Stockholm School of Economics

Is There Persistence in Growth on the Swedish Stock Market?

Master's Thesis in Accounting and Financial Management

Abstract

Forecasting growth rates are fundamental when valuing a company. Previous research has shown that growth forecasts are often based on extrapolating historical growth. This method has been criticized, and we study if this critique is rational in a Swedish context. Hence, we examine whether there is persistence in growth on the Swedish stock market, i.e. if the proportion of firms that have experienced above- or below-median growth for a consecutive number of years differs from what is expected by chance. We use three different growth measures: sales, operating income before depreciation and net income before extraordinary items. The results for the entire sample show significant persistence in sales growth compared to chance. However, for the growth measures of operating income and net income the proportion of firms cannot be separated from what is expected by chance, implying that extrapolation of historical growth is not rational when forecasting earnings growth. Nevertheless, there seems to be a possibility of identifying some firms ex ante that *do* experience persistence in earnings by analyzing certain characteristics.

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1. Introduction

1.1 Problem area

A company's future growth rates in operating performance[1] are necessary input data when valuing a company (Koller, Goedhart & Wessels, 2010, p. 95). Hence, analysts and investors need to make predictions of future growth. As these predictions differ a lot between companies, this infers that analysts and investors believe that it is possible to forecast growth, since otherwise they would forecast identical growth for all firms. However, forecasting growth rates is a challenge and analysts often tend to be overly optimistic (pessimistic) about future growth rates regarding firms with historically high (low) growth rates (e.g. Koller et al., 2010; La Porta, 1996; De Bondt & Thaler, 1985). This implies that historical growth is a large component when predicting future growth.

Moreover, Chan, Karceski & Lakonishok (2003, p. 643) (hereafter CKL) conclude that "there is no persistence in long-term earnings growth beyond chance", which means that it is very rare that firms live up to the belief of consistent high growth. Consequently, it seems to be unfavourable to take past growth into account when predicting future growth. Consistent high growth is also questioned by basic economic theory. For instance, competitive pressure suggests that companies' profitability and growth rates should dampen in a competitive environment (Fama & French, 2000, p. 174).

Given that analysts and investors tend to extrapolate historical growth when valuing companies, it is implied that lack of persistence in growth could lead to mispricing. This is due to the fact that analysts, in their belief of growth persistence, value companies at a too high or low multiple (e.g. La Porta, 1996; Dechow and Sloan, 1997; Skinner & Sloan, 2002). Therefore, it is of importance to be aware of if there is persistence in growth or not.

[1] Growth in operating performance is defined as growth in either sales, operating income before depreciation and net income before extraordinary items. Hereafter, the word "growth" will mean growth in all three operating performance measures unless something else is stated.

1.2 Aim of the study

Although persistence in growth as a field of research has been explored, there are to our knowledge still no studies made on Swedish data. Consequently, the starting-point in this thesis will be to find if it is probable that firms are able to sustain high[2] (low) growth rates over prolonged periods on the Swedish market, i.e. if there is persistence in growth? According to CKL's definition, persistence in growth occurs when the proportion of firms that have experienced above- or below-median growth for a consecutive number of years is greater than what is expected by chance. Negative persistence occurs when the proportion is less than what is expected from chance.

Furthermore, this study aims to investigate whether different subsets of firms are more likely to consistently achieve high (low) growth rates, i.e. does it matter if a firm acts within a certain industry, has a certain size or book-to-market ratio, has shown previous extreme levels of growth or is active during different time periods.

This will extend the previous research and seek to provide additional evidence whether persistence in growth exists. It will also give increased knowledge about the usefulness of historical growth, size, industry and whether the stock is considered to be a value stock or a glamour stock[3], when trying to forecast growth.

1.3 Scope of research

In the first part of the study, we test whether there is persistence in growth in the full sample. In the second part, we test if there is persistence in growth in different subsets of our sample. The paper is limited to investigating the period 1990 - 2009 and includes all listed firms on the Stockholm OMX stock exchange with available data on COMPUSTAT.

[2] High (low) growth is defined as having above-median (below-median) growth for the year in question.
[3] Value stocks are defined as stocks with a high book-to-market ratio and glamour stocks as stocks with a low book-to-market ratio, i.e. that future growth is valued higher.

1.4 Outline

We will present the thesis in the following order. Firstly, a summary of previous research and relevant theoretical framework is introduced to give some background to the study. Secondly, we will describe the introductory methodology used for testing our hypotheses, followed by a short section about the sample descriptive statistics. Next, each test will be described and we will summarize our findings for each test as well as interpret and analyze the results. Finally, we will present a concluding section and some suggestions for future research.

2. Previous research / Theory

2.1 Forecasting growth

The future growth in a firm's operating performance is a key component when it comes to the amount of value the company creates. Consequently, growth is necessary input data when valuing a company (e.g. Gordon, 1959; Malkiel & Cragg, 1970; Koller et al., 2010). However, the long-term growth forecasts that analysts make do not predict the future earnings growth in a satisfying way as they, more often than not, are incorrect (e.g. Dechow & Sloan, 1997; CKL, 2003; Cao, Myers & Sougiannis, 2010). Actually, naive time-series models have shown to have a higher accuracy as growth predictors than long-term growth forecasts (Harris, 1999, p. 725). Yet, the forecasts made by analysts are highly used and of great relevance to investors (La Porta 1996, p. 1716).

La Porta (1996, p. 1739) also found that investors make systematic errors when they are trying to forecast earnings growth. He noticed that when one year has passed from the original forecast, analysts systematically revise their expectations downwards for the stocks with high expected growth and upwards for the ones with low expected growth, concluding that growth expectations were too extreme. The explanation for this is called the *extrapolation hypothesis*, which states the belief that the future can be predicted by looking at the past. Furthermore, Lakonishok, Shleifer & Vishny (1994, p. 1562) concluded that extrapolation is not rational. As a result, they argued that analysts' inability to make good forecasts is largely due to a belief that persistence exists in cases

where it actually does not. Fama & French presented further evidence regarding the lack of persistence when they investigated if there was any predictability in changes in earnings. They actually found that it was possible to predict since changes in earnings tend to reverse from one year to another (Fama & French, 2000, p. 163).

2.2 Implications of erroneous forecasts

Incorrect expectations of long-term growth is one of the reasons that mispricing exists on the market (e.g. La Porta, 1996; Dechow & Sloan, 1997; Skinner & Sloan 2002) and one example of this is the *value premium*[4]. This phenomenon, that portfolios of value stocks earn higher returns than portfolios of growth stocks, has been documented in many studies (e.g. Fama & French, 1992; Chan & Lakonishok, 2004). Lakonishok et al. (1994) argued, in line with La Porta's findings (1996), that value stock investing strategies earn higher returns due to analysts' consistent extrapolation of glamour stocks' past growth in both sales and earnings. Moreover, Dechow & Sloan (1997, p. 26) found that more than fifty percent of the higher returns from value stock investing strategies is due to investors relying on incorrect forecasts made by analysts. Skinner & Sloan (2002, p. 289) stated that the value premium could be explained by negative earnings surprises as they showed that glamour stocks are (1) more likely to be the subject of a negative earnings surprise, and (2) more sensitive to negative earnings surprises. In any case, this implies that one fundamental requisite for a value stock investing strategy to work is that there is mispricing on the market, e.g. an extrapolation of historical growth, when persistence in growth does *not* exist.

However, there are also opposing studies such as Doukas & Kim (2002, p. 2161) who claimed that analysts are not more optimistic about glamour stocks compared to value stocks and thus find no evidence for the extrapolation hypothesis being true. When it comes to the Sweden, a recent thesis did not find a value premium on the Swedish market (Rosendahl & Svensson, 2009), while earlier studies on the Swedish market have come to different conclusions, revealing no clear answer in the question (e.g. Gyllenhoff & Johansson, 1987; Thysell, 1999; Bengtsson, 2001; Ahlberg & Niklasson & Stocki, 2002; as cited in Mayer-Kjärby & Winström, 2003).

[4] Value stock premium relates the phenomena that value stocks earn higher return than glamour stocks.

2.3 Does persistence in growth exist?

Lintner and Glauber (cited in Haugen, 2010, p. 38) made one of the first experiments in the subject in 1967. They tried to explain differences in growth in one period with differences in growth in the period that came before. However, their results showed no or little correlation between past and present growth. Brealey (cited in Haugen, 2010, p. 39) investigated this subject in a somewhat different way in 1983. He calculated the growth in earnings per share for U.S. companies and ranked them accordingly. After tabulating the number of runs that occurred when the firm is in the top or bottom half of the sample for a consecutive number of years, he discovered that shorter runs were more frequent than long runs and when plotting it on a curve it showed that the expected number of runs were the same as if it was just matter of chance.

CKL (2003) updated Brealey's test and elaborated further, although they were basically testing the same hypothesis as Brealey. The number of firms with above-median growth in sales, operating income and net income for a consecutive number of years were calculated and they came to the conclusion that for the earnings measures, the percentage of above-median firms was extremely similar to what is expected if you simply flipped a coin multiple times. They did however conclude that there was some persistence in sales growth. CKL completed further tests on subsets of the data set, based on different firm characteristics. They found that technological and pharmaceutical firms, i.e. firms that are often stated to be able to maintain high growth, show persistence in growth in sales and operating income but not in net income. Furthermore, they found that there is no great difference between the persistence for glamour and value stocks, which supports La Porta's conclusion that investors overestimate (underestimate) glamour (value) stocks' consistency in growth.

Hall & Tochterman (2008) (hereafter H&T) made a partial replication of CKL's study, but on the Australian market and on runs in both the top and bottom half of each industry. Contrary to CKL, they found significant levels of persistence in all three operating measures. They attributed this to some methodological differences and that the Australian market consists of a bigger proportion of low-volatility companies than the US market.

The methodological differences consisted mostly of the calculation of growth rates. These differences are summarized in the table below but will be discussed more in detail in section *3.1 Introductory methodology*.

It is also worth mentioning a study by Cao et al. (2010). They did not perform a test of runs but instead focused on whether earnings acceleration (change in earnings growth) conveyed any information about future earnings through a regression, and found that this was the case.

2.4 Summary of previous research

2.4.1 Forecasting growth & Implications of erroneous forecasts

Author (year)	Growth forecasting	Implications of growth forecasting
Lakonishok, Shleifer & Vishny (1994)	Extrapolation of historical growth is not rational.	Investing in value stocks earn higher returns than investing in glamour stocks, due to the extrapolation of historical growth.
La Porta (1996)	Future growth expectations are too extreme (too optimistic for glamour stocks and too pessimistic about value stocks).	Investment strategies that exploit these errors in analysts' forecasts earn superior returns.
Dechow & Sloan (1997)	Analysts systematically overestimate growth prospects of high-growth companies.	Investors have a naïve reliance on analysts' long-term earnings growth forecasts.
Harris (1999)	Extremely low forecasting accuracy.	As growth predictors, naïve time-series models have higher accuracy than long-term growth forecasts.
Fama & French (2000)	Changes in earnings tend to reverse from one year to the next.	Growth is predictable but not persistent.
Skinner & Sloan (2002)	Negative earnings surprises occur more often for glamour stocks than for value stocks.	The stock market overreacts to negative earnings surprises.
Doukas & Kim (2002)	Analysts do *not* overestimate growth of glamour stocks.	There must be some other factor that explains the value premium.
Chan & Lakonishok (2004)	-	The value premium exists due to extrapolative biases in investor behaviour.

