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R&D and Future Stock Returns:

A Study of Sweden in the Noughties Under IAS 38

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ABSTRACT

Our study aims at assessing the association of research and development (R&D) expenditures with future stock returns. This analysis is drawn from the debate on the existing or absent future benefits related to investments in R&D and the difference between capitalized (treated as assets) R&D and expensed (treated as costs) R&D. This is done in the light of the accounting standards RR 15 and IAS 38. Perhaps the most unique aspect of RR 15/IAS 38 and our study is that before the implementation, capitalization was not required but optional. This optionality leads to a "blurring effect". Potential capitalizers could be found among "true" expensers and too few firms capitalized. Our approach leads to a "purer" way of studying the effects of capitalized and expensed R&D. Our main finding is that unlike the majority of other studies, concerning R&D and especially capitalized R&D, we find an economically and statistically significant negative relationship between capitalized R&D and future three to five year holding period returns. This is still robust when we control for high-intensity R&D industries, such as high-tech industries and bio-tech industries, as well as for the financial crisis that followed the Lehman bankruptcy. The finding questions the investor's ability to evaluate the impact of capitalized R&D under IAS 38.

Keywords: R&D, Future Returns, Capitalization, IAS 38, RR 15

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I. Introduction

A subject to much debate today relates to whether there prevails an association between expenditures for research and development (R&D) and future benefits of firms. A majority of the previous research provide findings supporting that R&D outlays are positively related to future stock returns (for example Chan et al., 2001; Sougiannis, 1994; Zhao, 2002; Chauvin and Hirschey, 1993; Han and Manry, 2004; Chan et al., 2007; Hirschey, 1977). The resource based view states that the reason to why R&D intensive firm benefit from greater positive returns is due to them, independently of the external environment, focus their resources on activities matching their competencies, scale and scope (for example Chan et al., 2007; Wernerfelt, 1984; Peteraf, 1993; Vincente-Lorente 2001). The previous research have mostly been carried out in the US, and another commonly discussed reason for the positive returns related to R&D spending is the conservative accounting standards of the US GAAP (Generally Accepted Accounting Principles). This standard requires all R&D expenditures to be expensed, i.e. treated as costs as they incur, assuming that there are no future benefits associated with the expenditures. This, it is argued makes the assessment of firm value complicated for investors (for example Chan et al., 2001; Lev and Sougiannis, 1996; Chamber et al., 2002). A consequence may be stock prices that are initially depressed and later rebounds, as the future R&D benefits are realized (Aboody and Lev, 1998).

The effects of R&D activity on returns and firm value are, as indicated in the US case, highly dependent on the accounting treatment of the R&D expenditures. Another important aspect of R&D research, hence, is how the R&D expenditures should be reported to best reflect the value of firms (for example Lev and Sougiannis, 1996; Callimaci and Landry, 2004; Cazavan-Jeny and Jeanjean, 2006; Chan et al. 2007). The R&D expenditures can either be all expensed, as is the case in the US. Another alternative is to capitalize the R&D expenditures, treating them as assets. The options available to firms for treatment of R&D expenditures depend on the accounting standard prevailing in the country. Expensing of R&D expenditures is the only alternative in the US, under the standards of US GAAP. Capitalization of R&D expenditures fulfilling certain criteria, involving for instance probability of future benefits, is optional in many countries and was common in the EU prior to 2005. Under these standards managers have the choice to capitalize R&D spending according to their own judgment. In 2005 the International Financial Reporting Standards (IFRS) standard, IAS 38 for treatment of R&D expenditures was adopted in the EU and is today implemented or to be implemented in 100 countries. IAS 38 mandates capitalization of all R&D expenditures meeting certain criteria, for example measurable future benefits.

Following the above reasoning the first objective of our study is to examine the association of R&D expenditures with future stock returns. Furthermore, in the light of IAS 38 and its mandatory capitalization of R&D spending, fulfilling the corresponding criteria, we study future stock returns in relation to R&D expenditures that have been either capitalized or expensed.

In order to assess these research questions we use very recent R&D data from listed firms in Sweden between 2002 and 2012 with 985 firm-year observations. Unlike many previous studies, an advantage with our study is that we have access to real data on R&D expenditures, including specified data on capitalized R&D. Prior studies in the US, where capitalization of R&D spending is not allowed, have used models to calculate an estimated R&D capital with arbitrary amortization rates. Building our study on real data we hence expect to get more accurate results. In addition the Swedish setting provides our study with a unique advantage. As the accounting standard RR 15, preceding IAS 38 in Sweden since 2002, is to the greatest extent corresponding to IAS 38, the Swedish setting allow us with a situation as if IAS 38 had been the standard since 2002. This allows us to study equivalent effects of the IAS 38 implementation for a longer time period. Perhaps the most unique aspect of RR 15/IAS 38 and our study is that before the implementation, capitalization was not required. This optionality of whether to expense or capitalize leads to a "blurring effect". Potential capitalizers were apparent among "true" expensers and there was a lack of capitalizers in the group using the capitalizing approach. Despite this shortcoming few studies have been made under this accounting standard. (Tsoligkas and Tsalavoutas, 2011)

In order look at the relationship between R&D and stock returns we use a modified methodology used by Lev and Sougiannis (1996) and later by Chan et al. (2007). We are also inspired by studies such as Chan et al. (2001) and Chambers et al. (2002) to look at longer period of returns in order to capture the effect of R&D. To estimate firm performance we look at 1-5 year buy and hold stock returns. For the regressions we use a pooled cross sectional OLS approach. The variables we control for are based on previous literature. More specifically we control for both size and book to market (Fama and French, 1992; 1993; 1996). We also control for market risk by using beta. In order to estimate R&D intensity we as a proxy use R&D to market value of equity as used by for example Chan et al. (2001), Chan et al. (2007) and R&D to sales as used by Chan et al. (2001) and al Horani et al. (2003).

Our main finding is that unlike the majority of other studies (for example Aboody and Lev, 1998; Tsoligkas and Tsalavoutas, 2011; Lev and Sougiannis, 1996; Callimaci and Landry, 2004; Chan et al., 2007; Hirschey, 1977; Chauvin and Hirschey 1993), concerning R&D and especially capitalized R&D, we find a statistically significant negative relationship between capitalized R&D and future three to five year holding period returns. This is also robust when we control for high-intensity R&D industries such as high-tech industries and bio-tech industries. With further robustness test controlling for the financial crisis that followed the Lehman bankruptcy, the result is still strong both significantly and economically. The finding questions the investor's ability to evaluate the impact of capitalized R&D under IAS 38. Another finding in our study under RR 15/IAS 38 accounting standard is the disappearance of the statistically and economically strong effect of expensed R&D intensity to stock returns seen in the previous research literature (for example Tsoligkas and Tsalavoutas, 2011; Chan et al., 2007).

As these findings goes against most previous research we believe that the question regarding R&D and stock returns is far from settled and hope that our study can increase the incentives to investigate this matter further. This especially since there is a huge possibility to investigate all the countries in EU following the mandatory implementation if IAS 38 for listed companies in 2005.

