Estimating the Probability of Loss Reversal

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by

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Abstract

This study aims to examine loss reversals with an emphasis on the effect of research and development expenditures on the probability of experiencing loss reversals. This paper builds on previous research by examining a variety of company variables such as accruals, cashflows, dividends, company size, earnings and R&D expenses against the chance of experiencing loss reversals. This is done with a significantly larger dataset for US data then used in previous studies. It also looks at a more in depth analysis of the effects of post and pre R&D expenditures on the probability of loss reversal.

Previous studies such as Joos and Plesko (2005) find that R&D expenditures are considerably lower for persistent (more then one loss over the life of the firm) losses than transitory (one loss over the life of the firm) losses. However they do not analyze the impact of R&D expenditures on the probability of loss reversal. This study is done with the objective to see if earnings can explain the possibility of loss reversal once R&D is accounted for (added to earnings). The results provide evidence that R&D expenditures for the US markets do not have any significant impact on firms experiencing loss reversals.

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1. Introduction

The frequency of losses (defined as negative earnings for a company for a financial period) has greatly increased over the last few decades; this is not only due to an increase in negative cashflows but also according to Givoly and Hayn (2000) who use a US Compustat annual sample that spans the years 1950 to 1998, large increases in accruals are to blame. Their evidence shows a large and growing accumulation of negative non-operating accruals over the period. This increase makes effective loss reversal models for loss-making firms all the more important and relevant.

Another explanation for the increasing cases of loss making firms that has appeared in the last two decades is given by Hand (2001) and Hand (2003). They look at a sample of 271 Internet stocks on the InternetStockList for the years 1997 to 1999, and a random sample of 274 publicly traded non-Internet firms in the year 1998 using the Center for Research in Security Prices (CRSP). They present a case that the more losses you make the better the chance to destroy the competition by taking on huge expenditures on R&D or marketing to gain market share. Losses present a challenge for users of financial statements as they rely on the stated accounting earnings to make decisions. In company valuation terms, reported earnings are one of the most important proxies for the future expected earnings of the firm's assets. Overall losses severely complicate earnings based valuations models; because a loss reduces the ability of reported earnings to give insights into the earnings power of company assets.

Loss reversals are important for several reasons. First profits are a maintained hypothesis of financial reporting (going concern concept), investors expect firms to create profits for income and growth, and therefore they are the basis of effective and accurate valuations of firm assets. Second losses are assumed to be temporary as this is why investors would hold onto their assets and not liquidate them according to the abandonment hypothesis of loss valuation, developed by Hayn (1995). The Hayn (1995) study uses a Compustat US data sample that consists of all firm years over 29 years from 1962-1990 consisting of 9752 distinct firms.

In this study, a Loss reversal model tests a variety of company variables to see how substantial their impact is on predicting future loss reversals.

Joos and Plesko (2005) extend the work of Hayn (1995) by developing a loss reversal model that can be used as a predictor of the probability of loss reversal. They show that investors can use past and present financial information of the firm for estimating of the probability of loss reversals.

Jiang and Stark (2006) using a similar loss reversal model as Joos and Plesko (2005) examine the determinants of loss reversals for the UK. In this they confirm overall the results of Joos and Plesko (2005). Their data covers only the UK, where they pool the data five years prior to the loss-making year. This gives clearer insights into the importance of some of the independent variables. They extend the loss reversal model by looking at earnings pre and post R&D expenditures; their findings are that R&D expenditures provide a possible explanation for the causes of loss reversals in UK firms.

This study makes the following contribution to the literature. Joos and Plesko (2005) look at loss reversals for the US. They collect their data sample from Compustat, covering US annual data for the years 1971-2000, with a sample that contains 217085 firm-year observations. Jiang and Stark (2006) looked at loss reversals in the UK and find that R&D expenditure is possibly an explanation for the UK. This paper takes a dataset that expands Joos and Plesko (2005) dataset of firms and the time period used.

The objective is to see if earnings can explain the possibility of loss reversal once R&D is accounted for. The empirical question is whether earnings are negative because a company is making a genuine loss or if it is due to R&D expenditures.

2. Literature Review

The literature on losses and loss reversals falls into three categories. The three categories are the Causes of Losses, Market Reaction to Losses and Companies Reactions to Losses.

The 1st section, the Causes of Losses looks at what factors create negative earnings for companies. The 2nd Section looks at how investors and markets react to these losses, which depends on their expectation if the losses are expected to be transitory or persistent. The 3rd section, Companies Reactions to Losses looks at how companies try to manage the impact of their loss announcements to investors.

I. Causes of Losses

Givoly and Hayn (2000) blame the increasing conservatism of accounting for the large increase in accruals. The changes are measured using a number of methods of reporting conservatism.

Conservatism is the asymmetrical stock market response to gains and losses. There can be degrees of conservatism: the greater the difference in degree of verification required for gains versus losses, the greater the conservatism.

The measures rely on accumulation of non operating accruals such as (bad debt provisions, gains and losses on asset sales, deferral of revenues), the timeliness of earnings with respect to bad and good news, characteristics of the earnings contribution and the market to book ratio.

They show that the earnings distribution has become more dispersed and negatively skewed relative to the cash flows, which is consistent with an increase over time in the degree of reporting conservatism.

The effect of conservatism as a major cause of losses is well researched. In an extensive study by Givoly and Hayn (2002) on rising conservatism, they use four measures of conservatism:

a) The level and rate of accumulation over time of negative, non-operating accruals
b) Measures based on the earnings-return association during periods of good and bad news
c) Changes in the Market to Book (M/B) ratio
d) The skewness and variability of the earnings distribution relative to the cash flow distribution

They show that increased conservatism has contributed to a persistent and prevalent decline in reported profitability, an increase in the incidence of losses, and an increase in the dispersion of earnings.

Further analysis indicates that the decline in profitability is not a result of a change in the distribution of cash flows but results from a change in the relationship between cash flows and earnings (a change in accounting accruals), and it is not stable over time.

There is also an inability of accounting conservatism to take into account various investment costs that could be capitalized, according to McCallig (2003). He uses the Compustat North America all US Stock Exchanges annual data for the years 1980 to 1997. He tests whether current and past losses are associated with firm value, specifically the effects of revenue investment (defined as charges against income caused by investments) on the valuation of loss making firms. The reason to test for this is that some firms make losses because of investments, which cannot be capitalized such as R&D, marketing, training, rather than loss of economic value.

He argues that because revenue investment means that investments have been excluded from book value, it is not a good proxy for normal returns. This means that losses can be associated with value for firms that make revenue investments. He argues for more analysis of the components of book value when valuing loss-making firms.

Klein and Marquardt (2005) examine both accounting and non-accounting factors behind accounting losses over a fifty-year period, covering 259719 observations from 1951 to 2001. Firm numbers range from 614 in 1951 to 10313 in 1996.

They use the same accounting conservatism measures as Givoly and Hayn (2000). They comprise of the accumulation of non operating accruals, the timeliness of earnings with respect to bad and good news, the characteristics of the earnings contribution and the market to book ratio.

They make the assumption that conservatism and accounting charges over time are to blame and also that non-accounting fundamentals such as business cycle, size of firm have a part to play (small firms are classified as firms in the NYSE, AMEX, NASDAQ that have total assets less than the 25^{th} percentile of NYSE firms).

Their study examines four factors, accounting conservatism, Compustat coverage of small firms, real firm performance as measured by operating cash flows and macro economic productivity. They find a positive relation between the frequency of firms reporting negative income over time and accounting conservatism (non operating accruals). But overall it has a small role in determining the frequency of losses, as non-accounting factors are bigger factors.

Their results show that accounting losses are related to both accounting conservatism and non-accounting factors such as firm size, and business cycle.

Other findings are that accounting losses are inversely related to the business cycle and cash flows from operations. They conclude that non-accounting fundamentals add significant information about accounting losses over and beyond accounting conservatism.

Their results show that small firms are less diversified have higher risk, more negative levels of CFI which is defined as cashflows from investing minus R&D expenditure. They are also more likely to be at end of their lifecycle than larger firms. Firms' with these characteristics are more likely to record an accounting loss than profit for the year. Overall they find factors other then accounting conservatism is to blame, the business cycle, and cash flows from operations.