2.4.2 Persistence in growth

Author (year)	Data set	Growth measure	Handling of negative base values	Statistical approach	Conclusion
Lintner & Glauber (1967)	US listed firms 1946-1965	$(Earnings_t - Earnings_{t-1})/Earnings_{t-1}$	N/A	What percentage of the diff. in growth in one period can be associated with diff. in growth in the period before?	No or very little correlation between past and present growth.
Brealey (1983)	US listed firms 1951-1981	$(EPS_t - EPS_{t-1})/EPS_{t-1}$	N/A	Tabulates number of runs in the top or bottom half and their length and compares with what is expected by chance.	The expected number of runs was the same as if it was just a matter of chance.
Chan, Karceski & Lakonishok (2003)	US listed firms 1951-1998	(Op. perf.$_t$/No. of shares$_t$ – Op. perf.$_{t-1}$/No. of shares$_{t-1}$)/(Op. perf.$_{t-1}$/No. of shares$_{t-1}$)	Inferring growth rates from a population of growth rates that has stock price as base value.	Very similar to Brealey's, but counts only runs in the top half and includes three operating measures: sales, op. inc. bef. depr. and net inc. bef. extraordinary items.	Some persistence in sales growth, but no persistence in earnings measures.
Hall & Tochterman (2008)	Australian listed firms 1989-2006	[(Op. perf.$_t$ – Op perf.$_{t-1}$)/Op. perf.$_{t-1}$] * [(Net inc. bef. ext. it$_t$) / (BV of E_{t-1} - BV of E_{t-2})]	Deletes all observations with a negative base value.	Similar to CKL's, but tests run in both the top and bottom for each industry.	Significant persistence in all three measures.
Cao, Myers & Sougiannis (2010)	US listed firms 1963-2008	(Op. inc.$_t$/No. of shares$_t$ – Op. inc.$_{t-1}$/No. of shares$_{t-1}$)/(Total assets$_{t-1}$/No. of shares$_{t-1}$)	Last year's total assets in the base instead of last year's operating performance.	Through a regression, tests the relationship between change in earnings growth and future earnings.	Concludes that change in earnings growth does convey information about future earnings.

2.5 Theoretical framework - should persistence in growth exist?

2.5.1 Opposed to finding persistence in growth

CKL (2003, p. 683) stated that the belief of predictability in future earnings growth does not line up with economic intuition since competitive pressures in the economy will even out persistent low or high growth for a company. Consequently, the lack of persistence in growth connects to the basic microeconomic theory of markets with perfect competition. This assumes that in markets where firms have had high growth rates, competitive pressure would dampen the growth so that no firm can earn abnormal profit in the long run. However, the theory of perfect competition relies on a number of assumptions whose propositions cannot always be taken for granted in the real world. Nevertheless, many markets can be considered reasonably competitive and show many of the traits of the perfectly competitive market, and this model is often used when trying to predict the effects of decisions and events in the real world (Perloff, 2006, p. 221ff).

The implication of the competitive market that is most relevant for our study has to do with the inability to earn abnormal profit in the long run equilibrium. In the short run, there are fixed costs and the number of firms in the market is fixed since time is needed to enter a new market. Thus, market supply is upward sloping and there will be a possibility for firms to make abnormal profits or losses in the short run. In markets where abnormal profit is being made, firms will enter the market, supply will increase and drive down market price, while in unprofitable markets, firms will exit, supply will decrease and drive up market price. Entry or exit occurs until the last firm that enters earns zero abnormal profit, meaning that this mechanism would result in that no firm is able to earn abnormal profit in the long run (where fixed factors are now considered variable and there are no barriers to entry) (Perloff, 2006, p. 242).

An important question regarding the theory of perfect competition is the length of short run vs. long run, but in fact there is no clear-cut answer. The short run is where at least one input factor is fixed and the long run where all input factors are variable. This means that the short run and long run will differ between industries and is impossible to point out in a calendar (Perloff, 2006, p. 150).

Furthermore, as each product market has its' own natural life cycle, companies get mean-reverting growth cycles that correlates with the growth cycles of their products' markets (Koller et al., 2010, p. 87). Hence, it is reasonable to think that firms that only operate on a few product markets will not have an endless amount of consecutive high growth years.

2.5.2 In favour of finding persistence in growth

Assuming that the whole Swedish market fits into the assumptions of a perfect competitive market is not completely plausible. It might even be the case that many industries within the market are not even considered reasonably competitive, due to oligopoly- or monopoly-like qualities. These industries lie under a different set of assumptions; they are price-setters and not price-takers, i.e. they face a downward-sloping demand curve. This means that firms within these industries are able to earn an abnormal profit even in the long run (Perloff, 2006, p. 463), suggesting that there could

be persistence in growth. It might also be the case that certain industries in the Swedish market are quite far away from their "long run".

A theory connected to this is *Porter's five forces* (Porter, 2008) which states that an industry's attractiveness should be evaluated on criteria of the five forces: threat of substitute products, threat of established rivals, threat of new entrants, bargaining power of suppliers and bargaining power of customers. A perfectly competitive industry would be considered unattractive. However, the theory does not state that all firms within an industry, even if it is considered unattractive, are equally profitable. Porter stated that firms who are able to take advantage of their core competencies and their business model or network will also be able outperform the average profitability of their industry. This implies that there is a good possibility of achieving persistence in growth in some industries.

3. Introductory methodology

This part will explain the basic methodology, which will be the foundation for all the following tests. The methodology used will be similar to the one used by CKL for most parts of the study, but some aspects will be revised in order to fit our specific objectives. Data is collected from COMPUSTAT and then imported into STATA where all our analysis takes place.

3.1 Variables

Just like CKL and H&T, three indicators of operating performance are used, and growth rates will be calculated and analyzed for all of them. These are sales, operating income before depreciation (hereafter operating income) and net income before extraordinary items[5] (hereafter net income). The reason for having three indicators of growth is to get a more robust picture of growth behaviour, as patterns in the different indicators can be compared throughout our tests. The measures used are the same as CKL used, which makes comparison easier. In addition to this, there are needs for forecasts of growth in

[5] Extraordinary items are unforeseen and atypical events that should not be included in our measures since we want to focus on the companies' permanent income.

different operating measures, depending on which valuation method is used. E.g. a free cash flow valuation includes forecasting the income statement, where most items are driven trough the forecasted sales growth (Koller et al., 2010, p. 194). Another common method is valuation through multiples and as it is quite common that these are based on forecasts of income measures that exclude non-operating items (e.g. Enterprise value/EBITDA), it is interesting to analyze both types of earnings measures (Koller et al., 2010, p. 317ff).

3.2 Data collection

Data is collected for all the companies on the Swedish stock exchange (OMX Stockholm) that are available on COMPUSTAT. Most data is collected from COMPUSTAT's *Fundamentals Annually,* which is a well-renowned database that has annual data for most of the variables needed from 1987-2009. Some data have also been taken from COMPUSTAT's *Securities Daily.* Apart from the three indicators of growth, data of book value of equity, number of shares[6] (including an adjustment factor to adjust number of shares for stock splits and stock dividends), stock prices and global industry classification codes are collected in order to complete our calculations.

3.3 Calculating the persistence in growth

In order to test our main question and hypotheses, the persistence test that was first introduced by Brealey and then refined by CKL (2003, p. 653) will be used. A median growth rate is computed for the whole sample each year and firms are given the value 0 if they are below the median and 1 if they are above. Starting at each year (1990-2009), the number of consecutive years that a firm is in the top is computed. This is called a *run* and the number of runs of different lengths (1-9 years) is aggregated and compared with how many firms stay in the sample for the same time period. Number of one-year runs will by definition be 50% of total observations, thus the same as the probability of getting heads when flipping a coin. The chance of getting heads a consecutive number of times in a row is 0.5^n where n represents number of coin tosses. E.g. total number of two-year runs divided by total number of observations that stay in the sample for two years after measurement will then be compared with the probability of getting heads two times in a

[6] Number of common/ordinary shares outstanding as of the company's fiscal year-end.

row, which is $0{,}5^2 = 25\%$. This is repeated for runs up to nine years and persistence is defined as achieving a percentage that significantly differs from what is expected by chance.

CKL only tests persistence in the top median, but it is also interesting to see if there is persistence in growth in the bottom median. Therefore, we repeat the exact same procedure as above but with this one change. H&T (2008, p. 183) tests persistence in both halves aggregately, but testing both halves separately should give a better overall picture of the behaviour of growth. However, due to limited space we will only present the results from runs below median if they deviate markedly.

3.4 Statistical test of difference in proportion

In order to test our hypotheses, a statistical test that tells us to a certain level of significance if the proportions yielded from the test of runs can be statistically separated from what is expected by chance, is needed. The test that is relevant when comparing two different proportions consists of computing a z-statistic (Newbold, Carlson & Thorne, 2007, p. 352):

$$[\text{Equation 1}]\ z = (p_{act} - p_{chance}) / [(p_{chance} * (1 - p_{chance})) / n]^{0.5}$$

where $[(p_{chance} * (1 - p_{chance})) / n]^{0.5}$ = *standard deviation*

p_{act} = *actual proportion of firms*

p_{chance} = *proportion expected by chance*

n = *number of observations*

This method is valid when sample sizes are large, generally at least 40 observations (Newbold et al., 2007, p. 315). The z-statistic gives a p-value that can be analyzed. We can reject the null hypothesis, i.e. the proportion of firms, whose growth rate is consistently above (below) median, is *equal* to what would be expected by chance at different levels of significance depending on what z-statistic is yielded for our two-tailed test (Newbold et al., 2007, p. 841).

z >1.645→90% significance level (weak significance)

z >1.960→95% significance level (significance)

z >2.575→99% significance level (strong significance)

Table 1 – Significance levels presented in tables

	Positive persistence
*	= 90%
**	= 95%
***	= 99%
	Negative persistence
°	= 90%
°°	= 95%
°°°	= 99%

Since we are doing tests of runs, there will be a different z-statistic for 2-year runs, 3-year runs, 4-year runs etc. If the level of significance differs a lot between the different lengths of runs, this creates a difficulty in deciding whether or not the null hypothesis should be rejected or accepted. In these ambiguous cases we will go by the rule of thumb that at least 2/3 of the values should be significantly (95% significance or more) different from what is expected by chance in order to reject the null hypothesis. If less than 1/3 of the values are significantly different from what is expected by chance, we will accept the null hypothesis. If our results are in between these limits, we will not be able to reach a clear conclusion. Whenever a null hypothesis is rejected, we will state whether the persistence is positive (above what is expected by chance) or negative (below what is expected by chance).

3.5 Calculating growth rates

Calculating a meaningful growth rate is more complicated than one might think. Previous research shows us that there are a couple of different methodologies that have been used. Due to the many opinions on which growth rate is the "correct" one, our main test was run using different growth rates and then compared in order to pin down the differences. When comparing proportions from populations with different size, one must perform a slightly different statistical proportions-test than above (Newbold et al., 2007, p. 315):

[Equation 2] $z = (p_X - p_Y)/[(p_X * (1-p_X))/ n_X + (p_Y * (1-p_Y))/ n_Y]^{0.5}$

p_x = *proportion for sample x*

p_y = *proportion for sample y*

n_x = *number of observations in sample x*

n_y = *number of observations in sample y*

To start with, the most common way of calculating growth rates (raw growth rate) is calculated:

[Equation 3] $rg_t = (\text{Operating performance}_t - \text{Operating performance}_{t-1})/\text{Operating performance}_{t-1}$

However, H&T proposed a different measure that adjusts for changing investment bases and which they claimed to be superior to the raw growth rate. This adjusted growth rate is calculated in the following way: [7]

[Equation 4] $ag_t = g_t * (\text{Net income before extraordinary items}_t) / (\text{BV of equity}_{t-1} - \text{BV of equity}_{t-2})$

Calculating growth rates like this is problematic since observations where the change in BV of equity between year t-1 and t-2 is negative have to be deleted as well as when there is no data for BV of equity two years ago. Deleting observations is obviously not good for the accuracy in a study that is doing a test of runs. If the same observations are deleted (that H&T's method require) for the calculation of both *rg* and *ag* and comparing the results from the main persistence test, it could not be statistically proved with 95% significance that the results differ between the two (see table A1 and A2 in *Appendix*). Thus, it can be argued that there is no need for H&T's method since the results are the same and it requires deletion of a substantial amount of observations.

[7] Hall, Tochterman, p. 177

Another important issue regarding the calculation of growth rates is how to handle the observations where the base year value for operating performance is negative (which is not an issue for sales). In cases where the base year value is negative, a meaningful growth rate could not be calculated. CKL calculated inferred growth rates by using share price as a base instead. Firms are ranked according to growth per share price and when data gaps where base year earnings were negative occur, they are filled by picking the growth rate of a firm with the same rank but with positive base year earnings (CKL, 2003, p. 653). This method is criticized since inferred growth rates belong to a different population. Firms that have more observations with negative base values are more volatile and this volatility does not come through when inferring growth rates from firms that have positive base values (H&T, 2008, p. 183f). Other options are to have the absolute value of operating performance$_{t-1}$ or total assets$_{t-1}$ as the base value, in order to avoid deleting negative observations. These methods produce very similar outcomes that could not be significantly separated from each other (see table A2 in *Appendix*). Therefore we will use the asset-base method, as it is the one that is mostly present in previous research (CMS, 2010, p. 15).