II. Accounting Standards

Different Accounting Standards for R&D Expenditures

Accounting standards for the treatment of R&D expenditures differs between countries. R&D expenditures can either be "expensed", i.e. treated as a cost in the profit and loss statement, or "capitalized", i.e. classified as an asset on the balance sheet. The different accounting standards can broadly be characterized into three categories: expensing of R&D, optional capitalization of R&D and required capitalization of R&D.

i) Expensing of R&D

A representative example of the exclusionary expensing is the US GAAP (SFAS N°2), where R&D is to be expensed and cannot be capitalized. This prevails regardless of the probability of future benefits associated with the R&D expense. Only under one circumstance can R&D be capitalized and that is software development cost as defined in SFAS N°86 of the US GAAP.

ii) Optional capitalization of R&D

Under for example the UK GAAP (SSAP 13), the French GAAP (Art. 361-2, PCG 99), the Australian GAAP (AASB 1011) and the Canadian GAAP (CICA, section 3450), R&D expenditures are to be expensed as they incur but can be capitalized if it fulfills certain criteria. Although the definitions of the criteria might differ between countries the fundamental reasoning is the same. Commonly, capitalization of R&D expenditures is an option if all related costs of the project, without reasonable doubt, are expected to be more than covered by the related revenues. Other common criteria of capitalization are that the project concerned is: clearly identifiable; the associated costs can be measured separately; the project has a serious chance of technical success and commercial profitability and the necessary resources of completion exist.

iii) Required capitalization of R&D

Accounting standards in the EU are since January 1, 2005 the same for all listed companies, constituted by the International Financial Reporting Standards, IFRS. The IFRS have been, or is scheduled to be, adopted by more than 100 countries globally. Consequently, all listed companies in the EU must follow the IAS 38 accounting standard regarding accounting for R&D expenditures. Under IAS 38 capitalization of R&D expenditures is mandatory, conditional to certain criteria. The research part of the R&D should always be expensed. In order to capitalize the development expense, a firm should demonstrate: the technical feasibility of completing the intangible asset to enable it to be used or sold; the intention to complete the intangible asset with the ability to use or sell it; how probable future benefits will be generated by the asset; the availability of resources, technical or financial, to complete it and the ability to measure reliably the expenditure attributable during the development of the asset (IAS 38, paragraph 57). Compared to the accounting standards in France, Canada, UK, Australia etc. under the IAS 38 standard there hence is no choice involved regarding the capitalization of R&D expenditures meeting the criteria.

Accounting Standards in Sweden

In Sweden the standard RR 15, accounting for intangible assets, was implemented on January 1, 2002 and has been the standard up until the implementation of IAS 38 in 2005. Prior to the RR 15 in Sweden the BFN R 1 was the standard for accounting of R&D and advocated an optional capitalization of R&D expenditures. The substance of RR 15 is to the greatest extent in line with that of IAS 38. It divides R&D expenditures in a research part that is to be expensed as incurred and a development part that is required to be capitalized if it meets criteria that correspond to IAS 38. Hence in Sweden, even before the implementation of IAS 38, there was no optional capitalization of R&D expenditures meeting the criteria, as opposed to countries like the UK and France.

Table I

Accounting Standards and the Treatment of R&D Expenditures

The table makes a comparison of the different accounting standards commonly referred to in the R&D area of research.

		R&D expensed	R&D capitalized	
	Standard	General rule	Allowed	Optional
US GAAP	SFAS N°2	Yes	No	-
	SFAS N°86 (software)	Yes	Yes, if tech. feasability	Yes
International GAAP	IAS 38	Yes	Yes, with conditions	No
Swedish GAAP (prior -05)	RR15	Yes	Yes, with conditions	No
Australian GAAP	AASB 1011	Yes	Yes, with conditions	Yes
Canadian GAAP	CICA, section 3450	Yes	Yes, with conditions	Yes
UK GAAP	SSAP 13	Yes	Yes, with conditions	Yes
French GAAP	Art. 361-2, PCG 99	Yes	Yes, with conditions	Yes

III. Previous Research

R&D as an area of research has gained interest during the years as the importance of intangible assets has got more substantial. Numerous studies have been performed within the field of finance, as well as accounting, in several countries globally. Using a variety of methodologies a main objective of previous studies has been to assess whether there prevails a relation between R&D activity and firm performance, commonly evaluated as future stock returns.

Two major fields of study within R&D research are distinguishable from the prior research. The first field focuses on the R&D expenditures in relation to future stock returns. These studies commonly aim at assessing if there is a positive relation between R&D intensity and future returns. The other main field of research aims at further evaluating the relation between R&D expenditures and future returns by separating them into capitalized and expensed R&D expenditures. This is done in order to assess the effect on future returns from the respective accounting method.

R&D and Future Stock Returns

Numerous studies have been conducted in order to assess the association of R&D expenditures and future stock returns. Behind this research focus is the debate of the existence or absence of future benefit from R&D activities. A theory supporting the existence of future benefits is the resource based view of firms. Adapted to the R&D context, the resource based view implies that firms mainly focus on their own resources when developing strategies, independent of the external environment (Chan et al., 2007). Accordingly, firms with intensive R&D expenditures should benefit from greater returns as they will only allocate their resources to activities matching the abilities of the firm in terms of for example competencies and scale (for example Chan et al., 2007; Wernerfelt, 1984; Peteraf, 1993; Vincente-Lorente 2001).

There is empirical support for future benefits of R&D intensive firms, as the majority of the studies performed report findings of a positive association of R&D spending and future returns. These studies have been conducted mainly in the United States (for example Lev and Sougiannis, 1996; Sougiannis, 1994; Chan et al., 2001; Ho et al., 2006; Chambers et al., 2002). The studies are based on expensed R&D as a result of the US accounting standard that requires the expensing of all R&D outlays. The results of these studies indicate a positive relation between R&D expenditures and future returns.

A commonly cited study from the US is conducted by Lev and Sougiannis (1996). The authors find in their study a significant association between R&D capital, estimated from expensed R&D with a model, of their sample firms and the subsequent stock returns. The authors argue that this suggests either a systematic mispricing of the shares of R&D-

intensive companies, or that there is a compensation related to an additional market risk factor associated with R&D.

Chambers et al. (2002) confirms the findings of Lev and Sougiannis (1996) with the positive relation between the intensity of R&D investments and future excess returns. Additionally, the focus of their study is at assessing the main underlying reasons of the excess returns given as investor mispricing or risk compensation of R&D. A possible explanation of the positive returns is that the risk related to R&D is not captured entirely by the conventional controls of firm risk and the consequence then is a potential upward bias of the excess returns. According to several other previous studies, the explanation of the positive returns lies in the fact that the US accounting standard, with its compulsory expensing of R&D, fails to recognize the part of the R&D expenditures that might result in future benefits (for example Chan et al., 2001; Lev and Sougiannis, 1996; Chamber et al., 2002). This, it is argued, results in undervalued stocks. When the disregarded benefits of the R&D are realized in the future, the stock price bounces back and brings about positive returns (Aboody and Lev, 1998). This argument is subject to a debate on accounting standards in the US, where opponents of the mandatory expensing of all R&D spending argue that dividing the expenditures into expensed and capitalized R&D is more relevant to firm value and thereby helping investors making correct investment decisions (for example Chan et al., 2001; Lev and Sougiannis, 1996). The further research on the two accounting methods expensing and capitalizing, in order to assess possible effects on return and the value relevance, have been frequently research and can be seen as the other main field of study.