Joos and Plesko (2005) find using a broader definition of reporting conservatism that includes increasingly larger increases in R&D that this is a major factor in the increase of firms reporting negative earnings. They also find that the increase in reporting conservatism affects the ability of the variables to predict loss reversals.

Firms' with multiple years of losses are less likely to experience loss reversal; these are the firms with the lowest probability of recovery that have large negative cash flows and accruals, larger R&D expenditure and more special items then firms' with single losses.

Their results suggest the probability of loss reversal summarizes useful information to investors about how to value a loss firm. The market also assesses the effect of reporting conservatism and the attractiveness of abandoning the investment in the firm when it prices losses.

Jiang and Stark (2006) extend the work of Joos and Plesko (2005) by examining the determinants of loss reversals in the UK. They also investigate the predictive ability of the loss reversal models. They find that the UK has a similar situation to the USA in that there is an increasing occurrence of losses since 1991.

They extend previous work done by disaggregating earnings into earnings before R&D expenditures and R&D expenditures using data that covers a sample of annual loss observations from 1991 to 2004. The percentage of loss-making firms decreases when using earnings before R&D expenditures as a measure of performance.

The Loss Reversal model they use is:

$$P(y_{t+1}/x_t)=f(BX_t+c_t) \qquad (1)$$

y_{t+1} is an indicator variable equal to 1 if the firm makes a loss in year t and becomes profitable in year t+1, and 0 if the firm still makes a loss in year t+1.

c_t is a constant term.

x_t and X_t represent a vector containing 4 categories of information variables in the model:

Profitability measures the components of returns on assets

Size and growth variables;

Measures for the incidence and frequency of past losses; A dummy variable FIRSTLOSS indicating whether the loss year was preceded by a profit year, and measures for the dividend paying behavior of the firm.

Two dummies, DIVDUM and DIVSTOP, DIVDUM is one if the firm pays a dividend in the Loss year and zero otherwise.

DIVSTOP is one if the firm stops paying dividends in the loss year and zero otherwise. F is the logistic cumulative density function.

Equation (1) is based upon the same model that Joos and Plesko (2005) use, but it differs in two particular ways: variables are included that capture the average of five prior ROAs (Return on assets) and the number of losses in the prior five years.

They are excluded because:

a) Including them reduces the number of observations available for study
b) For the UK, the effectiveness of these variables in explaining the likelihood of loss reversals is limited.

They also use the variable of return on assets, not its decompositions.

They use a sample of loss observation from 1991 to 2004. The firm year observations are collected from Datastream for the years 1990 to 2004. 'Dead' firms are also included to mitigate the presence of survivorship bias and financial firms are deleted. Also firms that do not use sterling and have preference shares are deleted.

Firms with earnings firm-year observations in the current year or next year are deleted if they are zero, as reversal is defined as a return to positive profits from negative earnings. Each loss observation has three successive years of relevant data to compute variables in the loss-reversal model.

The independent variables used are defined as:

$(E+RD+EI)/TA^{-1}$ = earnings before RD and EI divided by last year's total assets, where E is net income available to common stockholders for the financial year, RD is R&D

expenditures, EI is the sum of extraordinary items and exceptional items, and TA is total assets, measured as the sum of total current assets, long term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets at the end of the financial year;

RD/TA^{-1} = RD divided by last year's total assets;

EI/TA^{-1} = EI divided by last year's total assets;

SIZE = the size of the firm, is measured as the log value of MV (market value in a given calendar year);

SALESGROWTH = sales growth, is calculated as the percentage growth of sales (Net Sales or revenues for the financial year for the calendar year), and is ((sales at year t minus sales at year t-1) divided by sales at year t-1);

FISRTLOSS = is a dummy variable which equals one if the firm was profitable in the prior year, and zero otherwise;

DIVDUM = is a dummy variable which equals one if the firm pays dividends in the current year, and zero otherwise, dividends are measured as the total common and preferred dividends paid to shareholders of the company (cash dividends) during the financial year;

DIVSTOP = is a dummy variable which equals one if the firm stops paying dividends in the current year, and zero otherwise.

Table 1.1 Previous Results for Aggregated Loss-Reversal Models

Panel A: (Table 4: P24 of Jiang and Stark (2006) Specification 1: Time Series Estimates averaged annually for period 1991-2004)

	Coefficient	S.D.	P-Value
C	-1.339	0.797	0.000
$(E+RD+EI)/TA^{-1}$	1.928	1.790	0.001
RD/ TA^{-1}	-5.785	9.544	0.041
EI/ TA^{-1}	-4.294	3.348	0.000
LOG(MV)	0.151	0.151	0.003
SALESGROWTH	0.038	0.251	0.577
FIRSTLOSS	0.165	0.329	0.082
DIVDUM	0.693	0.583	0.001
DIVSTOP	0.351	0.694	0.081

Note: The above table is a specification for the logistic loss-reversal model where the dependent variable is a dummy variable equal to 1 if the firm makes a loss in year t and becomes profitable in year t+1, and 0 otherwise. Specification 1 is the time series estimates for the model. Reported coefficients are the average of annual coefficients over the estimation period 1991-2004. S.D. is standard deviation of these annual coefficients. P-value is transformed from the associated t-statistic that is derived using the Fama and MacBeth (1973) procedure.

Panel B: (Table 4: P24 of Jiang and Stark (2006)) Specification 2: Pooled Data Regression for period 1994-2004: Time Series Estimates

	Coefficient	S.E.	P-Value
C	-1.465	0.198	0.000
$(E+RD+EI)/ TA^{-1}$	1.177	0.186	0.000
RD/ TA^{-1}	-3.971	0.591	0.000
EI/ TA^{-1}	-2.692	0.420	0.000
LOG(MV)	0.125	0.045	0.006
SALESGROWTH	0.001	0.002	0.501
FIRSTLOSS	0.242	0.086	0.005
DIVDUM	0.783	0.093	0.000
DIVSTOP	0.430	0.128	0.001

Note: The above table is a specification for the logistic loss-reversal model where the dependent variable is a dummy variable equal to 1 if the firm makes a loss in year t and becomes profitable in year t+1, and 0 otherwise. The results are obtained by running the regression on the pooled data over the period 1991-2004. The coefficients, standard errors and associated P-value are reported.

From the Fama-MacBeth procedure, for Panel A, SALESGROWTH, FIRSTLOSS, and DIVSTOP are the most important factors in deriving the probability of loss reversal. With the data pooled in Panel B all the variables are significant except SALESGROWTH. The other important result is that DIVSTOP is positive and significant, which is contrary to US Results.

Table 1.2 Classification Results

(Table 1.2: P30 of Jiang and Stark (2006))

Panel A: Model obtained by averaging prior five years annual Regressions

Predictions	Actual Outcome Reversal	Actual Outcome Non-Reversal	Total
Reversal	282	270	552
Non Reversal	587	1844	2431
Total	869	2114	2983

Panel B: Model obtained by using 5 years of Pooled Data

Predictions	Actual Outcome Reversal	Actual Outcome Non-Reversal	Total
Reversal	292	258	550
Non Reversal	577	1865	2433
Total	869	2114	2983

Note: the tables present the aggregated classification results, over the period 1996-2004 using models derived by two approaches. In Panel A, the model is obtained by averaging prior five-year annual regressions. In Panel B, the model is obtained on the pooled five years worth of data.

The signals that emerge from table 7 above is that, the loss reversal signal is accurate 51.09% (282/552) of the time and the non-reversal signal is accurate 75.85% (1844/2341) of the time. While pooling the data produces a slightly better result for predicting reversals. The loss reversal is accurate 53.09% of the time and non-reversals have 76.28% accuracy. Overall the picture given by Jiang and Stark (2006) is that losses are more permanent then they predict. They under predict how permanent losses are just like analysts under reaction to losses according to Skerratt and Forbes and Constantinou (2003).