[Equation 5] $g_t = [(\text{Operating performance}_t)-(\text{Operating performance}_{t-1})]/[\text{Total assets}_{t-1}]$

This does not apply to the growth rates for sales, since there is no issue regarding negative base year values for sales. As there is no difference in the results between the raw growth rate and the asset-based growth rate for sales (see table A1 in *Appendix*), the raw growth rate will be used in our future calculations for sales growth, since this there is no need for an alternative measure.

The last issue regards whether growth rates should be calculated per share or not. The authors that calculate growth per share, argue that this is done in order to calculate "growth per dollar invested" (Daniel & Titman, 2003, p. 24). Growth can take place by improving your operations (organic growth) or increasing the scale of your operations by e.g. M&A or issuing new shares. By calculating growth per share, the effect of "artificial

growth" is stripped. This is in line with Daniel & Titman (2003), Cao et al. (2010) and CKL (2003) but not Lintner & Glauber (1967) and H&T (2008).

One must be careful when using number of shares, as this number needs to be adjusted for stock splits and stock dividends, as it would otherwise be distorted. Adjusting for stock splits and stock dividends is done by collecting an *adjustment factor* from COMPUSTAT, which adjusts the number of shares for this specific purpose (Standard & Poor's Compustat® Xpressfeed, Understanding the Data, 2007, p. 88). The growth rate per share is calculated:[8]

[Equation 6] $g\ per\ share_t = [(Operating\ performance_t / No.\ of\ shares_t) - (Operating\ performance_{t-1} / No.\ of\ shares_{t-1})] / [Total\ assets_{t-1} / No.\ of\ shares_{t-1}]$

Testing the difference between the results from equations 5 and 6 (per share or not), it was found that the differences were significant in only 2 out of 24 cases (see table A2 in *Appendix*). Since most of the previous research (Daniel & Titman, 2003; CKL, 2003; Cao et al., 2010) is based on growth rates per share, this is the method that will be used in the rest of the analysis.

Firms with non-calendar fiscal years are included as there is no problem with calculating a meaningful growth rate. As they need to "belong" to a certain year, a growth rate between e.g. August 2006 and July 2007 will be considered a growth rate for year 2007. There are a few occasions where firms switch fiscal years during the period. In these very few cases, the first observation after the change is dropped and the growth rate is calculated over a period longer than one year, but is then annualized through the following formula:

[Equation 7] $Annualized\ growth\ rate = (Ending\ value / Beginning\ value)^{(12/x)}$

x = *number of months between ending value and beginning value*

[8] When calculating growth rates for sales, $Sales_{t-1}$ is used in the denominator instead of Total $assets_{t-1}$.

4. Descriptive statistics

As mentioned before, all data has been collected from COMPUSTAT. Most companies on the OMX are covered in the last ten years, but a considerable amount of data is available from the 90's as well. Both active and inactive companies are included for all years, something that is important for the sample's representativeness. The data that is included from the early 90's seems to be a bit skewed towards larger companies. However, the issue of size and comparison between the 90's and 00's will be dealt with in section 5.7 and 5.9. Another possible skewness could be that certain industries were overrepresented (or underrepresented) in the early sample. Although some trends are detectable, one cannot rule out that there have been similar trends in the Swedish stock market and that the early sample actually is representative. For example, there were barely any observations in the sample for IT firms in the early 90's, but this might actually convey the real world as this is before the IT-age broke through (see table A3 in *Appendix*). The sample will be analyzed per industry in section 5.6.

The main descriptive statistics is presented in table 2. One must remember that as stated in the previous section, the growth rate used is per share with previous year's assets in the base for operating income and net income. Therefore, the standard deviations might seem low for these growth rates because the denominator is larger and more stable compared to a raw growth rate, which has a bigger spread.

Table 2 – Main descriptive statistics

Year	No. of observations (still listed)	No. of observations (delisted)	Total no. of observations	Median g - Sales	Std. dev. - Sales	Median g - Op. Inc.	Std. dev. - Op. Inc.	Median g - Net Inc.	Std. dev. - Net Inc.
1990	26	46	72	8.6%	34%	0.0%	5%	-0.4%	4%
1991	27	51	78	-4.8%	27%	-2.4%	5%	-0.9%	4%
1992	28	46	74	-16.5%	43%	-3.1%	6%	-1.2%	4%
1993	30	45	75	3.1%	37%	1.9%	6%	2.6%	4%
1994	33	44	77	5.9%	119%	3.0%	6%	1.4%	5%
1995	36	45	81	9.1%	27%	1.9%	5%	0.9%	5%
1996	39	45	84	-3.0%	91%	-0.8%	7%	0.2%	6%
1997	73	79	152	10.1%	36%	1.2%	6%	0.6%	5%
1998	117	112	229	11.3%	53%	0.8%	8%	0.3%	7%
1999	146	118	264	8.2%	76%	1.1%	18%	0.4%	20%
2000	176	111	287	9.8%	103%	2.0%	19%	0.8%	21%
2001	201	102	303	6.2%	62%	-1.3%	15%	-1.4%	24%
2002	220	95	315	-0.1%	64%	1.6%	18%	0.6%	33%
2003	235	85	320	-2.4%	52%	1.0%	21%	1.5%	37%
2004	246	77	323	6.2%	60%	2.3%	18%	2.9%	31%
2005	265	69	334	10.8%	99%	3.1%	17%	3.3%	22%
2006	279	51	330	11.9%	69%	2.1%	13%	1.4%	15%
2007	301	40	341	10.5%	50%	1.7%	12%	1.0%	15%
2008	323	25	348	6.0%	64%	-0.8%	14%	-1.3%	17%
2009	322	12	334	-7.5%	105%	-0.2%	25%	-0.3%	33%
Total	**3123**	**1298**	**4421**	**5.6%**	**72%**	**1.0%**	**16%**	**0.6%**	**23%**

The sample can be split into industries through a Global Industry Classification code. Descriptive statistics for these (table 3) show that growth rates differ quite a bit between industries. *Telecommunications* have the highest median growth rate for sales and net income, but it actually only represents 1.7% of the sample. Noticeable here is that even though there are few observations from this industry, they represent a relatively large part of the OMX's market cap due to their large size (e.g. TeliaSonera and Tele2). *Materials*, *Financials* and *Industrial goods* are the three industries with lowest median growth in net income. *Health care* is in the top three in all three operating measures and *IT* is in the top two in both earnings measures.

Table 3 – Descriptive statistics by industry

Industry	% of sample	Median g - sales	Median g - op. inc.	Median g - net inc.	Avg. mkt cap per obs. SEK bn
Industrial goods	26.1%	6.1%	0.8%	0.4%	0.9
Information Technology	20.2%	4.7%	2.3%	1.7%	0.2
Financials	17.3%	4.1%	0.6%	0.4%	2.0
Consumer goods	15.9%	6.2%	1.4%	1.1%	0.8
Health Care	9.8%	9.8%	2.2%	1.5%	0.4
Materials	6.4%	3.5%	0.1%	0.0%	1.4
Telecommunication	1.7%	11.9%	1.8%	1.9%	16.8
Energy	1.7%	7.0%	1.5%	0.5%	2.1
Utilities	0.9%	6.8%	0.6%	0.4%	8.1
Total	**100%**	**5.6%**	**1.0%**	**0.6%**	**0.7**

During the study, the sample will also be split into size and book-to-market ratio. Table 4 show how these two categories overlap.[9] [10] Almost half of the small firms are considered value stocks and almost half of the large firms are considered glamour stocks.

Table 4 – Descriptive statistics, Size vs. Book-to-market ratio

Size	Value	Middle	Glamour	**Total**
Small	14%	10%	6%	**30%**
Medium	13%	22%	15%	**50%**
Large	3%	8%	9%	**20%**
Total	**30%**	**40%**	**30%**	**100%**

[9] Small companies are defined as those with market cap in the bottom three deciles, large are those with market cap in top two deciles, and middle are the ones in between. This is the same definition as CKL use.
[10] Value stocks are defined as those with a book-to-market ratio in the top three deciles and glamour stocks are those in the bottom three deciles. This is the same definition as CKL use.

5. Hypotheses, results and analysis

We will in this section motivate each hypothesis that will be tested. Also, we will include additional methodology for some tests. Thereafter, we will present our results and our analysis. This structure is chosen due to the large number of subtests and will help us avoid being repetitive as well as give the reader a better opportunity to follow our line of argument.

5.1 Main persistence test

Given the presented theories and the prior research, it is reasonable to believe that there should not exist any persistence in growth on the Swedish stock market in general. However, there are some uncertainties, e.g. Hall & Tochterman (2008) find persistence in their studies of the Australian stock market and some of the theories we present support their result. Therefore, we want to answer if there is persistence in growth on the Swedish stock market. The hypothesis that will be tested is the following:

> **$H1_0$**: The proportion of firms, whose growth rate is consistently above (below) the median, is equal to what would be expected by chance.
> **$H1_1$**: The proportion of firms, whose growth rate is consistently above (below) the median, differs from what would be expected by chance.

For the other subtests we will only present the null hypothesis, as the alternative hypothesis is implicit. If the null hypothesis states that a certain proportion is *equal* to what is expected by chance, the alternative hypothesis will be that this certain proportion *differs* from chance.

5.1.1 Method for main persistence test

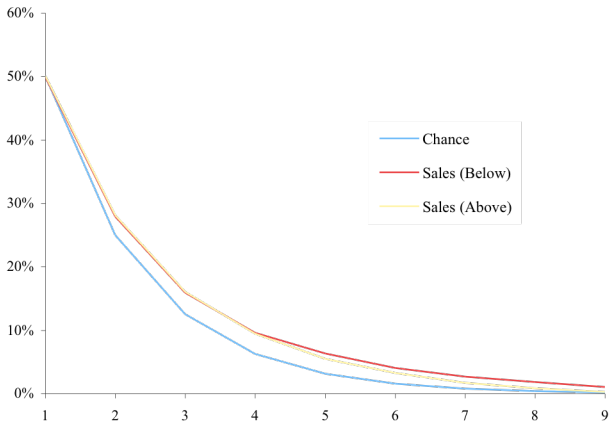
The methodology in this test is identical to the methodology described in section 3.

5.1.2 Results from main persistence test

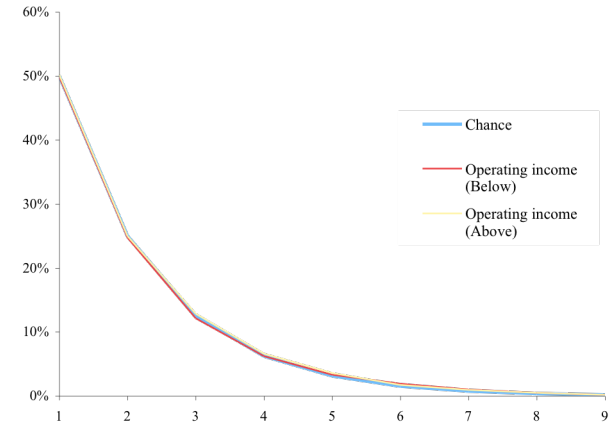
Table 5 – Persistence in growth

	Percentage of firms with above-median (below-median) growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
				a) Above-median growth					
Valid observations	*4421*	*3864*	*3338*	*2872*	*2449*	*2061*	*1711*	*1386*	*1084*
Sales	50.0%	28.1% ***	16.1% ***	9.5% ***	5.5% ***	3.2% ***	1.7% ***	0.8% **	0.3%
Op. Income	50.0%	25.0%	12.8%	6.6%	3.6%	1.8%	1.0%	0.5%	0.2%
Net income	50.0%	23.8% °	11.4% °	5.3% °°	2.9%	1.5%	0.8%	0.4%	0.2%
				b) Below-median growth					
Sales	50.0%	27.9% ***	15.9% ***	9.6% ***	6.4% ***	4.0% ***	2.7% ***	1.8% ***	1.1% ***
Op. Income	50.0%	24.8%	12.1%	6.2%	3.4%	2.0%	1.0%	0.5%	0.2%
Net income	50.0%	23.4% °°	11.0% °°°	5.0% °°°	2.2% °°°	1.1%	0.5%	0.3%	0.1%
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

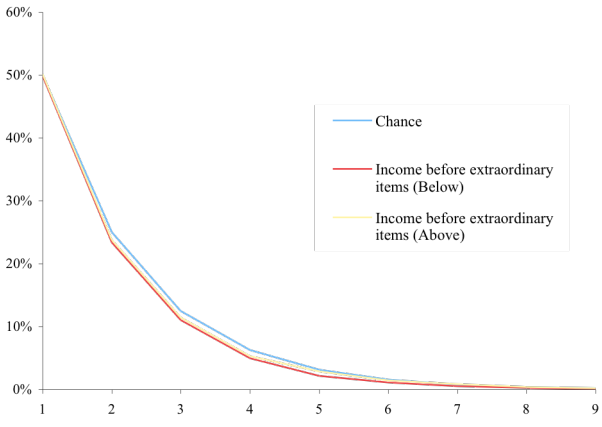
Graph 1 – Persistence in sales growth



Graph 2 – Persistence in operating income growth



Graph 3 – Persistence in net income growth



It is clear that the persistence in sales growth is positive and significant for all number of years except for the last. Percentages are higher for operating income growth than what is expected by chance but just barely and persistence cannot be significantly proved. For net income growth, percentages are actually below what is expected by chance but only by enough to prove negative persistence with weak significance for three years. The result for the below-median growth is the same except that the negative persistence for net income growth is more significant.

