risk management activities – indicate whether a firm engages in speculation. Most likely due to its negative connotation and similar to Géczy et al. (2007), we find that firms do not specify the intended use of speculation in written form in their annual disclosures. However, Zhang (2009) illustrates that changing accounting regulations affect risk-increasing firms more than risk-decreasing firms, and Gumb et al. (2018) show that accounting standards influence the hedging behavior of French firms. In this context, we find that some firms explicitly mention that their derivative instruments do not meet hedge accounting requirements according to accounting standard of IAS 39 and are hence regarded as 'speculative'. Others state that, while the majority of their derivative positions is in accordance with hedge accounting, their hedging policy allows for speculative transactions at the same time. Hedge accounting (HA) is a bookkeeping practice that permits treating underlying positions as well as corresponding hedges as one item in order to offset their gains and losses in financial statements. Since this accounting policy seems to be associated with speculation and appears to be a specific characteristic that differs among firms, we investigate whether the application of hedge accounting correlates with speculation. To the best of our knowledge, literature has hitherto

never examined this potential connection. We do so by introducing a dummy variable 'hedge accounting' that equals one [0.5] if a firm [partially] applies hedge accounting and zero otherwise. We are aware of the restrictions under IAS 39 to designate certain instruments and contexts as hedging relationships, this is why we also characterize a firm as hedge accounting user if it predominantly uses this bookkeeping practice. Partial hedge accounting users are characterized by only fractional designation of FX derivative transactions as hedge accounting component over our sample period. Comments that FX derivatives *may* serve as hedge but are not always eligible for hedge accounting are typical for this subgroup that only contains four firms.

Literature on hedge accounting shows that in the U.S., 25 percent of corporate survey respondents expect to not apply hedge accounting (Kawaller, 2002).[41] Glaum & Klöcker (2011) confirm this proportion with their survey in Germany and Switzerland and find that 28 percent of their non-financial sample firms do not adopt hedge accounting practises. We are unaware of such existing data for France, but our analysis reveals that 26 percent (16 out of 62) of our sample firms refrain from the application of hedge accounting (including four partial hedge accounting users).

In a multinomial logit regression model with robust standard errors, we examine whether the application of hedge accounting is associated with the extent of corporate speculation, where speculation refers to risk-increasing/-constant strategies in line with the literature. The dependent variable is our dummy variable 'hedge accounting' with its three possible characteristics. As measure of speculation, we evaluate the exposure before hedging per position to overall firm exposure ('speculation ratio'), i.e., we calculate the value-weighted proportion of speculation per firm during our sample period. This means that a position with an exposure of 0.1 million Euros is not equally important as a position with an exposure of 100 million Euros. The 'speculation ratio' ranges from zero to one and indicates for a value of for example 0.4 that a firm speculates with 40 percent of its total FX exposure during our sample period. Following Glaum & Klöcker (2011), we control for firm size, growth opportunities and leverage. We rely on the logarithm of total assets (log (total assets)) for size (Adam et al., 2017) and on the capital expenditures to total revenues (capex ratio) for growth opportunities following Beber and Fabbri (2012).[42] Similar to Glaum & Klöcker (2011), we employ the debt ratio (total liabilities to total assets) as approximation for leverage. To not bias the regression result, since the variables 'hedge

41 In the U.S., not IAS 39 but SFAS 133 is applicable.

42 For this analysis we select the capex ratio as proxy for growth opportunities, as it is more widely available in the databases for our sample firm than the alternative R&D ratio. The results with the R&D ratio are very similar and only involve fewer observations.

accounting' and 'speculation ratio' do not change per firm over time, we drop all duplicate values to rely on one observation per firm.[43] Due to data unavailability for capital expenditures, we further lose one firm.

According to Table 11, we observe statistically significant correlations between the proportion of speculation and hedge accounting. In detail, a one-unit increase in the variable speculation ratio is associated with an increase of 3.81 in the relative log odds of being a non-HA-user compared to a HA-user, significant at the 1 percent significance level. In other words, non-HA-users are more likely to speculate more than HA-users. The same relationship with almost equal magnitude is also observable between partial HA-users and HA-users.

Table 11: Identification of Speculation – Hedge Accounting

This table reports the multinomial logistic regression results of the application of hedge accounting as a function of firm characteristics with robust standard errors, with the case of hedge accounting application as base outcome. The dependent variable can take the values 'hedge accounting', 'no hedge accounting' or 'partial hedge accounting' according to a firm's approach on the application of this optional accounting policy. The independent variables are defined as follows: speculation refers to risk-increasing/-constant activities and the speculation ratio measures the value-weighted proportion of speculation per firm on a metric scale from 0 to 1, where 0 [1] indicates 100 percent hedging [speculation] with a firm's total FX exposure. Log (total assets) is the logarithm of total assets, the capex ratio divides the capital expenditures by total revenues and the debt ratio captures total liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
Hedge accounting	Base Outcome		
No hedge accounting	Speculation ratio	3.806	0.008***
	Log (total assets)	-0.239	0.486
	Capex ratio	3.275	0.493
	Debt ratio	3.144	0.211
	Constant	-3.258	0.178
Partial hedge accounting	Speculation ratio	3.105	0.018**
	Log (total assets)	0.264	0.529
	Capex ratio	-6.747	0.230
	Debt ratio	0.261	0.935
	Constant	-5.549	0.254
Observations		61	
Pseudo R-squared		0.249	

As a result concerning the identification of speculation from public corporate disclosures, we demonstrate that the unique regulatory environment with its additional FX risk management information enables the determination of speculation as well as its separation from hedging via firm-, currency-, and year-specific hedge ratios. Further, our analysis of qualitative statements in

[43] A firm reports on average FX-exposure data in 4.9 currencies per year, i.e., per firm we possess on average almost 30 firm-year-currency observations during the 6-year sample period. Since the variables 'hedge accounting' and 'speculation ratio' do not change over time, we drop the duplicate values and rely on one observations per firm for this regression analysis. For the control variables such as firm size or growth opportunities, we use the latest reporting data of the sample period, i.e., 2015.

the annual reports shows that corporate speculation is linked to the application of hedge accounting. This connection, however, is merely an indication and must not be interpreted as causal relationship or necessary or sufficient condition for speculation.

3.4 The Determinants of Speculation

3.4.1 Status Quo in Literature

Sufficient evidence of speculative activities in the corporate world has found its way into literature (Adam, Fernando, & Golubeva, 2015; Adam et al., 2017; Bodnar et al., 1998; Brown et al., 2006; Faulkender, 2005; Giambona et al., 2018; Glaum, 2002), but the determinants of corporate speculation remain nevertheless inconsistent. Literature on financial risk management offers various theoretical solutions to explain why companies might have an incentive to speculate as opposed to hedge (Adam et al., 2007; Campbell & Kracaw, 1999; Stulz, 1996). Empirical evidence, however, is ambiguous: Glaum (2002) summarizes in 2002 that most studies up to this date are at variance, and Adam et al. (2017, p. 269) recently conclude that it "remains a puzzle".

Two potential explanations for this disagreement arise. First, the exclusion of potential speculation with derivative financial instruments was a weak point of earlier research in terms of methodology (Glaum, 2002). Nonetheless, including most recent evidence of studies that incorporate speculation reveals a similar picture. With regard to the investigated aspects of firm size, growth opportunities and corporate liquidity, we find that inconsistency on the determinants on speculation still prevails (Adam et al., 2017; Brown et al., 2006; Géczy, Minton, & Schrand, 2007). A second potential explanations for the ambiguous empirical evidence originates from Judge (2007), who argues that a mixed outcome could be the result of deviating definitions among the studies. In fact, while Adam et al. (2017), similar to e.g., Brown et al. (2006) and Adam et al. (2015), refer to speculation as the inclusion of individual market views in hedge decisions ('selective hedging'), Géczy et al. (2007) use the term speculation to describe risk-increasing intentions. Further, we detect that even the results of Brown et al. (2006) and Adam et al. (2017) do not concur despite the assumption of selective hedging and the mutual usage of the gold industry dataset.[44] Since their approach on measuring 'speculation', which serves as dependent variable in both regression models, deviates, we assume that – overall – the non-uniform outcomes on the determinants of speculation may be explained by different

[44] While Brown et al. (2006)'s analysis covers the years of 1993 to 1998 across 44 gold producers, Adam et al. (2017) involves 92 firms from 1989 to 1998.

methodologies and definitions of speculation. To address this issue and investigate the determining factors of speculative activities, we differentiate between speculation (increasing or holding currency-specific FX exposure constant) and hedging (reducing currency-specific FX exposure) based on the advanced disclosures of our sample firms.

3.4.2 Hypothesis Development

Apart from Modigliani-Miller ideals in which risk management does not increase shareholder value, diverse theoretical considerations justify why firms could engage in hedging activities. Apart from classical managerial motives such as information asymmetry considerations, tax reasons or debt capacity coupled with financial distress costs (Froot et al., 1993; Judge, 2007; Smith & Stulz, 1985), Froot et al. (1993) mention the aspect of underinvestment when external financing is more expensive than internal financing. Easing the variability of cash flows through risk management measures can prevent underinvestment and increased external financing requirements that might be costly to firms.

Furthermore, the financial literature holds explanations for speculative positions, with a differentiation between selective hedging and risk-increasing strategies, where selective hedging describes the inclusion of individual market views into risk management programs. From a theoretical point of view, Stulz (1996) argues that companies with private information might be inclined to engage in selective hedging, rather than speculation.[45] That is, companies having both private information combined with an adequate financial resilience might benefit from taking bets on financial markets. Making use of superior market or industry knowledge such as specialized information on e.g., future FX-rates, might lend these firms a comparative advantage leading to extraordinary profits in derivative transactions. These, according to Stulz (1996), typically bigger firms should have the financial capabilities to withstand losses from erroneous market views, which in turn prevents a firm from the underinvestment problem due to high costs of external funds. In an FX-environment, however, Stulz (1996) states that most FX dealers do not possess specialized information about the future development of foreign currencies. Consequently, non-financial firms most likely also lack this expertise. In addition, they are supposedly not endowed with an enhanced ability to cope with FX risks and possible severe losses (Stulz, 1996). Alternatively, Stulz (1996) illustrates a rationale in favor of selective

[45] Stulz (1996) illustrates that selective hedging can also be risk-increasing, where Adam et al. (2017) find that selective hedging increases future stock return volatility. However, according to Stulz (1996), the use of private information will most likely lead to selective hedging and only occasionally to speculative positions.

hedging for firms in financial distress. Having nothing to lose, such firms might be motivated to take bets even without superior knowledge in order to generate exceptional, rescuing outcomes. This corresponds to the incentive described in Jensen & Meckling (1976), where equity-holding managers of indebted, low-rated firms are induced to engage in risky investments with high payoffs but low probability of success, also in the absence of private information. This asset substitution or wealth transfer problem arises because shareholders capture the gains of such risky projects, while debt holders might bear most of the losses.

Moreover, the convexity theories of Campbell & Kracaw (1999) and Adam et al. (2007) describe why speculation may be the optimal risk management decision. Based on a profit function convex in investment, the authors build upon the model of Froot et al. (1993) and argue that under certain circumstances, firms might perceive speculative, risk-increasing activities as optimal strategy. This incentive not to hedge but to speculate arises from the convexity of a firm's investment opportunities leading to the argument that positive outcomes of speculation allow for profitable investments that elsewise would not be carried out. Campbell & Kracaw (1999) expect that this effect might be empirically verifiable with firms that demonstrate the following features: substantial growth opportunities, modest internal funds as well as high cost of asymmetric information. Following Adam et al. (2017) and Graham et al. (2001), we assume that smaller firms suffer more from the market imperfection of informational asymmetry and are hence financially more constrained in raising external funds.

Given that non-financial firms do presumably not exhibit a comparative advantage in an FX-context and that Stulz (1996)'s theory rather encourages selective hedging practices while the granularity of dataset enables the identification of risk-increasing strategies, we adhere to the theoretical foundations of Campbell & Kracaw (1999) and Adam et al. (2007). We test the hypothesis that the convexity theories are empirically supported in FX risk management, where we expect a negative relation between firm size and speculation, a positive relation between corporate growth opportunities and speculation, as well as a negative relation between corporate liquidity (short- and long-term) and speculation. To test these hypotheses, we use the calculated firm-, year-, and currency-specific hedge ratios that allow us to capture speculation motives and separate them from hedging considerations.

3.4.3 Empirical Results

3.4.3.1 Logistic Regression

We examine the relationship between firm characteristics and speculation in a logistic regression model. According to our hedge ratio classification, we construct a dependent variable that can take the two categories hedging (risk-decreasing) or speculation (risk-increasing/-constant). The independent variables are chosen according to the theoretical basis of the convexity theories (Campbell & Kracaw, 1999; Adam et al., 2007) and detailed in section 3.2.2 and Table 10.

Table 12 reports the results of the logistic regression with robust standard errors, where Panel A presents, in line with Géczy et al. (2007), our main regression model with one firm characteristic per category firm size, growth opportunities and liquidity combined with one measure of debt. To ensure consistency, we substitute each variable in the so-called alternative regression model in Panel B.[46] The coefficient for the variable log (total assets) in Panel A is -0.31 with a statistical significance at the 1 percent level, which means that a one-unit increase in the variable log (total assets) is associated with a -0.31 decrease in the log-odds of the dependent variable. In other words, firms that increase their exposure, i.e., speculate, are more likely to be smaller than firms that decrease their exposure – a finding that confirms our expected negative relation between firm size and speculation. Panel B with the variable log (mkt value), the coefficient of -0.30 and again statistical significance at the 1 percent level confirms this finding. Similarly, firms that speculate exhibit a higher probability, significant at the 1 percent level, to have more growth opportunities than firms that follow hedging motives (Table 12 Panel A). This positive relationship between corporate growth opportunities and speculation is in line with Panel B as well as our hypothesis. As regards internal funds, we find that speculators are more likely to have lower operating cash flows and higher debt levels. Both the operating cash flow as well as the interest coverage ratio have a negative sign indicating lower liquidity for speculators, significant at the 1 percent level, respectively. As indicated before, we utilize both a static balance sheet indicator as well as a more dynamic cash flow indicator, which is less subject to accounting policy. For this reason, we use the operating cash flow as short-term liquidity indicator.[47] While the debt ratio was not significant in the main regression model, the alternative regression model illustrates significance at the 1 percent level for the short-term debt ratio. This observed negative

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46 We checked for correlations across the firm characteristics. The Pearson correlation coefficients are not so high as to represent a problem of multicollinearity.

47 While the coefficient for the quick ratio is also negative, the relationship is statistically not significant (Appendix 9 provides the regression results).

relation between a firm's liquidity situation and speculative activities contributes to a first overall impression of empirical evidence for the convexity theories in a currency risk context.

Table 12: Determinants of Speculation – Logistic Regression

This table reports the logistic regression results of our classification of FX derivative positions as a function of firm characteristics with robust standard errors. The dependent variable 'HR classification' can take the values 0 [1] for positions classified as hedging [speculation], where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. The independent variables are the firm characteristics detailed in Table 10. Panel A details our main regression model with one financial characteristic per category firm size and growth, as well as one short-term liquidity indicator and one debt measure. In Panel B, we substitute each variable to ensure consistency in an alternative regression model. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues, the operating cash flow is standardized by total revenues and interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The [short-term] debt ratio captures total [current] liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Panel A: Main regression model

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
HR classification	Log (total assets)	-0.305	0.000***
	R&D ratio	5.396	0.000***
	Operating CF	-2.844	0.009***
	Debt ratio	0.263	0.630
	Constant	1.576	0.002***
Observations	1,097		
Pseudo R-squared	0.131		

Panel B: Alternative regression model

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
HR classification	Log (mkt value)	-0.299	0.000***
	Capex ratio	2.329	0.092*
	Interest Coverage	-0.001	0.001***
	Debt ratio short-term	1.195	0.003***
	Constant	1.287	0.000***
Observations	1,725		
Pseudo R-squared	0.064		

To substantiate this evidence, we examine the relationship between firm characteristics and speculation from another perspective. A possible weakness of our analysis is that – depending on the respective hedge ratios – one firm might be attributed for one currency to the risk-decreasing (hedging) category and for another currency to the risk-increasing/-constant (speculation) category within the same year. To meet this objection and ensure robustness, we construct a firm-wide homogeneous classification for hedging and speculation.

3.4.3.2 Firm Classification and Multinomial Logistic Regression

Following Géczy et al. (2007), we categorize our sample firms as either marginal speculator, temporary speculator or frequent speculator to test the theories for optimal speculation. To do

so, we build upon the 'speculation ratio' from section 3.3, where we related the exposure before hedging per position to overall firm exposure to not give equal weight to a an exposure of 0.1 million Euros compared to an exposure of 100 million Euros. The range of the 'speculation ratio' goes from zero to one, where a value of e.g., 0.5 indicates that a firm speculates with 50 percent of its total FX exposure. We label firms as marginal speculator (MS) when they speculate with less than 20 percent of their exposure, whereas with more than 80 percent of speculative activities according to the 'speculation ratio', we label firms as frequent speculators (FS). The thresholds of 20 and 80 percent originate from the analysis of Hecht & Lampenius (2018), as detailed in section 3.2.1.[48] Further, we term the group of firms between 20 and 80 percent temporary speculators (TS). Since for one firm and one year, the firm characteristics do not change for the several employed currencies, we drop all duplicate values to rely on one observation per firm and year. Consequently, the dependent variable counts 337 hand-collected observations from the annual reports of our sample firms, where the classification scheme on firm-level shows 54 percent of our sample firms as MS, 17 percent as FS and the remaining 29 percent as TS.