Overall the results confirm Joos and Plesko's (2005) finding on the usefulness of past and current accounting information for the prediction of one-year ahead loss reversals. They also find the importance of various independent variables when the data is pooled.

One variable that captures whether a firm initiates a dividend stop in the year of the loss has the opposite effect than that found in the USA. They find no explanation for these results, this indicates that the use of dividends to signal future profitability is different in the UK than the USA.

Their results contribute to the literature in three ways. First they demonstrate that the number of loss making firms has significantly increased since the early 1990s in the UK. Second that current and past accounting information is able to explain and assist in predicting loss reversals in the UK. Third they develop a more parsimonious (simple) model then Joos & Plesko (2005) and demonstrate its effectiveness for UK data.

The effects of conservatism on earnings and therefore company valuations can also have an effect on Pricing Multiples of earnings for valuation purposes. Pack and Chen and Sami (2007) hypothesize that the pricing multiple on more conservative earnings is smaller than on less conservative earnings.

Their findings are that more conservative earnings are less persistent than less conservative earnings. This indicates that accounting conservatism creates larger under and overstatements of earnings in different periods, which reduces its valuation quality. This also reduces earnings persistence, and so reduces the ability of current earnings to predict future earnings.

II. Markets Reaction to Losses

This section looks at how markets and investors react to the announcements of Losses. The Hayn (1995) study uses a Compustat US data sample that consists of all firm years over 29 years from 1962-1990 consisting of 9752 distinct firms, she shows that in the cases of losses the return-earnings hypothesis is weak and hypothesizes that because shareholders have an abandonment (liquidation) option, losses are not expected to perpetuate. Therefore they are less informative than profits about the firm's future prospects; the informativeness of losses with respect to future cash flows is limited.

Earnings have information content, yet appear to explain only a small fraction of total variation in returns. A reason given for this is that earnings contain transitory components that are value irrelevant or have only a limited valuation impact.

The research attempts to identify the factors that determine the return-earnings relation that losses are looked at as temporary by investors. The reason for this is that investors consider losses temporary as they can always liquidate the firm rather than suffer from indefinite losses.

Firms' equity value is liquidation and expected earnings. In cases of losses, investors do not evaluate firms strictly on reported earnings so leading to a weak observed return-earnings association. The Earnings Return Coefficient (ERC) and the return earnings correlation almost triple when loss cases are excluded.

They also show that the return-earnings association is weak in loss situations and also in profitable cases where the reported earnings fall below the threshold that evokes the exercise of the liquidation option.

The main explanation for the low information content of losses appears to be that shareholders have the option to liquidate the firm when the current losses are expected to perpetuate. There is also the issue of information content of first losses and subsequent losses.

Chambers (1996) suggests that a firm's initial loss provides important information to investors for valuing a firm's future resource flows, also that its value relevance like gain is dependant on expected persistence. He also finds that non-earnings accounting information is of limited usefulness in predicting the persistence of initial losses.

Collins and Pincus and Xie (1999) research into why there is a negative relationship in the price earnings relation using the simple earnings capitalization model for firms that report losses. They obtain their annual Compustat data for the years 1974 to 1993, with 90171 firm year observations.

Their results are consistent with book value serving as a value relevant proxy for expected future normal earnings for loss firms and as a proxy for the abandonment option in loss firms likely to cease operations and liquidate.

Collins and Pincus and Xie (1999) find that including book value of equity in the valuation specification eliminates this negative relation. They also provide evidence of two explanations for the role that book value of equity plays in valuing loss firms. The results are consistent with book value serving as a value relevant proxy for expected future normal earnings for loss firms in general, and as a proxy for the abandonment option for loss firms most likely to cease operations and liquidate.

Other findings are that when stock prices are regressed on earnings for loss firms, the coefficient on earnings is reliably negative. When they augment the simple earnings capitalization model with the book value of equity, the coefficient on earnings becomes positive and close to zero. This is strong evidence that the simple earnings capitalization model is misspecified due to the omission of book value. This omission induces a negative bias in the coefficient on earnings for loss firms.

Collins and Pincus and Xie (1999) investigate further with two alternative value relevant factor based explanations for the role that book value of equity plays in valuation. They investigate whether the importance of book value stems from its role as (1) a proxy for loss firms' expected future normal earnings or (2) a proxy for loss firms abandonment option.

They find that replacing book value of equity with proxies for both expected future earnings and abandonment value eliminates the anomalous negative price earnings relation as book value does alone. This indicates that book value plays a part in these two roles in equity valuation.

The evidence suggests that in the presence of losses, the market acts as if it relies on book value of equity both as a proxy for expected future normal earnings and as a proxy for the abandonment value.

The data used here is obtained from the Compustat annual and Quarterly Primary, secondary, Tertiary, Full Coverage and Research Files. The dataset covers 20 years from 1974 to 1993. 90,171 firm years observations are identified with a positive book value of equity for 1975 to 1993. Loss observations are 22,495 and profit observations are 67,676.

Variables used are Cum-dividend price (Pt) (Compustat quarterly item #4).

Dividends per year for year t (annual data item #26). Income available to Common Stockholders (Compustat annual items #172 minus #19). Total number of shares outstanding (annual data item #25). Book Value of Equity per share (annual data item #60).

They test whether the negative coefficient on earnings for loss firms results from omitting book value of equity by estimating the equation:

$$Pt = a + BX_t + yBV_{t-1} + \varepsilon_t \quad (2)$$

P_t= stock price three months after fiscal year t

X_t=income available to stockholders divided by total number of shares outstanding

BV_{t-1}=book value of equity at the end of the year t-1 (annual data item #60) divided by total number of shares outstanding.

Table 1.3 Classification Results

(Table 7: P56 of Collins & Pincus (1999) Vuong Tests for Single vs Muliple Loss Firms for Equation (2))

	Intercept	X_t	BV_{t-1}
Single Loss Firms	2.98	.12	.60
	(11.33)**	(0.90)	(22.24)**
Muliple Loss Firms	2.11	-.10	.41
	(21.29)**	(-0.92)	(13.25)**

** Significant at the 1% level using White's heteroscedasticity-corrected standard error (two-tailed). Variable definitions: X_t = bottom-line earnings (Compustat income available to stockholders, annual data item #172, minus preferred dividends, annual data item #19) divided by total number of shares outstanding (annual data item #25); BV_{t-1} = book value of equity at the year end t-1 (annual data item #60) divided by total number of shares outstanding adjusted for stock splits and dividends. Single loss firms are composed of year t (t from 1979 to 1992) loss firms that have no losses in the four years prior to year t. Multiple loss firms are composed of year t (t from 1979 to 1992) loss firms that have three or four losses in the four years prior to year t.

They identify some limitations in their research. Areas identified are extending the analysis to incorporate proxies for internal adaptation value, for cases where it is likely to exceed external adaptation value. Another area to look at is to identify surviving firms that restructure their operations in years following the reporting of a loss.

Accounting conservatism shows up in many research papers as a major factor in explaining losses. There are several measures available and as of yet there is no consensus on which one is the most effective. Givoly and Hayn (2000) use an accounting data measure, in contrast to other data measures such as earnings return and book-to-market value of equity measure.

They recognize that relying only on market-based measures of conservatism is not enough, and it also looks at both time-series and distributional properties of earnings, cash flows and accruals.

The findings show persistent significant changes in the relation between earnings, cash flows and accruals; also reported profitability over the last 4 decades has declined. Evidence shows a massive accumulation of negative non-operating accruals over the period, which is consistent with an increase in reporting conservatism over time.

The earnings distribution has become more dispersed and negatively skewed relative to the cash flows. This is consistent with an increase over time in the degree of reporting conservatism.

Joos & Plesko (2005) advance research by looking if pricing is consistent with the abandonment hypothesis of Hayn (1995) by proposing a proxy for the likelihood of exercising the abandonment option based on an expectation of a loss reversal.

They show that the probability of loss reversal summarizes useful information to investors about how to value a loss making firm, with the market assessing if the losses are likely to be permanent or transitory (permanent losses are defined as a small probability of a firm returning to positive earnings and transitory losses, as firms' with negative earnings that have a strong possibility of reversing). This enables investors to see if the abandonment option is more attractive when pricing the losses, thereby affecting the value they attach to a company.