5.1.3 Analysis of main persistence test

These results are generally in line with CKL for all three measures. H&T on the other hand, who had a somewhat different methodology, found significant persistence for growth in operating income and net income as well. Finding persistence in sales growth is explained by CKL by the fact that firms are able to boost sales by for example adjusting their margins and selling at a discount. Furthermore, momentum in sales growth can be sustained by expanding into new geographic areas and markets or by rapidly putting out more types of products on the market. But maintaining high sales growth is often at the expense of growth in earnings (CKL, 2003, p. 655).

This non-existence of persistence in earnings growth is also in line with previous research that states that extrapolation of historical growth is not rational (e.g. Lakonishok et al., 1994; La Porta, 1996). The results indicate that historical sales growth can be used to some extent in forecasting but historical earnings growth should not be extrapolated. Given that investors actually do extrapolate historical growth rates when forecasting the future, our results also indicate that mispricing might exist on the market. The more specific issue of the value premium will be discussed in section 5.8.

$H1_0$: The proportion of firms, whose growth rate is consistently above (below) the median, is equal to what would be expected by chance.

REJECTED for sales

ACCEPTED for op. income & above-median net income

NOT CLEAR for below-median net income (negative)

5.2 Relaxed constraints

Even the most profitable companies can have a slump year once in a while, so it is also interesting to relax the constraint of having above-median growth *every* year and run the same tests again. Consequently, we will test the following hypothesis:

> **$H2_0$**: The proportion of firms, whose growth rate is above the median in *x* out of *(x+1)* years, is equal to what would be expected by chance.

5.2.1 Method for relaxed constraints test

Instead of focusing on number of consecutive years, we compute how many have been in the top half for 2 out of 3 years, 3 out of 4 years etc. These outcomes will then be compared with chance's probability percentages that are calculated through the following formula (Newbold et al., 2007, p. 152):

[Equation 8]

$$[N!/(n!*(N-n)!)]*(p^n)*((1-p)^{(N-n)})$$

$$n = no.\ of\ successes$$

$$N = no.\ of\ trials$$

$$p = probability = 0.5$$

5.2.2 Results from relaxed constraints test

Table 6 – Persistence with relaxed constraints

	Percentage of firms with above-median growth each year for number of years					
Variable	**2 out of 3**	**3 out of 4**	**4 out of 5**	**5 out of 6**	**6 out of 7**	**7 out of 8**
Sales	43.9% ***	29.3% ***	19.6% ***	13.4% ***	9.4% ***	5.7% ***
Op. Income	47.1% ***	29.2% ***	17.3% **	10.4%	5.8%	3.2%
Net income	48.3% ***	29.2% ***	16.1%	9.0%	4.9%	2.8%
Chance	*37.5%*	*25.0%*	*15.6%*	*9.4%*	*5.5%*	*3.1%*

Persistence is positive and significant for sales growth for all the periods. Persistence in operating income growth is positively significant for up to 4 out of 5 years and in net income for up to 3 out of 4 years. After this, persistence for the two income-measures cannot be separated from what is expected by chance.

5.2.3 Analysis of relaxed constraints test

Although, higher persistence is found for growth in operating income and net income in this test compared to the previous one, it does not give a clear picture. The results are in line with CKL's findings, i.e. that there is strong significant persistence for sales growth, but only in the medium-term for growth in operating income (3 to 5 years) and net income (3 to 4 years). Even though a concrete conclusion cannot be drawn for the earnings measures, these results indicate that investors with a medium-term investment horizon can to some extent take into account historical growth in earnings as well, as long as they do not focus on achieving high growth *every* year.

$H2_0$: The proportion of firms, whose growth rate is above the median in *x* out of *(x+1)*, is equal to what would be expected by chance.

ACCEPTED for sales

NOT CLEAR for op. income & net income

5.3 Survivorship bias

Survivorship bias is an issue that needs to be handled with care. Over time firms drop out of the sample and this can be attributed to missing data points or that the firm delists from the Stockholm Stock Exchange. A firm will delist for a number of reasons, one being failing to meet financial specifications set out by the stock exchange. If this happens, it will not be in the sample next year but should probably be considered as a firm with below-median growth. If a majority of the firms delist due to this reason, there will be survivorship bias that skews our results of persistence in the upward direction. Firms who delist for other reasons, such as being merged with another company, being acquired, or simply decides to delist, could have either above or below-median growth next year.
As we do not have any indications for neither to be the dominant factor, we expect to find similar levels of persistence for different levels of survivorship.

$H3_0$: The level of persistence is consistent for different levels of survivorship.

5.3.1 Method for survivorship test

One way to investigate this is to create subsets of our data, splitting our observations into groups that are sorted by how many years they will survive after the year of measurement. If a survivorship bias would exist, the groups with longer survival would show larger persistence. Both CKL and H&T used similar methods and concluded that the survivorship bias is not strong enough to invalidate their conclusions (CKL, 2003, p. 655; H&T, 2008, p. 192). In our study, the observations are split into three groups: 1-3 years, 4-6 years and >7 years of survival (from each point of measurement). The results from the persistence-test will not be compared to chance but instead to the results from the groups of different levels of survivorship, through the same statistical method as in equation 2.

5.3.2 Results from survivorship test

Table 7 – Persistence with different levels of survivorship bias

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=1549				**a) 1 to 3 years of survival**					
Sales	48.8%	27.2%	14.6%	-	-	-	-	-	-
Op. Income	49.9%	24.0%	10.0%	-	-	-	-	-	-
Net income	49.2%	22.4% °	10.1%	-	-	-	-	-	-
n=1161				**b) 4 to 6 years of survival**					
Sales	49.7%	28.5% ***	17.4% ***	9.9% ***	6.1% ***	4.0% ***	-	-	-
Op. Income	50.3%	25.8%	14.1% *	7.2%	4.3% *	1.8%	-	-	-
Net income	49.8%	24.8%	11.6%	4.9% °	3.1%	1.8%	-	-	-
n=1711				**c) > 7 years of survival**					
Sales	51.5%	28.7% ***	15.8% ***	9.5% ***	5.5% ***	3.2% ***	1.7% ***	0.9% ***	0.3%
Op. Income	50.6%	25.5%	13.0%	6.8%	3.8%	1.9%	1.1%	0.6%	0.2%
Net income	50.6%	24.1%	11.8%	5.7%	3.0%	1.5%	0.8%	0.4%	0.2%
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*
				d) Comparison between years of survival (z-statistics)					
Sales									
1-3 years vs. 4-6 years	0.44	0.67	1.39	-	-	-	-	-	-
1-3 years vs. >7 years	1.42	0.85	0.63	-	-	-	-	-	-
4-6 years vs. >7 years	0.91	0.12	-1.14	-0.34	-0.56	-0.69	-	-	-
Op. Income									
1-3 years vs. 4-6 years	0.19	0.95	2.39 **	-	-	-	-	-	-
1-3 years vs. >7 years	0.39	0.91	1.86 *	-	-	-	-	-	-
4-6 years vs. >7 years	0.17	-0.15	-0.91	-0.44	-0.57	0.06	-	-	-

Net income									
1-3 years vs. 4-6 years	0.26	1.28	0.89	-	-	-	-	-	-
1-3 years vs. >7 years	0.71	1.01	1.07	-	-	-	-	-	-
4-6 years vs. >7 years	0.41	-0.43	0.16	0.89	-0.15	-0.31	-	-	-

Note: The numbers in the comparisons are z-statistics that are equal to the difference between the different samples. Positive values denote higher persistence for longer survivorship.

5.3.3 Analysis of survivorship test

The results show a slight upward trend (two thirds of the comparison are positive) suggesting the existence of some survivorship bias, but the difference is only significant in one and weakly significant in one out of the 36 comparisons. Thus, one can conclude that survivorship bias does not have a significant effect on our results and the null hypothesis cannot be rejected. This is in line with both H&T and CKL, but an additional method is presented by H&T in order to give a more robust picture of survivorship bias, which follows below.

$H3_0$: The level of persistence is consistent for different levels of survivorship.
ACCEPTED

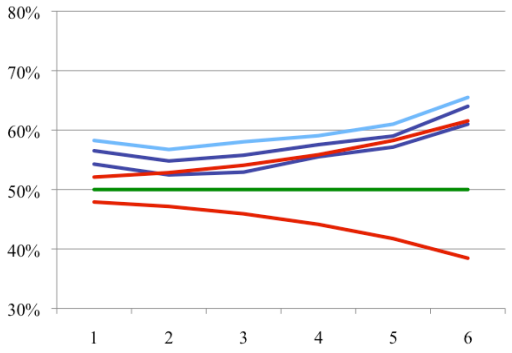
5.3.4 Method for survivorship test no. 2

This method presents the probability of achieving above-median growth next year conditional on above-median growth for the past x number of years, which includes upper and lower bounds that accounts for minimum and maximum levels of survivorship bias (H&T, 2008, p. 193). The upper bound represents the same probability but assumes that all the observations that had above-median growth for x number of years but dropped out of the sample next year, actually would have had above-median growth. The lower bound assumes maximum survivorship bias, i.e. that all firms that dropped out would have had below-median growth next year. This gives a good picture of the robustness of the tests and the impact of survivorship bias. It also gives a good picture of how persistence changes depending on how many years of previous above-median growth firms have had. The same test is performed for persistency in below-median growth but

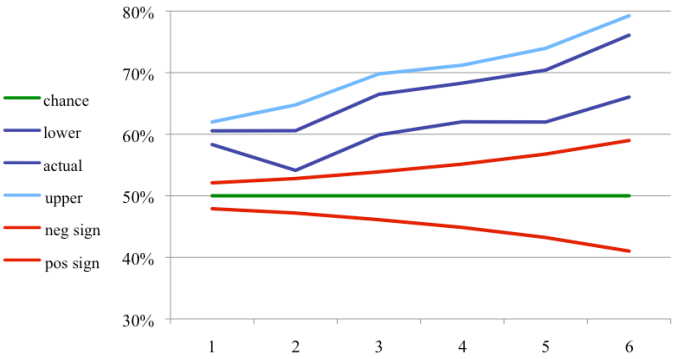
the upper bound represents maximum survivorship bias, since there would be more persistent low growth if the firms that dropped out had low growth the following year.

