

Is Sales Growth Of Companies Listed On The Warsaw Stock Exchange Mean-Reverting?

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ABSTRACT

Empirical research shows that corporate financial results (measured by sales growth, profitability, earnings growth, leverage, etc.) are characterized by the long-term reversion toward the levels average for the whole economy. In the case of sales growth this means that companies which in a given year show above-average growth in the following periods express the tendency to show slower pace of this growth and companies which in a given year show below-average growth in the following periods express the tendency to show faster pace of growth. In the paper we explore the reversion toward the mean of the sales growth of companies listed on the Warsaw Stock Exchange in the period of 2001-2009. The research confirmed the strong tendency of sales growth to revert toward the mean.

Keywords: mean-reversion of earnings; sales growth; earnings forecasting

1. INTRODUCTION

Forecasting corporate earnings constitutes an essential element of most models of corporate financial analysis and valuation [Moyer, McGuigan, Kretlow 1995; Penman 2007; DePamphilis 2008]. Analysts, when making forecasts, usually exploit a wide range of available information concerning the company under investigation (e.g. planned marketing activities, sales breakdown, employment, fixed-assets investment, etc.) as well as its economic environment (e.g. business climate, competitors' behavior, customer' preferences, exchange rates, etc.). The second approach to forecasting earnings is based solely on corporate historical financial results and the predictions are made with the use of mechanical methods (e.g. autoregressions). Despite the use of wide range of information the quality of analysts' forecasts is controversial and the research on analysts' forecasts relative accuracy is not unequivocal. Some research, conducted for the companies listed on American stock exchanges, points to the superiority (as regards accuracy) of analysts' forecasts over mechanical predictions [White, Sondhi, Fried 2003; Brown 1996; Chatfield, Moyer, Sisneros 1989], but other research indicates a higher accuracy of simple (in some cases even naïve) forecasting methods in comparison with analysts' predictions [Dreman 1998; Malkiel 2007]. Other research points to the analysts' superiority in forecasting with one-quarter ahead to two-quarter ahead horizon, comparable accuracy in forecasting with three-quarter horizon and the superiority of mechanical methods in the case of predictions with longer horizons [O'Brien 1988; Rothovius 2008].

Given the fact that in the case of long-term earnings predictions the analysts and their detailed forecasting approaches seem to be no significantly better than simple mechanical methods, knowing long-term properties of corporate financial results can be extremely helpful in forecasting these results. Abundant research shows that the characteristic feature of corporate financial results (measured by e.g. sales growth, profitability, etc.) is a long-term reversion of those results toward the economy-wide average levels [Fama, French 1999; Hwang, Keil, Smith 2005; Bajaj, Denis, Sarin 2000; Murstein 2003]. One research found that from 1960 through 1999 only 8 of the largest 150 companies on the "Fortune 500" list managed to increase their earnings by an annual average of at least 15% for two decades [Loomis 2001]. The other research, based on five decades of data, showed that only 10% of large U.S. companies had increased their earnings by 20% for at least five consecutive years, only 3% had grown by 20% for at least 10 years straight, and not a single one had done it for 15 years in a row [Zweig 2001]. This means that

maintaining above-average pace of corporate earnings growth is extremely difficult in the long-run. This mean-reversion of earnings is at least partially caused by mean-reversion of sales growth. This means that the companies that in a given period show above-average (below-average) sales growth in the following periods express the tendency to show slower (faster) pace of this growth. Palepu, Healy and Bernard confirm this on the basis of the American data, stating that “sales growth rates tend to be mean-reverting: firms with above-average or below-average rates of sales growth tend to revert over time to a “normal” level (historically in the range of 7 to 9 percent for U.S. firms) within three to ten years” [Palepu, Healy, Bernard 2004]. However, despite its importance and strong evidence, reversion toward the mean seems to be neglected or even unknown by most financial analysts. One research found that the consequence of this neglect is the fact that the most optimistic and most pessimistic earnings forecasts are usually too optimistic and too pessimistic and the forecasts’ accuracy can be improved by shrinking them toward the mean [Hwang, Keil, Smith 2004].

This paper explores the phenomenon of reversion toward the mean in the case of sales growth of companies listed on the Warsaw Stock Exchange in 2001-2009 period. The remainder of the paper is organized as follows. In the next section we describe the data and methodology used in the study. Then the section that presents the empirical results follows. The paper closes with concluding comments.