Capitalized and Expensed R&D

In the light of the US situation where the mandatory expensing of R&D outlays is criticized (for example Healy et al., 2002; Kothari et al., 2002; Lev and Sougiannis, 1996; Callimaci and Landry, 2004), research of accounting standards and their prescribed accounting methods have gained interest. The objective has been to assess which type of accounting standard that best incorporates the information given by R&D expenditures. There are several studies performed that aims at addressing the effects on stock returns from the respective method of capitalization and expensing of R&D spending (Aboody and Lev, 1998; Lev and Sougiannis, 1996; Callimaci and Landry, 2004; Cazavan-Jeny and Jeanjean, 2006; Chan et al., 2007). These studies have been performed either in the US with synthetic data on capitalized R&D or in other countries such as France, the UK, Canada and Australia where capitalization of R&D spending has been optional to firms.

Lev and Sougiannis (1996) estimate R&D capital from data on expensed R&D of a large number of firms in the US. In their research design they adjust the earnings and book values of the sample firms for the estimated capitalized R&D and find this to be of value relevance to investors. Value relevance is commonly, in the literature, defined as the association between accounting amounts and security market values.

Callimaci and Landry (2004) in their study of Canadian listed firms investigate whether capitalized R&D provides useful information to market participants and find capitalized R&D to be related to higher stock returns.

Cazavan-Jeny and Jeanjean (2006) study French listed firms in the setting of the French GAAP, which allows for optional capitalization of R&D spending. With real data on R&D capital, rather than estimated from a model as in the US, the authors research how R&D reporting (expensed as incurred or capitalized) is associated with future returns. Contrary to previous studies the authors find a negative relation of capitalized R&D and stock prices and returns.

In contrast to the US situation where all R&D spending are expensed, in an Australian setting where capitalizing R&D is allowed, Chan et al. (2007) study the long-term future returns of firms adopting the different accounting treatments for R&D expenditures, with focus on the intensity of R&D. They employ a large sample of Australian firms and find that firms with higher R&D intensity perform better, regardless of the accounting method used. Additionally they find some evidence that firms expensing R&D outperform firms which capitalize R&D, after controlling for R&D intensity.

A recent focus within this field of research is the perspective of the new accounting standard IAS 38 and its required capitalization of R&D expenditures fulfilling given criteria, in contrast to most previous standards where capitalization is optional. Within this research focus is the discussion of the value relevance and effects on future returns when the choice of capitalization is removed and all expenditures that meet the criteria for capitalization actually are capitalized. Previously, with choice involved, R&D expenditures with predicted future benefits were not necessarily capitalized but could be expensed instead and recent studies focus on the potential effects on returns when the optionality to capitalize has been removed. Despite the recency, studies on capitalized R&D after the transition to IAS 38 have been extremely limited. Presumably an explanation is the lack of data as a result of the absence of capitalization in the US and the optionality of capitalization in many European countries and countries like Australia and Canada.

One recent study by Tsoligkas and Tsalavoutas (2011) is the first, it is argued, to study value relevance of capitalized and expensed R&D succeeding the mandatory transition to IAS 38 in the UK. The authors find that capitalized R&D is significantly and positively related to market values, implying that the R&D expenditures are perceived to have future economic benefits. Expensed R&D the authors find to be significantly negatively related to market values under IAS 38. This supports the idea that expensed R&D should not reflect any future benefits when the possibility of inclusion of capitalized R&D, due to the choice involved in the capitalization, is removed. Finally the authors conclude that there are implications of IFRS on the valuation of R&D expenditure in the UK.

IV. Approach

Research Questions

The purpose of our study is to look at the relationship between R&D activities and future stock returns. More specifically we look at two research questions:

i) How does the intensity of R&D expenditures affect future stock returns?
ii) What is the effect of the two accounting methods, capitalizing and expensing of R&D expenditures, on future stock returns?

The first of our research questions relates to investors' differing opinions on the existing or absent benefits from R&D expenditures. This question aims at assessing the relation between R&D activity and future stock returns, whereas the second question further evaluates this potential relation by considering the value relevance of the expensed and capitalized parts of R&D separately. The second question relates to the debate of accounting standards prescribing expensing of all R&D expenditures as in the US, alternatively allowing for, or even mandating, capitalization of R&D expenditures meeting certain criteria.

Research Characteristics and Advantages

In relation to the previous research we have found an approach with several characteristics, covering areas sparsely treated or absent in prior studies. In our study we are examining R&D expenditures and future stock returns in a Swedish setting and there are five main advantages characterizing our study:

i) Required capitalization of R&D

Perhaps the most unique aspect of our study is that it uses an accounting standard that requires capitalization of R&D. Before the mandatory implementation of accounting standard IAS 38 in EU 2005, Sweden had the RR 15. This standard was basically the same as IAS 38 as it not only allowed for capitalization of R&D but actually required it. Before when capitalization was not required there was a "blurring effect" due to the optionality of whether to capitalize or not to capitalize R&D expenditures. Potential capitalizers, could chose to expense instead of capitalize. This lead to potential capitalizers that was apparent among "true" expensers and a lack of capitalizers existed in the group using the capitalizing approach. With the RR 15 and IAS 38 this choice is removed and. This lead to a new "purer" way of studying the effects of capitalized and expensed R&D. Despite this shortcoming with expensers tainted with capitalizers few studies have been made under this new accounting standard RR 15/ IAS 38.

ii) Access to real data

Unlike the majority of the previous studies, we have access to real data on capitalized R&D expenditures. Since capitalization of R&D spending is not allowed in the US, where most of the studies have been performed, other than for software development costs, these studies are using models generating a measured, synthetic R&D capitalization (see for example Chan et al., 2001; Lev and Sougiannis, 1996; Healy et al., 2002). Using real data in our study we are able to draw conclusions on the true situation of the firms.

iii) Research of the Swedish setting

Our study is carried out using data on R&D spending in Sweden. Research on the association of R&D spending and future stock return in Sweden is very limited. To our knowledge, our study is the largest and most comprehensive on R&D expenditures and future stock returns in Sweden. The only comparable studies are, as far as we know, a couple of MSc papers that either look at shorter time period, time periods not covering the implementation of IAS 38 or use a very small sample of firms with insignificant results.

iv) Conformity of the international standard IAS 38 with RR 15 in Sweden

Sweden as the setting for our study comes with a unique feature when exploring R&D spending and future stock returns. This is the fact that the accounting standard RR 15 for R&D accounting treatment, reigning in Sweden for three years prior to the transition to IAS 38, is to the greatest extent corresponding to IAS 38. This implies that we are not only limited to studying the potential effects of IAS 38 the years succeeding the implementation in 2005, but should actually be able to capture an equivalent effect already at the transition between BFN R 1 and RR 15 in 2002. The transition between BFN R 1 and RR 15 is equivalent to that of RR 15 and IAS 38 since both meant a shift from optional to mandatory capitalization of R&D expenditures fulfilling certain criteria. This implies an additional three years for the potential effects to materialize, which is a substantial advantage as it is commonly argued that R&D investments need several years to be realized.

With the unique circumstance that this brings along, we can contribute with valuable findings on the effects of R&D on stock returns and its value relevance after the important IAS 38 transition. This is otherwise a research area that despite its recency and relevance has been surprisingly sparsely researched, according to previous literature (for example Tsoligkas and Tsalavoutas, 2011).

v) Study covering the noughties

Most previous studies look at data spanning up to the noughties, i.e. the 2000s, or just the beginning of it. Our study is based on very previous data covering the whole time period of the 2000s and is, to our knowledge, the most comprehensive study of R&D and future stock returns during this decade. This time period covers the transition to IAS 38 and also covers a whole business cycle starting with the tech-bubble up to the credit-crunch and its aftermath. Another advantage with our study hence, as a benefit of the longer time period, is that it allows for the R&D to materialize, which has not commonly been the case in previous studies otherwise similar to ours. Another important aspect of covering the 2000s is the increasing importance if intangible assets of a firms balance sheet. The portion of a firm's intangible assets in relation to its tangible assets is ever increasing. That motivates the importance of being able to understand the effect of intangible assets such as R&D on a firm's future stock returns. It also increases the importance of investors being able to value intangible assets correctly.