They document a more pronounced stock price response to transitory losses, consistent with investors being less likely to exercise the abandonment option.
They also find evidence consistent with investor pricing persistent losses negatively, which goes against the abandonment option hypothesis.

Their test results show that the Earnings Response Coefficient (ERC) of the transitory group is significantly positive while the ERC for the persistent group is significantly negative. Results show a bigger stock price response to a loss when investors assess the loss to be transitory and the likelihood of exercising the abandonment option to be smaller.

Further exploration of the pricing patterns of both transitory and persistent losses reveals large differences between the relative magnitude of cash and accruals, and R&D, special items components. Investors will price them differently on the expectation of the persistence of the losses.

For the components of persistent losses, the increasing R&D expenditure may explain their negative valuation. This growing R&D component in persistent losses implies that they have become a weaker indicator of exercising the abandonment option.

They use the following data:

Compustat's Industrial and Research Annual databases for the years 1971-2000.

Earnings are income (loss) before extraordinary items and discontinued operations (Compustat data item #18).

The sample contains 217085 firm year observations, 29.63% are loss observations. The hypothesis is that investors will price the earnings of a loss firm conditional on whether they expect the loss to reverse.

The model of the loss reversal used is:

$$y_{t+1} = X_t B + \varepsilon_{t+1} \qquad (3)$$

y_{t+1} is an indicator variable equal to one if the firm becomes profitable in the subsequent period and zero otherwise.

X_t represents the information variables of the model ε_{t+1} is the error term.

To estimate the proxy for investors' assessment of loss persistence three broad categories of (accounting) variables are used in the equation.

The first specification has a set of variables that measures the financial profile of the firm. Profitability is measured using return on assets (ROA) as income before extraordinary items (annual compustat item #18) scaled by lagged total assets (annual compustat item #6).

The second specification, ROA is decomposed into its cash flow and accrual components. CFO is cash flow from operations scaled by lagged total assets). This is measured as net income (annual compustat data item #172) minus accruals.

Accruals are measured as (ΔCurrent Assets (compustat data item #4)- Δcash (data item #1)- ΔCurrent Liabilities(data item #34)+ Depreciation and Amortizations (data item #14), scaled by lagged by lagged total assets.

To complement the profitability variables, size and growth variables are included in the model, as according to Hayn (1995) there is a strong link between the occurrence of losses and firm size.

SIZE is measured as the log of current market value (annual Compustat data item #199 * annual Compustat data item #125).

The proxy for growth is recent growth in sales, SALESGROWTH measured as the percentage growth in sales (annual Compustat item #12) during the current year.

The second set of variables measures the incidence and frequency of past losses.

The descriptive statistics of equation (3):

Table 1.4 Logistic Regression Model of Loss Reversal: Descriptive Statistics

Panel A: Indicator Variables (Table 2: P857 Joos and Plesko (2005))

	Value	Observations	Reversal%	P-value
First Loss	0	11253	25.19	.000
	1	7021	44.65	
DIVDUM	0	15374	28.70	.000
	1	2900	53.72	
DIVSTOP	0	17486	32.57	.196
	1	776	34.79	

The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971-2000. Losses are based on IB, which is defined as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18). FIRSTLOSS is an indicator variable equal to one if the current year's loss is the first in a sequence (i.e., the firm was profitable last year) and zero otherwise; DIVDUM is an indicator variable equal to one if the firm is paying dividends (annual Compustat data item #21) and zero otherwise; DIVSTOP is an indicator variable equal to one if the firm stopped paying dividends in the current year and zero otherwise.

They also test whether investors' price losses as a function of their expected persistence. They extend the pricing analysis work of Hayn (1995). To explore this, they estimate ERCs in the persistent and transitory loss samples using the regression:

$$\text{RET}_t = a + B.IB_t + \varepsilon_t \tag{4}$$

RET_t is the return over 12 months. IB_t is the earnings per share in year t (Compustat data item #18 scaled by compustat #25) scaled by P_{t-1} share price (compustat data item #199) at year-end of t-1, ε_t is the error term.

They estimate equation (4) in each year of the sample period and assess the significance of the ERCs using the Fama-Macbeth procedure (1973)

Table 1.5 Earnings Response Coefficient Analysis

Panel A: Descriptive Statistics: Cross Sectional Results (Table 5: Joos and Plesko (2005) Earnings Response Coefficient Analysis, P863)

Variable	Sample	Observations	Mean	Std Deviation	Median
IB	Persistent	3796	-0.371	0.402	-0.225
	Transitory	3784	-0.087	0.133	-0.048
RET	Persistent	3796	0.193	1.401	-0.196
	Transitory	3784	-0.050	0.646	-0.162

Panel B: Earnings Response Coefficients for Raw Data

Sample	Average No Obs	Intcpt (t-stat)	ERC (t-stat)	Adj R2
Persistent	188	0.080 (0.656)	-0.181 (2.793)	0.006
Transitory	187	-0.037 (0.938)	0.166 (1.672)	0.007

Panel C: Earnings Response Coefficients for Rank Regressions

Sample	Average No Obs	ERC	Adj R2
Persistent	188	-0.017 (0.491)	0.007
Transitory	187	0.081 (3.773)	0.004

The data are collected from Compustat's Industrial and Research Annual Data Bases and cover the period 1971-2000. Losses are based on IB, defined as income (loss) before extraordinary items and discontinued operations (annual Compustat data item #18).

Panel A shows descriptive statistics of the variables included in the ERC regressions. RET is the return over the 12 month period commencing with the fourth month of fiscal year t, IB is the earnings per share variable in year t (annual Compustat data item #18 scaled by annual Compustat data item #25), scaled by Pt-1 or share price (annual Compustat data item #199) at the end of the year t-1.

We define two samples of losses based on the distribution of the predicted reversal probabilities. We sort the loss observations annually into quartiles based on their estimated probability of reversal and define persistent (transitory) losses as those least likely to reverse, and transitory losses those most likely to reverse.

Panel B reports the results of the estimation of the following regression:

$$RET_t = a + \beta IB_t + \varepsilon_t$$

We estimate the equation in each year of the sample period and assess the significance of the ERCs using the Fama-Macbeth procedure (1973). Panel B shows the results of the estimation of the equation using raw data and rank data.

For Panel A the mean annual returns are positive in the persistent loss sample (0.193), but negative in the transitory sample (-0.050).

The median returns of persistent loss firms are more negative than median returns of transitory losses.

In Panel B, looking at the raw data results, there is a negative and statistically significant ERC in the persistent sample.

While the ERC in the transitory sample is positive and significant, the ERC results show market returns reflect the information in transitory losses. For persistent losses, the market does not seem to react positively or negatively.

Valuation formulas used are

$$\text{RET}_t = a + BCFO_t + \gamma ACC_t + \varepsilon_t \qquad (5)$$

$$\text{RET}_t = a + BOTHIB_t + \gamma R\,\&\,D_t + \delta SPI_t + \varepsilon_t \qquad (6)$$

OTHIB is (IB-R&D-SPI)

In the main results investors price only the accruals component of persistent losses, suggesting market returns do not reflect the information in cash flows. Further focusing on the pricing of R&D and SPI (special projects and Investments), it is observed investors price only the cash flow component of transitory losses. This indicates that investors identify the negative accruals to be transitory and therefore are not pricing them.

The response coefficients of cashflow from operations (CFO) decrease in both samples over time, whereas the markets pricing of the accruals component of losses does not change.

Panel B shows that for the persistent loss sample, the OTHIB & SPI coefficients are positive and significant. R&D seems to be priced negatively.

The response coefficients on OTHIB and R&D decrease over time in the persistent sample i.e. investors value the OTHIB component less and R&D more over time.

In terms of how capital markets price the risk of loss making firms Ertimur (2004) shows that capital markets seem to have on average higher bid-ask spreads for loss firms than profit firms. Also multiple loss firms have higher bid-ask spreads than single loss firms.

This suggests that in the case of loss firms, earnings and book values provide less valuation relevant information to capital markets then in the case of profitable firms.