2. DATA AND METHODOLOGY

In the research the data concerning yearly net sales of companies listed on the Warsaw Stock Exchange were used. The historical financial results were obtained from *parkiet.com.pl* database. In the sample we included the companies for which all the necessary data were available. Due to significant accounting differences we omitted all the financial companies as well as The National Investment Funds. The analysis comprised the period between the 2001 and 2009 (the earlier periods were omitted due to quite a small number of then listed companies). The only analyzed variable was the corporate sales growth defined as follows:

$$NSG_t = \frac{NS_t}{NS_{t-1}}, \tag{1}$$

where:

NSG_t - growth of net sales of a given company in year t ,

NS_t - net sales of a given company in year t .

The summary statistics of the data used are presented in the table below.

Table 1: Summary statistics computed for sales growth* in the analyzed samples.

| Year | Arithmetic average | Median | Standard deviation |
|------|--------------------|--------|--------------------|
| 2001 | 1.12 | 1.00 | 1.07 |
| 2002 | 1.06 | 0.99 | 0.77 |
| 2003 | 1.18 | 1.08 | 0.70 |
| 2004 | 1.72 | 1.16 | 6.94 |
| 2005 | 1.25 | 1.10 | 0.98 |
| 2006 | 1.38 | 1.20 | 1.31 |
| 2007 | 1.73 | 1.26 | 3.40 |
| 2008 | 1.24 | 1.14 | 0.54 |
| 2009 | 0.98 | 0.96 | 0.39 |

* sales growth as defined by equation (1)
 Source: *parkiet.com.pl*; author’s calculations.

The whole sample under investigation was divided into five moving sub-samples (each sub-sample comprised five years). The first sub-sample embraced the period between 2001 and 2005, the second one embraced 2002-2006 period, etc. The last sub-sample embraced the period between 2005 and 2009. In each of the sub-samples we visually analyzed the reversion toward the mean of the corporate sales growth.

In the case of the first sub-sample all the companies under investigation were sorted in order of decreasing sales growth in the 2001 (from the company with the highest growth to the company with the lowest growth in 2001). The sales growth data computed for the individual companies were then normalized with the following formula:

$$NNSG_t^i = \frac{NSG_t^i}{Median NSG_t^n}, \quad (2)$$

where:

$NNSG_t^i$ - normalized growth of net sales of i -th company in year t ,

NSG_t^i - growth of net sales of i -th company in year t (as defined by formula 1),

$Median NS_t^n$ - median growth of net sales of all n companies in year t ,

n – number of companies included in the sample in year t .

Then the sorted companies were divided into ten deciles so that the first decile embraced 10% of companies with the fastest normalized sales growth in 2001 and the last decile embraced 10% of companies with the slowest normalized sales growth in 2001. Because total number of observations cannot be divided equally into ten deciles we omitted from the computation the proper number of the observations with the lowest sales growth. For each of the deciles constructed in this way the median normalized sales growth in 2001 was computed. Then the median normalized sales growth in the following four years was computed for the same deciles. Analogous computations were made for the remaining four sub-samples (comprising 2002-2006, 2003-2007, 2004-2008 and 2005-2009 periods). Then the results obtained in all the sub-samples were averaged.

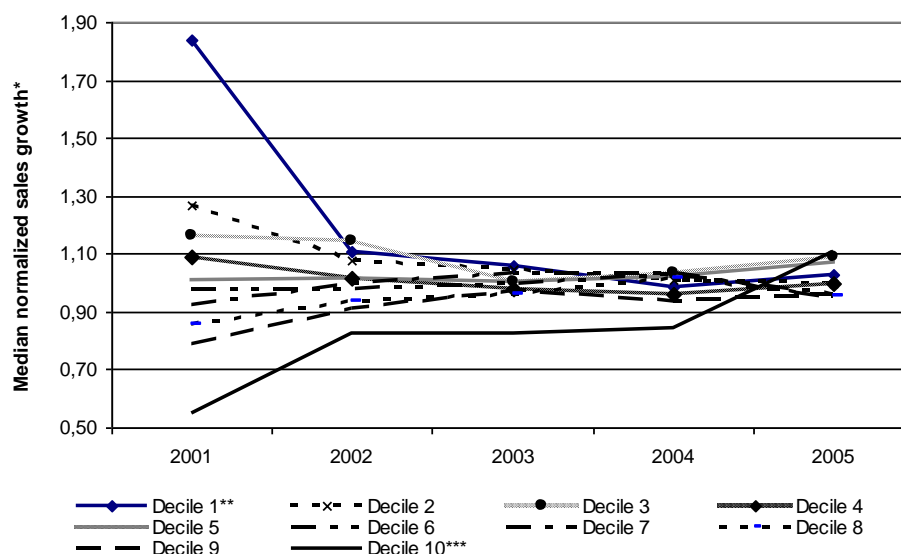
The methodology described above enables visual inspection of the mean-reversion of the corporate sales growth. It enables observation of the path and the pace of the decrease / increase of the median sales growth in the deciles with the highest / lowest initial sales growth.