Hypotheses

Relating to our research questions, our approach and previous research, we state the following hypotheses:

H1: *R&D intensity is associated with positive future stock returns.*

We expect to find a positive relation between future stock returns and intensity in R&D expenditures. This expectation is in line with results from previous studies such as (for example Chan et al., 2001; Sougiannis, 1994; Zhao, 2002; Chauvin and Hirschey, 1993; Han and Manry, 2004; Chan et al., 2007; Hirschey, 1977). According to Chauvin and Hirschey (1993) R&D spending of firms act, just like information on current cash flows, as a help for investors in their formation of expectations regarding future cash flows. This the authors argue that this means R&D spending can be viewed as investment in intangible assets with future cash flows that are predicted to be positive.

H2*: Capitalization of R&D expenditures is highly and positively associated with future stock returns.*

We expect a positive relation of capitalized R&D and future stock returns. According to the criteria of IAS 38 that mandates capitalization, as well as the GAAP standard that allows optional capitalization of R&D outlays, these outlays can be capitalized only if future benefits are predicted. Hence, capitalized R&D is expected to generate future positive cash flows resulting in a positive impact on future returns.

Prior research has, accordingly, shown a positive relation between capitalized R&D and future stock returns (for example Aboody and Lev, 1998; Callimaci and Landry, 2004; Han and Manry, 2004). As our study is performed under the IAS 38 standard we expect all R&D expenditures with probable future benefits to be capitalized and therefore capitalization of R&D should be reflected more accurately and result in even higher positive future returns than previous studies (Tsoligkas and Tsalavoutas, 2011). Also, since there is no option to expense R&D under RR 15 and IAS 38 if the requirements for capitalizing R&D are met, firms who have been potential capitalizers choosing to expense in the past are now included as capitalizers. As more capitalizers with certain positive future benefits are among the capitalizers the impact on stock returns should be greater. Studies reporting a negative relation between capitalized R&D and future returns are rare, although one example is Cazavan-Jeny and Jeanjean (2006) and Cazavan-Jeny et al. (2010). They argue that a possible explanation of the findings is earnings management by managers resulting in investors to react badly.

H3: *Expensing of R&D expenditure is negatively associated with future stock returns.*

We expect to find a negative impact of expensed R&D on future stock returns. The rationale behind this hypothesis is that given the mandatory capitalization of R&D meeting the criteria of among other things measurable and probable future benefits, what remains is R&D expenditures with no predicted future benefits. Hence, expensed R&D should be negatively associated with future stock returns (Tsoligkas and Tsalavoutas, 2011).

This hypothesis goes in line with evidence from previous studies reporting a negative association of expensed R&D and future stock returns (for example Aboody and Lev, 1998; Chan et al., 2007; Tsoligkas and Tsalavoutas, 2011). Some studies indicate a positive association with future returns. However, as these are based on data under accounting standards with optional capitalization of R&D outlays and it can be argued that the positive association might be from R&D expenditures that meet the criteria for capitalization but that managers have chosen not to capitalize and hence these expenditures that should have been capitalized affect the expensed R&D positively. As a consequence of the IAS 38 standard with its mandatory capitalizing of R&D outlays, expenditures that should have been capitalized are removed from the expensed R&D and left are the non-beneficial R&D expenditures. Since there are only pure expensers left with non-certain positive benefits this should have a negative impact on the stock returns on average if you look at the whole sample.

V. Data

Data selection

The data for this study is gathered from two different databases Retriever and Datastream. As data about R&D capitalization is hard to find none of the more established databases such as Datastream, Worldscope, CRSP, Compustat etc. can’t be used. Instead the Swedish database Retriever is used in order to obtain accounting data for the firms included in this study. Thus Retriever is the base for our study. The sample consists of all listed companies in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Year 2002 is chosen as starting year of our study since it was the first year RR 15 became mandatory. To complement the accounting data from Retriever market data regarding stock prices, number of shares and market value of the firms was obtained from Datastream. The total R&D to market value of equity is created by summing both expensed R&D and capitalized R&D from Retriever and thereby dividing it by the market value of equity from Datastream. The expensed R&D to market value of equity is created by dividing expensed R&D from Retriever by market value of equity from Datastream. The capitalized R&D to market value of equity is created by dividing capitalized R&D from Retriever by market value of equity from Datastream. The book-to-market ration is created by dividing the book value of equity from Retriever with the market value of equity from Datastream. The size variable is the market value of equity from Datastream and beta variable is the annual beta from Datastream.

Description of data

The first thing we notice regarding the data sample is that all firms doing some sort of R&D has a mean book-to-market ratio that is in the region 40%-60% compared to non-R&D firm which has a mean book-to-market ratio closer to one. According to Fama and French (1992, 1993, 1996) high book-to-market tend to have a better return than those firms with a lower one. That may point to R&D stocks be considered more glamour stocks that has an expected high growth rate. This may give a hint to that R&D may experience lower mean return compared to value stocks with a high book-to-market ratio.

The second thing we notice with the sample are the extreme outliers in the expensed R&D to sales ratio. This probably affects the mean as well as it is large at almost 500 %. This we control for in the robustness test.

A potential bias with our sample is the survivorship bias as only firm that exist today are in the sample. Potential high returns stemming from this must be considered carefully.

A second potential bias with our sample is that it includes smaller stock list, such as First North NGM for example, than just OMX Large Cap. This creates a potential liquidity problem that may affect the stock prices in the sample.

Table II
Descriptive statistics for the whole sample

This table shows the descriptive statistics (number of observations, mean, standard deviation, minimum value and maximum value) for the variables RDTMV (total R&D to market value of equity), RDES (expensed R&D to sales), RDCMV (capitalized R&D to market value of equity), BtM (book-to-market ratio), MVE (market value of equity) and Beta (annual beta). The sample consists of all listed companies in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Year 2002 is chosen as starting year of our study since it was the first year RR 15 became mandatory.