In another study on earnings and their effect on valuation Pope and Wang (2004) produce an accounting based valuation model that takes account of conservatism consisting of four financial statement items, two earnings components, Book value and dividends. In this study they show that an earnings component can be irrelevant in valuation.

III. Companies Reactions to Losses

This section looks at how companies try to manipulate the impact of earnings loss announcements to investors on their company.

Pae and Thorton (2003) conclude in their research that analysts' earnings forecasts do not fully incorporate the implications of earnings conservatism. Also the forecast dispersion is greater for bad news than good news firms, and greater for low than high P/B (Price to book ratio) firms, consistent with the hypothesis that accruals used to accelerate the recognition of bad news spawn disagreement about forthcoming earnings: forecasts fail to fully incorporate the implications of earnings conservatism.

Joos & Plesko (2004) show that in cases where companies have increased their dividends while they are experiencing losses caused by negative cash flows, that it could be an indication that management believes that the returns on the firm will be good even though current earnings are not. This indicates that the more costly a dividend signal is, the more information the dividend has about the firms' future performance, and that the management of the company has faith in the prospects of the firm even though current earnings do not.

IV. R&D expenses and Loss Reversals

The studies by Joos and Plesko (2005) and Jiang and Stark (2006) have briefly looked into R&D expenditures and their impacts on loss making firms. This study contributes to the existing literature in the following ways

First, we use a significantly larger US dataset then used by previous studies, by analyzing a sample of 450720 firm year observations over the time period 1987 to 2006. The data was collected from the same source as Joos and Plesko (2005). Joos and Plesko (2005) base their study on a sample of 64322 firm year observations from Compustat Industrial and Research Annual Databases for the years, 1971 to 2000.

Second we encapsulate the impact of R&D expenditures on the probability of loss reversal in US equity markets. Joos and Plesko (2005) find that R&D expenditures are considerably lower for persistent (more then one loss over the life of the firm) losses then transitory (one loss over the life of the firm) losses. However they do not analyze the impact of R&D expenditures on the probability of loss reversal.

Third the only study to our knowledge that looks at the impact of R&D expenditures on the probability of loss reversal is Jiang and Stark (2006). Their sample consists of 4374 firm year observations of companies listed on the London Stock Exchange, over the time period 1990 to 2004. They include R&D expenditures as an additional explanatory variable in a model of loss reversal, which is similar to Joos and Plesko (2005). They find that R&D expenditures are significantly negative in predicting loss reversal; therefore loss reversals can be caused by R&D expenditures. This result highlights the importance of R&D expenditure in explaining loss reversals.

In this study we empirically evaluate the Jiang and stark (2006) loss reversal model for US equity markets. In other words we include R&D expenditures in the Joos and Plekso (2005) model to empirically examine whether R&D expenditures affect the probability of loss reversal in the US market. For robustness we use two alternative measures of including R&D expenditures in loss reversal models. First we deduct R&D expenditures from earnings and second following Jiang and Stark (2006) we include R&D expenditure as an independent t explanatory variable in predicting loss reversals.

We believe this is an important empirical question in the literature of loss making firms. Ever since Hayn (1995) there have been numerous studies that have offered various explanations for the causes of losses (for more information see Section 2). Given the empirical findings of both Joos and Plesko (2005) and Jiang and Stark (2006) we will examine whether R&D expenditures may provide an explanation to the puzzle of loss making firms, of how and why those losses are reversed.

3. Data

The data is taken from the Active and Research files from the Compustat database with codes $C+$R. They cover 22536 firms across all capital markets in the USA. The Time period consists of annual data from the years 1987 to 2006; the final sample yields 20 years with a total of 450720 firm year observations per variable. The Compustat variables and Codes used are in the table below:

Table 1.6 Descriptions of Variables and Codes

Variable Abbreviation	Description of variable	Compustat Item Code
MKVAL	Market Value is the Monthly Close Price multiplied by the Quarterly Common Shares Outstanding.	MKVAL
NI	Net income after extraordinary items and discontinued operations	#172
DVC	The total dollar amount of dividends (other than stock dividends) declared on the common stock of the company during the year	#21
PRCCF	Price close at the fiscal year end	#199
CSHO	Common shares outstanding at the year end	#25
FYR	Fiscal Year	FYR
AT	Assets Total	#6
COREEARN	S&P Core annual earnings	COREEARN
SALE	Sales	#12
ACT	Current assets	#4
CHE	Cash	#1
LCT	Current liabilities	#5
DLC	Debt in current liabilities	#34
DP	Depreciation and amortization	#14
RD	Research and Development	#46

4. Econometric Methodology

I. Logistic regression model for all loss quintiles

The loss reversal model is run using a logistic regression. A Logistic regression obtains a percent probability of a certain result given a variable parameter.

The model of the loss reversal used is:

$$y_{t+1} = c + X_t B + \varepsilon_{t+1}$$

Y_{t+1} is an indicator variable equal to one if the firm becomes profitable in the subsequent period and zero otherwise.

X_t represents the information variables of the model ε_{t+1} is the error term.

To estimate the proxy for investors' assessment of loss persistence a broad category of (accounting) variables are used in the equation.

C is the constant in the Loss reversal model. C represents any relevant information in y_{t+1} that is not incorporated in X_t.

ROA is net income after extraordinary items and discontinued operations, (Compustat data item #172), PAST_ROA is ROA for the previous year.

There are two test specifications used, one is ROA and the other is ROA decomposed into its cashflow and accrual components. This is according to work done by Dechow (1994) where she finds that earnings are equal to cashflows and accruals.

CFO is defined as cashflow scaled by lagged total assets. Cashflow is measured as net income (annual Compustat data item #172) - accruals. Accruals or ACC are measured as (ΔCurrent Assets (data item #4) - ΔCash (data item #1) - ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Deprecation and Amortizations (data item #14), scaled by lagged total assets (data item #6).

PAST_CFO and PAST_ACC are defined as CFO and ACC above but for the previous year. There is also a measure for the total assets of the firm; it is defined as SIZE, which is Assets total for the year (Compustat data item #6).

Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).

Variables that cover R&D are the following: RD expenses (Compustat data item #46); this is to see if R&D expenses affect earnings ability to influence future loss reversals. Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus RD expenses. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.

The last set of variables captures the frequency of the losses. This is needed for robustness tests. In general this is to test what effect firms' with only one loss (transitory) and firms' with (multiple) losses have on loss reversals. The SINGLE variable is a dummy variable defined as a count of firms that have only experienced one year of losses. The dummy variable is equal to 1 if the firm had only one loss or 0 if the firm had multiple losses (2 or more consecutive years of losses). The MULTIPLE variable is the opposite of the SINGLE variable. The indicator variable is defined as 1 if the firm has experienced multiple years of losses, and 0 if the firm has experienced only 1 loss year.

Table 2: Logistic regression models of loss reversal after R&D has been deducted

Variable	Predicted Sign	Specification
C	**?**	-0.648
		(-96.418)*
ROA	**+**	0.575
		(2.342)*
PAST_ROA	**+**	0.039
		(2.786)*
SIZE	**+**	0.002
		(10.255)*
DIV	**+**	0.047
		(2.497)*
PAST_DIV	**+**	0.035
		(3.188)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
ROA is net income after extraordinary items and discontinued operations, (Compustat data item #172), PAST_ROA is ROA for the previous year.
There is a measure for the total assets (size) of the firm; it is defined as SIZE, which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Number of observations is the cleaned dataset used consisting of loss making firms' data only.
*, Indicate significance at the 5% level.

The results are in agreement with Joos and Plesko (2005), this is not surprising given that table 2 is a replication of their results using a similar though extended dataset. In summary the variable SIZE is positive and significant indicating the larger the firm the greater the chance to experience loss reversal. This is logical as the more financial resources a firm has the higher the probability it can survive and return to profit in future years. The results for ROA and PAST_ROA indicate that companies making a profit in this year and the previous year have a bigger chance of loss reversal next year. This is what we would expect as they would have better cash reserves to survive future downturns.