3. THE RESULTS

Chart 1 presents the phenomenon of reversion toward the mean in the case of sales growth in the first sub-sample (comprising 2001-2005 period). The chart shows the medians of normalized sales growth in ten deciles formed on the basis of the data for 2001 year. As can be seen, there was the strong tendency of reversion toward the mean of sales growth in the period under investigation.

Analogous computations were conducted for the remaining sub-samples, but due to the space limitations the detailed results for the individual sub-samples are not presented here. However, in the Table 2 as well as on the Chart 2 the averages obtained for all five sub-samples are presented.

Chart 1: Medians of normalized sales growth* in ten deciles of companies in 2001-2005 sub-sample.



* normalized sales growth was computed as the ratio of sales growth of a given company to the median sales growth among all the listed companies in the same period

** 10% of companies with the highest sales growth in 2001

*** 10% of companies with the lowest sales growth in 2001

2001 is the year for which the initial sort of all the companies is made.

Source: parkiet.com.pl; author’s calculations.

Table 2: Averaged* medians of normalized sales growth in ten deciles of companies in all five sub-samples.

| Deciles of companies | Period** | | | | |
|----------------------|----------|------|------|------|------|
| | T | T+1 | T+2 | T+3 | T+4 |
| Decile 1*** | 1.68 | 1.20 | 1.09 | 1.05 | 1.06 |
| Decile 2 | 1.26 | 1.06 | 1.07 | 1.02 | 1.02 |
| Decile 3 | 1.15 | 1.08 | 1.03 | 1.05 | 1.02 |
| Decile 4 | 1.08 | 1.03 | 1.01 | 1.02 | 1.01 |
| Decile 5 | 1.03 | 1.01 | 1.00 | 1.01 | 0.99 |
| Decile 6 | 0.98 | 0.99 | 0.96 | 1.01 | 0.98 |
| Decile 7 | 0.94 | 0.96 | 0.97 | 0.98 | 1.01 |
| Decile 8 | 0.89 | 0.94 | 0.94 | 0.95 | 0.96 |
| Decile 9 | 0.81 | 0.89 | 0.96 | 1.02 | 1.06 |
| Decile 10**** | 0.65 | 0.94 | 0.93 | 0.97 | 1.02 |

* each number in the table is the arithmetic average from the five values taken from the five sub-samples for a given decile and for the given period

** T means initial period (year in which the companies are sorted and divided into five deciles); periods from T+1 to T+4 are the following years

*** 10% of companies with the highest sales growth in initial period (i.e. in year T)

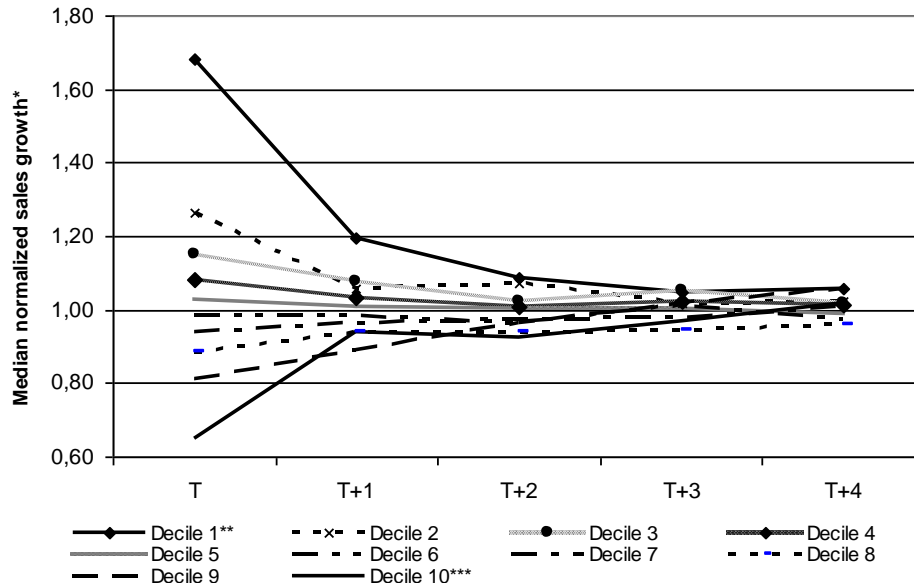
**** 10% of companies with the lowest sales growth in initial period (i.e. in year T)