Variable	N	Mean	SD	Min	Max
All Firms R&D					
RDTMV	985	.1200626	.2224446	.0000216	2.896368
RDES	985	1.248669	27.16679	0	848.2657
RDCMV	985	.0847603	.2117849	0	2.896368
BtM	985	.5634862	.7203814	.0003242	14.19134
MVE	985	1.03e+07	3.91e+07	2540	4.23e+08
Beta	985	.9387711	.8727032	-8.3225	6.921667
Expensing R&D					
RDES	237	4.69202	55.31751	.0002046	848.2657
BtM	237	.5824715	.5162773	.014581	4.038986
MVE	237	1.91e+07	4.02e+07	31990	2.46e+08
Beta	237	1.018587	.6073865	-.1008333	5.076
Capitalizing R&D					
RDCMV	482	.1297714	.2816126	.0000216	2.896368
BtM	482	.5899687	.9110884	.0003242	14.19134
MVE	482	1269250	6913351	2540	8.20e+07
Beta	482	.7941758	1.020133	-8.3225	6.8825
Cap & Exp R&D					
RDES	266	.4433446	1.108247	.0006266	11.32898
RDCMV	266	.0787184	.1115966	.0005605	.7925858
BtM	266	.4985837	.4208203	.0238175	2.804744
MVE	266	1.89e+07	6.21e+07	21850	4.23e+08
Beta	266	1.129668	.7281848	-.1091667	6.921667
Non-R&D					
BtM	1456	.9971932	5.658529	.000276	156.3337
MVE	1456	6783709	2.51e+07	1330	3.84e+08
Beta	1456	.8806106	.7462308	-3.76	8.57375

VI. Methodology

Research design

For our study we use a modified methodology used by Lev and Sougiannis (1996) and later by Chan et al. (2007). We are also inspired by studies such as Chan et al. (2001) and Chambers et al. (2002) to look at longer period of returns in order to capture the effect of R&D. To estimate firm performance we look at 1-5 year buy and hold stock returns. We use returns as it is more interesting from an investor perspective and also in order to deal with potential spurious relationship between stock prices and R&D. By differencing and looking at returns instead of prices we help mitigate this issue. The holding period returns are measured at the end of April each year in order to capture all the effects from the accounting data in the annual reports. We then assume that all the relevant accounting information has been released and taken into account. For the regressions we use a pooled cross sectional OLS approach. The variables we control for are based on previous literature. More specifically we control for both size and book to market (Fama and French, 1992; 1993; 1996). We also control for market risk by using beta. Since the Swedish setting provides us with naturally occurring groups of firms that treat R&D differently, we do not need to use an arbitrary capitalization method as applied by numerous studies performed in the US (for example Chambers et al., 2002; Chan et al., 2001; Chauvin and Hirschey, 1993). In order to estimate R&D intensity we as a proxy use R&D to market value of equity as used by for example Chan et al. (2001), Chan et al. (2007) and R&D to sales as used by Chan et al. (2001) and al Horani et al. (2003). To control for time fixed effects we use year dummies.

Regression for all firms doing R&D

We estimate a pooled cross-sectional OLS model of the form:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDTMV_{it} + \quad YR_{it} + e_{it} \qquad (i)$$

Where,

- HPR_{it} : holding period returns for firm i at the end of April year t
- $Beta_{it}$: CAPM-based beta for firm i as a measure of firm risk for year t
- $lnSize_{it}$: logarithm of the market value of equity for firm i at the end of April year t
- $lnBtM_{it}$: logarithm of the book-to-market value of equity for firm i at the end of April year t
- $RDTMV_{it}$: annual total R&D relative to market value of equity for firm i and year t
- YR_{it} : year dummy as time indicator that takes on value one if an observation is from fiscal year t and zero otherwise

According to our hypothesis H1, we expect $b_4 > 0$ which implies a positive association of total R&D with returns.

Regression for firms both expensing and capitalizing R&D

We estimate a pooled cross-sectional OLS model of the form:

$$HPR_{it} = a + b_1Beta_{it} + b_2lnSize_{it} + b_3lnBtM_{it} + b_4RDES_{it} + b_5RDCMV_{it} + \quad YR_{it} + e_{it} \qquad (ii)$$

Where,

- HPR_{it} : holding period returns for firm i at the end of April year t
- $Beta_{it}$: CAPM-based beta for firm i as a measure of firm risk for year t
- $lnSize_{it}$: logarithm of the market value of equity for firm i at the end of April year t
- $lnBtM_{it}$: logarithm of the book-to-market value of equity for firm i at the end of April year t
- $RDES_{it}$: annual expensed R&D relative to sales for firm i and year t
- $RDCMV_{it}$: annual capitalized R&D relative to the market value of equity for firm i and year t
- YR_{it} : year dummy as time indicator that takes on value one if an observation is from fiscal year t and zero otherwise

According to our hypothesis H2 and H3, we expect $b_4 < 0$ and $b_5 > 0$, which implies a negative association of expensed R&D with returns and a positive association with capitalized R&D.

Regression for firms capitalizing R&D

We estimate a pooled cross-sectional OLS model of the form:

$$HPR_{it} = a + b_1Beta_{it} + b_2lnSize_{it} + b_3lnBtM_{it} + b_4RDCMV_{it} + \quad YR_{it} + e_{it} \qquad (iii)$$

Where,

- HPR_{it} : holding period returns for firm i at the end of April year t
- $Beta_{it}$: CAPM-based beta for firm i as a measure of firm risk for year t
- $lnSize_{it}$: logarithm of the market value of equity for firm i at the end of April year t
- $lnBtM_{it}$: logarithm of the book-to-market value of equity for firm i at the end of April year t
- $RDCMV_{it}$: annual capitalized R&D relative to the market value of equity for firm i and year t

- YR_{it} : year dummy as time indicator that takes on value one if an observation is from fiscal year t and zero otherwise

According to our hypothesis H2, we expect $b_4 > 0$ which implies a positive association of capitalized R&D with returns and.

Regression for firms expensing R&D

We estimate a pooled cross-sectional OLS model of the form:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + \quad YR_{it} + e_{it} \qquad (iv)$$

Where,

- HPR_{it} : holding period returns for firm i at the end of April year t
- $Beta_{it}$: CAPM-based beta for firm i as a measure of firm risk for year t
- $lnSize_{it}$: logarithm of the market value of equity for firm i at the end of April year t
- $lnBtM_{it}$: logarithm of the book-to-market value of equity for firm i at the end of April year t
- $RDES_{it}$: annual expensed R&D relative to sales for firm i and year t
- YR_{it} : year dummy as time indicator that takes on value one if an observation is from fiscal year t and zero otherwise

According to our hypothesis H3, we expect $b_4 < 0$ which implies a negative association of expensed R&D with returns.

VII. Results

Regression results

Table III
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on all firms doing R&D

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on all firms doing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model (1) in the text:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDTMV_{it} + \quad YR_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDTMV_{it}$ is the total R&D relative to the market value of equity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.0653**	0.1074	-0.0579	-0.1709*	-0.1129
	(0.029)	(0.140)	(0.087)	(0.103)	(0.144)
lnBtM	0.0717***	0.1907***	0.2001***	0.2922***	0.3648***
	(0.020)	(0.045)	(0.062)	(0.074)	(0.100)
lnSize	0.0032	-0.0081	-0.0039	-0.0224	-0.0347
	(0.009)	(0.026)	(0.026)	(0.038)	(0.059)
RDTMV	-0.0098	-0.3193	-0.5347	-0.2613	-0.9926
	(0.132)	(0.214)	(0.457)	(1.130)	(0.784)
Constant	-0.4156***	0.2631	0.5307	2.1728***	2.8894***
	(0.133)	(0.327)	(0.397)	(0.732)	(1.058)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	985	832	685	548	433
R-square	0.2566	0.1941	0.2589	0.2174	0.1208

According to our stated hypothesis H1 the effect of total R&D intensity should be positive on future holding period returns. Comparing this to our findings from the regression results in table III we find that is not the case. Instead we find a negative one. This is in contrast to findings from previous research done in the US (for example Ho et al. 2006, 2005; Chan et al. 2001; Lev and Sougiannis 1996) and in Australia (by for example Chan et al. 2007). However, since the coefficient is not significant for any holding period return we can't say anything definite about the results.