Subject to the firm classification, Table 13 presents univariate statistics of firm characteristics of our sample firms. Further, we report the results of a t-test that compares the mean values of the marginal speculators with frequent speculators (marginal speculators with temporary speculators) [frequent speculators with temporary speculators]. We rely on the Welch's t-test due to potential unequal variances as well as sample sizes.

[48] In a robustness check in section 3.4.3.3, we rule out the possibility that our results depend on the thresholds of 20 and 80 percent.

Table 13: Univariate Statistics of Firm Characteristics According to Firm Classification

This table reports univariate statistics for the firm characteristics according to our firm classification into marginal speculators (MS), temporary speculator (TS) or frequent speculator (FS) subject to their speculative share relative to total firm exposure, where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. Based on the limits of 20 percent and 80 percent, firms are labelled marginal speculators [frequent speculator] (temporary speculator) when speculating with less [more] (between) than 20 percent [80 percent] (20 percent and 80 percent) of their exposure. The MS vs. FS [MS vs. TS] {FS vs. TS} column reports the significance level of a Welch's t-test comparing the mean values for marginal speculators versus frequent speculators [marginal speculators vs. temporary speculators] {frequent speculators vs. temporary speculators}. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. For the firm classification, we drop all duplicate values to rely on one observation per firm and year (see section 3.4.3.2). Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues and the quick ratio captures the sum of cash plus short-term investments divided by total current liabilities. Interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. Total [operating] cash flow is standardized by total revenues and the [short-term] debt ratio captures total [current] liabilities in relation to total assets. All variables are defined in Appendix 8.

	Marginal Speculator (N = 182)		Frequent Speculator (N = 57)			Temporary Speculator (N = 98)			
	Mean	SD	Mean	SD	MS vs. FS	Mean	SD	MS vs. TS	FS vs. TS
Firm size									
Log (total assets)	8.274	1.419	6.640	1.349	***	7.664	1.645	***	***
Log (mkt value)	8.009	1.489	6.066	1.433	***	7.206	1.690	***	***
Growth opportunities									
R&D ratio	0.042	0.036	0.239	0.197	***	0.100	0.111	***	***
Capex ratio	0.046	0.025	0.063	0.071		0.032	0.024	***	
Liquidity (short/long-term)									
Quick ratio	0.454	0.396	0.377	0.479		0.367	0.342		
Interest coverage	205.400	531.100	14.810	37.110	***	15.500	27.280	***	
Operating CF	0.134	0.067	0.071	0.085		0.095	0.082		
Debt ratio	0.558	0.166	0.618	0.201	*	0.579	0.150		
Debt ratio short-term	0.333	0.132	0.407	0.134	***	0.379	0.159	**	***

First, we focus on the differences between firms that frequently and those that marginally speculate: We observe that, according to both measurements of *firm size*, frequent speculators are significantly smaller than marginal speculators. As regards *growth* potential measured by R&D expenditures to total revenues, frequent speculators exhibit significantly more investment opportunities compared to marginal speculators. Alternatively, using capital expenditures instead of R&D investments seems to confirm the results, where the differences between the groups are not significant. The *liquidity* measures indicate that marginal speculators possess more internal funds than frequent speculators, where the differences for interest coverage and the debt ratios are statistically significant. The different levels of debt show that frequent speculators have significantly higher debt proportions than marginal speculators, where we also find the same relationship with even stronger significances for the short-term debt ratio.

Consistent with this evidence, the *firm size* of temporary speculators falls in between the thresholds of MS and FS, i.e., temporary speculators are significantly smaller than marginal speculators and significantly bigger than firms that frequently speculate. Similarly, for the firm

characteristics categorized in *growth* and *liquidity*, Table 13 illustrates that the values for temporary speculators are logically interjacent to marginal and frequent speculators, with significant differences for e.g., the R&D ratio, interest coverage and the short-term debt ratio.

Following the univariate analysis and Géczy et al. (2007), we examine the relationship between the firm characteristics and speculation in a multinomial logistic regression. According to our firm classification, the nominally scaled dependent variable can take the three categories marginal speculators, temporary speculator or frequent speculator. The dependent variable includes 337 observations, where data availabilities from Compustat Global explain the differing observation numbers. For the sake of consistency, the independent variables are the same as in the main and alternative regression model from Table 12.

Table 14 reports the results of the multinomial logistic regression with robust standard errors and with the marginal speculators class as base category, where Table 14 Panel A [B] presents the estimates for the main [alternative] regression model. The evidence provided is consistent with the univariate analysis and the logit regression results. In Panel A [B], a one-unit increase in the variable log (total assets) is associated with a reduction of -0.42 [-0.56] in the relative log odds of being a frequent speculator compared to a marginal speculator. That is, frequent speculators tend to be smaller than marginal speculators. For the category *growth* we find once more that frequent speculators are more likely to exhibit higher growth opportunities than marginal speculators. Concerning *liquidity*, the short- and long-term liquidity indicators together with the debt ratios illustrate lower cash positions and higher debt levels for frequent speculators. Further, also firms that temporarily speculate differ significantly from marginal speculators in terms of *firm size, growth* and *liquidity* in Panel A and B, where the parameter estimates are again logically interjacent to marginal and frequent speculators.

Table 14: Determinants of Speculation – Multinomial Logistic Regression

This table reports the multinomial logistic regression results of our firm classification as a function of firm characteristics with robust standard errors and the marginal speculators classification as base outcome. The dependent variable can take the values marginal speculator, temporary speculator or frequent speculator according to their speculative share relative to total firm exposure, where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. Based on the limits of 20 percent and 80 percent, firms are labelled marginal speculators [frequent speculator] (temporary speculator) when speculating with less [more] (between) than 20 percent [80 percent] (20 percent and 80 percent) of their exposure. The independent variables are the firm characteristics detailed in Table 10. Panel A details our main regression model with one financial characteristic per category firm size and growth, as well as one short-term liquidity indicator and one debt measure. In Panel B, we substitute each variable to ensure consistency in an alternative regression model. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues, the operating cash flow is standardized by total revenues and interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The [short-term] debt ratio captures total [current] liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Panel A: Main regression model

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
Marginal speculators	Base Outcome		
Frequent speculator	Log (total assets)	-0.419	0.029**
	R&D ratio	25.504	0.000***
	Operating CF	-17.027	0.000***
	Debt ratio	4.290	0.021**
	Constant	-0.795	0.698
Temporary speculator	Log (total assets)	-0.366	0.013**
	R&D ratio	15.963	0.000***
	Operating CF	-5.805	0.086*
	Debt ratio	1.186	0.444
	Constant	1.224	0.294
Observations		203	
Pseudo R-squared		0.252	

Panel B: Alternative regression model

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
Marginal speculators	Base Outcome		
Frequent speculator	Log (mkt value)	-0.556	0.000***
	Capex ratio	10.342	0.007***
	Interest coverage	-0.004	0.126
	Debt ratio short-term	6.964	0.000***
	Constant	-0.320	0.742
Temporary speculator	Log (mkt value)	-0.208	0.011**
	Capex ratio	-9.796	0.060*
	Interest coverage	-0.004	0.005***
	Debt ratio short-term	1.105	0.345
	Constant	1.085	0.162
Observations		327	
Pseudo R-squared		0.144	

In the aggregate, the findings substantiate the evidence provided in our logit model and support all three parts of our hypothesis regarding empirical evidence for the convexity theories in FX risk management. A potential point of criticism for the firm classification and the multinomial logistic regression analysis is that it forces the weighted sum of positions into a rigid structure

with the fixed thresholds of 0.2 and 0.8. To mitigate this shortcoming, we alter these thresholds to ensure robustness of our results.

3.4.3.3 Robustness of Results

To ensure the stability of our results, we have already used a main and an alternative regression model with different firm characteristics in both the logit model in Table 12 and the multinomial logit model in Table 14, where the results of the multinomial logit analysis confirm the logit model. Further, our findings from the multinomial logit analysis hinge on the division of our sample into marginal, temporary or frequent speculators. To demonstrate robustness, we use alternative input parameters for the separation of our sample.

First, the firm classification in the multinomial logit analysis into marginal, temporary and frequent speculator was based on the limits of 20 percent and 80 percent due to the findings of Hecht & Lampenius (2018). We alter these thresholds in a sensitivity analysis to the extent of +/- 10 percent. Table 15 reports the resulting estimates, Panel A [B] for the main [alternative] regression model, where we find overall robust evidence for both limits of 30 percent/70 percent and 10 percent/90 percent. For both limit pairs and models, speculation remains to be negatively correlated to *firm size*, positively correlated to *growth* and negatively to *liquidity*, where a higher debt ratio confirms the lower operating cash flow for frequent speculators in relation to marginal speculators. For both limit pairs, the stated relationships are predominantly statistically significant at the 1 percent and 5 percent level with only few exceptions, where Panel A and B complement each other to mitigate the exceptions.

Table 15: Determinants of Speculation – Robustness Checks

This table reports a robustness check of the multinomial logistic regression results of our firm classification as a function of firm characteristics with robust standard errors. The independent variables are the firm characteristics detailed in Table 10. Panel A [B] refers to our main [alternative] regression model detailed in Table 14, and present the outcome of the sensitivity analysis of the firm classification based on the limits of 20 percent and 80 percent to the extent of +/- 10 percent., where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. The dependent variable can take the values marginal speculators, temporary speculator or frequent speculator according to their speculative share relative to total firm exposure, with the marginal speculators classification as base outcome. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues, the operating cash flow is standardized by total revenues and interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The [short-term] debt ratio captures total [current] liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Panel A: Robustness check 'sensitivity analysis' for main regression model

		Limits of 30% and 70%		**Limits of 10% and 90%**	
Dependent Variable	**Independent Variables**	**Coef.**	**p-value**	**Coef.**	**p-value**
Marginal speculators	Base Outcome				
Frequent speculator	Log (total assets)	-0.295	0.066*	-0.244	0.212
	R&D ratio	12.879	0.000***	21.536	0.000***
	Operating CF	-12.409	0.000***	-15.340	0.001***
	Debt ratio	2.541	0.108	4.323	0.036**
	Constant	-0.219	0.895	-2.311	0.347
Temporary speculator	Log (total assets)	-0.412	0.007***	-0.405	0.003***
	R&D ratio	3.851	0.152	5.065	0.081*
	Operating CF	-5.733	0.061*	3.927	0.213
	Debt ratio	0.565	0.719	-1.645	0.308
	Constant	2.220	0.084*	3.589	0.001***
Observations			203		203
Pseudo R-squared			0.170		0.240

Panel B: Robustness check 'sensitivity analysis' for alternative regression model

		Limits of 30% and 70%		**Limits of 10% and 90%**	
Dependent Variable	**Independent Variables**	**Coef.**	**p-value**	**Coef.**	**p-value**
Marginal speculators	Base Outcome				
Frequent speculator	Log (mkt value)	-0.463	0.000***	-0.452	0.000***
	Capex ratio	8.469	0.045**	2.828	0.635
	Interest coverage	-0.002	0.004***	-0.003	0.116
	Debt ratio short-term	5.376	0.000***	5.545	0.000***
	Constant	-0.214	0.807	-0.167	0.878
Temporary speculator	Log (mkt value)	-0.275	0.001***	-0.108	0.137
	Capex ratio	-2.447	0.555	-7.941	0.068*
	Interest coverage	-0.006	0.054*	-0.001	0.003***
	Debt ratio short-term	-0.175	0.885	-0.697	0.484
	Constant	1.324	0.105	1.658	0.026**
Observations			327		327
Pseudo R-squared			0.120		0.091

Second, we reduce the number of categories from three to two and divide our sample in only two homogeneous parts, where we attribute speculation with less [more] than 50 percent of a firm's exposure to a minor speculator [major speculator]. The results are robust for all three

categories *firm size*, *growth* and *liquidity* (Appendix 10 provides the regression results). Overall, the outcomes confirm our main results and we deduce that they are not subject to a particular threshold for the definition of speculation.

Finally, as we observed diverging results with the same dataset but different subperiods for Adam et al. (2017) and Brown et al. (2006), we test for a potential bias originating from our sample period. Consequently, we alter our sample period to check for robustness of our results from both the logit and multinomial logit analysis. We find robust evidence when we for example limit our sample period to the years of 2010 to 2013 or 2012 to 2015 in both the logit and multinomial logit model (Appendix 11 provides the regression results).

3.5 Conclusion

Until present, openly available publications did not enable the identification of corporate speculative activities. If at all, a retrospective determination by means of confidential, private sources could shed some light into the dark. We attempt to overcome this limitation by exploring a unique regulatory setting, where the regulating authority advocates additional disclosures that exceed existing IFRS reporting requirements. These optional recommendations in the realm of FX risk management enable the calculation of firm-, currency-, and year-specific hedge ratios. These hedge ratios allow us to identify speculation as activity that increases or holds currency-specific FX exposure constant and separates it from hedging that reduces currency-specific FX exposure, so we are able to show that it is possible to identify speculative activities related to FX risk management reading public corporate disclosures.

In addition, we focus on the determinants of speculation to help solve the issue of who these speculators are and why they speculate. So far, the empirical literature provides conflicting results on these determinants of corporate speculation. When analysing most recent empirical evidence, we deduce that the heterogenous findings may be the result of different methodologies in defining and determining speculation. Using our hedge ratio classification to distinguish between speculation (increasing or holding currency-specific FX exposure constant) and hedging (reducing currency-specific FX exposure), we provide evidence that frequent speculators are smaller, have more growth potential and are endowed with lower internal resources compared to marginal speculators. These, to our knowledge, unprecedented findings confirm the convexity theories in a corporate FX context.

Finally, the new evidence on the determinants of speculation illustrates the significance of the additionally disclosed FX-information that might facilitate various benefits via an *optional*

supplement. In connection with the result of Sapra (2002), who assumes that firms are endowed with private information and finds that *mandatory* hedge disclosures might induce excessive speculation, future research is required as to whether regulatory improvements via optional or mandatory requirements are more appropriate to avoid incautious risk management activities.

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3.7 Appendix

Appendix 5: Template of Information Requested in the Registration Document

This table presents the recommendations, including a numerical example currency position, detailed by the supervisor of the French financial markets, Autorité des Marchés Financiers (AMF), in position paper n°2009-16. In this guideline document, the AMF has established a so-called 'registration document', which as optional supplement, aims at providing additional information regarding risk management of foreign exchange exposure for various stakeholders. The original document is in French language and not available in English.

Year	Assets* [a]	Liabilities* [b]	Forecasted Exposure (Sales (+) and Purchases (-)) [c]	Exposure Before Hedging [d] = [a] - [b] + [c]	Hedging Instruments (Long (+) and Short (-)) [e]	Exposure After Hedging [f] = [d] + [e]
Currency 1	120	30	10	100	-50	50
Currency 2						
Currency n						
…						
Total	…	…	…	…	…	…

* Mostly in form of FX-trade receivables and FX-trade payables, respectively.

Appendix 6: Examples of Reported FX Information from Registration Documents

Sensitivity to foreign exchange risk

(in thousands of foreign currencies)	2015 US Dollar	Pound sterling	Yen	Canadian dollar	Australian dollar
Trade receivables	204,956	23,954	37,757	8,086	25,210
Trade payables	(184,278)	(14,513)	(786)	(11,607)	(9,105)
Gross balance sheet exposure	**20,678**	**9,441**	**36,971**	**(3,521)**	**16,105**
Estimated forecast sales	458,703	60,781	541,743	30,044	46,381
Estimated forecast purchases	(389,222)	(16,944)	-	-	-
Gross exposure	**90,159**	**53,278**	**578,714**	**26,523**	**62,486**
Foreign exchange derivative instruments	-	-	-	-	-
Forward purchases	11,300	-	-	361	-
Forward sales	(13,200)	(8,482)	(541,743)	(5,974)	(7,600)
Options	-	-	-	-	-
Net exposure	**88,259**	**44,796**	**36,971**	**20,910**	**54,886**

(in thousands of foreign currencies)	2014 US Dollar	Pound sterling	Yen	Canadian dollar	Australian dollar
Trade receivables	174,994	29,570	13,477	10,448	15,458
Trade payables	(177,804)	(16,571)	(534)	(11,999)	(4,329)
Gross balance sheet exposure	**(2,810)**	**12,999**	**12,943**	**(1,551)**	**11,129**
Estimated forecast sales	395,492	56,783	555,000	41,524	27,976
Estimated forecast purchases	(342,031)	(23,750)	-	-	-
Gross exposure	**50,651**	**46,032**	**567,943**	**39,973**	**39,105**
Foreign exchange derivative instruments					
Forward purchases	26,300	-	-	463	-
Forward sales	(4,791)	(19,146)	(555,000)	(14,600)	(2,297)
Options	-	-	-	-	-
Net exposure	**72,160**	**26,886**	**12,943**	**25,836**	**36,808**

NOTE 30 HEDGING OF CURRENCY AND INTEREST RATE RISKS

30.1 Transactions in foreign currency and derivatives

Transactions in foreign currency are converted at the exchange rate prevailing on the transaction date. Receivables and payables are converted at the year-end exchange rate. Resulting gain or loss is recorded in the income statement as operating income or expenses for operating receivables and payables, and under "Other financial income and expense" for other receivables and payables.