The only difference with Joos and Plesko (2005) is that previous years' earnings PAST_ROA have a positive impact on the probability of loss reversal. They find it to be insignificant; this could be due to the fact that we use a significantly larger dataset then they did.

The DIV and PAST_DIV variables are both positive and significant, signifying that firms that pay out dividends in the present or past years have a stronger probability to experience loss reversal because dividends signal future company performance according to Rees (1997).

An interesting question is why firms that experience multiple losses would still be paying out dividends. Shefrin and Statman (1984) argue that small capital losses on shareholdings can be integrated into a total shareholder return, which also contains a dividend payment to avoid the bad effects of a loss. For larger capital losses this doesn't work. This may also explain any tables where past dividends are significantly positively valued but not current dividends in the loss year itself when capital losses may grow.

Table 3: Logistic regression models for accruals and cashflow after R&D has been deducted

Variable	Predicted Sign	Specification
C	**?**	-0.648
		(-96.159)*
CFO	**+**	0.590
		(2.331)*
ACC	**+**	0.590
		(2.331)*
PAST_CFO	**+**	0.0005
		(-0.076)
PAST_ACC	+	0.0005
		(-0.080)
SIZE	+	0.002
		(10.247)*
DIV	+	0.002
		(2.631)*
PAST_DIV	+	0.025
		(2.185)*

Number of observations: 47392

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.

CFO is defined as cashflow scaled by lagged total assets. Cashflow is measured as net income (annual Compustat data item #172) - accruals. Accruals or ACC are measured as (ΔCurrent Assets (data item #4) - ΔCash (data item #1) - ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Deprecation and Amortizations (data item #14), scaled by lagged total assets (data item #6).

PAST_CFO and PAST_ACC are defined as CFO and ACC above but for the previous year. There is also a measure for the total assets (size) of the firm; it is defined as SIZE, which is Assets total for the year (Compustat data item #6).

Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).

*, Indicate significance at the 5% level.

For table 3 the earnings are decomposed into cashflow and accruals, following Dechow (1994) who define earnings as cash flows plus accruals. The findings are that the results for table 2 hold. However there is a significant difference in that the past accruals and cashflows do not explain the probability of loss reversal, which is in agreement with Joos and Plesko (2005), who found similar results.

An interesting finding was that the cashflow and accrual coefficient were the same. Joos and Plesko (2005) also found the coefficients to be equal. This is surprising as we would expect the cashflow to be bigger, as accruals are mean-reverting as found by Bath and Cram and Nelson (2001).

The other variables SIZE, DIV and PAST_DIV again match Joos and Plesko (2005) results and the results in Table 2.

Table 4: Logistic regression models of loss reversal after R&D

Variable	Predicted Sign	Specification
C	?	-0.649
		(-97.693)*
ERD	+	0.512
		(2.260)*
PAST_ERD	+	0.114
		(1.630)
SIZE	+	0.002
		(10.273)*
DIV	+	0.051
		(2.619)*
PAST_DIV	+	0.025
		(2.172)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
There is a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Variables that cover R&D are the following: RD expenses (Compustat data item #46), this is to see if R&D expenses affect earnings ability to influence future loss reversals.
Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus the previous year's RD. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.
*, Indicate significance at the 5% level.

The results from table 4 show that the results from table 2 hold after R&D expenditures are included in earnings. The ERD and PAST_ERD results suggest that companies are still making losses after R&D expenditure is incorporated into earnings. The ERD variable is positive and significant this is inline with the findings that Jiang and Stark (2006) that present R&D expenditure reduces the possibility of loss reversal.

The DIV and PAST_DIV variables are again both positive and significant, signifying that firms that pay out dividends in the present or past years have a stronger probability to experience loss reversal. The SIZE variable is again positive and significant indicating the larger the firm the greater the chance to experience loss reversal

Table 5: Logistic regression models for accruals and cashflow after R&D

Variable	Predicted Sign	Specification
C	?	-0.648
		(-96.178)*
ACCRD	+	0.591
		(2.331)*
PAST_ACCRD	+	0.0001
		(-0.014)
CFORD	+	0.591
		(2.331)*
PAST_CFORD	+	0.00005
		(-0.009)
SIZE	+	0.002
		(10.361)*
DIV	+	0.021
		(1.059)
PAST_DIV	+	0.048
		(2.869)*
Number of observations: 47392		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
There is a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Variables that cover R&D are the following: RD expenses (Compustat data item #46), this is to see if R&D expenses affect earnings ability to influence future loss reversals.
Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus the previous year's RD. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.
*, Indicate significance at the 5% level.

The results from table 5 remain intact after earnings are decomposed into cashflow and accruals after RD expenditures. The results show some deviations from Joos and Plesko (2005) results in that only past dividends seem to be significant, and not present dividends. The present and past cashflow and accruals results match even when RD expenses are included. This indicates that R&D expenses don't seem to have any significant effect when compared to Joos and Plesko (2005) results. While the PAST_DIV and SIZE variables match Joos and Plesko (2005) results, the DIV variable, doesn't and it is now insignificant.

There is a possible explanation for this, is that once earnings are decomposed into their accruals and cashflows components then dividends don't matter since in the table above cashflow information is available which has greater information content than dividends.

II. Robustness Testing

As a robustness measure, tables 2 to 5 are extended for single and multiple losses. A single loss is a firm that has experienced a single loss for the duration of one year only. A multiple loss is any firm that has experienced 2 or more consecutive loss firm years.

Logistic regression model for Multiple Losses

Table 6: Logistic regression model of loss reversal before R&D

Variable	Predicted Sign	Specification
C	?	0.255
		(10.676)*
ROA	+	0.581
		(2.337)*
PAST_ROA	+	0.043
		(2.983)*
SIZE	+	0.002
		(10.108)*
DIV	+	0.040
		(2.331)*
PAST_DIV	+	0.028
		(2.647)*
MULTIPLE	-	-0.971
		(-39.724)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
ROA is net income after extraordinary items and discontinued operations, (Compustat data item #172), PAST_ROA is ROA for the previous year.
There is also a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
The MULTIPLE variable is an indicator variable defined as 1 if the firm has experienced multiple years of losses, and 0 if the firm has experienced only 1 loss year.
*, Indicate significance at the 5% level.

The results for table 6 hold for table 2.

To summarize the previous results, the variable SIZE is positive and significant indicating the larger the firm the greater the chance to experience loss reversal. This is logical as the more financial resources a firm has the higher the probability it can survive and return to profit in future years. The DIV and PAST_DIV variables are again both positive and significant.

The results for ROA and PAST_ROA indicate that companies making a profit in this year and the previous year have a bigger chance of loss reversal next year. This is again as expected, as they would have better cash reserves to survive future downturns.

The difference with Joos and Plesko (2005) again shows up in that previous years' earnings PAST_ROA have a positive impact on the probability of loss reversal. They find it to be insignificant; as mentioned before this could be due to the fact that we use a significantly larger dataset then they did.

The multiple variable is very strong and negative, this indicates that firms with multiple loss years are less likely to recover than firms that experience only single losses. This is logical as firms' with multiple loss years would have less cash reserves available to continue operating.

Table 7: Logistic regression models of loss reversal after R&D

Variable	Predicted Sign	Specification
C	?	0.254
		(10.669)*
ERD	+	0.521
		(2.238)*
PAST_ERD	+	0.120
		(1.552)
SIZE	+	0.002
		(10.140)*
DIV	+	0.042
		(2.441)*
PAST_DIV	+	0.021
		(1.979)*
MULTIPLE	-	-0.970
		(-39.737)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
There is a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Variables that cover R&D are the following: RD expenses (Compustat data item #46), this is to see if R&D expenses affect earnings ability to influence future loss reversals.
Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus the previous year's RD. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.
The MULTIPLE variable is an indicator variable defined as 1 if the firm has experienced multiple years of losses, and 0 if the firm has experienced only 1 loss year.
*, Indicate significance at the 5% level.

The results for table 7 hold for table 4.

The ERD and PAST_ERD results again suggest, that companies are still making losses after R&D expenditure is incorporated into earnings. The ERD variable is positive and significant this is inline with the findings of Jiang and Stark (2006) that present R&D expenditure reduces the possibility of loss reversal.