Table IV

Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms both expensing and capitalizing R&D

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms expensing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC).). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model (2) in the text:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + b_5 RDCMV_{it} \quad YR_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDCMV_{it}$ is the capitalized R&D relative to the market value of equity and $RDES_{it}$ is the expensed R&D relative to sales. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	-0.0347	-0.1441*	-0.3073**	-0.5464*	-0.8004***
	(0.052)	(0.082)	(0.129)	(0.285)	(0.224)
lnBtM	0.0804*	0.0967	-0.1093	-0.1372	-0.0906
	(0.043)	(0.080)	(0.173)	(0.160)	(0.152)
lnSize	0.0028	0.0074	-0.0350	0.0075	0.0459
	(0.018)	(0.025)	(0.048)	(0.045)	(0.050)
RDES	0.0047	-0.0767*	-0.1678*	-0.2398	-0.1707
	(0.054)	(0.040)	(0.091)	(0.180)	(0.112)
RDCMV	-0.1808	0.4233	2.6897	8.1463	4.3294
	(0.362)	(0.545)	(2.007)	(6.339)	(3.415)
Constant	0.8089***	0.7960**	0.4645	2.2984**	0.3653
	(0.304)	(0.382)	(0.557)	(1.097)	(0.710)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	266	235	200	165	133
R-square	0.3020	0.2934	0.2773	0.2676	0.2510

According to hypotheses H2 and H3 we expect to find a negative relationship between expensed R&D intensity and future holding period returns and a positive relationship between capitalized R&D and future holding period returns. When comparing the regression results from table IV we find that it is in line with the hypotheses when looking at two to five year holding period returns. However the findings are not significant except when looking at the effect of expensed R&D on two and three year holding period returns. Then it is significant on a 10% significance level.

Table V
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms capitalizing R&D

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms capitalizing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model (3) in the text:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDCMV_{it} + \quad YR_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDCMV_{it}$ is the capitalized R&D relative to the market value of equity. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.0823**	0.0002	-0.0493	-0.0718	-0.0526
	(0.037)	(0.051)	(0.053)	(0.065)	(0.092)
lnBtM	0.0627**	0.1506***	0.1542**	0.2566***	0.4252***
	(0.026)	(0.045)	(0.066)	(0.090)	(0.159)
lnSize	0.0073	0.0109	0.0324	-0.0041	0.0127
	(0.018)	(0.036)	(0.050)	(0.078)	(0.108)
RDCMV	0.0391	-0.2047	-0.7861**	-1.2518**	-1.4637*
	(0.159)	(0.213)	(0.394)	(0.517)	(0.820)
Constant	-0.5579**	-0.0054	2.7401***	1.4997	2.2332
	(0.227)	(0.523)	(0.918)	(1.212)	(1.827)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	482	397	318	243	188
R-square	0.2264	0.1809	0.2587	0.2472	0.1323

According to hypothesis H2 we expect to find a positive relationship between capitalized R&D intensity and future holding period returns. When comparing the hypothesis to the regression results in table V we surprisingly find the opposite to be true. Capitalized R&D intensity has a negative relationship on two to five year holding period returns. This is statistically significant on a 5% significance level for three and four year holding period returns and statistically significant on a 10% significance level for five year holding period returns. The magnitude of the coefficients also motivates an economical significance of our finding. Capitalizing R&D yields a negative holding period return of approximately -80% to -150% depending on how many years of holding period return.

This finding is in stark contrast to the majority of previous literature in the US using synthetic models of R&D capitalization, such as (for example Lev and Sougiannis, 1996; Sougiannis, 1994; Chan et al., 2001; Ho et al., 2006; Chambers et al., 2002) and to for example the study by Aboody and Lev (1998) using actual capitalized R&D data but only on software development expenditures. However this finding is in line with a studies made with real capitalized R&D data in France by Cazavan-Jeny and Jeanjean (2006) and Cazavan-Jeny et al. (2011) where they also find a negative relationship between capitalized R&D intensity and future stock returns. Possible explanations discussed in the two studies relate to the optionality to capitalize under the French GAAP. This opens up for possible earnings manipulation and capitalization might then be seen by investors as earnings manipulation and hence the investors react badly to capitalization of R&D. Another explanation put forward is the inherent difficulties in estimating the future effect of R&D. However in Sweden, under both RR15 and IAS 38, the option to capitalize does not exist but is required. Hence there should be no room for earnings manipulation. Furthermore, according to both of the accounting standards uncertain, i.e. difficult to estimate, benefits from R&D should not be able to be capitalized and should be expensed instead. This implies that the possible explanations put forward for the French setting does not apply for the Swedish case.

One possible explanation of the negative relationship between capitalized R&D and future returns could be that under RR 15 and IAS 38 investors might overvalue the impact of capitalized R&D given that firms are required to capitalize R&D if they can. The benefits might not materialize as predicted and the firm performs worse than expected and thus yielding the negative future holding period returns seen in table V. Thus the investor might have problem evaluating the impact of capitalized R&D. If this is the case it is alarming since the increasing importance of intangible assets, such as R&D, of a firm's total assets.

Table VI
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms expensing R&D

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms both expensing and capitalizing R&D. The sample includes all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model (4) in the text:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + \quad YR_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDES_{it}$ is the expensed R&D relative to sales. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.1125	1.1198	0.2000	-0.2967	0.0429
	(0.096)	(0.887)	(0.550)	(0.551)	(0.800)
lnBtM	0.0867**	0.3293***	0.5770***	0.6678***	0.5051**
	(0.038)	(0.122)	(0.203)	(0.236)	(0.232)
lnSize	-0.0158	-0.0925	-0.0881	-0.1225*	-0.1063
	(0.019)	(0.064)	(0.053)	(0.065)	(0.092)
RDES	0.0031***	0.0000	0.0031***	0.0028**	0.0001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	0.8036**	1.2898**	1.6869*	3.2754***	2.4713
	(0.353)	(0.539)	(0.942)	(1.214)	(1.594)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	237	200	167	140	112
R-square	0.3802	0.3300	0.3522	0.2883	0.1264

According to the hypothesis H3 we expect to find a negative relationship between expensed R&D intensity and future holding period returns. Comparing the regression results from table VI to the hypothesis we find them to be positive instead of negative. This is in line with findings from for example Chan et al. (2007) and Aboody and Lev (1998). Even though we find significance on the 1% level on one and three year holding period return and significance on the 5% level on four year return the economic significance of expensed R&D is limited since the coefficients are quite small. Thus the economic significance is limited since the effect is only approximately 0.3% on the holding period return for the years where statistical significance is observed. This can in fact give some support to our hypothesis since we expect that capitalizers that previously have been present as expensers under for example US GAAP, UK GAAP or Australian GAAP now are required to capitalize. As this group is removed the future benefits associated with capitalized R&D is also removed from the expensers to capitalizers. Hence, the effect of expensed R&D should be smaller. Perhaps that is the effect observed in table VI.

Robustness test

The first thing we can comment on the robustness is that the R-square of our regressions are of limited magnitude. Thus there are more factors explaining the future holding period returns of the stocks and our model has a limited ability to explain the future holding period stock returns. In order to further check the robustness of our regressions we perform three robustness tests. Firstly, we control for R&D intensive industries. Secondly, we control for extreme outliers in the R&D to sales ratio. Thirdly, we control for the financial crisis.

i) According to other studies for example Lev and Sougiannis (1996) industry play a large role in R&D and its relations to stock returns. Hence we believe it is important to control for R&D intensive industries. We construct two dummies related to industries associated with large R&D expenditures, the high-tech industry and the bio-tech industry. The first dummy, related to high-tech industries is denoted HT. If a firm is in an industry with a SNI-code (Svensk Näringsgrensindelning) that starts with either 30, 32 33, 353 or 2423 it is classified as being in a high-tech industry. The second dummy, related to bio-tech industries is denoted BT. If a firm is in an industry with a SNI-code that starts 72 it is classified as being in a high-tech industry. The regressions for robustness test can be seen in the appendix tables VII-X.