Faurecia uses derivative instruments traded on organized markets or purchased over-the-counter from first-rate counterparties to hedge currency and interest rate risks.

They are recorded at fair value in the balance sheet.

30.2 Hedging of currency risks

Currency risks relating to the commercial transactions of the Group's subsidiaries are managed centrally by Faurecia using forward purchase and sale contracts and options as well as foreign currency financing. Faurecia manages the hedging of currency risks on a central basis, through the Group Finance and Treasury department, which reports to Group Executive Management. Hedging decisions are made by a Market Risk Committee that meets on a monthly basis.

Currency risks on forecast transactions are hedged on the basis of estimated cash flows determined in forecasts validated by Executive Management; these forecasts are updated on a regular basis. The related derivatives are classified as cash flow hedges when there is a hedging relationship that satisfies the IAS 39 criteria.

Subsidiaries with a functional currency different from the euro are granted inter-company loans in their operating currencies. Although these loans are refinanced in euros and eliminated in consolidation, they contribute to the Group's currency risk exposure and are therefore hedged through swaps.

The effective portion of changes in the fair value of instruments used to hedge future revenues is recorded in equity and taken to operating income when the hedged revenues are received.

Changes in the fair value of instruments used to hedge trade receivables and payables are recorded as operating income or expense.

The portion of the change in fair value of these hedges that is ineffective (time value of the hedges) is recorded under "Other financial income and expense" together with changes in the fair value of instruments used to hedge other receivables and payables.

AS OF DECEMBER 31, 2015

Currency exposure *(in € millions)*	USD	CZK	CAD	RUB	GBP	PLN	MXN	ZAR
Trade receivables (net of payables)	1.0	(6.5)	0.0	0.0	0.0	(13.1)	0.0	11.1
Financial assets (net of liabilities)*	375.9	0.0	(11.2)	11.7	(53.7)	0.0	0.0	26.6
Forecast transactions**	43.2	(56.3)	(9.1)	37.6	1.2	(135.1)	(57.1)	(18.8)
Net position before hedging	**420.1**	**(62.8)**	**(20.3)**	**49.3**	**(52.5)**	**(148.2)**	**(57.1)**	**18.9**
Currency hedges	(418.7)	58.0	21.9	(40.5)	53.7	140.9	52.3	(26.6)
Net position after hedging	1.4	(4.9)	1.6	8.7	1.2	(7.3)	(4.8)	(7.7)

* *Including inter-company financing.*
** *Commercial exposure anticipated over the next six months.*

AS OF DECEMBER 31, 2014

Currency exposure *(in € millions)*	USD	CZK	CAD	RUB	GBP	PLN	ZAR
Trade receivables (net of payables)	17.2	0.0	0.0	0.0	(1.7)	(16.9)	(0.3)
Financial assets (net of liabilities)*	357.1	0.0	115.6	(3.0)	(68.6)	0.0	34.5
Forecast transactions**	41.4	(59.3)	(9.6)	43.0	20.4	(108.1)	(0.8)
Net position before hedging	**415.7**	**(59.3)**	**106.0**	**40.0**	**(49.9)**	**(125.0)**	**33.4**
Currency hedges	(415.6)	50.7	(109.5)	(2.1)	50.4	117.4	(37.8)
Net position after hedging	0.1	(8.6)	(3.6)	37.9	0.5	(7.6)	(4.3)

* *Including inter-company financing.*
** *Commercial exposure anticipated over the next six months.*

(In millions of euros)	2015	2014
Net interest cost on provisions for pensions and other employee benefits	(25)	(27)
Currency gains (losses)	(6)	(15)
Gains (losses) on commodity derivatives (trading and ineffective portion)	(1)	-
Gains (losses) on interest rate derivatives (ineffective portion)	(1)	(1)
Other	(2)	(3)
Other financial income and expenses	**(35)**	**(46)**

8.3 Risk management policy

A detailed description of the Group's risk management policy is set out in Chapter 2, pages 61 to 74.

8.3.1 Market risks

8.3.1.1 Foreign currency risk

A detailed description of the Group's foreign currency risk management policy is set out in Chapter 2, pages 61 to 74.

Exposure to foreign currency risk

The Group systematically hedges statement of financial position exposure and three-month commercial transaction forecasts. Subsidiaries principally hedge their transactions with Valeo, the parent company, which then hedges net Group positions with external counterparties (leading banks). The corresponding currency instruments are classified in the trading book in accordance with the standard on financial instruments.

For specific, material transactions, the Group also enters into longer-term hedges (based on a budget or contractual period). In this case, it applies hedge accounting rules as permitted by the standard on financial instruments. The principal currency hedging instruments used by the Group are forward purchases and sales of foreign currencies, as well as swaps and options. The principal instruments used by the Group to hedge its foreign currency risk are generally not eligible for hedge accounting within the meaning of IAS 39. Exceptionally, the Group applies hedge accounting to highly probable future cash flows from the date the derivatives are contracted.

In 2015, an unrealized gain of 7 million euros related to these hedges was recognized directly in other comprehensive income. In 2014, an unrealized gain of 17 million euros related to these hedges was recognized directly in other comprehensive income; a portion of this gain was reclassified to operating income during 2015.

The Group set up a cross currency swap in yen for 237 million euros on inception of its 250 million euro syndicated loan taken out to finance Japanese group Niles. This derivative matched the loan in terms of maturity and was not eligible for hedge accounting within the meaning of IAS 39. Portions of this swap were successively repaid in 2013 (35 million euros), 2014 (69 million euros) and 2015 (133 million euros), in line with the repayments of identical amounts by Valeo Japan.

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The Group's net exposure to foreign currency risk based on notional amounts arises on the following main currencies (excluding entities' functional currencies):

	December 31, 2015				December 31, 2014
(In millions of euros)	USD	JPY	EUR	Total	Total
Accounts and notes receivable	91	12	403	506	442
Other financial assets	62	51	70	183	717
Accounts and notes payable	(165)	(33)	(505)	(703)	(701)
Long-term debt	(128)	(10)	(324)	(462)	(443)
Gross exposure	**(140)**	**20**	**(356)**	**(476)**	**15**
Forward sales	(623)	(115)	(92)	(830)	(1,299)
Forward purchases	1,068	170	88	1,326	1,004
Net exposure	**305**	**75**	**(360)**	**20**	**(280)**

In the table above, the EUR column represents the euro exposure of Group entities whose functional currency is not the euro. Exposure arises chiefly on subsidiaries based in Central and Eastern Europe – mainly the Czech Republic – which are financed in euros by Valeo.

At December 31, 2014, the breakdown by currency of the net exposure in the statement of financial position for a negative amount of 280 million euros is as follows:

- a positive amount of 220 million euros relating to the US dollar;
- a positive amount of 20 million euros relating to the Japanese yen;
- a negative amount of 520 million euros relating to the euro.

Appendix 7: Hedge Ratio Properties

This table illustrates properties of the hedge ratio (*HR*) and contains a numerical illustration to demonstrate the combination of FX exposure before hedging (denominator) and the hedging instruments (numerator) in the hedge ratio using the column references introduced in Appendix 5. For illustrative purposes we assume as base scenario a firm with an exposure before hedging in a particular currency of 100 units, i.e., $E^b = 100$. That firm can now take one out of six exemplary, fundamentally different positions that differ in the amount of hedging instruments (H) and the resulting exposure after hedging (E^a), where two of the six positions result in a decrease in risk, two in an increase in risk and two keep the risk at a constant level. Further, it illustrates the hedge ratio range given the six fundamentally different positions.

Hedge Ratio Range:						
	Risk-increasing strategy	Risk-decreasing strategy	Risk-decreasing strategy	Risk-increasing strategy	Risk-constant strategy	Risk-constant strategy
Exposure Before Hedging [d]	100	100	100	100	100	100
Hedging Instruments [e]	-250	-150	-50	50	-200	0
Exposure After Hedging [f]	-150	-50	50	150	-100	100
Hedge Ratio (HR = [e] / [d])	-2.5	-1.5	-0.5	0.5	-2	0
HR:	←			→		
	-∞	-2	-1	0	∞	

Appendix 8: Definition of Variables

Variables	**Description of variables**
Capex ratio	Capital Expenditures / Total Revenues
Quick ratio	(Cash + Short-Term Investments) / Total Current Liabilities)
Debt ratio	Total Liabilities / Total Assets
Debt ratio short-term	Total Current Liabilities / Total Assets
E_t^b	Exposure before hedging in t
HR	Hedge ratio with $HR_t = H_t / E_t^b$ percentage of FX exposure covered by financial instruments
H_t	Hedging instruments in t
Interest coverage	(Pretax Income + Interest Expense) / Interest Expense
Log (mkt value)	Log (Com. Shares Outstanding * Closing Share Price End of Year)
Operating CF	Operating Cash Flow / Total Revenues
R&D ratio	R&D Expense / Total Revenues
Speculation ratio	This variable measures the value-weighted proportion of speculation per firm on a metric scale from 0 to 1, where 0 [1] indicates 100 percent hedging [speculation] with a firm's total FX exposure during the sample period.

Appendix 9: Determinants of Speculation – Logistic Regression with Quick Ratio

This table reports the logistic regression results of our classification of FX derivative positions as a function of firm characteristics with robust standard errors. The dependent variable HR classification can take the values 0 [1] for positions classified as hedging [speculation], where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. The independent variables are the firm characteristics detailed in Table 10. Panel A details our main regression model with one financial characteristic per category firm size and growth, as well as one short-term liquidity indicator and one debt measure. In Panel B, we substitute each variable to ensure consistency in an alternative regression model. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues and the quick ratio is defined as cash and short-term investments over total current liabilities. The [short-term] debt ratio captures total [current] liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Panel A: Main regression model with Quick Ratio

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
HR classification	Log (total assets)	-0.329	0.000***
	R&D ratio	5.712	0.000***
	Quick ratio	-0.340	0.168
	Debt ratio	0.608	0.242
	Constant	1.289	0.009***
Observations	1,097		
Pseudo R-squared	0.127		

Panel B: Alternative regression model with quick ratio

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
HR classification	Log (mkt value)	-0.319	0.000***
	Capex ratio	2.608	0.060*
	Quick ratio	-0.015	0.918
	Debt ratio short-term	1.216	0.006***
	Constant	1.364	0.000***
Observations	1,737		
Pseudo R-squared	0.057		

Appendix 10: Robustness Checks: Reduced Speculation Categories

This table reports the logistic regression results of our firm classification as a function of firm characteristics with robust standard errors. The dependent variable is a binary dummy variable that can take the values minor speculators (0) or major speculator (1) on firm-level according to their speculative share relative to total firm exposure, where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. Based on a limit of 50 percent, firms are labelled minor [major] speculator when speculating with less [more] than 50 percent of their exposure. The independent variables are the firm characteristics detailed in Table 10. Panel A [B] refers to our main [alternative] regression model detailed in Table 12. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues, the operating cash flow is standardized by total revenues and interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The [short-term] debt ratio captures total [current] liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Panel A: Robustness check 'reduced speculation categories' for main regression model

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
Minor/Major Spec.	Log (total assets)	-0.521	0.001***
	R&D ratio	10.043	0.000***
	Operating CF	-5.926	0.021**
	Debt ratio	2.493	0.083*
	Constant	1.333	0.354
Observations	327		
Pseudo R-squared	0.177		

Panel B: Robustness check 'reduced speculation categories' for alternative regression model

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
Minor/Major Spec.	Log (mkt value)	-0.511	0.000***
	Capex ratio	3.609	0.374
	Interest Coverage	-0.002	0.001***
	Debt ratio short-term	3.519	0.001***
	Constant	1.246	0.097*
Observations	327		
Pseudo R-squared	0.177		

Appendix 11: Robustness Checks: Alternative Sample Period

This table reports the (multinomial) logistic regression results of our hedge ratio (firm) classification as a function of firm characteristics with robust standard errors. Panel A [B] refers to our main [alternative] regression model detailed in Table 12, but limits the sample period to the years 2010 to 2013 [2012 to 2015]. Here, the dependent variable is a binary dummy variable that can take the values hedging (0) or speculation (1) on currency position level, where hedging [speculation] refers to risk-decreasing [risk-increasing/-constant] activities. Panel C [D] refers to our main [alternative] regression model detailed in Table 14, but limits the sample period to the years 2010 to 2013 [2012 to 2015]. Here, the dependent variable can take the values marginal speculator, temporary speculator or frequent speculator according to their speculative share relative to total firm exposure. The independent variables are the firm characteristics detailed in Table 10. Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues, the operating cash flow is standardized by total revenues and interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The [short-term] debt ratio captures total [current] liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 8.

Panel A: Robustness check 'sample period' for main regression model with HR classification

		Years 2010 – 2013		Years 2012 – 2015	
Dependent Variable	**Independent Variables**	**Coef.**	**p-value**	**Coef.**	**p-value**
HR classification	Log (total assets)	-0.279	0.000***	-0.399	0.000***
	R&D ratio	4.385	0.000***	6.111	0.000***
	Operating CF	-2.628	0.038**	-1.198	0.394
	Debt ratio	-1.082	0.117	1.467	0.054*
	Constant	-2.222	0.001***	1.312	0.041**
Observations			694		758
Pseudo R-squared			0.100		0.175

Panel B: Robustness check 'sample period' for alternative regression model with HR classification

		Years 2010 – 2013		Years 2012 – 2015	
Dependent Variable	**Independent Variables**	**Coef.**	**p-value**	**Coef.**	**p-value**
HR classification	Log (mkt value)	-0.254	0.000***	-0.326	0.000***
	Capex ratio	0.430	0.812	3.601	0.037**
	Interest coverage	-0.001	0.001***	-0.001	0.093*
	Debt ratio short-term	0.281	0.573*	1.832	0.000***
	Constant	1.407	0.001***	1.212	0.001***
Observations			1121		1180
Pseudo R-squared			0.053		0.071

Panel C: Robustness check 'sample period' for main regression model with firm classification

		Years 2010 – 2013		Years 2012 – 2015	
Dependent Variable	**Independent Variables**	**Coef.**	**p-value**	**Coef.**	**p-value**
Marginal speculators	Base Outcome				
Frequent speculator	Log (total assets)	-0.384	0.095*	-0.478	0.068*
	R&D ratio	25.371	0.000***	26.235	0.000***
	Operating CF	-18.233	0.001***	-16.223	0.001***
	Debt ratio	2.511	0.282	5.551	0.027**
	Constant	0.138	0.958	-1.346	0.646
Temporary speculator	Log (total assets)	-0.421	0.022**	-0.259	0.146
	R&D ratio	15.748	0.000***	16.838	0.000***
	Operating CF	-2.953	0.539	-8.407	0.033*
	Debt ratio	2.880	0.177	-0.357	0.849
	Constant	0.262	0.869	1.611	0.247
Observations			131		141
Pseudo R-squared			0.256		0.260

Panel D: Robustness check 'sample period' for alternative regression model with firm classification

		Years 2010 – 2013		Years 2012 – 2015	
Dependent Variable	**Independent Variables**	**Coef.**	**p-value**	**Coef.**	**p-value**
Marginal speculators	Base Outcome				
Frequent speculator	Log (mkt value)	-0.545	0.000***	-0.575	0.000***
	Capex ratio	10.446	0.023**	10.261	0.020**
	Interest coverage	-0.002	0.063*	-0.003	0.142
	Debt ratio short-term	6.076	0.000***	7.027	0.000***
	Constant	-0.145	0.909	-0.129	0.916
Temporary speculator	Log (mkt value)	-0.205	0.036**	-0.169	0.093*
	Capex ratio	-7.613	0.214	-15.485	0.018**
	Interest coverage	-0.006	0.027**	-0.003	0.006***
	Debt ratio short-term	1.307	0.370	1.031	0.443
	Constant	0.896	0.369	1.077	0.234
Observations			217		224
Pseudo R-squared			0.133		0.160

4 How Do Firms Manage Their Interest Rate Exposure?[49]

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Using new publicly reported data on interest rate (IR) exposure before and after hedging with corresponding hedged amounts, we tackle the complexity of IR risk and examine how firms manage their exposure. We find that assets are an essential component of the IR exposure and that firms predominantly swap from fixed- to floating-rate positions in the short-to medium-term. Based on calculated firm-, year-, maturity-, and currency-specific hedge ratios, we find that 63 [37] percent of IR firm exposure are managed using risk-decreasing [risk-increasing/-constant] strategies. When we attribute these findings to speculative behavior and combine the IR- with currency data, we find that a firm that speculates with IR derivatives does not necessarily speculate with currency derivatives, and that the exposure of frequent speculators is significantly smaller for both IR and currency risk.

Keywords: Corporate Risk Management; Interest Rate Risk; Speculation; Disclosure;

JEL: G32, G38, G39

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4.1 Introduction

"[I]nterest rate risk may be more complex, since identifying a firm's interest rate exposure is not so straightforward" [50]

Faulkender (2005) points out that interest rate (IR) risk is complex, more complex than foreign exchange (FX) or commodity risk, which makes it difficult to determine a firm's interest rate exposure and thus to analyze how firms manage their interest rate risk. A major reason is that interest rate risk comprises two different types of risk, the cash flow and the fair value risk, with important interdependencies. To manage this complexity, the extant literature assumes that firms work toward a target fixed/floating debt structure and hence analyze the mix of fixed- and floating-rate debt as proxy for IR exposure (e.g., Chava & Purnanandam, 2007; Chernenko & Faulkender, 2011; Oberoi, 2018). However, non-financial firms focus, in contrast to banks and financial corporations, on the cash flow risk (Backhaus, 2018)[51] rather than working with a target fixed/floating mix as anecdotal evidence from interviewed treasury executives suggests. Further, the debt-based approach in literature neglects that assets might be an essential component of the IR exposure of non-financial firms.