5.3.5 Results for survivorship test no. 2

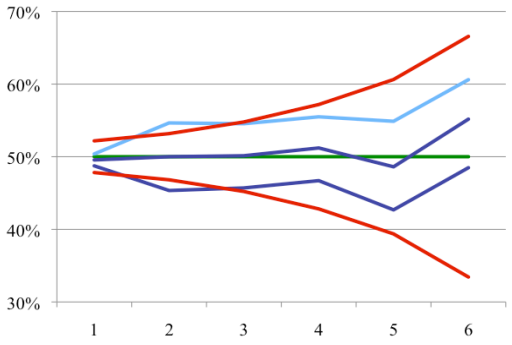
Graph 4 – Sales above median



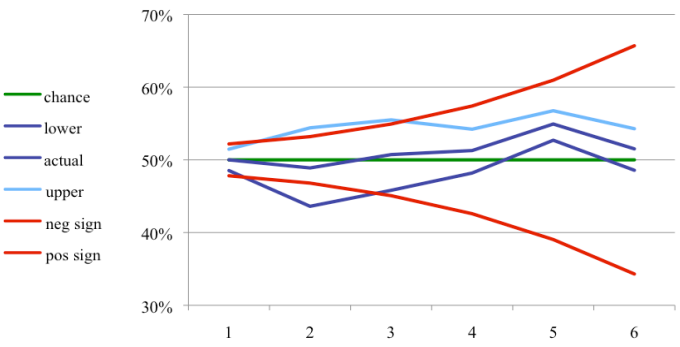
Graph 5 – Sales below median



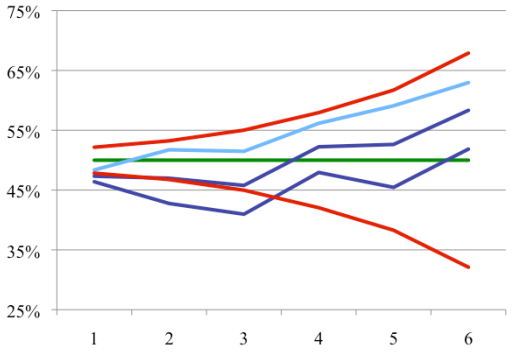
Graph 6 – Op. inc. above median



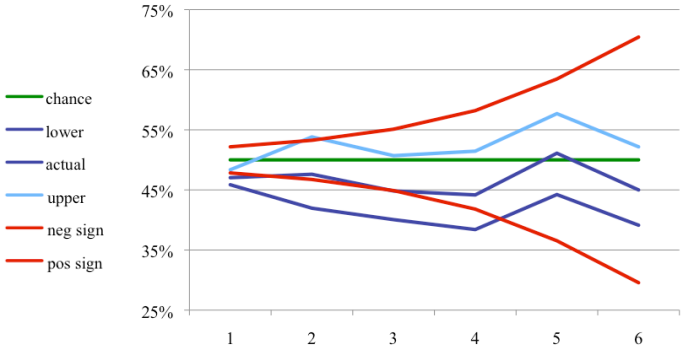
Graph 7 – Op. inc. below median



Graph 8 – Net inc. above median



Graph 9 – Net inc. below median



5.3.6 Analysis for survivorship test no. 2

The red lines indicate the cut-off point for significance (95%). It becomes broader since observations become less for every extra conditional year. From the graphs it is clear that our results are robust to survivorship bias except for a few times where the blue-shaded lines go outside the red lines. It is mostly the lower bound for net income growth that is below the lower red line, which means that assuming maximum survivorship bias would result in a slight negative persistence, which is in fact in line with our main results.

Also, one can notice that the probability of achieving below-median sales growth the next year becomes greater the longer a firm has had below-median growth in the past. However, the probability of achieving *above*-median growth for any operating measure the next year does *not* get significantly greater the longer a firm has performed well previous years.

5.4 3-year growth rates

So far, all tests have been run using 1-year growth rates. Often growth rates are calculated on a longer time horizon, thus we will also run the test using 3-year growth rates, to see if they deviate markedly.

> **$H4_0$ a)**: The proportion of firms, whose rolling 3-year growth rate is consistently above the median, is *equal* to what would be expected by chance.
> **$H4_0$ b)**: The proportion of firms, whose 3-year growth rate in blocks of three years is consistently above the median, is *equal* to what would be expected by chance.

5.4.1 Method for testing 3-year growth rates

As stated in the hypotheses, we do this in two ways. In the first one we use rolling growth rates, e.g. 1990-92 and 1991-1993. This creates a problem of overlapping since firms that have had above-median growth the year before are likely to have it the following year as well since two out of the three years included in the first growth rate are also included in the second growth rate. The other way is to run our test in blocks of three years, e.g. 1990-92 and 1993-1995 etc., which gets rid of the problem of overlapping.

5.4.2 Results from 3-year growth rates test

Table 8 – Persistence for 3-year periods

	Percentage of firms with above-median growth each year/period for number of years/periods								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=3338				**a) Rolling 3-year**					
Sales	50.0%	37.6% ***	28.6% ***	21.2% ***	16.2% ***	12.2% ***	8.5% ***	6.3% ***	5.2% ***
Op. Income	50.0%	35.7% ***	25.9% ***	18.6% ***	13.2% ***	9.4% ***	7.0% ***	5.1% ***	3.7% ***
Net income	50.0%	34.1% ***	22.8% ***	14.3% ***	9.0% ***	5.9% ***	4.1% ***	2.8% ***	2.6% ***
n=904				**a) Blocks of 3-year**					
Sales	50.0%	26.3%	14.3%	8.3%	6.2%	3.6%	-	-	-
Op. Income	50.0%	24.2%	13.5%	4.9%	3.4%	3.0%	-	-	-
Net income	50.0%	21.5% °°	11.1%	4.0%	2.9%	2.1%	-	-	-
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

5.4.3 Analysis of testing 3-year growth rates

As expected, strong persistence is found when using rolling 3-year growth rates for all operating measures. Running the test in blocks of three years shows similar patterns to our original tests with 1-year growth rates for all measures, except for sales where the results cannot be significantly separated from what is expected by chance. All in all, the results that we will focus on will be the ones based on 1-year growth rates.

$H4_0$ a): The proportion of firms, whose 3-year growth rate in blocks of three years is consistently above the median, is *equal* to what would be expected by chance.

ACCEPTED

$H4_0$ b): The proportion of firms, whose rolling 3-year growth rate is consistently above the median, is *equal* to what would be expected by chance.

REJECTED

5.5 Splitting the data set

In order to further analyze our results we will split the data into subsets. This allows us to check if the persistency patterns are specific to any particular type of firms. The data set will be split according to the following characteristics:

- Industry
- Size (market capitalization)
- Book-to-market ratio
- Time period
- Extreme values of growth
- Historical persistence

For the following tests, the percentage with above-median growth for one year does not need to equal 50% as the subsets are measured against the median that includes all observations that year. The first value can therefore be analyzed in these tests.

5.6 Industry

This test investigates whether there is significant positive or negative persistence for certain industries. As described earlier, assuming perfect competition we expect not to be able to find any greater persistence in growth of earnings in industries that are close to their long-run equilibrium, since all firms should earn zero abnormal profit in the long run. The theory does not directly imply the same for sales, but one could assume a similar development. Equivalently, we believe that persistence might exist in industries far away from their long run equilibrium and/or with high entry barriers. Thus, hypotheses that will be tested are the following:

> *The proportion of firms in the following industries, whose growth rate is consistently above the median, is equal to what would be expected by chance:*
>
> **$H6_0$ a)**: Materials[11]
>
> **$H6_0$ b)**: Industrial goods
>
> **$H6_0$ c)**: Consumer goods

[11] $H5_0$ does not exist as the hypothesis number follow the section number.

$H6_0$ d): Health care

$H6_0$ e): Financials

$H6_0$ f): Information technology (IT)

5.6.1 Method for industry test

When our data is downloaded, a Global Industry Classification code is included which tells us what industry each company is in and the run-test is performed for each industry.[12] H&T performed the same test with one difference. They compared the growth rates within each industry with the *industry* median and not the median for the whole sample. This method tells us whether there is persistence within a certain industry, while the method that we will focus on tells us whether firms belonging to certain industries are persistent within the whole sample, which is the method that CKL used. The results from H&T's method are found in table A7 in *Appendix*.

5.6.2 Results from industry test

Table 9 – Persistence for different types of industries (CKL's method)

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=290				**a) Materials**					
Sales	45.0% °	21.6%	11.4%	5.8%	3.1%	1.8%	0.0%	0.0%	0.0%
Op. Income	45.4% °	20.1% °°	9.2% °	4.2%	1.0% °	0.0% °	0.0%	0.0%	0.0%
Net income	43.3% °°	17.4% °°°	6.5% °°°	2.1% °°°	0.5% °°	0.0% °	0.0%	0.0%	0.0%
n=1137				**b) Industrial goods**					
Sales	51.2%	29.6% ***	17.2% ***	10.4% ***	6.5% ***	4.1% ***	2.5% ***	1.0% **	0.3%
Op. Income	48.2%	22.7% °	11.8%	5.5%	2.9%	1.2%	0.2%	0.0%	0.0%
Net income	48.5%	21.0% °°°	9.3% °°°	3.5% °°°	1.6% °°	0.7% °	0.2%	0.0%	0.0%
n=700				**c) Consumer goods**					
Sales	50.8%	30.4% ***	19.0% ***	13.2% ***	8.2% ***	4.6% ***	2.4% ***	1.0%	0.7%
Op. Income	51.0%	25.4%	13.3%	7.6%	4.7% *	3.0% **	2.0% **	1.6% ***	0.7%
Net income	49.5%	24.5%	12.0%	6.0%	2.7%	1.3%	1.2%	1.0%	0.7%
n=426				**d) Health care**					
Sales	55.5% **	34.1% ***	21.2% ***	12.7% ***	7.1% ***	4.8% ***	1.9%	0.8%	0.0%
Op. Income	55.3% **	31.6% ***	18.5% ***	10.8% ***	7.6% ***	5.1% ***	3.8% ***	2.4% ***	1.1% *
Net income	54.9%	30.2% **	16.9% **	8.6%	5.5% **	3.6% **	2.5% **	1.6% **	1.1% *

[12] The industries of *Energy*, *Telecommunications* and *Utilities* are not included as there are not enough observations to complete a meaningful run-test.

n=728				**e) Financials**					
Sales	47.6%	23.6%	12.4%	6.5%	3.0%	0.6%	0.0%	0.0%	0.0%
Op. Income	43.5% °°°	19.3% °°°	7.1% °°°	3.2% °°	1.1% °°	0.7%	0.4%	0.0%	0.0%
Net income	44.9% °°°	17.7% °°°	5.7% °°°	2.3% °°°	1.2% °°	0.8%	0.3%	0.0%	0.0%
n=530				**f) Information technology**					
Sales	48.5%	26.3%	13.2%	6.9%	3.7%	2.6% *	1.6% *	1.3% **	0.6%
Op. Income	55.9% ***	30.0% ***	16.2% ***	8.7% **	4.8% **	2.8% **	1.0%	0.4%	0.0%
Net income	56.8% ***	29.9% ***	16.5% ***	8.9% **	5.8% ***	2.9% **	1.6%	0.4%	0.0%
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

The results from this test show that there are quite big differences in persistence for different industries. For sales growth, persistence is strongly significant for the majority number of years when it comes to *Industrial goods*, *Consumer goods* and *Health care*. No persistence is found for *Materials*, *Financials* and *Information Technology. Health care* and *Information Technology* show significant positive persistence in both operating income growth and net income growth.

The test where the growth rates were compared with the industry median showed mostly results that were symmetrical to the results from the main test, as persistence was found within most industries for sales growth but not for the other operating measures (see table A7 in *Appendix*).

5.6.3 Analysis of industry test

First of all, results mainly follow what is expected from table 3, which describes the median growth rate for each industry. A high median industry growth rate does not necessarily mean higher persistence, but this often seems to be the case.

Companies within *Health care* and *IT* are able to achieve persistence when it comes to the earnings measures. These two industries account to 30% out of all the observations in our sample but they are actually a quite small part of the sample, market cap-wise. As can be seen in table 3, observations within these two industries have the smallest median market cap. To connect to the theory presented, *IT* is an industry that first saw the light in the late 90's and it is therefore reasonable to believe that it is far from its long run equilibrium and therefore experiences higher persistence in growth. *Health care* as an

industry might not be as young as *IT*, but has very high barriers to entry. Large investments are needed and it might take a long time before revenue is being made. So if a firm is already established, there will be low threat of new entrants and probably also low threat from substitutes and established rivals since patents rule the business. Furthermore, the bargaining power of customers is low as the demand for medicine is often inelastic. Thus, if applying Porter's theory of the five forces, these factors could explain why persistence is found for the industry of *Health care*.