   When controlling for R&D intensive industries the regression results compared to the basic regression results doesn't differ much. Most notable is that the significance of expensed R&D intensity on two year holding period return has become more significant and is now significant on a 5% significance level. Hence we conclude that the basic regressions are robust to R&D intensive industries.

ii) The second robustness test involves the possible effects of outliers in the R&D to sales ratio. In order to deal with them we Winsorise the R&D to sales ratio on the 1^{st} and 99^{th} percentile. The regression results are presented in the appendix tables XI-XII.

   The most notable result is that all the significance of expensed R&D intensity on future holding period return has disappeared completely. It is now not possible to say if the coefficients of expensed R&D intensity on future holding period return are different from zero and if there in fact is an effect. This can perhaps be related to our hypothesis since we expect that capitalizers that previously have been present as expensers under for example US GAAP, UK GAAP or Australian GAAP now are required to capitalize. As this group is removed the future benefits associated with capitalized R&D is also removed from the expensers to capitalizers. Hence, the effect should be smaller or even vanish altogether. Maybe that is the effect we can spot when we remove extreme outliers from the sample.

iii) The third robustness test tries to deal with the effects of the financial crisis following the Lehman bankruptcy in 2008. In order to test the robustness we remove all the observations from the year 2009-2011 in our sample. The result can be seen in the appendix table XIII.

Since the negative effect of capitalized R&D on future holding period returns occur on three to five year holding period returns it might be that it just is an effect of the financial crisis. Even after controlling for the financial crisis, the robustness of capitalized R&D on future holding period returns seem to be persistent. It is not affected by either R&D intensive industries or the financial crisis.

VIII. Concluding Remarks

In our study we set out to answer two questions:

i) How does the intensity of R&D expenditures affect future stock returns?
ii) What is the effect of the two accounting methods, capitalizing and expensing of R&D expenditures, on future stock returns?

Our main finding is that unlike the majority of other studies, concerning R&D and especially capitalized R&D, we find a statistically significant negative relationship between capitalized R&D and future three to five year holding period returns. This is also robust when we control for high-intensity R&D industries such as high-tech industries and bio-tech industries. With further robustness test controlling for the financial crisis that followed the Lehman bankruptcy, the result is still strong both significantly and economically.

Our data set provides a unique way to study R&D in several ways. Firstly we, unlike the majority of other studies, use real accounting data since capitalization of R&D is allowed in Sweden. Furthermore the area have been little studied in Sweden and this adds to the importance of the study. Also we look at almost the whole noughties which has not been done previously. We follow a whole business cycle from the tech bubble through the financial crisis the ensued after the collapse of Lehman Brothers. Perhaps the most unique aspect of our study is that before the mandatory implementation of accounting standard IAS 38 in EU 2005, Sweden had the RR 15. This standard was basically the same as IAS 38 as it not only allowed for capitalization of R&D but actually required it. This lead to a new "purer" way of studying the effects of capitalized and expensed R&D. Before when capitalization was not required there was a "blurring effect" of potential capitalizers apparent among "true" expensers and lack of capitalizers in the group using the capitalizing approach. Despite this shortcoming few studies have been made under this accounting standard. (Tsoligkas and Tsalavoutas, 2011)

One finding in our study under RR 15/IAS 38 accounting standard is the disappearance of the statistically and economically strong effect of expensed R&D intensity to stock returns seen in the previous research literature. This might under our hypothesis H3 be interpreted as the removal of capitalizers with "good" R&D, from the expensing of R&D group, lead to smaller and even vanishing significant effect of expensed R&D on future stock returns.

One interpretation of our finding of statistically and economically strong negative relationship between capitalized R&D on future holding period returns is that the negative relationship of capitalized R&D could perhaps be that under RR 15 and IAS 38 investor might overvalue the impact of capitalized R&D given that firms are required to capitalize R&D if they can. There are also strict rules governing the certainty of future benefits in order to be able to capitalize R&D. The benefits might not materialize as predicted and the firm performs worse than expected and thus yielding the negative future holding period returns. Thus the investor might have problem evaluating the impact of capitalized R&D. If this is the case it is alarming since the increasing importance of intangible assets, such as R&D, of a firm's total assets.

Our sample suffers from two potentially severe limitations. A survivorship bias, since only current listed companies have capitalized R&D data available. The other bias is a liquidity bias stemming from using less liquid stock list in our sample. This might have an adverse effect on the stock prices in the sample.

Despite these limitations and as these findings goes against most previous research we believe that the question regarding R&D and stock returns is far from settled and hope our study can increase the incentives to investigate this matter further. This especially since there is a huge possibility to investigate all the countries in EU following the mandatory implementation if IAS 38 for listed companies in 2005.

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X. Appendix

Table VII

Pooled cross-sectional OLS regression for 1-5 year future holding period returns on all firms doing R&D checked for robustness using dummies HT and BT

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on all firms doing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDTMV_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDTMV_{it}$ is the total R&D relative to the market value of equity. HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.0671**	0.1135	-0.0482	-0.1551	-0.0964
	(0.029)	(0.144)	(0.088)	(0.100)	(0.147)
lnBtM	0.0694***	0.1837***	0.1904***	0.2775***	0.3466***
	(0.020)	(0.043)	(0.063)	(0.074)	(0.098)
lnSize	0.0029	-0.0092	-0.0061	-0.0260	-0.0381
	(0.009)	(0.026)	(0.026)	(0.039)	(0.059)
RDTMV	0.0010	-0.2877	-0.4704	-0.1723	-0.9063
	(0.134)	(0.202)	(0.475)	(1.176)	(0.773)
Constant	-0.4093***	0.2865	0.5738	2.2470***	2.9693***
	(0.135)	(0.333)	(0.404)	(0.751)	(1.076)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	985	832	685	548	433
R-square	0.2569	0.1952	0.2608	0.2203	0.1241

Table VIII

Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms expensing R&D checked for robustness using dummies HT and BT

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms expensing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDES_{it}$ is the expensed R&D relative to sales. HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.1287	1.2900	0.3187	-0.1646	0.1962
	(0.098)	(0.976)	(0.608)	(0.602)	(0.855)
lnBtM	0.0751*	0.2304**	0.5220***	0.6153***	0.4106*
	(0.041)	(0.115)	(0.196)	(0.235)	(0.222)
lnSize	-0.0208	-0.1398	-0.1190*	-0.1519*	-0.1442
	(0.021)	(0.097)	(0.069)	(0.078)	(0.111)
RDES	0.0032***	0.0010**	0.0038***	0.0035***	0.0010
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Constant	0.8679**	1.8832**	2.0954**	3.6595***	2.9665*
	(0.379)	(0.743)	(0.998)	(1.276)	(1.704)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	237	200	167	140	112
R-square	0.3822	0.3558	0.3666	0.2965	0.1396

Table IX
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms both expensing and capitalizing R&D checked for robustness using dummies HT and BT