To analyze the two risk types separately and focus on the cash flow risk for non-financial firms, we exploit a unique regulatory environment that contains publicly reported IR exposure data separately for fixed- and floating-rate positions. Our new, hand-collected dataset further details the firms' exposures before and after hedging with corresponding hedged amounts, which allows us to examine how firms manage their IR exposure based on an unprecedented data granularity. As additional advantage, the dataset also illustrates the composition of the exposure between assets and liabilities, which enables us to test whether the debt-based approach in literature is appropriate or whether assets are an integral part of firms' IR exposure.

Bartram (2002) and Glaum (2011) illustrate the importance of interest rate risk and its management for non-financial firms where hedging the cash flow risk is not the same as hedging the fair value risk. The cash flow risk describes the direct impact of interest rate changes on payments for floating-rate financial assets and liabilities, while the fair value risk represents the

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50 As appeared in the *Journal of Finance* article "Hedging or market timing? Selecting the interest rate exposure of corporate debt" by Faulkender (2005, p. 935).

51 Anecdotal evidence from four consulted treasury executives of major German non-financial corporations, including two DAX-30 firms, confirms this emphasis on the floating-rate interest rate exposure of non-financial firms. Further, our sample firms indicate in their annual disclosures that they focus on the cash flow risk.

effect of interest rate fluctuations on the market value of fixed-rate financial assets and liabilities. Both types can impact the borrowing capacity of a firm (Oberoi, 2018). In addition, the by far most important hedging instrument, i.e., an interest rate swap (Backhaus, 2018; Chava & Purnanandam, 2007), creates interrelations between both risk types: When hedging the cash flow risk by decreasing its floating-rate exposure with swap contracts, this involves a direct increase of its fixed-rate positions, i.e., of the fair value risk. To examine how firms manage their IR exposure, the existing literature assumes a target fixed/floating ratio and analyzes the mix of fixed- and floating-rate debt (e.g., Chava & Purnanandam, 2007; Chernenko & Faulkender, 2011; Oberoi, 2018). For example, Chava & Purnanandam (2007) analyze the determinants of a firm's debt structure using the share of floating-rate debt of total corporate debt as key indicator. Most recently, Oberoi (2018)'s central theme is the choice and trade-off between cash flow and fair value risk. Using the proportion of fixed-rate debt as major element, Oberoi (2018) examines the after-swap mix of fixed- and floating-rate debt of non-financial firms. In order to focus on the relevant cash flow risk, data granularity would be required to isolate the cash flow from the fair value risk and to separately analyze the cash flow risk actions.

With his dataset that takes advantage of the accounting regulations during the 1990s, Oberoi (2018) states that he is able to overcome some of the data limitations in literature. Using actual derivative positions specifying the face value and direction of the derivative instead of proxy variables, Oberoi (2018) combines this information with data on debt positions to analyze how firms modify the mix of fixed- and floating-rate debt with derivative transactions. Far beyond that, our dataset from the 2010s provides – separately for fixed- and floating-rate exposure – information on the actual IR exposure before and after hedging together with the amount of hedging instruments, and further describes the composition of the exposure in terms of assets and liabilities. In addition, the entire information is usually stated separately for maturities up to one year, between one and five as well as beyond five years. This innovative database enables us to analyze entirely new aspects of the interest rate risk management activities of non-financial firms and distinguishes us from the existing literature.

The analysis of the reported data shows that assets are a meaningful ingredient in the interest rate exposure of our non-financial sample firms, in particular for floating-rate positions. In addition, we find that firms use hedging instruments to swap from fixed- to floating-rate positions predominantly in the short-to medium-term. Further, we use the advanced disclosures on the exposure before and after hedging to determine firm-, year-, maturity-, and currency-specific hedge ratios for interest rate risk management activities for both fixed- and floating-rate positions. These hedge ratios enable us to analyze whether firms decrease, increase or keep their

exposure constant with IR derivative transactions. We find that overall 63 percent of IR firm exposure are managed using risk-decreasing strategies, while 37 percent are managed using risk-increasing/-constant strategies, where our sample firms seem to be more risk-taking in the long run.

Next, we relate these findings to speculative behavior in IR risk management, where Oberoi (2018) states that, especially with regard to interest rates, the disentanglement of hedging and speculative activities is too complex to be measured by simple proxies. The granularity of our dataset allows us to help solve this problem of capturing speculation empirically. Following the extant literature that uses the terms hedging [speculation] for risk-decreasing [risk-increasing/-constant] strategies, we label the characteristic values (i.e., risk-decreasing, risk-increasing, risk-constant) of our hedge ratio variable – as simple proxy for hedging and speculative behavior – accordingly. Our analysis of the financial characteristics of IR-speculators indicates that frequent speculators have less growth opportunities and higher short- and long-term liquidity. Similar to the advanced disclosures on IR risk management, the regulatory environment also advocates FX information with similar data granularity (Hecht, 2018).[52] We document that the evidence from interest rates does not match with the result from the FX setting, but it corresponds to Géczy, Minton, & Schrand (2007), who simultaneously analyze the IR- and FX risk behavior of their sample firms, and find no significant overlap between IR- and FX-speculators. To empirically verify potential interdependencies between both risk types, we combine the present IR- with the FX-dataset of Hecht (2018), and find that firms that speculate with FX-derivatives do not necessarily speculate with IR-derivatives. In contrast to Géczy et al. (2007), we find the exposure of frequent speculators to be significantly smaller for both FX and IR risk. Interestingly, we observe that the exposure of firms that frequently speculate with FX risk is short, while the exposure of firms that speculate to a lesser extent is long. For the floating IR risk, we find the opposite: the exposure of frequent speculators is long, whereas marginal and temporary speculators have a short exposure. This suggests that currency speculators could engage in risk-increasing activities to reduce their payments on liabilities, whereas IR-speculators use their floating-rate assets for speculative transactions.

Finally, we examine the interdependency of accounting and derivative usage. Similar to Hecht (2018) for the FX-context, we find speculation to be negatively associated with the probability of applying hedge accounting in an IR-context. However, this correlation between the accounting

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52 Hecht (2018) documents that frequent speculators are smaller, have more growth opportunities and possess lower internal resources, which indicates unprecedented empirical evidence for the theories for optimal speculation (Adam et al., 2007; Campbell & Kracaw, 1999).

policy and speculative elements is merely an indication and not a necessary or sufficient condition for speculation.

We contribute to the literature on corporate interest rate risk management in three ways. First, based on the granularity of our dataset we are able to differentiate between the exposure before and after hedging for fixed- and floating-rate positions across different maturities and currencies and hence contribute to the understanding of how firms manage their IR exposure. Moreover, we demonstrate that assets are an important component of the interest rate exposure of non-financial firms. Second, the granularity of the data enables us to establish a hedge ratio measure that allows discriminating interest rate positions as risk-decreasing, risk-increasing or risk-constant. Following the designation of risk-increasing/-constant positions as speculation in the literature, we are able to provide new evidence on speculative elements in corporate interest rate risk management. Third, by combining the IR- with the FX-dataset of Hecht (2018), we are to our knowledge the first to illustrate dissimilarities between IR and FX speculation based on reported quantitative data.

The remainder of the paper is structured as follows. Section 4.2 illustrates the new level of granularity of our dataset with the sample description and establishes the hedge ratio measure. Section 4.3 analyzes the reported data on IR risk management to illustrate how firms manage their IR exposure. Section 4.4 deals with speculative elements in IR risk management and related activities. Section 4.5 concludes.

4.2 Data and Sample Description

4.2.1 Information Provided in the Registration Document

We examine publicly available accounting data from France due to the prevailing unique regulatory environment, where the regulating authority endorses the publication of advanced disclosures on corporate interest rate risk management that exceed existing IFRS requirements through an optional supplement. In the preparation guidelines (position paper n°2009-16, Autorité des Marchés Financiers, 2009) for this so-called 'registration document'[53], the supervisor of the French financial markets, the Autorité des Marchés Financiers (AMF), recommends enhanced corporate disclosures concerning the management of interest rate risks. Exceeding the specifications of IFRS 7 §33 and 34, firms are requested to provide information on the

[53] For details on the 'registration document' refer to http://www.amf-france.org/en_US/Acteurs-et-produits/Societes-cotees-et-operations-financieres/Document-de-reference.html.

composition of their interest rate risk as well as on their IR exposure before and after management by year and with the differentiation of fixed-and floating-rate positions. Beyond that, most firms also differentiate their specifications by maturity and currency, which is similar to above, voluntary.[54] Table 16 demonstrates the recommended format for the data provision by the AMF with exemplary figures.

Table 16: Template of Information Requested in the Registration Document

This table presents the recommendations, including a numerical example, detailed by the supervisor of the French financial markets, Autorité des Marchés Financiers (AMF), in position paper n°2009-16. In this guidance document, the AMF has established a so-called 'registration document', which, as an optional supplement, is intended to provide additional information on interest rate risk management activities for various stakeholders. The original document is in French language and not available in English.

Year	Financial Assets* [a]		Financial Liabilities* [b]		Exposure Before Hedging [c] = [a] - [b]		Hedging Instruments [d]		Exposure After Hedging [e] = [c] + [d]	
	Fixed Rate	Floating Rate	Fixed Rate	Floating Rate	Fixed Rate	Floating Rate	Fixed Rate	Floating Rate	Fixed Rate	Floating Rate
Less than 1 year	130	…	30	…	100	…	-50	…	50	…
From 1 to 2 years										

More than 5 years										
Total	…	…	…	…	…	…	…	…	…	…

* The issuer specifies in the registration document which financial assets and liabilities have been taken into account.

In detail, firms typically specify separately their fixed- and floating-rate assets (column [a]) and liabilities (column [b]) that are subject to interest rate risk. Further, the registration document contains the netted sum of these figures, i.e., the exposure before hedging for fixed- and floating-rate positions individually (column [c]). Further, the firms provide information on the corresponding hedging instruments (column [d]), that can be long (positive) or short (negative), and the resulting exposure after hedging (column [e]). In addition, the row headers in Table 16 indicate that this information on interest rate exposure is further broken down in terms of maturity, where firms predominantly split into maturities up to one, between one and five as well as beyond five years. To illustrate the structure of the analyzed data, assume a firm that reports 130 units of fixed-rate assets and 30 units of fixed-rate liabilities to be subject to interest rate risk. The netted position of 100 units (130 – 30) is reported as exposure before hedging (E_t^b), which is hedged with corresponding hedging instruments (H_t) of, for example, 50 units. The exposure after hedging results in 50 units (100 + (-50)). Similar to this example with fixed-rate positions,

[54] 63 percent of our sample firms distinguish in their specification between different maturities, predominantly between up to one year, between one and five as well as beyond five years.

the firm reports its floating- rate exposure in the same structure. In addition, both the fixed- and floating-rate interest rate exposure data are usually specified separately for maturities up to one year, between one and five as well as beyond five years, and if applicable, the firm provides this data for other relevant currencies. Appendix 12 provides examples of the reported IR information from the registration documents. Altogether, the reported data in the registration document captures the firm-, year-, maturity- and currency-specific interest rate exposure before and after hedging separately for fixed- and floating-rate positions of our sample firms. This new level of granularity allows us to accurately determine a firm's interest rate exposure and to examine how firms manage their IR exposure from new perspectives.

4.2.2 Hedge Ratio Measure

The detailed information provided in the registration documents enables us to evaluate the IR activities based on hedge ratios. We use the data on the exposure before and after hedging together with the hedged amount to determine firm-, year-, maturity-, and currency-specific hedge ratios for fixed- and floating-rate positions separately. For this purpose, we define a hedge ratio in t (HR_t) as $HR_t = H_t \,/\, \mathrm{E}_t^b$, where H_t denotes the hedging instruments and E_t^b the exposure before hedging in t, so that hedge ratios illustrate the percentage of IR exposure covered by financial instruments. Since both H_t and E_t^b can be positive or negative (i.e., long and short), HR can also take positive and negative values. Note that a long [short] derivative position (H_t) is identified through a positive [negative] sign and that a combination with a positive [negative] exposure before hedging (E_t^b) results in s positive [negative] hedge ratio (HR). In analogy to Hecht & Lampenius (2018), Appendix 13 illustrates this combination of the hedging instruments (numerator) and the exposure before hedging (denominator) in the hedge ratio, where we assume a base scenario with a long exposure before hedging of 100 units, i.e., $E^b = 100$. In dependence on the amount of hedging instruments, Appendix 13 demonstrates numerically the six exemplary, fundamentally different positions a firm may take. Two of these six positions are risk-decreasing, where first hedging short e.g., 50 units with hedging instruments ($H = -50$, $HR = -0.5$) decreases a firm's IR exposure from 100 to 50 units, and second hedging short e.g., 150 units ($H = -150$, $HR = -1.5$) also decreases a firm's IR exposure from 100 to a short exposure of -50 units.[55] Further, we identify two positions that are risk-increasing, where

[55] The overhedging changes the sign of the exposure, which could imply speculative intentions. Similar to Hecht & Lampenius (2018) and Hecht (2018), we can classify such positions as risk-decreasing, since imperfect hedge conditions in the real world also lead to under-/overhedging (Hull, 2015).

first hedging short e.g., 250 units ($H = -250$, $HR = -2.5$) results in a 'higher' short IR exposure (from 100 to -150 units) and second hedging long e.g., 50 units ($H = 50$, $HR = 0.5$) results also in a higher long IR exposure (from 100 to now 150 units). Finally, two positions are risk-constant, where not hedging ($H = 0$, $HR = 0.0$) and hedging short 200 units using derivative instruments ($H = -200$, $HR = -2.0$) keeps the level of exposure constant. Appendix 13 further demonstrates the overall hedge ratio range, where the two risk-constant strategies ($HR = -2$ and 0) mark the limits between risk-decreasing and risk-increasing strategies. While all positive hedge ratios ($HR > 0$) as well as hedge ratios below –2 ($HR < -2$) increase risk, negative hedge ratios between –2 and 0 ($-2 < HR < 0$) decrease risk. This distribution of the different positions illustrates the discontinuous nature of the hedge ratio in relation to the categories of risk-increasing and risk-decreasing. Thus, the interpretation of the hedge ratio is range-dependent. Most importantly, since the information provided in the registration document distinguishes between fixed- and floating-rate positions, we can derive two hedge ratios per year and firm.
Overall, this approach allows us to determine interest rate positions that either decrease, increase or keep IR exposure constant. Such an unprecedented discrimination of hedging activities with derivative transactions in IR risk management is in line with the general literature on corporate risk management. Both Hentschel & Kothari (2001) and Allayannis & Ofek (2001) use stock returns as central risk measure and refer to risk-decreasing [risk-increasing] strategies as hedging [speculation]. Further, Zhang (2009) differentiates between 'effective hedgers' ['ineffective hedgers/speculators'] for firms that [fail to] reduce their risk exposure, where Zhang (2009) compares the risk exposure to an expected risk level. Due to the information content of our dataset, we can rely on actually reported results.[56]

4.2.3 Sample Selection

As the position paper of the AMF with the recommendations and details for the preparation of the registration document dates from December 2009, we start our analysis with the year 2010 and include the period until 2015. Our panel dataset comprises all French firms quoted in the CAC All-Tradable index as of April 2016. The initial sample includes 333 firms, where we exclude 18 financial firms due to their different business model and motivation for derivative usage. For all remaining 315 firms, we hand-collect the reported information on IR-exposure and

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[56] Chava & Purnanandam (2007) also discuss the question of risk-decreasing or risk-increasing for IR only, but in a different context. Chava & Purnanandam (2007) approximate the managerial incentive to decrease [increase] firm risk by the delta [vega] of the CEO's and CFO's stock and option holdings, and show that risk-increasing and risk-reducing incentives of chief financial officers influence the debt structure of firms

corresponding hedged amounts per year, maturity, currency and type of risk (fixed- or floating-rate). Since 178 firms do not have any or no material IR exposure and 69 firm do not report the IR exposure according to the recommendations of the AMF[57], we are able to collect the relevant data for 68 firms (952 firm-year observations). Further, 12 firms provide the required IR information but never hedge. Following Adam et al. (2015), we exclude these to avoid a bias towards firms that never hedge their IR risks, i.e., we only include active hedgers. Our final sample counts 56 firms and 752 firm-year observations across 48 industries (according to the four digit SIC code), where we possess per firm-year observation one specification for fixed-rate and one for floating-rate positions separately. We match this information of our sample firms on IR exposure with interest rate data from Bloomberg (see section 4.3.2) and with firm characteristics from the Compustat Global Vantage database (see section 4.4). To eliminate data outliers, we winsorize the firm characteristics to the 1st and 99th percentile. The hand-collected data on interest rate risk management activities is not winsorized, since all data points are meaningful. We ignore all transaction costs related to hedging activities and assume IR markets to be efficient in the weak sense of informational efficiency (Fama, 1970).