For the industries that show negative persistence this means that it is more probable than chance to achieve below-median growth in the future. In comparison to *Health Care* and *IT*, it is more difficult to maintain a competitive advantage in the industries of *Financials*, *Materials* and *Industrial goods and* this could explain why we observe less persistence in growth in these industries compared to *Health Care* and *IT*.

To compare with previous research, the only industry that CKL singles out is *Technology*, which is a combination of firms within *IT* and *Health care*. Persistence is found for growth in sales and operating income but not for growth in net income, which contrasts slightly from our results since *IT* and *Health care* show persistence in net income growth as well.

The proportion of firms in the following industries, whose growth rate is consistently above the median, is equal to what would be expected by chance:

$H6_0$ a): Materials

ACCEPTED for sales and op. income

NOT CLEAR for net income

$H6_0$ b): Industrial goods

ACCEPTED for op. income

REJECTED for sales (positive)

NOT CLEAR net income

$H6_0$ c): Consumer goods

ACCEPTED for net income

REJECTED for sales (positive)

NOT CLEAR for op. income

$H6_0$d): Health care

REJECTED for all measures (positive)

$H6_0$ e): Financials

ACCEPTED for sales

NOT CLEAR op. income and net income

$H6_0$ f): Information technology (IT)

ACCEPTED for sales

REJECTED op. income and net income (both positive)

5.7 Size (market capitalization)

Another breakdown of our sample is to split the firms into subsets of different sizes. It is interesting to investigate if there is a size effect when it comes to persistence in growth and if companies of a certain size are more prone to achieve persistence than others.

> *The proportion of firms of the following size, whose growth rate is consistently above (below) the median, is equal to what would be expected by chance:*
>
> **$H7_0$ a)**: Small
>
> **$H7_0$ b)**: Medium
>
> **$H7_0$ c)**: Large

5.7.1 Method for size test

In order to make comparison possible, the size test was performed according to CKL's test, where the sample was split into three parts: small, medium and large (CKL, 2003, p. 658). Each firm's market capitalization each year was calculated by multiplying its stock price at the end of the year (from COMPUSTAT's *Securities Daily*) with number of shares and the bottom three deciles were considered small, the top two were considered large and the rest were considered medium. So the original run-test was completed again

but for each category of size. Approximately 10% of the observations are dropped due to missing data for stock prices for the size test as well as the book-to-market test, which follows in the next section.

5.7.2 Results from size test

Table 10 – Persistence for different types of sizes

	Percentage of firms with above-median (below-median) growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=794				**a) Small**					
Sales	43.3% °°°	20.5% °°°	8.6% °°°	4.6% °	3.1%	2.1%	1.0%	1.0%	0.4%
Op. Income	50.5%	22.9%	11.4%	5.3%	3.9%	2.0%	1.0%	0.6%	0.0%
Net income	52.0%	24.9%	13.0%	6.2%	4.3% *	2.6% *	1.2%	0.3%	0.0%
n=794				**a) Small (below median)**					
Sales	56.7% ***	35.1% ***	22.2% ***	13.5% ***	8.8% ***	4.2% ***	2.3% ***	1.3% **	0.4%
Op. Income	49.5%	20.9% °°°	8.7% °°°	3.7% °°°	1.5% °°	0.4% °°	0.0% °	0.0%	0.0%
Net income	48.0%	18.9% °°°	7.5% °°°	2.5% °°°	1.2% °°°	0.4% °°	0.0% °	0.0%	0.0%
n=1939				**a) Medium**					
Sales	53.2% ***	30.7% ***	18.1% ***	10.2% ***	5.3% ***	2.9% ***	1.8% ***	0.8%	0.3%
Op. Income	50.6%	25.8%	13.6%	6.5%	3.4%	1.7%	1.1%	0.4%	0.3%
Net income	49.0%	23.5%	11.2%	5.5%	2.8%	1.0%	0.8%	0.4%	0.3%
n=1182				**a) Large**					
Sales	53.9% **	33.7% ***	22.2% ***	15.0% ***	9.1% ***	4.7% ***	2.5% ***	1.5% ***	0.7%
Op. Income	49.2%	26.0%	14.4%	8.9% **	4.2%	2.7%	2.1% **	1.6% ***	0.7%
Net income	48.3%	22.9%	10.3%	5.5%	2.9%	1.6%	1.2%	1.0%	0.7%
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

Large and medium firms had significantly persistent sales growth in the top, while small firms showed signs of negative persistence. Something that stuck out a bit was that small firms below median were significantly persistent so it is clear that small firms have a relatively harder time to maintain high levels of sales growth. Also, small firms below median showed signs of negative persistence for the two measures of earnings.

5.7.3 Analysis of size test

Small firms seem to be more likely to bounce back after bad performance and one explanation could be that a small firm is less probable to be active on a lot of different product markets, being more dependent on the performance of that specific market. This could be the reason that small firms are less likely to achieve persistence in sales growth. In contrast, large firms are more likely to have monopoly- or oligopoly-like qualities and

are able to manipulate margins and boost sales to a greater extent, which could explain why they can achieve persistence in sales growth. For the other operating measures these explanations do not hold, as persistence levels for growth in operating income and net income do not differ markedly between the differently sized firms. Compared to CKL's test, results are very similar except for sales growth for small firms, which were found to be persistent in their test.

The industry test showed that *IT* and *Health care*, two industries that consist of mostly small and medium firms, were able to achieve persistence in earnings growth. Thus, one can conclude that their persistence in earnings growth is not due to their size, since persistence was not found for either small or medium firms.

The proportion of firms of the following size, whose growth rate is consistently above (below) the median, is equal to what would be expected by chance:

$H7_0$ a): Small

ACCEPTED for op. income and net income

REJECTED for below-median sales (positive)

NOT CLEAR for above-median sales, below-median op. income and net income.

$H7_0$ b): Medium

ACCEPTED for op. income and net income

REJECTED for sales (positive)

$H7_0$ c): Large

ACCEPTED for net income

REJECTED for sales (positive)

NOT CLEAR for operating income

5.8 Book-to-market ratio

A large part of the difference between value stocks and glamour stocks is based on predictions of future growth. This implies that investors expect that glamour stocks should experience positive persistence while value stocks should experience less or negative persistence. However, CKL (2003, p. 658) finds that persistence is "not

markedly different across the two sets of stocks", which tells us that it might be irrational to expect a higher future growth when pricing these stocks. Since the issue of the value premium is not as clear in Sweden as different studies have come to different conclusions, it is of interest to split the data sample with respect to book-to-market ratio and do the run-test in order to reveal something about the value premium puzzle. We will test the following hypothesis:

> **$H8_0$ a):** The proportion of firms with high book-to-market, i.e. value stocks, whose growth rate is consistently above than the median, is equal to what would be expected by chance.
> **$H8_0$ b):** The proportion of firms with low book-to-market, i.e. glamour stocks, whose growth rate is consistently above than the median, is equal to what would be expected by chance.

5.8.1 Method for book-to-market ratio test

The test is a replication of CKL's test and works just like the size-test above. Glamour stocks and value stocks are often categorized through either its price-to-earnings ratio or book-to-market ratio. We will follow previous research, ranking stocks after book-to-market ratio each year and glamour stocks are categorized as the bottom three deciles and value stocks as the top three deciles.

5.8.2 Results from book-to-market ratio test

Table 11 – Persistence for different types of book-to-market ratios

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=1182				**a) Value stocks (high book-to-market ratio)**					
Sales	43.4% °°°	18.9% °°°	8.3% °°°	3.5% °°°	1.7% °	0.5% °	0.0%	0.0%	0.0%
Op. Income	42.5% °°°	13.7% °°°	5.2% °°°	2.6% °°°	1.5% °°	0.5% °	0.0% °	0.0%	0.0%
Net income	44.7% °°°	14.5% °°°	6.8% °°°	3.3% °°°	2.6%	1.4%	0.3%	0.0%	0.0%
n=1182				**a) Glamour stocks (low book-to-market ratio)**					
Sales	57.4% ***	37.9% ***	25.7% ***	16.4% ***	9.7% ***	6.3% ***	3.8% ***	2.2% ***	1.1% ***
Op. Income	58.7% ***	37.1% ***	21.7% ***	11.3% ***	6.2% ***	4.1% ***	3.0% ***	1.4% ***	0.4%
Net income	58.3% ***	36.0% ***	19.6% ***	8.8% ***	4.3% *	2.5% *	2.0% ***	1.1% **	0.3%
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

5.8.3 Analysis of book-to-market ratio test

These tests give clear results for all three operating measures for glamour stocks. Glamour stocks experience significant positive persistence in growth and while value stocks show signs of negative persistence in growth, although not significant enough to reject the null hypothesis. These results indicate that it is rational for investors to put a value on the fact that there is a higher probability of future consistent high growth for glamour stocks than for value stocks. This contradicts CKL's results and would be an explanation for the possible non-existence of the value premium on the Swedish market. However, it is still impossible to draw a concrete conclusion about the value premium from our limited experiment. Even though our results show that it is rational that glamour stocks trade at a premium, the results say nothing about the size of this premium in relation to the level of persistence.

As was noted in table 4, almost half of the large firms are glamour stocks, but since there was no difference in persistence in earnings growth for different sizes, the effect described above is probably not due to size differences in glamour stocks vs. value stocks. Sales growth on the other hand showed higher levels of persistence for large firms and might affect the results in this test.

$H8_0$: The proportion of firms with high book-to-market, i.e. value stocks, whose growth rate is consistently above than the median, is equal to what would be expected by chance.

NOT CLEAR

$H8_0$: The proportion of firms with low book-to-market, i.e. glamour stocks, whose growth rate is consistently above than the median, is equal to what would be expected by chance.

REJECTED (positive)

5.9 Time period

Brealey performed his test on data from before 1983, CKL used data from 1951-1998 while H&T used data from 1989-2006. It is possible that the difference in results that

H&T noticed could be due to that persistence has changed over time. Therefore, we want to examine whether we can find persistence in different time periods, i.e. if there is more persistence in the 90s compared to the 00s (or vice versa). Also, since there is an issue whether the sample from the 90's is truly representative, it is interesting to find out if it deviates markedly from the 00's.

> **$H9_0$**: The proportion of firms during the 90s, whose growth rate is consistently above than the median, is equal to the proportion of firms during the 00s.

5.9.1 Method for time period test

The data set is split into two halves, 1990-1999 and 2000-2009. The original test is performed for both groups and the results are then compared according to the same method that was used when comparing results from different growth rates (equation 2).

5.9.2 Results from time period test

Table 13 – Persistence for different types of time periods

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=1186				**a) 1990 - 1999**					
Sales	50.0%	27.8% *	15.0% *	8.2% *	4.2%	2.8% *	1.9% *	0.7%	0.0%
Op. Income	50.0%	25.3%	12.3%	6.3%	2.9%	1.1%	0.0%	0.0%	0.0%
Net income	50.0%	22.4% °	9.4% °°	4.5%	1.6% °	1.0%	.5%	0.0%	0.0%
n=3235				**b) 2000 – 2009**					
Sales	50.0%	28.2% ***	16.3% ***	9.5% ***	5.6% ***	3.3% ***	1.9% ***	1.0% **	0.6%
Op. Income	50.0%	24.8%	13.1%	7.1%	4.1% **	2.2% *	1.7% ***	1.1% ***	0.5%
Net income	50.0%	24.3%	12.2%	6.0%	3.6%	2.0%	1.3% *	0.8%	0.5%
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*
				c) Comparison between time periods (z-statistics)					
Sales	0.0	-0.26	-0.83	-0.89	-1.22	-0.41	0.05	-0.39	-1.42
Op. Income	0.0	0.29	-0.49	-0.58	-1.08	-1.36	-3.91 °°°	-2.66 °°°	-1.42
Net income	0.0	-1.18	-2.04 °°	-1.34	-2.55 °°	-1.4	-1.5	-2.25 °°	-1.42

Note: The numbers in the comparison are z-statistics that are equal to the difference between 90s and 00s. Negative values denote lower persistence for the 90s.