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms capitalizing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + b_5 RDCMV_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDCMV_{it}$ is the capitalized R&D relative to the market value of equity and $RDES_{it}$ is the expensed R&D relative to sales.HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	-0.0237	-0.1399*	-0.3165**	-0.5744**	-0.8596***
	(0.049)	(0.082)	(0.132)	(0.287)	(0.222)
lnBtM	0.0761*	0.0842	-0.1373	-0.1953	-0.1647
	(0.044)	(0.082)	(0.182)	(0.181)	(0.166)
lnSize	-0.0019	0.0045	-0.0368	0.0044	0.0585
	(0.020)	(0.026)	(0.051)	(0.044)	(0.043)
RDES	0.0171	-0.0731	-0.1757*	-0.2772	-0.2430*
	(0.057)	(0.044)	(0.098)	(0.194)	(0.134)
RDCMV	-0.1638	0.6764	3.3342	9.4290	5.5108
	(0.383)	(0.573)	(2.277)	(6.856)	(3.779)
Constant	0.8661***	0.8242**	0.5547	2.3343**	0.2006
	(0.324)	(0.393)	(0.608)	(1.042)	(0.652)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	266	235	200	165	133
R-square	0.3048	0.2991	0.2890	0.2977	0.2892

Table X
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms capitalizing R&D checked for robustness using dummies HT and BT

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms both expensing and capitalizing R&D. The sample includes all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDCMV_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDCMV_{it}$ is the capitalized R&D relative to the market value of equity. HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.0828**	0.0017	-0.0465	-0.0696	-0.0451
	(0.037)	(0.050)	(0.053)	(0.064)	(0.093)
lnBtM	0.0612**	0.1485***	0.1483**	0.2515***	0.4137***
	(0.026)	(0.046)	(0.067)	(0.089)	(0.154)
lnSize	0.0071	0.0090	0.0317	-0.0061	0.0116
	(0.018)	(0.036)	(0.050)	(0.079)	(0.109)
RDCMV	0.0411	-0.2093	-0.7732**	-1.2547**	-1.4542*
	(0.163)	(0.207)	(0.391)	(0.516)	(0.810)
Constant	-0.5519**	0.0211	2.7550***	1.5346	2.2685
	(0.231)	(0.529)	(0.929)	(1.228)	(1.845)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	482	397	318	243	188
R-square	0.2265	0.1813	0.2593	0.2477	0.1331

Table XI
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms expensing R&D checked for robustness using dummies HT and BT and Winsorised RDES

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms expensing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDES_{it}$ is the expensed R&D relative to sales. HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. . $RDES_{it}$ is Winsorised on the 1st and 99th percentile in order to control for outliers. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.1499	1.3527	0.3276	-0.2004	0.1705
	(0.100)	(1.004)	(0.637)	(0.634)	(0.889)
lnBtM	0.0718	0.1745	0.5324***	0.6634***	0.4370**
	(0.045)	(0.131)	(0.198)	(0.232)	(0.213)
lnSize	-0.0194	-0.1397	-0.1158	-0.1456*	-0.1391
	(0.021)	(0.096)	(0.071)	(0.080)	(0.114)
RDES	-0.0457	-0.3368	0.0297	0.3032	0.2181
	(0.105)	(0.318)	(0.257)	(0.262)	(0.306)
Constant	0.9383**	1.8844**	2.0186**	3.6057***	2.9229*
	(0.383)	(0.732)	(1.003)	(1.276)	(1.705)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	237	200	167	140	112
R-square	0.3307	0.3620	0.3512	0.2914	0.1403

Table XII
Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms both expensing and capitalizing R&D checked for robustness using HT and BT and Winsorised RDES

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms both expensing and capitalizing R&D. The sample includes all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDES_{it} + b_5 RDCMV_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDCMV_{it}$ is the capitalized R&D relative to the market value of equity and $RDES_{it}$ is the expensed R&D relative to sales. HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. $RDES_{it}$ is winsorised on the 1st and 99th percentile in order to control for outliers. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	-0.0075	-0.1213	-0.3031**	-0.6174*	-0.8686***
	(0.053)	(0.086)	(0.145)	(0.330)	(0.247)
lnBtM	0.0669	0.0686	-0.1540	-0.1867	-0.1721
	(0.043)	(0.081)	(0.176)	(0.169)	(0.163)
lnSize	-0.0047	-0.0006	-0.0448	0.0039	0.0489
	(0.019)	(0.025)	(0.049)	(0.047)	(0.047)
RDES	-0.0495	-0.1879*	-0.3055**	-0.2097	-0.3280
	(0.089)	(0.103)	(0.131)	(0.286)	(0.204)
RDCMV	-0.0467	0.7026	3.1194	8.7422	4.9956
	(0.445)	(0.554)	(2.131)	(6.580)	(3.637)
Constant	0.8997***	0.8851**	2.0367***	2.3677**	0.3796
	(0.312)	(0.392)	(0.741)	(1.140)	(0.725)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	266	235	200	165	133
R-square	0.3053	0.3021	0.2875	0.2875	0.2791

Table XIII

Pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms capitalizing R&D checked for robustness using HT and BT and accounting for the financial crisis

This table shows the results of the pooled cross-sectional OLS regression for 1-5 year future holding period returns on firms capitalizing R&D. The sample is all listed firms in Sweden between 2002 and 2011 with the exception of firms traded OTC (NGM OTC). Accounting data is taken from Retriever and market data from Datastream. The data is taken at the end of April each year to fully incorporate the information from the annual reports. The regression follows model:

$$HPR_{it} = a + b_1 Beta_{it} + b_2 lnSize_{it} + b_3 lnBtM_{it} + b_4 RDCMV_{it} + \quad YR_{it} + HT_{it} + BT_{it} + e_{it}$$

Where, HPR_{it} is the holding period return at the end of April for firm i at year t. $Beta_{it}$ is the CAPM-based beta as a measure for firm risk. $lnSize_{it}$ is the natural logarithm of the market value of the firm and $lnBtM_{it}$ is the natural logarithm of the book-to-market value. $RDCMV_{it}$ is the capitalized R&D relative to the market value of equity. HT_{it} is a dummy variable if the firm is a high-tech firm and BT_{it} is a dummy variable if the firm is a bio-tech firm. In order to control for the financial crisis observations between 2009 and 2011 are removed. ***, ** and * indicate statistical significance at the 1, 5 and 10% levels, respectively. (Robust standard errors in parenthesis)

	Holding period return				
Variable	1-year	2-year	3-year	4-year	5-year
Beta	0.1036**	-0.0023	-0.0602	0.0312	0.2661
	(0.045)	(0.067)	(0.089)	(0.098)	(0.898)
lnBtM	0.0962***	0.2413***	0.3579*	0.4794**	0.9718**
	(0.035)	(0.075)	(0.186)	(0.233)	(0.386)
lnSize	-0.0085	-0.0282	-0.0246	-0.0320	-0.1821
	(0.027)	(0.066)	(0.105)	(0.152)	(0.274)
RDCMV	-0.0278	-0.4583	-1.0516**	-1.5998**	-2.3224*
	(0.249)	(0.376)	(0.510)	(0.682)	(1.314)
Constant	-0.3384	0.5836	0.9011	2.0018	4.9969
	(0.350)	(0.924)	(1.396)	(2.171)	(3.773)
Year dummy	Yes	Yes	Yes	Yes	Yes
Number of observations	243	188	142	96	59
R-square	0.2777	0.1380	0.1639	0.2124	0.0769