4.3 Empirical Analysis

4.3.1 Analysis of the Reported Data on IR Exposure and its Management

Exposure, not only to interest rate risk, usually has two sides: assets and liabilities, i.e., it can be long or short. For example, following the cash flow risk, a raise in interest rates increases both incoming payments on floating-rate assets and outgoing payments on floating-rate debt. Consequently, the accurate exposure to interest rate risk is the netted position of both assets and liabilities (column [c] according to Table 16). While the extant literature has so far concentrated on the liability side, with a focus on debt issues and the mix of fixed- and floating-rate debt (e.g., Antoniou, Zhao, & Zhou, 2009; Chava & Purnanandam, 2007; Chernenko & Faulkender, 2011; Faulkender, 2005; Oberoi, 2018; Vickery, 2008), the granularity of our dataset enables the differentiation of assets and liabilities. If the liabilities dominate in the exposure before hedging and assets are negligibly small, the debt-based approach would be justified. Otherwise, it could lead to a potential bias. To examine whether assets are an integral part of the IR exposure of

[57] Due to the optional disclosure of the detailed IR data, our results could be subject to a selection bias. In view of the high direct cost of compliance with the guidelines of the AMF, as firms have to provide additional information on their activity, financial situation and prospects in the registration document, we consider the selection bias as not significant.

non-financial firms, we analyze the distribution of assets, liabilities and the exposure before hedging of our sample firms, separately for fixed- and floating-rate positions.

Table 17: Descriptive Statistics of IR Exposure and Hedging Instruments

This table presents descriptive statistics of the (composition of) IR exposure before and after hedging together with associated hedging instruments. The entries correspond to the information requested in the registration document as illustrated in Table 16.

	No. Obs.		Mean		Median		SD		Min		Max	
	Fix	Float	Fix	Float	Fix	Float	Fix	Float	Fix	Float	Fix	Float
Assets	138	354	144.495	869.678	45.782	194.600	265.554	1751.415	0.130	-48.400	1,645	12,307
Liabilities	464	580	1046.438	537.844	186.859	128.809	2152.266	1080.264	-51.000	-26.076	13,741	9,549
Exposure Before Hedging	535	690	-1704.125	-123.337	-123.100	-27.650	6140.531	1566.589	-56,840	-9,250	4,128	11,047
Hedging Instruments	328	477	245.786	-34.597	-20.800	47.400	1787.637	1640.333	-2,900	-22,261	22,261	5,860
Exposure After Hedging*	582	693	-1428.013	-146.616	-100.00	-11.000	5080.528	2181.624	-47,462	-29,604	3,128	10,024

* Due to the fact that not all positions of the exposure before hedging are covered with hedging instruments, the average/median exposure after hedging is not simply the sum of the exposure before hedging and hedging instruments.

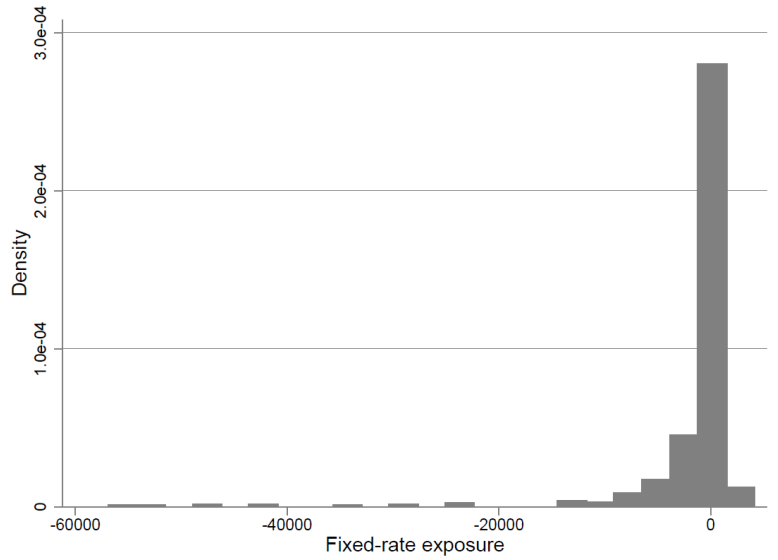
As Table 17 shows, we find average fixed-rate [floating-rate] assets of 144.50 [869.68] million Euros and average fixed-rate [floating-rate] liabilities of 1046.44 [537.84] million Euros, i.e., assets seem to be meaningful, in particular for floating-rate positions. Similarly, the histograms of the exposure before hedging for fixed- and floating-rate positions in Figure 1 confirm that assets are a non-negligible part of the floating-rate exposure. In total, we observe the exposure before hedging for fixed-rate positions to be long [short] and hence mainly driven by assets [liabilities] in 16 [84] percent of the observations, while for floating-rate positions the exposure before hedging is long [short] in 37 [63] percent of the observations. As Table 17 further illustrates, the average exposure before hedging for fixed-rate [floating-rate] positions amounts to -1704.13 [-123.34] million Euros.[58] Overall, these findings demonstrate that – especially for floating-rate positions – assets are an essential component of the interest rate exposure of our non-financial sample firms.

[58] Determining the average exposure before hedging by deducting liabilities of assets is not possible because some firms do not distinguish between assets and liabilities but directly report the exposure before hedging.

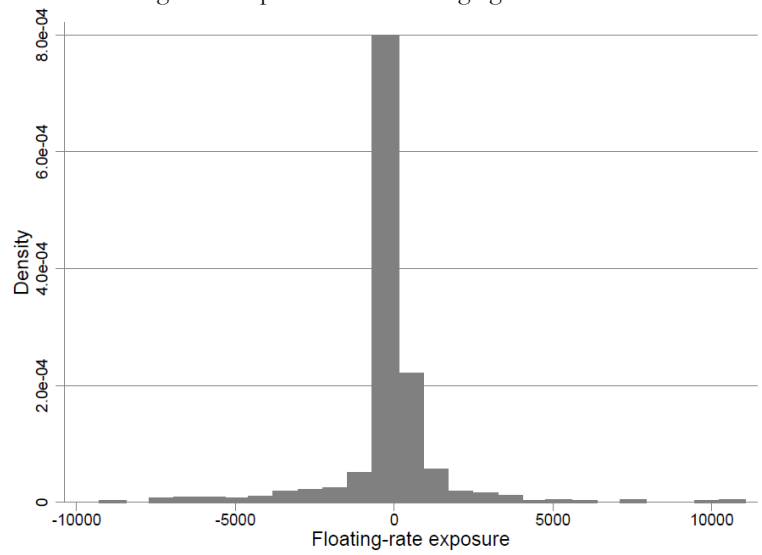
Figure 1: Histogram: Exposure Before Hedging

This figure reports the distribution of the exposure before hedging as detailed in Table 17, where Panel A relates to the fixed-rate exposure and Panel B to the floating-rate exposure.

Panel A: Fixed-Rate Exposure Before Hedging



Panel B: Floating-Rate Exposure Before Hedging



As can be seen from the column 'SD', the standard deviation is quite large and hence indicates a greater variance in the underlying values. Since the median is more robust to outliers, Table 17 includes the median for all positions. Similar to the average values for the exposure before hedging, the median values in Table 17 also show that assets are substantial and that the IR exposure is overall negative, i.e., short for both fixed- and floating-rate positions with -123.10 [-27.65] million Euros. For the hedging instruments, we find a median for fixed-rate [floating-rate] positions of -20.80 [47.40]. This indicates that – based on the median – our sample firms lower [raise] their fixed-rate [floating-rate] exposure, i.e., swap from fixed- to floating-rate positions.

Similarly to the exposure before hedging, the exposure after hedging is also negative in both cases, with a median for fixed-rate [floating-rate] positions of -100.00 [-11.00] million Euros.

Of particular interest is also how firms manage this exposure for different maturities. Following the recommendation of the AMF, the majority of our sample firms disclose their information on interest rate exposure differentiated by maturities of up to one, between one and five as well as beyond five years. This allows us to analyze (the distribution of) assets, liabilities, the exposure before and after hedging as well as the corresponding hedged amounts separately by maturity. To the best of our knowledge, there is no study with access to such data granularity.

Table 18: Maturity Analysis

This table presents the maturity analysis of assets, liabilities, the IR exposure before and after hedging as well as associated hedging instruments, broken down into maturities less than one year, between one and five years and more than five years. The entries correspond to the information requested in the registration document as illustrated in Table 16.

	Assets							
Maturity	No. Obs.		Mean		Median		SD	
	Fix	Float	Fix	Float	Fix	Float	Fix	Float
Less than 1 year	64	169	194.113	1.139.330	59.000	284.550	349.546	2.146.872
Between 1-5 years	36	42	38.939	55.694	10.800	15.900	57.518	115.468
More than 5 years	22	19	79.024	89.950	1.255	54.400	140.732	116.031
	Liabilities							
Maturity	No. Obs.		Mean		Median		SD	
	Fix	Float	Fix	Float	Fix	Float	Fix	Float
Less than 1 year	123	199	349.972	353.733	48.007	109.050	765.549	581.136
Between 1-5 years	141	170	935.143	375.624	316.500	154.400	1591.821	786.346
More than 5 years	92	66	662.083	86.111	222.400	28.500	1.074.062	140.448
	Exposure Before Hedging							
Maturity	No. Obs.		Mean		Median		SD	
	Fix	Float	Fix	Float	Fix	Float	Fix	Float
Less than 1 year	134	207	-98.335	604.706	-5.048	49.394	988.564	1.624.736
Between 1-5 years	149	178	-746.359	-326.989	-220.750	-145.400	1738.518	767.525
More than 5 years	100	84	-558.808	-41.230	-115.000	-9.600	1.059.572	164.758
	Hedging Instruments							
	No. Obs.		Mean		Median		SD	
Maturity	Fix	Float	Fix	Float	Fix	Float	Fix	Float
Less than 1 year	97	135	36.373	41.108	-31.220	42.920	551.721	560.944
Between 1-5 years	98	134	30.615	131.490	-47.727	80.000	816.970	791.377
More than 5 years	22	29	84.643	-116.196	-9.200	7.200	357.282	472.235
	Exposure After Hedging							
Maturity	No. Obs.		Mean		Median		SD	
	Fix	Float	Fix	Float	Fix	Float	Fix	Float
Less than 1 year	156	200	-61.850	653.658	-25.000	127.332	636.758	1.603.871
Between 1-5 years	157	180	-689.143	-225.636	-175.500	-77.000	1349.712	840.485
More than 5 years	100	92	-540.852	-73.358	-125.000	-9.600	1035.7926	300.492

We find clear differences among the analyzed items in terms of the stated maturities. Table 18 reports this maturity analysis separately for mean and median values, where we focus on median values, as they are less vulnerable to outliers. We find that both fixed- and floating-rate assets that are subject to interest rate risk occur predominantly in the short-term, i.e., with a maturity lower than one year. As concerns liabilities, fixed- and floating-rate positions differ: fixed-rate liabilities arise mainly with maturities between one and five as well as beyond five years, while

floating-rate liabilities occur predominantly with a maturity lower than one and between one and five years. This also applies to the exposure before and after hedging. With regard to the utilized hedging instruments, Table 18 illustrates that interest rate hedging predominantly occurs – on median – for both fixed- and floating-rate positions in the short-to medium-term, i.e., with a maturity lower than one and between one and five years. Interestingly, the different leading signs for fixed- and floating-rate positions indicate that our sample firms swap – on median – from fixed- to floating-rate positions. This is in line with Table 17 above, where we also find for the median that the fixed-rate [floating-rate] exposure is decreased [increased] using hedging instruments, i.e., swapped from fixed- to floating-rate positions. A potential explanation for this observed pattern could be that our sample firms finance themselves in long-term fixed-rate position and swap these into floating-rate positions in the short-term to benefit from the historically low interest rates, as one interviewed treasury executive suspected. In line with this behavior, we find in a breakdown by year that the hedging instruments are negative for fixed- and positive for floating-rate positions across all six years.

The granularity of our dataset also allows us to differentiate between the interest rate exposures in different currencies of our French sample firms. By far the most common currency is naturally the EUR, with more than 80 percent (602 observations), followed by the USD with about 10 percent (78 observations) of the positions. The following currencies are in descending order the BRL, JPY, CNY, THB, AUD, INR, CAD and GBP, but account only for very few observations.[59]

4.3.2 Hedge Ratio Analysis

Exposure to interest rates implies two types of risk: first the cash flow risk and second the fair value risk. The cash flow risk refers to the effect of interest rate changes on payments for floating-rate financial assets and liabilities, whereas the fair value risk describes the impact of interest rate changes on the market value of fixed-rate financial assets and liabilities. While recent articles on IR risk management assume that firms work toward a target fixed/floating exposure (e.g., Chava & Purnanandam, 2007; Chernenko & Faulkender, 2011; Oberoi, 2018), anecdotal evidence from indicative interviews with treasury executives shows that non-financial firms take

[59] Few firms also group their remaining exposure in unspecified 'Other Currencies' (27 observations, less than 4 percent of all observations). Appendix 14 explains all currency codes.

particular interest in the cash flow risk and hence floating-rate positions (Backhaus, 2018)[60]. Contrary to the extant literature, the granularity of our dataset allows us to separately evaluate fixed-and floating-rate interest rate exposures and thus to put the focus on the floating-rate positions.

To analyze how firms manage these different interest rate exposures, we examine whether firms increase or decrease their risk with interest rate derivatives. For this purpose, we summarize descriptive statistics of the hedge ratios in Table 19, separately for fixed-rate and floating-rate positions in Panel A and B, respectively. As the previous section indicates, our sample firms swap from fix to floating, i.e., the median for the hedging instruments is short [long] for fixed-rate [floating-rate] positions. To be able to determine whether swapping from fix to floating is risk-decreasing or risk-increasing, we need to take the exposure before hedging into account. As illustrated in Table 17, the exposure for both fixed-rate and floating-rate positions is – on average and median – negative, i.e., this short exposure is then associated with short [long] hedging instruments for fixed-rate [floating-rate] positions. In case of fixed-rate positions, combining the short exposure with short derivative instruments would be risk-increasing, while for floating-rate positions the short exposure combined with long derivative instruments would be risk-decreasing.

This connection of hedging instruments (numerator) and the exposure before hedging (denominator) and is captured in hedge ratios, which we further analyze on a position level. For fixed-rate positions, we find that approximately 26 percent (137 observations) of the positions are risk-decreasing, with approximately the same percentage of positions being risk-increasing (27 percent, 143 observations). The remaining share of approximately 46 percent (242 observations) are risk-constant positions, i.e., the exposure is not hedged. For floating-rate positions, we observe a different allocation. Risk-decreasing positions are now the majority with more than 38 percent (265 observations), while risk-increasing positions account for less than 29 percent (198 observations) and risk-constant positions for 33 percent (228 observations). Overall, these distributions show that the exposure from floating-rate positions is more often decreased than increased, where for fixed-rate positions it is more balanced and rather the

[60] An analysis of our sample firms underlines this assumption. We randomly select 20 of our sample firms to check whether they state the importance of each type of risk in the registration documents. Almost all firms put the emphasis on the cash flow risk, with only one firm indicating that it arbitrates between both types of risk.

opposite applies.[61] This complements the previous finding that our sample firms swap from fix to floating.

Table 19: Descriptive Statistics of Hedge Ratio

This table reports descriptive statistics of the hedge ratio (HR), defined as the percentage of IR exposure covered by financial instruments ($HR_t = H_t / \mathrm{E}_t^b$), where H_t and E_t^b denotes the hedging instruments and the exposure before hedging in t , respectively. Panel A [B] refers to fixed-rate [floating-rate] positions and Panel C presents the combined HR measure with priority given to floating-rate positions. Descriptive statistics are presented separately based on risk-decreasing, risk-increasing, and risk-constant strategies, where we introduce the following classification: (a) risk-decreasing strategies reduce the exposure with $-2 < HR < 0$; (b) risk-increasing strategies raise the exposure with $HR < -2$ or $HR > 0$ and (c) risk-constant strategies keep the exposure constant with $HR = -2$ or $HR = 0$.