5.9.3 Analysis of time period test

Results show that the latter decade have higher levels of persistence for all three operating measures, although it can only be proved with significance for 5 out of 24

results and we cannot reject the null hypothesis. The sample in the 90's was smaller and consisted of a smaller proportion *IT* and *Health care* companies, and therefore it was expected that earlier period showed less persistence than the latter. There are tendencies towards these results but they cannot be significantly proved. The fact there is not a big difference between the two time periods, tells us that the sample in the 90's is quite representative even though it lacks observations.

$H9_0$: The proportion of firms during the 90s, whose growth rate is consistently above than the median, is equal to the proportion of firms during the 00s.
ACCEPTED

5.10 Extreme past performances

The next issue is whether firms with extreme past performance in growth are more or less likely to have persistent growth. Being in the top decile could indicate that the firm is able to take advantage of its core competencies as Porter describes. However, it could also be a sign of the long run equilibrium getting closer and that growth will revert soon.

> *The proportion of firms in the following percentiles, whose growth rate is consistently above the median, is equal to what would be expected by chance:*
> **$H10_0$ a)**: Top decile
> **$H10_0$ b)**: Top quartile
> **$H10_0$ c)**: Middle two quartiles
> **$H10_0$ d)**: Bottom quartile
> **$H10_0$ e)**: Bottom decile

5.10.1 Method for extreme past performances test

The data set is split into groups according to how well they performed the year before. Low-performance firms are firms that were in the bottom quartile the year before, top-performance firms were in top quartile and middle-performance firms were in the two middle quartiles. An extra complement to this test was completed where we performed the same tests on the top and bottom deciles as well.

5.10.2 Results from extreme past performances test

Table 13 – Persistence for different types of time periods

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=399				**a) Top decile year before**					
Sales	51.0%	25.9%	13.8%	7.8%	3.3%	1.2%	0.7%	0.0%	0.0%
Op. Income	52.0%	26.9%	12.5%	6.6%	2.7%	1.1%	0.7%	0.0%	0.0%
Net income	50.5%	25.3%	10.7%	6.0%	3.7%	2.3%	0.0%	0.0%	0.0%
n=989				**b) Top quartile year before**					
Sales	56.3% ***	31.8% ***	19.0% ***	10.8% ***	6.5% ***	4.1% ***	2.0% ***	0.7%	0.0%
Op. Income	52.0%	26.9%	14.4%	8.4% **	4.8% **	3.0% **	1.7% **	0.7%	0.0%
Net income	47.1% °	23.9%	11.8%	6.3%	3.3%	1.6%	0.8%	0.7%	0.0%
n=1978				**c) Middle two quartiles year before**					
Sales	47.7% °	27.9% ***	15.5% ***	9.7% ***	5.5% ***	3.1% ***	1.3%	0.2%	0.0%
Op. Income	45.6% °°°	22.3% °°	10.3% °°	5.4%	2.5%	1.0%	0.5%	0.0%	0.0%
Net income	46.0% °°°	19.8% °°°	8.7% °°°	3.7% °°°	1.8% °°	1.0%	0.4%	0.2%	0.0%
n=989				**d) Bottom quartile year before**					
Sales	44.5% °°°	22.5%	12.1%	6.8%	4.5% *	2.6%	1.7% *	0.8%	0.5%
Op. Income	55.6% ***	27.4%	15.3% **	7.1%	4.5% *	2.2%	0.9%	0.8%	0.0%
Net income	61.1% ***	32.2% ***	16.5% ***	7.7%	4.8% **	2.4%	1.5%	0.7%	0.5%
n=399				**e) Bottom decile year before**					
Sales	67.7% ***	39.7% ***	23.2% ***	13.0% ***	9.8% ***	4.7% ***	2.2% *	1.9% **	1.2% **
Op. Income	65.1% ***	36.7% ***	20.1% ***	9.5% **	5.9% **	3.6% **	1.4%	0.9%	0.0%
Net income	67.7% ***	39.7% ***	23.2% ***	13.0% ***	9.8% ***	4.7% ***	2.2% *	1.9% **	1.2% **
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

Results differ quite a lot between the three operating measures. The top quartile shows positive significant persistence in sales growth but not for the other measures, which is in line with our main results. The middle two quartiles show signs of negative persistence in net income growth, while the bottom quartile shows signs of positive significance.

5.10.3 Analysis of extreme past performances test

The pattern observed that firms who have had low earnings growth the year before are able to maintain high sales growth is a sign of the bounce-back effect mentioned earlier. The tests showing the persistence for even more extreme values in the top and bottom deciles reveal a slightly different picture. Surprisingly enough, firms that were in the top decile the year before showed no significant persistence for any measure. This tells us that extreme growth one year is not an indication of being able to uphold high growth in

the future. On the other end of the spectrum, firms that were in the bottom decile show strong significance in all three measures, which indicates a strong bounce-back effect for all measures when growth has been extremely low the year before. These results are more sensitive to survivorship bias and are therefore also expected. Firms that have performed poorly will need to bounce back in order to stay in business. If they don't, they will leave the sample without dragging down the persistence results (which they should have done if they were still in the sample).

The proportion of firms in the following percentiles, whose growth rate is consistently above the median, is equal to what would be expected by chance:

$H10_0$ a): Top decile

ACCEPTED for all measures

$H10_0$ b): Top quartile

ACCEPTED for net income

REJECTED for sales (positive)

NOT CLEAR for op. income

$H10_0$ c): Middle two quartiles

REJECTED for sales (positive)

NOT CLEAR for op. income and net income

$H10_0$ d): Bottom quartile

ACCEPTED for sales and op. income

NOT CLEAR for net income

$H10_0$ e): Bottom decile

REJECTED for all measures (positive)

5.11 Historical persistence

As can be indicated by graphs 4 – 9, persistence changes depending on how many years in a row a firm has had above-median growth prior to the date of measurement. Are firms that have been in the top or bottom for many years in a row more or less likely than what is expected by chance to be so in the future as well?

The proportion of firms with historical above-median growth for x number of years, whose growth rate is consistently above the median, is equal to what would be expected by chance:

$H11_0$ a): x = 1 year

$H11_0$ b): x = 2 years

$H11_0$ c): x = 3-4 years

$H11_0$ d): x = 5-7 years

5.11.1 Method for historical persistence test

The data set will be split into groups dependent on how many years of historical above-median growth the firm has had in a row. For every extra year, the number of firms decrease, so in order to avoid doing the proportions-test with too few observations, the groups of three and four years as well as the groups of five, six and seven were joined together into two groups. The original test is then performed on each group.

5.11.2 Results from historical persistence test

Table 14 – Persistence for different types of time periods

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
				a) 1 year above-median performance					
Sales (*n=2100)*	56.5% ***	29.3% ***	14.8% ***	7.6% **	3.9% **	1.8%	0.9%	0.3%	0.1%
Op. Income (*n=1917)*	49.6%	23.2% °	10.6% °°	4.9% °°	2.0% °°°	0.9% °°	0.4% °	0.1% °	0.0% °
Net income (*n=1942)*	47.3% °°	20.8% °°°	8.5% °°°	4.0% °°°	1.7% °°°	0.8% °°	0.3% °°	0.1% °	0.0% °
				b) 2 years					
Sales (*n=1051)*	54.8% ***	28.7% ***	15.0% **	7.8% *	3.5%	1.8%	0.7%	0.2%	-
Op. Income (*n=838)*	50.0%	23.5%	11.0%	4.6% °	2.1%	0.9%	0.3%	0.0% °	-
Net income (*n=811)*	47.0% °	19.9% °°°	9.4% °°	4.1% °°	1.9% °	0.7% °	0.3%	0.0% °	-
				c) 3 to 4 years					
Sales (*n=747)*	56.4% ***	30.8% ***	15.7% **	7.4%	3.5%	1.3%	0.5%	-	-
Op. Income (*n=537)*	50.5%	23.8%	10.5%	4.8%	1.9%	0.4% °°	-	-	-
Net income *(n=466)*	47.6%	23.0%	10.6%	4.7%	1.7%	0.5% °	-	-	-
				d) 5 to 7 years					
Sales (*n=209)*	57.4% **	28.4%	13.3%	5.2%	2.0%	-	-	-	-
Op. Income (*n=114)*	50.9%	24.3%	9.4%	2.4%	-	-	-	-	-
Net income (*n=92)*	53.3%	25.9%	9.5%	3.2%	-	-	-	-	-
Chance	*50.0%*	*25.0%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*

There are signs of persistence in sales growth regardless of how many years in a row the company has been in the top or bottom historically, although not significant enough to reject the null hypothesis. The significance levels fade for the values that require more than seven years in total of consecutive growth (including historical growth rates). Persistence levels in operating income growth are not separable from what is expected by chance. Net income growth shows negative persistence when firms have been in the top for one year, but this fades gradually.

5.11.3 Analysis of historical persistence test

In general, these results support the findings in our main test. Sales growth shows signs of positive persistence and net income growth shows signs of negative persistence. However, as more and more years of consecutive growth are required, it becomes harder to achieve significant results. One conclusion that can be drawn is that more years of historically high growth do not lead to higher or lower persistence, as there is no clear trend observable.

The proportion of firms with historical above-median growth for x number of years, whose growth rate is consistently above the median, is equal to what would be expected by chance:

$H11_0$ a): x = 1 year

REJECTED for net income (negative)

NOT CLEAR for sales and op. income

$H11_0$ b): x = 2 years

ACCEPTED for op. income

NOT CLEAR for sales and net income

$H11_0$ c): x = 3-4 years

ACCEPTED for op. income and net income

NOT CLEAR for sales

$H11_0$ d): x = 5-7 years

ACCEPTED for all measures

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6. Conclusions

We have investigated whether the proportion of firms that have experienced above- or below-median growth for a consecutive number of years differs from what is expected by chance. The tests have been run on data from the Swedish stock market during the period 1990-2009. Previous research has shown that growth forecasting is often based on extrapolating historical growth. This method has been criticized, and our study was aimed at exploring whether this critique is rational in a Swedish context or if there actually exists persistence in growth. The results for the entire sample show that on the one hand, the proportion of firms that have experienced above- or below-median growth in sales for a consecutive number of years *exceeds* what is expected by chance with significance. On the other hand, for the growth measures of operating income and net income the proportion of firms cannot be significantly separated from what is expected by chance.

Our results are in line with what CKL found on the American market but not with what H&T found on the Australian market, as they found persistence in all three operating measures. The difference could be due to methodological differences or the fact that the markets have different characteristics. The issue of survivorship bias is handled in the same way as CKL and H&T and we conclude that our results are robust to this issue.

In order to further penetrate the topic of persistence, we have divided our sample into subsets and examined whether persistence could be found in any of the groups. Firms within *Health care* and *IT* were able to outperform the rest of the sample in the income measures. Moreover, firms with a low book-to-market ratio (glamour stocks) did also show persistence to a much higher extent than firms with a high book-to-market ratio (value stocks). The fact that certain groups stick out contrasts to CKL's findings, who conclude that the "odds of an investor successfully uncovering the next stellar growth stock are about the same as correctly calling coin tosses". This might be true for our entire sample, but with a more narrow focus, i.e. looking at certain industries or the level of book-to-market ratios, the chance of finding a company with consistent above-median growth are better than 50/50. However, it is important to remember that even though the

chances might be considered better than a fair coin toss, it is still not anywhere near a safe bet.

In conclusion, there is persistence in sales growth but not in growth in operating income and net income. Thus, extrapolating historical growth is not rational when forecasting earnings growth. Nevertheless, there seems to be a possibility of identifying some firms ex ante that *do* experience persistence in earnings by analyzing certain characteristics.

7. Critique and suggestions for further research

The main methodological issues in our study are missing data and the calculation of growth rates. According to our analysis of descriptive statistics and the comparison between persistence in the 90's and 00's, the sample seems to be quite representative, but of course it would be preferable to have had more observations from the 90's. Moreover, it is a problem that we need to drop 10% of our observations when we do the size test and book-to-market test. Both these problems are due to shortcomings of the database used and a different data source might have solved this problem. Another possible critique is the inclusion of firms with non-calendar fiscal years. When comparing those firms with firms with calendar fiscal years, a sudden change in the business climate could weaken the comparability.

In the introductory methodology, the issue of calculating growth rates is thoroughly dealt with, but there does not seem to be any consensus in previous research on which growth rate is the "correct" one. However, according to our reasoning, we believe that the asset-based growth rate per share (for the earnings measures) is the best one for this study, but it is possible that other methods would reveal results closer to reality.