The DIV and PAST_DIV variables are again both positive and significant, signifying that firms that pay out dividends in the present or past years have a stronger probability to experience loss reversal. The SIZE variable is again positive and significant indicating the larger the firm the greater the chance to experience loss reversal

The multiple variable is very strong and negative, this indicates that firms with multiple loss years are less likely to recover than firms that experience only single losses. This could indicate firms that are heading for liquidation or acquisition.

Table 8: Logistic regression models for accruals and cashflow before R&D

Variable	Predicted Sign	Specification
C	?	0.256 (10.719)*
CFO	+	0.597 (2.329)*
ACC	+	0.597 (2.329)*
PAST_CFO	+	0.001 (-0.205)
PAST_ACC	+	0.001 (-0.208)
DIV	+	0.043 (2.454)*
PAST_DIV	+	0.021 (1.995)*
SIZE	+	0.002 (10.110)*
MULTIPLE	-	-0.973 (-39.744)*
Number of observations: 47392		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
CFO is defined as cashflow scaled by lagged total assets. Cashflow is measured as net income (annual Compustat data item #172) - accruals. Accruals or ACC are measured as (ΔCurrent Assets (data item #4) - ΔCash (data item #1) - ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Deprecation and Amortizations (data item #14), scaled by lagged total assets (data item #6).
PAST_CFO and PAST_ACC are defined as CFO and ACC above but for the previous year. There is also a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
The MULTIPLE variable is an indicator variable defined as 1 if the firm has experienced multiple years of losses, and 0 if the firm has experienced only 1 loss year.
*, Indicate significance at the 5% level.

The results for table 8 hold for table 3 in which the findings are that there is a significant difference in that the past accruals and cashflows do not explain the probability of loss reversal, which is in agreement with Joos and Plesko (2005), who found similar results. Again the cashflow and accruals coefficients were the same, Joos and Plesko (2005) also found the coefficients to be equal.

The other variables SIZE, DIV and PAST_DIV are again significant and positive and match Joos and Plesko (2005) results. The multiple variable is very strong and negative, this indicates that firms with multiple loss years are less likely to recover than firms that experience only single losses.

Table 9: Logistic regression models for accruals and cashflow after R&D

Variable	Predicted Sign	Specification
C	?	0.257 (10.747)*
ACCRD	+	0.599 (2.329)*
PAST_ACCRD	+	0.0009 (-0.134)
CFORD	+	0.599 (2.329)*
PAST_CFORD	+	0.0009 (-0.130)
SIZE	+	0.002 (10.102)*
DIV	+	0.018 (0.994)
PAST_DIV	+	0.042 (2.677)*
MULTIPLE	-	-0.973 (-39.749)*
Number of observations: 47392		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
There is a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Variables that cover R&D are the following: RD expenses (Compustat data item #46), this is to see if R&D expenses affect earnings ability to influence future loss reversals.
Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus the previous year's RD. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.
The MULTIPLE variable is an indicator variable defined as 1 if the firm has experienced multiple years of losses, and 0 if the firm has experienced only 1 loss year.
*, Indicate significance at the 5% level.

The results for table 9 hold for table 5.

As the results from table 5 showed they remain intact after earnings are decomposed into cashflow and accruals after RD expenditures. The results again show some deviations from Joos and Plesko (2005) findings in that only past dividends seem to be significant, and not present dividends. The present and past cashflow and accruals results match even when RD expenses are included. This indicates that R&D expenses don't seem to have any significant effect when compared to Joos and Plesko (2005) results. While the PAST_DIV and SIZE variables match Joos and Plesko (2005) results, the DIV variable, doesn't and it is now insignificant.

As expected the multiple variable is very strong and negative, this indicates that firms with multiple loss years are less likely to recover than firms that experience only single losses.

Logistic regression model for Single Losses

Table 10: Logistic regression models of loss reversal after R&D

Variable	Predicted Sign	Specification
C	?	-0.716
		(-103.904)*
ERD	+	0.052
		(2.238)*
PAST_ERD	+	0.012
		(1.552)
SIZE	+	0.002
		(10.140)*
DIV	+	0.042
		(2.441)*
PAST_DIV	+	0.021
		(1.979)*
SINGLE	+	0.970
		(39.737)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
There is also a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Variables that cover R&D are the following: RD expenses (Compustat data item #46), this is to see if R&D expenses affect earnings ability to influence future loss reversals.
Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus the previous year's RD. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.
The SINGLE variable is an indicator variable defined as a count of firms that have only experienced one year of losses. The indicator variable is equal to 1 if the firm had only one loss or 0 if the firm had multiple losses.
*, Indicate significance at the 5% level.

The results for table 10 hold for table 4.

It showed that the ERD and PAST_ERD results suggest that companies are still making losses after R&D expenditure is incorporated into earnings. Again the ERD variable is positive and significant meaning that R&D expenditure with present earnings reduces the possibility of loss reversal.

The DIV and PAST_DIV variables are again both positive and significant, signifying that firms that pay out dividends in the present or past years have a stronger probability to experience loss reversal. The SIZE variable is again positive and significant indicating the larger the firm the greater the chance to experience loss reversal

The single variable is again as expected significantly positive, this is logical as firms that have experienced transitory losses are more likely to have the financial resources to facilitate a loss reversal.

. The results suggest that companies with single losses are still making losses after R&D expenditure is incorporated into earnings.

Table 11: Logistic regression models for accruals and cashflow before R&D

Variable	Predicted Sign	Specification
C	?	-0.716
		(-102.503)*
CFO	+	0.597
		(2.329)*
ACC	+	0.597
		(2.329)*
PAST_CFO	+	0.001
		(-0.205)
PAST_ACC	+	0.001
		(-0.208)
DIV	+	0.043
		(2.454)*
PAST_DIV	+	0.021
		(1.995)*
SIZE	+	0.002
		(10.110)*
SINGLE	+	0.973
		(39.744)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
CFO is defined as cashflow scaled by lagged total assets. Cashflow is measured as net income (annual Compustat data item #172) - accruals. Accruals or ACC are measured as (ΔCurrent Assets (data item #4) - ΔCash (data item #1) - ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Deprecation and Amortizations (data item #14), scaled by lagged total assets (data item #6).
PAST_CFO and PAST_ACC are defined as CFO and ACC above but for the previous year. There is also a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
The SINGLE variable is an indicator variable defined as a count of firms that have only experienced one year of losses. The indicator variable is equal to 1 if the firm had only one loss or 0 if the firm had multiple losses.
*, Indicate significance at the 5% level.

The results for table 11 hold for table 3.

As in table 3 the earnings are decomposed into cashflow and accruals, following Dechow (1994) who define earnings as cash flows plus accruals. Again here the findings are that the results for table 2 hold. There is still a significant difference in that the past accruals and cashflows do not explain the probability of loss reversal, which is in agreement with Joos and Plesko (2005), who found similar results. The other variables SIZE, DIV and PAST_DIV are again significant and positive and match Joos and Plesko (2005) results and the results in Table 2.

An interesting result in this table is that unlike the two previous tables with a breakdown of earnings into cashflows and accruals the DIV and PAST_DIV are both positive and significant. An explanation for this is that for single loss firms, investors would naturally pay a lot of significance to present dividends as an indication of the confidence of the company's management in the future profitability of the firm.

The single variable is as expected significantly positive, this is logical as firms that have experienced transitory losses are more likely to have the financial resources to experience loss reversal.