Panel A: Descriptive Statistics of Hedge Ratios for Fixed-Rate Positions

Strategy	Hedge Ratio	No. Obs.	Cum. Obs.	Mean	Median	SD	Min	P25	P75	Max
Risk-decreasing	$-2 < HR < -1$	5	5	-1.501	-1.469	0.345	-1.867	-1.808	-1.328	-1.034
	$-1 < HR < 0$	132	137	-0.413	-0.343	0.291	-0.998	-0.645	-0.171	-0.001
Risk-increasing	$HR < -2$	10	147	-326.446	-3.752	1018.735	-3225.806	-6.173	-2.309	-2.090
	$0 < HR$	133	280	7.740	0.570	38.832	0.004	0.118	3.297	412.000
Risk-constant	$HR = 0$	242	522	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Panel B: Descriptive Statistics of Hedge Ratio for Floating-Rate Positions

Strategy	Hedge Ratio	No. Obs.	Cum. Obs.	Mean	Median	SD	Min	P25	P75	Max
Risk-decreasing	$-2 < HR < -1$	34	34	-1.373	-1.274	0.267	-1.876	-1.603	-1.125	-1.001
	$HR = -1$	11	45	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000	-1.000
	$-1 < HR < 0$	220	265	-0.459	-0.446	0.285	-0.998	-0.714	-0.234	-0.002
Risk-increasing	$HR < -2$	43	308	-35.638	-3.670	118.015	-567.000	-9.181	-2.646	-2.026
	$0 < HR$	155	463	9.382	0.823	40.622	0.002	0.182	3.103	390.500
Risk-constant	$HR = 0$	228	691	0.000	0.000	0.000	0.000	0..000	0.000	0.000

Panel C: Combined Hedge Ratio Measure

Strategy	No.Obs.	Percentage
Risk-decreasing	267	35.51
Risk-increasing	216	28.72
Risk-constant	269	35.77
Total	752	100.00

Due to the peculiarities of interest rate risk, we further construct a combined measure of both fixed- and floating-rate positions. The most common instrument to hedge interest rate risk, a swap agreement (Backhaus, 2018; Chava & Purnanandam, 2007), creates reciprocal effects on both the cash flow and fair value risk. For instance, a firm with a cash flow risk orientation aims at reducing its floating-rate exposure and hence swaps floating-rate positions into fixed-rate positions. This decreases the floating-rate exposure (cash flow risk) and increases at the same time the fixed-rate exposure (fair value risk). For this reason, Table 19 Panel C illustrates a joint

61 The descriptive statistics presented in Table 19 Panel A and B illustrate few extreme hedge ratios. These outliers arise when firms swap from e.g., floating-to fixed-rate positions to manage the cash flow risk, but the exposure before hedging of e.g., fixed-rate positions is very small.

measure that considers both fixed- and floating-rate positions, with the focus on floating risk actions consistent with the cash flow risk orientation of non-financial firms. For positions where the hedge ratio for both the fixed and floating part indicates risk-decreasing [risk-increasing] strategies according to Table 19 Panel A and B, the combined measure takes the same value of risk-decreasing [risk-increasing]. In case the hedge ratio for the fixed exposure represents risk-increasing [risk-decreasing] but the hedge ratio for the floating exposure represents risk-decreasing [risk-increasing] strategies, we categorize this position as risk-decreasing [risk-increasing] to give priority to floating-rate positions and thus the cash flow risk.[62]

Using this joint classification scheme, we examine whether the overall interest rate activities of our sample firms are driven by risk-decreasing or risk-increasing strategies.[63] We find that almost 36 [29] percent of the combined interest rate positions can be classified as risk-decreasing [risk-increasing], where the remaining share of almost 36 percent belongs to risk-constant strategies, i.e., the exposure remains unchanged. However, interest rate observations might differ considerably with regard to the amount of exposure, and an observation with an exposure of 0.5 million Euros should not be equally important as an observation with an exposure of 500 million Euros. For this reason, we evaluate the data in relative terms, i.e. we relate the exposure before hedging per interest rate position to overall firm exposure. Consequently, a position of 0.5 million Euros at stake is not given equal weight than a position of 500 million Euros, and we find that overall 63 [37] percent of IR firm exposure are managed using risk-decreasing [risk-increasing/-constant] strategies.

These unique findings from a IR-context relate to the literature, in particular to Zhang (2009), who classifies firms as 'effective hedgers' ['ineffective hedgers/speculators'] if they [fail to] reduce their risk exposure in the area of FX, commodities and IR. While Zhang (2009) makes this distinction according to the development of the risk exposures compared to an expected level, we use actually reported outcomes. Out of 225 sample firms, Zhang (2009) finds that 55 percent (125 firms) reduce their risk exposure, while 39 percent (87 firms) fail to do so. Since the remaining 6 percent (13 firms) are classified as neutral due to ambiguity among the three areas of FX, commodity and IR, a proportion of 55 to 39 percent of risk-decreasing vs. risk-increasing/-constant emerges. Further, Glaum (2002) provides survey evidence that speculative elements are

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62 The argument that a firm focusing on its cash flow risk should only be analyzed using the floating-rate positions is appropriate, but in the absence of observations, a joint examination still allows to evaluate a firm's risk management activities and to foster a holistic view of a firm's IR risk management approach. In addition, floating-rate positions are also the crucial element in the combined measure.

63 We investigated whether only certain firms with specific business models (e.g. with an in-house banking license) have contrarian values. We find this pattern across all firms, maturities and currencies.

more pronounced in IR risk management compared to FX risk management. Glaum (2002) differentiates between selective hedging, i.e., the inclusion of individual views in hedge decisions, and risk-increasing strategies, and finds that both are more prevalent in the realm of interest rates. To test whether the evidence on the basis of reported quantitative IR-data is in line with survey result of Glaum (2002), we relate our findings to the outcome with exclusively FX-data of Hecht & Lampenius (2018). As Hecht & Lampenius (2018) find that firms manage 20 percent of their FX exposure using risk-increasing/-constant strategies while 80 percent of the FX exposure are managed with risk-decreasing strategies, our quantitative analysis shows that risk-increasing/-constant strategies in IR risk management are more pronounced than in FX risk management.

Nonetheless, the observed number of risk-increasing positions (216 observations) requires further investigation. First, defining interest rate risk is a difficult endeavor, as it concerns two unequal types of risk with important interdependencies. To include practical expertise, we interviewed four treasury executives of major German non-financial corporations, including two DAX-30 firms. Besides the finding that non-financial firms focus on the floating-rate interest rate exposure, the interviewed practitioners further reveal that the definition of interest rate risk might not be clear-cut and firm specific. In fact, we have found consistent evidence that the cash flow risk is of particular interest for non-financial firms. However, as the anecdotal evidence indicates, a firm managing its cash flow risk might decide, according to their views on future IR developments, to also (partially) manage the impact of changing interest rates on fair values. In this respect, we have introduced an innovative classification scheme that combines simultaneous fixed- and floating-rate observations. In case when these observations are contrarian, we follow the cash flow risk orientation of non-financial firms and give higher weight to the floating-rate risk component. This approach mitigates a potential ambiguity resulting from the nature of IR risk, but it may also be an error-prone component of our analysis. Second, we point to the recent survey of Gumb et al. (2018) for an explanation of the high amount of risk-increasing observations. In their interview study with 48 French corporate treasurers, they find that their behavior is neither stable nor homogenous: while some treasury officials are willing to increase volatility, other refuse to do so. Since their study covers the same period and about 21 percent of the sample firms overlap with our sample, we consider their results to be highly relevant. Third, as alternative explanation, one interviewed treasury executive indicated that the current strategy of our sample firms could be based on long-term fixed-rate funding that is swapped into floating-rate positions in the short-term to take advantage of the historically low interest rates. One of our sample firms indeed explains its hedging activities in the registration document on the grounds that it intends to profit from the low interest rate level.

Further, we examine whether a firm's hedging behavior differs in terms of currency and maturity. Overall, we identified that about 63 [37] percent of IR firm exposure are managed using risk-decreasing [risk-increasing/-constant] strategies. Analyzed separately for EUR and USD observations, we find that the proportion for EUR [USD] is 63-37 [60-40] percent, i.e., the currency does not seem to influence the hedging behavior. Regarding maturity, we evaluate the proportion separately for maturities less than one, between one and five as well as beyond five years. For medium-term maturities between one and five years, we find exactly the identical proportion of 63 vs. 37 percent for risk-decreasing vs. risk-increasing/-constant strategies as in the overall outcome. For short-term maturities less than one year, we observe an equal distribution of 50 vs. 50 percent, while for long-term maturities beyond five years, we find 19 [81] percent of IR firm exposure are managed using risk-decreasing [risk-increasing/-constant] strategies, i.e, firms are more risk-taking in the long run.

Finally, we evaluate whether the level of interest rates affects the hedging behavior of our sample firms, because anecdotal evidence indicates that firms try to benefit from the historically low interest rates. Since our dataset contains interest rate exposures with mainly EUR observations[64], we analyze the potential impact of EURIBOR changes on the choice of risk-decreasing vs. risk-increasing/-constant strategies. Similar to Chernenko & Faulkender (2011) we use the 3-month EURIBOR as indicator, since commercial loans with floating interest rates are often tied to this benchmark. For the period of 2010 to 2015, we observe the average 3-month EURIBOR to increase from 0.81 to 1.39 in 2011 and then decrease to -0.02 in 2015. We find, however, that the proportion of risk-decreasing vs. risk-increasing/-constant strategies is rather stable during our sample period, with most of the values close to the percentages of 63 and 37 and maximum deviations of +/- 10 percent.

In summary, we find assets to be an essential ingredient in the interest rate exposure of our non-financial sample firms, which is predominantly short for both fixed- and floating-rate positions, and where our analysis indicates that using hedging instruments, firms swap from fixed- to floating-rate positions. Further, while the taken positions with derivative instruments are predominantly risk-decreasing, we find that a considerable part of positions increase IR exposure. We do not observe that the choice of these differing strategies depends on specific years and interest rate levels, but firms seem to have a bigger risk appetite in the long run.

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64 78 observations (10 percent) are denoted in USD. An analysis per year is not feasible due to insufficient observations per year.

4.4 Speculation in Interest Rate Risk Management and Related Activities

4.4.1 Speculation in General

"We have also seen that, in the case of interest rates, hedging or speculative behavior is too complex to be captured by a simple proxy such as active swap usage or the level of variation in the share of fixed rate debt"[65]

In his analysis on active swap usage and the extent of variation of the after-swap mix, Oberoi (2018) concludes that separating hedging and speculation in IR risk management is too complicated to be solved with simple proxies. In a broader sense, his conclusion is observable in the literature. While sufficient evidence demonstrates the relevance of speculative elements in several areas of corporate risk management practices, most of the empirical attention was devoted to commodity (e.g., Adam et al., 2015, 2017; Brown et al., 2006), and FX risk (Beber & Fabbri, 2012; Hecht & Lampenius, 2018). Very few empirical evidence comes from corporate interest rate risk, in spite of survey outcomes (Bodnar, Marston, & Hayt, 1998; Glaum, 2002) that indicate speculative activities in this area. What are the reasons for the meagre attention and findings of speculation in corporate interest rate risk management? As Oberoi (2018)'s quote suggests, the complexity of interest rate risk with its differing sub-categories of cash flow and fair value risk as well as important interdependencies make it more difficult to analyze than FX or commodity risk. Using the granularity of our dataset, we are able to calculate firm-, year-, maturity- and currency-specific hedge ratios for both fixed- and floating-rate positions separately and hence classify a firm's overall interest rate activities as risk-decreasing, risk-increasing or risk-constant. Following the literature that often uses the terms 'hedging' and 'speculation' for risk-decreasing and risk-increasing/-constant strategies, respectively (Allayannis & Ofek, 2001; Géczy et al., 2007; Hentschel & Kothari, 2001; Zhang, 2009; see section 2.2), we denominate these positions accordingly. Our hedge ratio measure could hence be a potential proxy for speculative behavior in the complex environment of corporate IR risk management.

4.4.2 Financial Characteristics of Speculators

The identification of speculative, risk-increasing activities is linked to the questions of who these speculators are and why they engage in speculative actions. As until now it has been very difficult to capture speculation in the realm of interest rate risk management, the financial characteristics

[65] As appeared in the *Journal of Banking and Finance* article "Interest rate risk management and the mix of fixed and floating rate debt" by Oberoi (2018, p. 83).

of speculators remain vague in the literature. Based on survey data on FX and IR risk, Géczy et al. (2007) denominate speculation as risk-increasing activity and distinguish between frequent, sometimes and non-speculators in their analysis, in which they find that frequent speculators are larger and have lower leverage than non- or sometimes speculators. To our knowledge, only the analysis of Chernenko & Faulkender (2011) focuses exclusively on interest rates and sheds light on the characteristics of firms that speculate as opposed to those who hedge. In the decomposition analysis of their panel data, Chernenko & Faulkender (2011) assume for each of their sample firms a stable target share of fixed-rate debt to separate hedging from speculation and argue that the cross-sectional component examines the hedging part of interest rate swap usage, whereas the time-series variation delivers insights on a firm's speculative activities with interest rate swaps. Chernenko & Faulkender (2011) find that hedging of interest rate exposure is clustered among high-investment firm, while speculative elements seem to depend on the structure of executive compensation contracts. Without the assumption of an optimal stable hedge ratio over time, we use our hedge ratio measure to identify speculation as risk-increasing/-constant strategy and distinguish it from hedging (risk-decreasing strategy) to analyze the financial characteristics of speculators and hedgers.

The variables that we examine are chosen according to Géczy et al. (2007) and the theories for optimal speculation of Campbell & Kracaw (1999) and Adam, Dasgupta, & Titman (2007), which describe incentives to increase a firm's risk exposure.[66] Campbell & Kracaw (1999) and Adam et al. (2007) illustrate that a firm's profit function that is convex in investment provides an incentive to speculate. Following this convexity of investment opportunities, positive speculative outcomes allow for productive investments that would otherwise be abandoned. According to Campbell & Kracaw (1999), this pattern should be observable with firms that exhibit the following characteristics: high cost of asymmetric information [size][67], important growth opportunities [growth] as well as meagre internal resources [liquidity]. Following Adam et al. (2017) and Géczy et al. (2007) we approximate firm size by the logarithm of total assets (log (total assets) and alternatively by the logarithm of market capitalization (log (mkt value). Similar to Géczy et al. (2007), we measure growth opportunities by the ratio of research and development expenses over total revenue (R&D ratio) and as alternative, following Beber &

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66 Stulz (1996) also provides explanations for speculative positions, such as having specialized information. However, Stulz (1996) points out that such private information would lead to selective hedging rather than speculative, risk-increasing practices. In addition, non-financial firms do most likely not possess a comparative advantage regarding IR risk management.

67 Similar to Adam et al. (2017) and Graham et al. (2001), we presume that informational asymmetry affects smaller firms more than bigger ones and that smaller firms are more constrained in external financing.

Fabbri (2012) by capital expenditures to total revenues (capex ratio).[68] Following Géczy et al. (2007) we measure short- and long-term liquidity with the quick ratio (cash and short-term investments to total current liabilities) and the interest coverage ratio ((pretax income + interest expense) / interest expense), respectively. Further, we investigate the levels of indebtedness, where we follow Géczy et al. (2007) and use the long-term debt ratio with total long-term debt over total assets. All variables are defined in Appendix 14 and Table 20 Panel A presents descriptive statistics of the financial characteristics.

Following the approach of Géczy et al. (2007) with the classification in frequent, sometimes and non-speculators, we similarly categorize firms as either marginal speculator (MS), temporary speculator (TS) or frequent speculator (FS) according to the firm-specific share of speculation ('speculation ratio'). According to section 4.3.2 with the value-weighted proportion of speculation to not evaluate a position of 0.5 million Euros as equal to a position of 500 million Euros, we assess the exposure before hedging relative to overall firm exposure, which means that we calculate the value-weighted proportions of hedging (reducing IR exposure) and speculation (increasing/constant IR exposure) per firm. The resulting 'speculation ratio' ranges from zero to one and shows for a value of e.g., 0.3 that a firm speculates with 30 percent of its total IR exposure. We then classify firms that speculate with less than 37 percent [more than 63 percent] of their exposure as marginal speculator [frequent speculator]. Firms that speculate between 37 percent and 63 percent are labelled temporary speculator, where we overall find a distribution of 34 percent MS, 45 percent FS and 21 percent TS. The limits of 37 percent and 63 percent are the result of the findings in section 4.3.2, where the analysis shows that 63 percent of IR exposure is hedged and 37 percent is speculated with.[69] This approach is in line with Hecht (2018).[70]

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68 Please note that we do not employ the book-to-market-ratio due to potential misinterpretations. Géczy et al. (2007) state off-balance sheet correlations with speculation as possible explanation.

69 In a robustness check, we rule out the possibility that our results depend on these limits. Similar to Hecht (2018), we alter the thresholds in a sensitivity analysis to the extent of +/– 10 percent and find overall robustness. We conclude that our results are not subject to a particular limit for the definition of speculation.

70 Per firm and per year, we typically have several observations that differ in terms of maturity. Since for these observations, the financial characteristics such as firm size are the same for one year and one firm, we drop all duplicate values to rely on one observation per firm and year.

Table 20: Descriptive Statistics of Financial Characteristics (According to Firm Classification)

This table reports summary statistics of the financial characteristics of our sample firms in Panel A as well as the financial characteristics according to our firm classification into marginal speculators (MS), temporary speculator (TS) or frequent speculator (FS) in Panel B. The MS vs. FS [MS vs. TS] {FS vs. TS} column reports the significance level of a Welch's t-test comparing the mean values for marginal speculators versus frequent speculators [marginal speculators vs. temporary speculators] {frequent speculators vs. temporary speculators}. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. For the firm classification, we drop all duplicate values to rely on one observation per firm and year (see section 4.4.2) . Log (total assets) is the logarithm of total assets, log (mkt value) the logarithm of market capitalization, the R&D [Capex] ratio divides the R&D expense [capital expenditures] by total revenues and the quick ratio captures the sum of cash plus short-term investments divided by total current liabilities. Interest coverage is measured by the sum of pretax income plus interest expense, divided by interest expense. The long-term debt ratio captures total long-term debt in relation to total assets. All variables are defined in Appendix 14.