It could be interesting to run the same tests on quarterly data in order to investigate if there are shorter periods of persistence. As quarterly reports are of great significance in today's financial markets, finding persistence from one quarter to another could help analysts and investors to make more rational decisions.

When analyzing subsets of our sample, it is important to make sure that we are testing what we set out to test. E.g. testing industry differences could be affected by size differences between industries. Although we have attempted keep this in mind and comment on these issues, it is still possible that there are other underlying factors that affect the results.

Another possible method would be to perform all our tests comparing firms' growth rates to the industry median (like H&T) as well as the whole sample's median. This was not done due to space limitations, but is briefly discussed in the section with the industry test. It is possible that this method could reveal different results, but the results in table A7 in *Appendix* do not indicate any large differences compared to our main test.

Due to space limitations we have only examined persistence through tests of runs. It would also be interesting to perform a multiple regression analysis that incorporates all the variables that we have discussed and tests whether they have predicting power on future growth rates. As Fama & French (2000, p. 163) argue, there might not be persistence in growth but it can still be predictable. Also, our definition of high vs. low growth (above or below median) is quite inflexible and broad and it would be possible to define persistence in a different way and reach other interesting results.

Our reasoning takes for granted that investors actually do extrapolate historical growth (according to the majority of previous research). But since there are no studies to our knowledge that are written about this issue in Sweden, it would be interesting to replicate e.g. La Porta (1996) with Swedish data.

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9. Appendix

Table A1 – Comparison of persistence between different types of methods for Sales

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=2610				**a) "Hall & Tochterman"**					
Sales	50.0%	32.3% ***	20.1% ***	14.4% ***	10.3% ***	6.6% ***	4.8% ***	3.8% ***	1.1% **
				b) Raw (When deleting same obs. as H&T)					
Sales	50.0%	32.7% ***	21.7% ***	14.4% ***	11.4% ***	9.8% ***	7.5% ***	4.3% ***	0.9% *
				c) Comparison between H&T and Raw (z-statistics)					
Sales	0.00	-0.25	-0.9	-0.02	-0.51	-1.45	-1.13	-0.23	0.16
n=4504				**d) Raw, not per share**					
Sales	50.0%	28.8% ***	16.2% ***	9.4% ***	5.7% ***	3.6% ***	2.0% ***	1.3% ***	0.7% ***
				e) Asset base, not per share					
Sales	50.0%	29.6% ***	17.2% ***	9.5% ***	6.4% ***	3.9% ***	2.3% ***	1.7% ***	1.2% ***
				f) Comparison between Raw & Asset base (z-statistics)					
Sales	0.00	-0.75	-1.13	-0.07	-0.94	-0.58	-0.76	-0.95	-1.31
n=4421				**g) Raw + per share**					
Sales	50.0%	28.1% ***	16.1% ***	9.5% ***	5.5% ***	3.2% ***	1.7% ***	0.8% **	0.3%
				h) Comparison between Raw & Raw + per share (z-statistics)					
Sales	0.00	-0.72	-0.19	0.06	-0.40	-0.67	-0.59	-1.18	-1.35

Table A2 – Comparison of persistence between different types of methods for operating income and net income

	Percentage of firms with above-median growth each year for number of years								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=2610				**a) "Hall & Tochterman"**					
Op. Income	50.0%	31.5% ***	19.6% ***	14.4% ***	10.7% ***	6.9% ***	2.8% ***	1.6% **	1.2% **
Net income	50.0%	31.3% ***	18.2% ***	11.8% ***	7.0% ***	4.3% ***	2.6% ***	2.2% ***	1.1% **
				b) Raw (When deleting same obs. as H&T)					
Op. Income	50.0%	32.3% ***	20.5% ***	14.7% ***	10.8% ***	8.1% ***	5.5% ***	2.0% ***	0.0%
Net income	50.0%	31.3% ***	19.9% ***	12.4% ***	7.8% ***	4.5% ***	2.1% **	1.2% *	0.9% *
				c) Comparison between H&T and Raw (z-statistics)					
Op. Income	0.00	-0.43	-0.53	-0.14	-0.04	-0.52	-1.36	-0.21	1.01
Net income	0.00	0.00	-0.98	-0.34	-0.46	-0.12	0.31	0.67	0.17
n=4504				**d) Asset base, not per share**					
Op. Income	50.0%	25.9%	13.3%	7.3% **	4.0% **	2.3% ***	1.3% **	0.7% *	0.3%
Net income	50.0%	24.3%	11.7%	5.6%	2.7%	1.4%	0.8%	0.3%	0.2%

				e) Absolute values, not per share					
Op. Income	50.0%	25.8%	13.0%	6.8%	3.7% *	1.9%	.8%	0.1%	0.0%
Net income	50.0%	23.6% °°	11.0% °°°	4.7% °°°	2.2% °°°	.8% °°°	.4% °°	.1% °°	.%
				f) Comparison between "Asset base" & "Absolute values" (z-statistics)					
Op. Income	0.00	0.11	0.4	0.66	0.44	0.74	1.49	2.31 **	2.0 **
Net income	0.00	0.72	0.96	1.73 *	1.12	1.7 *	1.88 *	1.63	1.42
n=4421				**g) Asset base + per share**					
Op. Income	50.0%	25.0%	12.8%	6.6%	3.6%	1.8%	1.0%	0.5%	0.2%
Net income	50.0%	23.8% °	11.4% °	5.3% °°	2.9%	1.5%	0.8%	0.4%	0.2%
				h) Comparison between "Asset base" & "Asset base + per share" (z-statistics)					
Op. Income	0.00	-0.9	-0.61	-0.96	-0.71	-1.17	-0.79	-0.49	-0.68
Net income	0.00	-0.36	-0.07	0.39	1.06	1.57	1.79 *	2.24 **	1.42

Note: The numbers in the comparisons are z-statistics that are equal to the difference between the different methods. Positive values denote higher persistence for the top method.

Table A3 – Descriptive statistics, industry composition

Year	Materials	Industrial goods	Consumer goods	Health Care	Financials	IT	Energy	Telecom	Utilities
1990	16%	36%	8%	5%	28%	2%	0%	0%	5%
1991	18%	37%	8%	5%	26%	2%	0%	0%	5%
1992	19%	39%	8%	5%	23%	2%	0%	0%	5%
1993	18%	39%	8%	5%	24%	2%	0%	0%	5%
1994	17%	39%	7%	6%	23%	1%	0%	1%	4%
1995	16%	38%	8%	5%	25%	1%	0%	1%	4%
1996	16%	34%	9%	5%	27%	3%	1%	1%	4%
1997	11%	32%	11%	5%	23%	12%	1%	1%	2%
1998	9%	31%	12%	7%	19%	18%	1%	2%	1%
1999	7%	27%	14%	8%	17%	23%	2%	2%	1%
2000	6%	25%	15%	10%	16%	23%	2%	2%	1%
2001	5%	24%	16%	11%	16%	25%	1%	3%	0%
2002	5%	23%	17%	11%	15%	25%	2%	2%	0%
2003	5%	24%	18%	11%	14%	24%	2%	2%	0%
2004	5%	25%	17%	11%	14%	24%	2%	2%	0%
2005	4%	25%	18%	12%	14%	23%	2%	2%	0%
2006	4%	25%	19%	11%	15%	22%	2%	2%	0%
2007	4%	23%	20%	12%	15%	22%	2%	1%	0%
2008	5%	23%	19%	11%	16%	21%	2%	1%	1%
2009	5%	24%	17%	11%	15%	22%	2%	2%	1%
Total	**7%**	**26%**	**16%**	**10%**	**17%**	**20%**	**2%**	**2%**	**1%**

Table A4 – Descriptive statistics, distribution of growth rates

Percentile	Sales	Op. inc.	Net inc.
10	-46.9%	-10.2%	-11.3%
25	-11.8%	-3.1%	-3.2%
40	0.2%	-0.2%	-0.4%
50	**5.6%**	**1.0%**	**0.6%**
60	10.7%	2.4%	1.9%
75	22.3%	5.7%	5.1%
90	57.0%	15.9%	18.2%

Table A5 – Descriptive statistics, industry vs. size

Industry	Small	Medium	Large	**Total**
Industrial goods	6%	15%	5%	**26%**
Information Technology	9%	10%	1%	**20%**
Financials	5%	8%	4%	**17%**
Consumer goods	3%	8%	5%	**16%**
Health Care	4%	4%	2%	**10%**
Materials	2%	3%	1%	**8%**
Telecommunication	1%	0%	1%	**2%**
Energy	0%	1%	1%	**2%**
Utilities	0%	1%	0%	**1%**
Total	**30%**	**50%**	**20%**	**100%**

Table A6 – Descriptive statistics, industry vs. book-to-market

Industry	Value	Middle	Glamour	**Total**
Industrial goods	9%	12%	5%	**26%**
Information Technology	5%	8%	7%	**20%**
Financials	4%	6%	7%	**17%**
Consumer goods	7%	5%	4%	**16%**
Health Care	2%	3%	5%	**10%**
Materials	2%	3%	1%	**6%**
Telecommunication Services	0%	1%	1%	**2%**
Energy	1%	1%	0%	**2%**
Utilities	0%	1%	0%	**1%**
Total	**30%**	**40%**	**30%**	**100%**

*Table A7 – Persistence **within** different types of industries (H&T's method)*

	Percentage of firms with above-median growth each year for number of years (divided by industry)								
Variable	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
n=290				**a) Materials**					
Sales	50.0%	27.5%	14.1%	6.3%	2.0%	1.2%	0.7%	0.0%	0.0%
Op. Income	50.0%	25.2%	12.9%	6.4%	2.4%	0.6%	0.0%	0.0%	0.0%
Net income	50.0%	24.1%	10.2%	5.0%	1.4%	0.6%	0.0%	0.0%	0.0%
n=1137				**b) Industrial goods**					
Sales	50.0%	29.3% ***	16.3% ***	9.5% ***	5.7% ***	3.2% ***	1.5% *	0.8%	0.3%
Op. Income	50.0%	25.8%	13.5%	7.1%	3.9%	1.6%	0.2%	0.0%	0.0%
Net income	50.0%	22.5% °	9.7% °°	3.4% °°°	1.2% °°°	0.9%	0.4%	0.0%	0.0%
n=700				**c) Consumer goods**					
Sales	50.0%	29.4% **	18.0% ***	12.0% ***	8.8% ***	6.0% ***	4.5% ***	3.6% ***	2.8% ***
Op. Income	50.0%	25.5%	12.9%	6.5%	3.8%	3.0% **	2.4% ***	1.6% ***	0.7%
Net income	50.0%	24.1%	10.2%	5.0%	1.4%	0.6%	0.0%	0.0%	0.0%
n=426				**d) Health care**					
Sales	50.0%	26.5%	15.1%	8.2%	5.3% *	3.2% *	0.6%	0.0%	0.0%
Op. Income	50.0%	27.0%	14.8%	7.5%	4.2%	2.6%	1.3%	0.8%	0.0%
Net income	50.0%	25.9%	13.8%	5.7%	2.5%	2.0%	1.9%	1.6% **	1.1% *
n=728				**e) Financials**					
Sales	50.0%	26.2%	14.2%	9.3% ***	6.0% ***	3.2% **	1.9% **	1.3% **	1.1% ***
Op. Income	50.0%	23.5%	9.5% °°	4.6%	2.5%	1.0%	0.4%	0.0%	0.0%
Net income	50.0%	22.8%	9.7% °°	3.5% °°	1.4% °°	0.8%	0.3%	0.0%	0.0%
n=530				**f) Information technology**					
Sales	50.0%	29.9% ***	17.3% ***	10.2% ***	6.5% ***	5.2% ***	4.2% ***	3.0% ***	1.2% ***
Op. Income	50.0%	26.1%	13.7%	7.2%	3.9%	1.8%	1.3%	0.8%	0.0%
Net income	50.0%	25.2%	12.9%	7.6%	4.5% *	2.1%	1.3%	0.8%	0.0%
Chance	50.0%	*25.%*	*12.5%*	*6.3%*	*3.1%*	*1.6%*	*0.8%*	*0.4%*	*0.2%*