Table 12: Logistic regression models for accruals and cashflow after R&D

Variable	Predicted Sign	Specification
C	?	-0.716
		(-102.435)*
ACCRD	+	0.599
		(2.329)*
PAST_ACCRD	+	0.0009
		(-0.134)
CFORD	+	0.599
		(2.329)*
PAST_CFORD	+	0.0009
		(-0.130)
SIZE	+	0.002
		(10.102)*
DIV	+	0.018
		(0.994)
PAST_DIV	+	0.042
		(2.677)*
SINGLE	+	0.973
		(39.749)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
CFO is defined as cashflow scaled by lagged total assets. Cashflow is measured as net income (annual Compustat data item #172) - accruals. Accruals or ACC are measured as (ΔCurrent Assets (data item #4) - ΔCash (data item #1) - ΔCurrent Liabilities (data item #5) + ΔDebt in Current Liabilities (data item #34) + Deprecation and Amortizations (data item #14), scaled by lagged total assets (data item #6).
PAST_CFO and PAST_ACC are defined as CFO and ACC above but for the previous year. There is also a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
The SINGLE variable is an indicator variable defined as a count of firms that have only experienced one year of losses. The indicator variable is equal to 1 if the firm had only one loss or 0 if the firm had multiple losses.
*, Indicate significance at the 5% level.

The results for table 12 hold for table 5.

The results from table 5 remain intact after earnings are decomposed into cashflow and accruals after RD expenditures. The past dividends only seem to be significant which is different from the results of Joos and Plesko (2005) in that only present dividends were significant. The present and past cashflow and accruals results match even when RD expenses are included, this matched Joos and Plesko (2005) equal results on cashflow and accruals without RD expenses being included. This indicates that R&D expenses don't seem to have any significant effect when compared to Joos and Plesko (2005) results. While the PAST_DIV and SIZE variables match Joos and Plesko (2005) results, the DIV variable, doesn't and it is now insignificant.

The single variable is as expected significantly positive. This is logical as firms that have experienced transitory losses are more likely to have the financial resources to experience loss reversal.

Table 13: Logistic regression models for Jiang and Stark R&D[1]

Variable	Predicted Sign	Specification
C	?	-0.716
		(-102.435)*
RD	**-**	-0.057
		(-1.574)
ERD	+	0.052
		(2.329)*
PAST_ERD	+	0.012
		(-0.134)
SIZE	+	0.002
		(10.102)*
DIV	+	0.042
		(0.994)
PAST_DIV	+	0.0021
		(2.677)*
SINGLE	+	0.973
		(39.749)*
Number of observations: 47555		

The table shows the results of the annual estimation of logistic regressions where the dependant Variable has the value of 1 when the firm becomes profitable one-year into the future, and zero otherwise. The reported coefficients are the coefficient over the period and below them are the T-stats in brackets.
There is a measure for the total assets (size) of the firm, it is defined as SIZE which is Assets total for the year (Compustat data item #6).
Another set of data measures the dividend paying behavior of the firm. The variables DIV and PAST_DIV (annual Compustat data item #21) measure present dividends and past dividends (last year's dividends).
Variables that cover R&D are the following: RD expenses (Compustat data item #46), this is to see if R&D expenses affect earnings ability to influence future loss reversals.
Earnings variables that capture Research and development are also used. ERD is defined as ROA (see above) plus RD (annual data item #46) for the present year. While PAST_ERD is PAST_ROA plus the previous year's RD. CFORD is defined as CFO plus RD expenses, PAST_CFORD is PAST_CFO plus RD expenses. ACCRD is defined as ACC plus RD expenses and PAST_ACCRD is PAST_ACC plus RD expenses.
The SINGLE variable is an indicator variable defined as a count of firms that have only experienced one year of losses. The indicator variable is equal to 1 if the firm had only one loss or 0 if the firm had multiple losses.
*, Indicate significance at the 5% level.

[1] The logistic models for all empirical analysis (table 2to 15) were implemented with the use of a Logit model. For robustness we repeated the analysis with the Probit model. The results do not change and are available upon request.

As a final robustness test, we also included R&D expenditures as an additional explanatory variable in the Joos and Plesko (2005) loss reversal model. This model is a repeat of the Jiang and Stark (2006) model. We have not estimated this model in this study because R&D expenditure is captured in the Earnings variable and the R&D explanatory variable. This would make our results inaccurate because of the concept of double counting.

However in order to compare our results to Jiang and Stark (2006) we include R&D expenditure as an additional explanatory variable even after we have incorporated R&D expenditures into earnings. The results can be seen in table 13. The results show that previous variables have the correct sign and significance as in the previous tables.

The results for table 13 show that the RD variable is insignificant and it cannot explain the probability of loss reversal in US equity markets. It does not agree with Jiang and Stark (2006) who find that R&D is significantly negative and that it decreases the probability of loss reversal.

5. Conclusion

This paper examines loss reversals in the US and builds on the loss reversal model of Joos and Plesko (2005) by analyzing a larger dataset and by looking at earnings post and pre R&D expenditures. The inclusion of R&D expenditures, is motivated by Jiang and Stark (2006) as they did it for the UK. Overall for the earnings variable before R&D expenditures there is a positive and significant effect on the probability of loss reversal, when we consider earnings in the present time and in the previous financial year.

When we decompose earnings into accruals and cashflows the results of the earnings variable hold, with the exception being, that the accruals and cashflows in the previous financial year are insignificant. When we examine earnings after R&D expenditure, the results in the previous paragraph remain intact. In other words, R&D expenditures do not change the probability of loss Reversal. This suggests that financial losses are not caused by R&D expenditures.

For robustness, we differentiate the losses into single and multiple losses. Single losses are defined as a single loss over the entire duration of the sample. Multiple losses are defined as more then one loss in the duration of the sample. We find that companies with multiple losses have a lower probability of loss reversal then companies with single losses. This agrees with Joos and Plesko (2005) indicating that companies with permanent losses have a very minor chance of reversing them.

In the case of R&D expenditures, they do not explain losses for US data, Joos and Plesko (2005) found that it does explain losses for the extreme cases of very small and very large losses (this was their 1st and 4th quartile samples). R&D expenditures does not cause losses for the overall sample that we used, in comparison Jiang and Stark (2006) find that it does explain losses for the UK. A reason for this could be that R&D expenditure is probably higher relatively for UK firms then US firms and this might explain why it is significant.

The difference we found with Jiang and Stark (2006) was that we found the individual RD variable to be insignificant and it cannot explain the probability of loss reversal in US equity markets. This did not agree with their findings where R&D is significantly negative and that it decreases the probability of loss reversal.

The earnings after R&D expenditure were positive and significant while the past earnings after R&D expenditure were not. This matches the findings of Jiang and Stark that present R&D expenditure reduces the probability of loss reversal.

The dividend variables produce an interesting result in the tables where earnings were decomposed into cashflow and accruals, present dividends became insignificant. An explanation for this could be that there is noise in earnings because companies manipulate their accruals in order to combat this uncertainty. Companies use dividends to signal future company performance. Once earnings are decomposed into cashflow and accruals the uncertainty disappears. This in turn suggests that the role of dividends as a signaling hypothesis decreases in importance when cashflow and accrual information is available.

There were as expected some very strong results for some of the other variables. The size variable showed that the larger the firm the greater the chance there is to experience loss reversal. This makes sense as the more financial resources a firm has the higher the probability it has to survive and return to profit in future years.

For earnings before R&D expenditure the results for present and past earnings indicate that companies making a profit in this year and the previous year have a bigger chance of loss reversal next year. This is what we would expect as they would have better cash reserves to survive future downturns.

The strongest results overall were for the multiple and single variables indicating as expected that firms with multiple loss years are less likely to recover then firms that experience only single losses. Also as expected firms that experience single losses are more likely to have the financial resources to experience loss reversal.

While R&D expenditure does not seem to have any effect on loss reversals for US data, a question is why would a multiple loss firm not cut back costs such as jobs and R&D to focus on survival. A possible answer is given by Kose and Lang (1992) with a study that uses a sample of 46 firms from a US Compustat database that covers all firms' in the 1980s that had an annual average of at least a billion dollars in assets, and one negative year of earnings followed by 3 years of positive earnings. They show that some multiple loss making firms continue to spend on R&D as a way of attracting bidders by having some good intellectual property intangibles on their books to attract investors.

Future research could analyze other international markets and look if the same results hold for them. In addition, extraordinary items could be included in the earnings variable. Another area for future research would be to look at other interpretations of multiple loss years as for example we did not differentiate between 2 years of losses and

3 years and longer of losses, this could bring valuable insight into how very long years of losses affects the probability of loss reversal.

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