Panel A: Descriptive Statistics of Financial Characteristics

	N	Mean	SD	Min	p25	p50	p75	Max
Log (total assets)	744	8.796	1.542	5.489	7.818	8.873	10.050	12.020
Log (mkt value)	735	8.106	1.687	3.183	7.197	8.479	9.357	11.100
R&D ratio	502	0.047	0.050	0.000	0.013	0.034	0.053	0.260
Capex ratio	742	0.063	0.078	0.005	0.026	0.041	0.069	0.467
Quick ratio	739	0.376	0.368	0.037	0.177	0.298	0.416	2.248
Interest coverage	740	18.870	90.180	-13.510	3.259	6.799	10.620	1,457
Debt ratio long-term	740	0.189	0.115	0.000	0.098	0.170	0.268	0.509

Panel B: Descriptive Statistics of Financial Characteristics According to Firm Classification

	Marginal Speculator (N = 101)		Frequent Speculator (N = 134)			Temporary Speculator (N = 63)			
	Mean	SD	Mean	SD	MS vs. FS	Mean	SD	MS vs. TS	FS vs. TS
Log (total assets)	8.567	1.907	8.714	1.304		9.137	1.302	**	**
Log (mkt value)	7.712	2.082	8.085	1.259		8.428	1.487	**	
R&D ratio	0.057	0.051	0.038	0.058	**	0.042	0.029	**	
Capex ratio	0.075	0.094	0.061	0.083		0.043	0.020	***	**
Quick ratio	0.315	0.263	0.439	0.446	***	0.366	0.224		
Interest coverage	14.590	52.088	42.290	188.204		10.430	14.129		*
Debt ratio long-term	0.208	0.110	0.178	0.120	**	0.213	0.134		*

Across the three groups of speculators, Table 20 Panel B presents descriptive statistics for the financial characteristics. With respect to firm size, frequent speculators seem to be bigger than marginal speculators, but overall the groups do not differ significantly for both of our measures. Regarding growth opportunities, we find that frequent speculators have significantly lower R&D ratios than firms that only marginally speculate. The alternative measure for growth opportunities, the capex ratio, also illustrates this relationship, where only the differences between frequent and marginal speculators are not significant. In terms of liquidity, frequent speculators have significantly higher quick ratios than marginal speculators, which could indicate higher short-term liquidity. Further, the ratios of interest coverage also indicate higher long-term liquidity for frequent speculators, but the differences between the groups are insignificant. In line with Géczy et al. (2007), we also find that the long-term debt ratios of frequent speculators are significantly lower than those of marginal speculators. Overall, our findings on the financial characteristics of speculators are inconsistent with the theoretical explanations for optimal

speculation of Campbell & Kracaw (1999) and Adam et al. (2007). Interestingly, this evidence is not in accordance with the outcome of Hecht (2018), who finds empirical evidence for the theories of Campbell & Kracaw (1999) and Adam et al. (2007) in an FX-context, but it corresponds to Géczy et al. (2007), who identify no significant overlap between firms that frequently speculate with FX derivatives and those with IR derivatives. The next section addresses this combination of IR and FX data, where we link the present IR dataset with the FX-dataset of Hecht (2018) to empirically verify potential interrelations between both risk classes.

4.4.3 Interrelation Between IR and FX Speculation

Due to access to the survey data of Bodnar et al. (1998), Géczy et al. (2007) are in the unique position to simultaneously analyze the IR and FX risk behavior and potential interdependencies of their sample firms. In this respect, two major findings are that firms focus on either IR or FX speculation, and that the initial exposure of frequent FX-speculators is bigger compared to non- and sometimes speculators. Parallel to the recommendations for extended disclosures concerning the management of interest rate risks, the AMF provides similar guidelines for the reporting of FX risk management activities (Hecht & Lampenius, 2018; Hecht, 2018). By combining both datasets, we can, similar to Géczy et al. (2007), jointly analyze the IR and FX risk activities of our sample firms. We merge our IR-dataset with the FX-dataset of Hecht (2018) and find that 37 firms are identical in both samples.

We address the findings of Géczy et al. (2007) based on the survey outcome of 1998 with our empirically observed data between 2010 and 2015. First, Géczy et al. (2007) identify overall 13 frequent speculators and find that firms tend to focus on either FX or IR speculation. In particular, they document that two-third (six out nine firms) of their identified FX-speculators cannot be characterized as frequent IR-speculators, and conclude that firm specialize in either FX or IR speculation. Following the classification scheme of the previous section 4.4.2 into marginal, temporary or frequent speculator, we identify overall 21 frequent speculators (of which 7 [17] for FX [IR]), where 57 percent [82 percent] of the frequent FX [IR] speculators cannot be described as such for the other risk category. Altogether, we observe that 26 of the 37 firms (70 percent) change their classification and only 11 (30 percent) stick to the same behavior. In total, the analysis of our quantitative data shows that a firm that speculates with currency derivatives does not necessarily speculate with interest rate derivatives.

Second, Géczy et al. (2007) analyze the size of the exposure of frequent speculators compared to non- and sometimes speculators. They document that firms that frequently speculate with FX derivatives have a significantly higher exposure than firms that do not or only sometimes

speculate with FX derivatives, where they measure exposure as the percentage of operating revenues and costs denominated in foreign currencies. In an IR-setting, they do not find such a pattern. We also address this outcome with our combined FX- and IR dataset using the exposure before hedging stated in the registration documents. Contrary to the survey findings, we find that the exposure before hedging of frequent speculators is in absolute numbers significantly smaller than of marginal and temporary speculators for both FX and IR risk, where a t-test shows that the differences between the groups are significant at the 1 percent significance level.

Interestingly, we observe that frequent FX-speculators have on average a negative, i.e., short exposure of -38.47 million Euros, whereas marginal and temporary speculators exhibit a positive, i.e., long exposure of 48.37 and 83.14 million Euros, respectively. A contrarian differentiation is visible for the floating interest rate exposure: While the average exposure before hedging of frequent speculators is long (182.21 million Euros), the average exposure of marginal and temporary speculators is short with -401.83 and -253.74 million Euros, respectively. A possible interpretation is that frequent FX-speculators try to reduce their payments on liabilities with risk-increasing activities, while frequent IR-speculators use their floating-rate assets (mainly cash and cash equivalents) for speculative purposes. For the fixed interest rate exposure, the average exposure before hedging is short for frequent, marginal and temporary speculators (-844.50, -2907.68 and -1805.90 million Euros, respectively).

4.4.4 Speculation and Hedge Accounting

Another aspect that is associated with speculation is hedge accounting (HA). This accounting practice allows both underlying positions and related hedges to be treated as one item in order to offset their gains and losses in financial statements. We report our results on the relation between speculation and hedge accounting, which has not been well studied in the literature. To our knowledge, Hecht (2018) was the first to analyze potential correlations of the accounting policy with speculation. His motivation to examine this relationship was based on ambiguous statements in annual corporate disclosures, where speculation is explicitly regarded as part of the hedging policy but hedge accounting requirements would not be met. In his FX setting, Hecht (2018) finds that firms that do not apply hedge accounting are more likely to speculate more than firms that apply hedge accounting. He points out that this relationship is a mere indication and it cannot be regarded as necessary or sufficient condition for the evidence of speculation.

To examine the relationship between speculation and hedge accounting in the realm of IR risk management, we conduct a similar analysis. Survey evidence from the U.S. as well as Germany together with Switzerland indicates that 25 percent and 28 percent of the corporate sample firms

refrain from the application of hedge accounting, respectively (Glaum & Klöcker, 2011; Kawaller, 2002). Hecht (2018) shows in an FX-environment that in France 26 percent of the firms do not apply hedge accounting. For our present IR-dataset, we find that 21 percent (12 out of 56) of our non-financial sample firms can be characterized as non-HA-adopters. We introduce a dummy variable 'hedge accounting' that takes the value of one if a firm applies hedge accounting and zero otherwise. Since IAS 39 can restrict the designation of derivative instruments and contexts as hedging relationships, we classify a firm as hedge accounting user if it predominantly applies hedge accounting. In a logit regression analysis with robust standard errors, the 'hedge accounting' variable represents the dependent variable, and as independent variable, we include the 'speculation ratio', i.e., the value-weighted proportion of speculation per firm. Similar to section 4.4.3, the 'speculation ratio' ranges from zero to one, where a value of 0.3 indicates that a firm speculates with 30 percent of its overall IR exposure. According to Glaum & Klöcker (2011), we further control for firm size, growth opportunities and leverage. We use the logarithm of total assets (log (total assets)) for size, and capital expenditures over total revenues (capex ratio) for growth opportunities.[71] Following Glaum & Klöcker (2011), we employ the debt ratio (total liabilities over total assets) as approximation for leverage.[72]

71 We use the capex ratio as proxy for growth opportunities due to its greater availability in the databases for our sample firm compared to the alternative R&D ratio. The outcome with the R&D ratio is very similar and only contains fewer observations.

72 Since the variables 'hedge accounting' and 'speculation ratio' remain constant per firm over time, we drop all duplicated values to rely on one observation per firm to not bias the results. For the control variables such as firm size or growth opportunities, we use the latest reporting data of the sample period, i.e., 2015. Due to non-availability of data for capital expenditures, we lose two firms.

Table 21: Hedge Accounting – Logistic Regression

This table reports the logistic regression results of the application of hedge accounting as a function of firm characteristics with robust standard errors. The dependent variable 'hedge accounting' takes the value of one if a firm applies hedge accounting and zero otherwise. The independent variables are defined as follows: The 'speculation ratio' measures the value-weighted proportion of speculation per firm on a metric scale from 0 to 1, where 0 [1] indicates risk management [speculation] with a firm's total IR exposure. Log (total assets) is the logarithm of total assets, the capex ratio divides the capital expenditures by total revenues and the debt ratio captures total liabilities in relation to total assets. *, ** and *** denote significance at the 10 percent, 5 percent and 1 percent level, respectively. All variables are defined in Appendix 14.

Dependent Variable	**Independent Variables**	**Coef.**	**p-value**
Hedge accounting	Speculation ratio	-7.708	0.024**
	Log (total assets)	2.333	0.000***
	Capex ratio	-0.022	0.996
	Debt ratio	-2.002	0.631
	Constant	-9.855	0.001***
Observations		54	
Pseudo R-squared		0.546	

As show in Table 21, the extent of speculation is associated with the application of the hedge accounting. In detail, we find that a one-unit increase in the variable 'speculation ratio' correlates with a decrease of 7.71 in the relative log odds of being a HA-user compared to a non-HA-user, significant at the 5 percent threshold. In other words, firms that do not apply hedge accounting are more likely to speculate more than firms that apply hedge accounting. This negative relationship between speculation and the probability of applying hedge accounting confirms the findings of Hecht (2018) in an IR-environment. We emphasize again that this link to hedge accounting is not a necessary or sufficient condition for speculation. Further, we observe a statistically significant correlation between firm size and hedge accounting. We find that firms that do not apply hedge accounting are presumably smaller than hedge accounting users, significant at the 1 percent level. This pattern is in line with Glaum & Klöcker (2011) who also associate the usage of hedge accounting with bigger firm size.

4.5 Conclusion

We approach the complexity caused by two different subcategories of interest rate risk with the new degree of granularity of our hand-collected dataset. This unprecedented level of detail provides actually reported data on IR exposure before and after hedging, separately for fixed- and floating-rate positions. We find – especially for floating-rate positions – that assets are an integral part of the interest rate exposure of our non-financial sample firms, who mainly swap from fixed- to floating-rate positions in the short-to medium-term. Further, based on the advanced disclosures on IR exposure before and after hedging, we calculate firm-, year-, maturity-, and currency-specific hedge ratios. Our unique findings indicate that 63 percent of IR

firm exposure are managed using risk-decreasing strategies and 37 percent are managed using risk-increasing/-constant strategies, where firms appear to have a higher risk appetite in the long-term.

Following the extant literature's designation in 'hedging' ['speculation'] for risk-decreasing risk-increasing/-constant strategies, we find that IR-speculators possess less growth opportunities and higher short- and long-term liquidity. According to the survey outcome of Géczy, Minton, & Schrand (2007), we combine the IR-dataset with the FX-dataset of Hecht (2018) to empirically examine potential interrelations between both risk types. We find that IR-speculators do not necessarily speculate with FX-derivatives and that the exposure of frequent speculators is significantly lower for both IR and FX risk. Moreover, for frequent FX-speculators we document a short exposure, while non-frequent speculators have a long exposure. In contrast, the floating-rate exposure of frequent IR-speculators is long, while non-frequent speculators exhibit a short exposure. This indicates that frequent FX-speculators could try to decrease their payments on liabilities with risk-increasing activities, while frequent IR-speculators use their floating-rate assets for speculative transactions.

4.6 References

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4.7 Appendix

Appendix 12: Examples of Reported IR Information from Registration Documents

The net interest rate position of manufacturing and sales companies is as follows:

		31 December 2015			
(in million euros)		Intraday to 1 year	2 to 5 years	Beyond 5 years	Total
Total assets	Fixed rate	354	145	427	926
	Variable rate	11,025	-	-	11,025
Total liabilities	Fixed rate	-	(2,382)	(1,686)	(4,068)
	Variable rate	(3,266)	-	-	(3,266)
NET POSITION BEFORE HEDGING	**FIXED RATE**	**354**	**(2,237)**	**(1,259)**	**(3,142)**
	VARIABLE RATE	**7,759**	**-**	**-**	**7,759**
Derivative financial instruments	Fixed rate	(470)	(61)	-	(531)
	Variable rate	531	-	-	531
NET POSITION AFTER HEDGING	**FIXED RATE**	**(116)**	**(2,298)**	**(1,259)**	**(3,673)**
	VARIABLE RATE	**8,290**	**-**	**-**	**8,290**

Operational currency risk:

The Group's international operations expose it to currency risks bearing on transactions carried out by affiliates in a currency other than their operating currency (transaction accounting risk).

In all cases, it is Group policy to invoice end customers in the functional currency of the distributing entity. Exposure to exchange rate risk on invoicing between producer and distributor affiliates is managed *via* a monthly payment centralisation procedure involving most countries with freely convertible and transferable currencies and whose internal legislation allows this participation. This system hedges against net exposure using forward exchange contracts.

Residual risk is partially hedged using financial derivatives (forward purchases, forward sales or options) to hedge certain or highly probable non-Group operating receivables and payables.

In addition, the Group may use firm or optional hedges with the aim of reducing the impact of currency fluctuations on its operating activities in some Brand Companies that make significant purchases in currencies other than the euro – especially USD, GBP or SEK – or in order to secure the payment of dividends back to the parent.

Management of interest rate risk

At 30 June 2015, the Pernod Ricard group's debt comprised floating-rate debt (mainly the syndicated loan and other bank loans) and fixed-rate debt (mainly bonds), in addition to a hedging portfolio including swaps in EUR and USD.

The Group cannot guarantee that these hedges will prove sufficient, or that it will be able to maintain them on acceptable terms.

Schedule of floating-rate debt and hedging in EUR *(notional value in millions of euros)*

At 30.06.2015 *In euro million*	< 1 year	> 1 year and < 5 years	> 5 years	Total
Total assets (cash)	69	-	-	69
Total floating-rate liabilities	(548)	(424)	-	(972)
NET FLOATING-RATE DEBT BEFORE HEDGING	(479)	(424)	-	(903)
Derivative instruments	(717)	478	533	294
NET FLOATING-RATE DEBT AFTER HEDGING	(1,197)	54	533	(610)

Schedule of floating-rate debt and hedging in USD *(notional value in millions of euros)*

At 30.06.2015 *In euro million*	< 1 year	> 1 year and < 5 years	> 5 years	Total
Total assets (cash)	51	-	-	51
Total floating-rate liabilities	(265)	(43)	(48)	(356)
NET FLOATING-RATE DEBT BEFORE HEDGING	(213)	(43)	(48)	(305)
Derivative instruments	1,430	(363)	(1,430)	(363)
NET FLOATING-RATE DEBT AFTER HEDGING	1,217	(407)	(1,478)	(668)

Analysis of the sensitivity of financial instruments to interest rate risks (impact on the income statement)

A 50 bp increase or decrease in (USD and EUR) interest rates would increase or reduce the cost of net financial debt by €4 million.

Analysis of the sensitivity of financial instruments to interest rate risks (impact on equity)

A relative fluctuation of +/-50 bp in interest rates (USD and EUR) would generate an equity gain or loss of approximately €46 million as a result of changes in the fair value of the derivatives documented as cash flow hedges (swaps).

Analysis of the sensitivity of financial instruments used to hedge risks related to farm raw materials (impact on equity)

At 30 June 2015, the sensitivity of the portfolio was not significant.

Counterparty risk in financial transactions

The Group could be exposed to counterparty default *via* its cash investments, hedging instruments or the availability of confirmed but undrawn financing lines. In order to limit this exposure, the Group performs rigorous selection of counterparties according to several criteria, including credit ratings, and depending on the maturity dates of the transactions.

However, no assurance can be given that this rigorous selection will be enough to protect the Group against risks of this type, particularly in the current economic climate.

8.3.1.3 Interest rate risk

The Group's interest rate risk management policy is described in Chapter 2, section 2.1.4, page 72.

Exposure to interest rate risk

The Group may use interest rate swaps to convert the interest rates on its debt into either a variable or a fixed rate, either at inception or during the term of the loan. Cash and cash equivalents are mainly invested in variable-rate instruments. Debt is essentially at fixed rates.

The interest rate derivatives used by the Group to hedge changes in the value of its fixed-rate debt are designated as fair value hedges under IAS 39. These derivatives are remeasured at fair value in the statement of financial position, with changes in fair value taken to income. For the effective portion of the hedge, the impact on income is offset by a symmetrical revaluation of the hedged item.

On August 5, 2009, the Group set up an interest rate swap to hedge the variable-rate interest on its EIB loan. In June 2015, two interest rate swaps were issued to hedge variable interest on the private placements. The fair value of these derivatives is initially recognized in the statement of financial position, with subsequent changes in fair value taken to other comprehensive income until the hedged interest falls due. In 2015, changes in the fair value of these swaps had a positive impact of 3 million euros on other comprehensive income.

At the end of the reporting period, the Group's net interest rate position based on nominal values can be analyzed as follows:

2015

(In millions of euros)	Less than 1 year		1 to 5 years		More than 5 years		Total nominal amount		
	Fixed portion	Variable portion	Fixed portion	Variable portion	Fixed portion	Variable portion	Fixed portion	Variable portion	Total
Financial liabilities	46	558	457	47	724	-	1,227	605	1,832
Loans	-	-	-	(1)	-	-	-	(1)	(1)
Cash and cash equivalents	-	(1,725)	-	-	-	-	-	(1,725)	(1,725)
Net position before hedging	**46**	**(1,167)**	**457**	**46**	**724**	**-**	**1,227**	**(1,121)**	**106**
Derivative instruments	156	(156)	-	-	-	-	156	(156)	-
Net position after hedging	**202**	**(1,323)**	**457**	**46**	**724**	**-**	**1,383**	**(1,277)**	**106**

2014

(In millions of euros)	Less than 1 year		1 to 5 years		More than 5 years		Total nominal amount		
	Fixed portion	Variable portion	Fixed portion	Variable portion	Fixed portion	Variable portion	Fixed portion	Variable portion	Total
Financial liabilities	51	334	490	370	724	-	1,265	704	1,969
Loans	-	-	-	(1)	-	-	-	(1)	(1)
Cash and cash equivalents	-	(1,497)	-	-	-	-	-	(1,497)	(1,497)
Net position before hedging	**51**	**(1,163)**	**490**	**369**	**724**	**-**	**1,265**	**(794)**	**471**
Derivative instruments	56	(56)	57	(57)	-	-	113	(113)	-
Net position after hedging	**107**	**(1,219)**	**547**	**312**	**724**	**-**	**1,378**	**(907)**	**471**

Analysis of sensitivity to interest rate risk

At December 31, 2015, 75% of long-term debt is at fixed rates (72% at December 31, 2014).

Fixed-rate debt carried at amortized cost is not included in the calculation of sensitivity to interest rate risk. The Group's exposure to interest rate risk therefore arises solely on its variable-rate debt.

The tables below show the pre-tax impact on income and other comprehensive income of a sudden 1% rise in the interest rates applied to variable-rate financial assets and liabilities, after hedging:

(In millions of euros)	December 31, 2015		December 31, 2014	
	Income Gain (loss)	Equity Gain (loss)	Income Gain (loss)	Equity Gain (loss)
Impact of a 1-point change in interest rates	11	-	12	3

Similarly, at December 31, 2015, a sudden 1% fall in interest rates would have the opposite impacts for the same amount.

locally. Significant investments are decided at the level of Management (buildings, plant and machinery, significant R&D projects) financed partially through borrowing or lease financing by the entity concerned. ACTIA Automotive S.A., as the head of the Automotive division, sometimes finances major capital expenditure programs for its subsidiaries (for example, a telematics equipment investment for ACTIA Nordic).

In 2015, in response to the sharp increase in interest rates by banks in Brazil and, for several months, the Group has decided to carry the short term financing needs of the structure from France and provide it with the funds required to cover its operating activity, through current account advances from its parent company. In this way, significant savings will be achieved in terms of bank interest starting in 2016 (approximately €250,000).

Lastly, the Group benefits from cash surpluses at certain subsidiaries, and has established bilateral treasury management agreements.

To date, ACTIA Automotive S.A. has signed master agreements for cash pooling with its subsidiaries ACTIA Systems (Spain), I+Me ACTIA (Germany), ACTIA Italia (Italy) and ACTIA PCs (France) to optimize surplus cash flows within the Group. In 2015, ACTIA Automotive S.A had cash of €1,900,000 originating from its subsidiaries:

- ACTIA PCs: €900,000,
- ACTIA I+Me: €1,000,000

At December 31, 2015, a balance of €1.0 million remained available for ACTIA Automotive S.A. and will be largely repaid in the first half of 2016.

Similarly, ACTIA Telecom executed a bilateral cash pooling agreement with its parent company ACTIA Group S.A. for €3.0 million, with €2.0 million used at December 31, 2015.

It should be noted that the purpose of these cash pooling agreements is to make use of available cash within the Group to limit recourse to short-term financing facilities and in this way reduce financial expenses. As such, they do not involve the transfer of bank loans to the subsidiaries.

Note 25.6 Market risks

- Interest rate risk

The Company has conducted an analysis of its interest rate risk. Figures obtained from this analysis are provided below:

(€ thousands)	Financial assets* (a)		Financial liabilities* (b)		Net position before hedging (c) = (a) - (b)		Interest rate risk hedges (d)		Net position after hedging (e) = (c) + (d)	
	Fixed rate	Variable rate	Fixed rate	Variable rate	Fixed rate	Variable rate	Fixed rate	Variable rate	Fixed rate	Variable rate
< 1 year	138,025		62,867	62,906	75,158	<62,906>	21,000	<21,000>	54,158	<41,906>
1 to 2 years	3,239		7,412	9,789	<4,173>	<9,789>			<4,173>	<9,789>
2 to 3 years	3,292		6,384	6,942	<3,092>	<6,942>			<3,092>	<6,942>
3 to 4 years	3,708		4,984	4,097	<1,276>	<4,097>			<1,276>	<4,097>
4 to 5 years			2,975	1,207	<2,975>	<1,207>			<2,975>	<1,207>
> 5 years	789		2,370		<1,582>	0			<1,582>	0
Total	**149,053**	**0**	**86,992**	**84,943**	**62,060**	**<84,943>**	**21,000**	**<21,000>**	**41,060**	**<63,943>**

* Detailed information on financial assets and liabilities is provided in Note 11 to the consolidated financial statements.

At Group level, the control is carried out on the breakdown of total interest rate risk to ensure that interest expense on bank remains at a reasonable levels.

EXPOSURE TO EURO INTEREST RATE RISK

An interest rate swap was taken out to convert the fixed rate payable on the new €200 million bond issue carried out in first-half 2014 and maturing in April 2024 to a floating rate.

These swaps are eligible for fair value hedge accounting.

(In € millions)	Dec. 31, 2014 Fair value	Notional amount (in €)	Less than 1 year	1 to 5 years	More than 5 years	Dec. 31, 2015 Fair value	Notional amount (in €)	Less than 1 year	1 to 5 years	More than 5 years
Interest rate swaps										
Fixed-for-floating	14	200	-	-	200	11	200	-	-	200
TOTAL	14					11				

For the €200 million bond issue, changes in the fair value of the hedging instrument and the hedged item within the scope of this hedge are recognized in "Financial income (loss)" as follows:

(In € millions)	Dec. 31, 2014	Dec. 31, 2015
Change in fair value of hedging instrument	14	(2)
Change in fair value of hedged item	(14)	2
IMPACT OF FAIR VALUE INTEREST RATE HEDGES ON PROFIT	-	-

Exposure to euro interest rate risk before and after hedging:

Dec. 31, 2014 (In € millions)	Current Fixed rate	Current Floating rate	Non-current Fixed rate	Non-current Floating rate	Total Fixed rate	Total Floating rate
Interest-bearing financial liabilities	15	1,327	265	394	280	1,721
Other financial assets	-	118	-	113	-	231
Cash and cash equivalents	51	1,276			51	1,276
Net exposure before hedging	(36)	(67)	265	281	229	214
Derivatives[1]	-	-	(200)	200	(200)	200
Net exposure after hedging	(36)	(67)	65	481	29	414

(1) Notional amount.

Dec. 31, 2015 (In € millions)	Current Fixed rate	Current Floating rate	Non-current Fixed rate	Non-current Floating rate	Total Fixed rate	Total Floating rate
Interest-bearing financial liabilities	19	725	247	369	266	1,094
Other financial assets	-	114	-	67	-	181
Cash and cash equivalents	40	1,420			40	1,420
Net exposure before hedging	(21)	(809)	247	302	226	(507)
Derivatives[1]	-	-	(200)	200	(200)	200
Net exposure after hedging	(21)	(809)	47	502	26	(307)

(1) Notional amount.

EXPOSURE TO USD INTEREST RATE RISK

The interest rate on the Group's February 9, 2012 issue of USD 1.2 billion in senior unsecured notes on the US private placement market (USPP) has also been partially converted to a floating rate. At their inception, floating-rate borrower/fixed-rate lender USD swaps were set up on the 10-year and 12-year tranches, for USD 540 million and USD 505 million, respectively. The 7-year tranche for USD 155 million has been kept at a fixed rate.

These swaps are eligible for fair value hedge accounting.

(in € millions)	Dec. 31, 2014 Fair value	Notional amount (USD)	Less than 1 year	1 to 5 years	More than 5 years	Dec. 31, 2015 Fair value	Notional amount (USD)	Less than 1 year	1 to 5 years	More than 5 years
USD interest rate swaps										
Fixed-for-floating	15	1,045	-	-	1,045	24	1,045	-	-	1,045
TOTAL	15					24				

Changes in the fair value of the hedging instrument and hedged item within the scope of this hedge are recognized in "Financial income (loss)" as follows:

(in € millions)	Dec. 31, 2014	Dec. 31, 2015
Change in fair value of hedging instrument	51	9
Change in fair value of hedged item	(51)	(9)
IMPACT OF FAIR VALUE INTEREST RATE HEDGES ON PROFIT	-	-

Exposure to USD interest rate risk before and after hedging:

Dec. 31, 2014 (in USD millions)	Current		Non-current		Total	
	Fixed rate	Floating rate	Fixed rate	Floating rate	Fixed rate	Floating rate
Interest-bearing financial liabilities	29	145	1,212	-	1,241	145
Other financial assets	39	86	-	-	39	86
Cash and cash equivalents	161	83			161	83
Net exposure before hedging	(171)	(24)	1,212	-	1,041	(24)
Derivatives[1]	-	-	(1,045)	1,045	(1,045)	1,045
Net exposure after hedging	(171)	(24)	167	1,045	(4)	1,021

(1) Notional amount

Dec. 31, 2015 (in USD millions)	Current		Non-current		Total	
	Fixed rate	Floating rate	Fixed rate	Floating rate	Fixed rate	Floating rate
Interest-bearing financial liabilities	81	53	1,231	-	1,312	53
Other financial assets	40	102	11	-	51	102
Cash and cash equivalents	176	64			176	64
Net exposure before hedging	(135)	(113)	1,220	-	1,085	(113)
Derivatives[1]	-	-	(1,045)	1,045	(1,045)	1,045
Net exposure after hedging	(135)	(113)	175	1,045	40	932

(1) Notional amount

Appendix 13: Hedge Ratio Properties

This table illustrates properties of the hedge ratio (HR) and contains a numerical illustration to demonstrate the combination of the hedging instruments (numerator) and FX exposure before hedging (denominator) in the hedge ratio using the column references introduced in Table 16. For illustrative purposes we assume as base scenario a firm with an exposure before hedging of 100 units, i.e., $E^b = 100$. That firm can now take one out of six fundamentally different positions that differ in the amount of hedging instruments (H) and the resulting exposure after hedging (E^a), where two of the six positions result in a decrease in risk, two in an increase in risk and two keep the risk at a constant level. Further, it illustrates the hedge ratio range given the six fundamentally different positions.

	Hedge Ratio Range:					
	Risk-increasing strategy	Risk-decreasing strategy	Risk-decreasing strategy	Risk-increasing strategy	Risk-constant strategy	Risk-constant strategy
Exposure Before Hedging [c]	100	100	100	100	100	100
Hedging Instruments [d]	-250	-150	-50	50	-200	0
Exposure After Hedging [e]	-150	-50	50	150	-100	100
Hedge Ratio (HR = [d] / [c])	-2.5	-1.5	-0.5	0.5	**-2**	**0**
HR:	-∞	**-2**	**-1**	**0**	∞	

Appendix 14: Definition of Variables

Variables	**Description of variables**
Capex ratio	Capital Expenditures / Total Revenues
Debt ratio	Total Liabilities / Total Assets
Debt ratio long-term	Total Long-Term Debt / Total Assets
E_t^b	Exposure before hedging in t
HR	Hedge ratio with $HR_t = H_t / E_t^b$ percentage of FX exposure covered by financial instruments
H_t	Hedging instruments in t indicated by derivative instruments reported
Interest coverage	(Pretax Income + Interest Expense) / Interest Expense
Log (mkt value)	Log (Com. Shares Outstanding * Closing Share Price End of Year)
Quick ratio	(Cash + Short-Term Investments) / Total Current Liabilities)
R&D ratio	R&D Expense / Total Revenues
Speculation ratio	This variable measures the value-weighted proportion of speculation per firm on a metric scale from 0 to 1, where 0 [1] indicates 100 percent hedging [speculation] with a firm's total IR exposure.

Currency Codes:

AUD	Australian dollar	GBP	Pound sterling
BRL	Brazilian real	INR	Indian rupee
CAD	Canadian dollar	JPY	Japanese yen
CNY	Chinese renminbi	THB	Thai baht
EUR	Euro	USD	United States dollar

5 Conclusion

Contemporary corporate risk management with its diverse facets and categories commonly involves the usage of derivative instruments. Most of the relevant empirical literature originates from commodity risk management, even though the most important risk categories in terms of derivative usage are FX and IR risk. Empirical evidence in these areas is rare and often relies on alternative indicators of derivative usage due to a limited availability of adequate data. We close this gap in the literature and introduce two innovative datasets – one for FX and one for IR risk – from the unexplored regulatory environment in France. Based on an unprecedented data granularity with advanced exposure and derivative usage information, we examine the preeminent topics on the relevance and the determinants (together with the identification) of speculative activities in corporate FX and IR risk management in three empirical papers.

Chapter 2 focuses on how firms manage their FX exposure. Regarding the composition of FX exposure, we find the exposure before hedging to be predominantly long, i.e., driven by FX-receivables and forecasted FX-sales, which is on average [median] hedged to about 90 [49] percent with mostly short derivative instruments.

Regarding the relevance of speculative elements, we evaluate whether firms decrease, increase or keep their FX exposure stable with derivative instruments and find that about 61 percent of the taken currency positions can be classified as risk-decreasing and about 39 percent as risk-increasing/-constant. Instead of solely evaluating the number of occurrences, we further relate the exposure before hedging per currency position to overall firm exposure and find that approximately 80 percent of total FX exposure are managed using risk-decreasing strategies and 20 percent of total firm exposure are managed using risk-increasing/-constant strategies.

We further address the documented impact of prior outcomes on hedging decisions with the informational advantage of our FX dataset. We find supportive evidence that in response to benchmark losses, management hedges significantly more of its exposure and adjusts the hedge ratio closer to its benchmark. In addition, we analyze whether the impact of prior hedging outcomes is subject to the choice of risk-decreasing vs. risk-increasing strategies. With our finding that previous benchmark losses are only considered in risk-increasing strategies, where the exposure is again decreased following prior benchmark losses, but not in risk-decreasing strategies, we complement the growing literature on the relevance of prior hedging outcomes.

In **chapter 3**, we first examine whether the advanced disclosures in FX risk management of our dataset enable the identification of speculation reading openly available corporate publications. For the first time, the detailed information on FX exposures before and after hedging with corresponding hedged amounts allows for the calculation of firm-, currency-, and year-specific hedge ratios to quantitatively identify speculation as activity that increases or keeps currency-specific FX exposure constant reading public corporate disclosures.

As anecdotal evidence suggests, this identification of speculation entails several advantages, such as raising the inhibition threshold to engage in speculative activities, providing a new informational base for share- and stakeholders as well as enabling unprecedented benchmarking and competitor analyses for the corporate environment.

In a qualitative analysis, we find that the application of hedge accounting correlates with the extent of corporate speculation. This connection, however, is not a necessary or sufficient condition, but only an indication for speculation.

Further, we examine the determining factors of speculative activities and find that frequent speculators are smaller, possess more growth opportunities and have lower internal resources. While several theories for speculative behavior have been tested empirically several times, our findings indicate unprecedented empirical evidence for the convexity theories in an FX environment.

Chapter 4 examines how firms manage their IR exposure with the differing subcategories of cash flow and fair value risk. When analyzing the structure of the interest rate exposure, we find that assets are a significant component, especially for floating-rate positions. Further, the advanced IR risk reporting includes IR exposure data before and after hedging separated for different maturities. We observe that our sample firms use derivative transactions to swap from fixed- to floating-rate positions mainly in the short-to medium-term.

Similar to FX risk, we evaluate the relevance and determinants of speculation in IR risk management. We observe that speculative elements are more pronounced in IR compared to FX risk management when finding that 63 percent of IR firm exposure are managed using risk-decreasing strategies, whereas 37 percent are managed using risk-increasing/-constant strategies.

Contrary to the results in the FX setting, we observe frequent IR-speculators to have less growth opportunities and higher short- and long-term liquidity. We finally combine the FX and IR dataset to examine potential interactions. We find that firms seem to specialize in either FX or

IR speculation and that the exposure of frequent speculators is significantly smaller for both risk categories.

In summary, we provide unprecedented empirical evidence on speculative elements in corporate risk management that adds the perspectives of FX and IR risk to the growing discussion and literature. As a useful extension to our analyses, future research could examine whether, in addition to firm characteristics, managerial characteristics on executive level influence the observed risk management behavior.