Source: parkiet.com.pl; author’s calculations.

The data shown in Table 2 and on Chart 2 present the averaged numbers for all five sub-samples. For example, the value for the first decile in year T (equaling 1.68), where T is the year for which the initial sort of all the companies is made, constitutes the arithmetic average of the five values of medians of normalized sales growth obtained for the first decile in the first year of all five sub-samples. This number (equaling 1.68) means that the median sales growth in the group of 10% of companies with the fastest sales growth in any given year is on average about 68% higher than the median sales growth in the group of all the companies listed on the Warsaw Stock Exchange in the same year. Analogously, the value for the first decile in period T+1 (equaling 1.20), where T+1 is

the year following the year for which the initial sort of all the companies is made, constitutes the arithmetic average of the five values of medians of normalized sales growth obtained for the first decile in the second years of all five sub-samples. This number (equaling 1.20) means that the median sales growth in the group of 10% of companies with the fastest sales growth in period T, which in period T is on average about 68% higher than the median sales growth in the group of all the companies, in the following year (i.e. T+1) is on average only about 20% higher than the median sales growth in the group of all the companies.

Chart 2: Averaged* medians of normalized sales growth in ten deciles of companies in all five sub-samples.



* each number on the chart is the arithmetic average from the five values taken from the five sub-samples for a given decile and for the given period

** 10% of companies with the highest sales growth in initial period (i.e. in year T)

*** 10% of companies with the lowest sales growth in initial period (i.e. in year T)

Source: parkiet.com.pl; author’s calculations.

As it can be seen on the Chart 2, the 2001-2009 period was characterized by a significant reversion toward the mean of sales growth of companies listed on the Warsaw Stock Exchange. In the periods under investigation the median normalized sales growth in the first decile in period T averaged 1.68. That means that the median sales growth in the first decile exceeded the median sales growth among all the companies by about 68% on average. The analogous value for the tenth decile averaged 0.65. That means that the median sales growth in the tenth decile in period T was lower than the median sales growth among all the companies by about 35% on average. However, this difference starts to diminish as soon as in the following year. The distance between the highest and the lowest value of median normalized sales growth (i.e. between the medians in the first and the last decile), that in year T averages 104 percentage points, in the following year declines to 26 percentage points, and in years T+2, T+3 and T+4 declines further to 16, 8 and 4 percentage points, respectively. The observation of the median normalized sales growth in the remaining deciles brings similar findings. The distance between the second highest and the second lowest value of median normalized sales growth (i.e. between the medians in the second and the ninth decile), that in year T averages 45 percentage points, in the following year declines to 17 percentage points, in year T+2 declines further to 11 percentage points and in the years T+3 and T+4 becomes insignificant. However, it should be noticed that despite the discernible reversion toward the mean, in all the periods between T+1 and T+4 the relative sales growth in the first decile remains on the above-average levels.

The visual inspection conducted above showed that the reversion toward the mean was evidently present in sales growth of the companies listed on the Warsaw Stock Exchange in 2001-2009 period. It means that if in any year some company experiences above-average (below-average) sales growth, this relative sales growth usually declines (rises) in the following years toward all-the-companies average level. Given the fact that the total reversion toward the mean takes more than one year, the quantification of the average pace of this reversion was conducted. In order to evaluate the average pace of reversion toward the mean we computed, for all the deciles, the ratio of average median normalized sales growth in the year T+1 to the average median normalized sales growth in the year T. These computations are shown in the Table 3.

Table 3: Averaged medians of normalized sales growth in year T and T+1 and the changes of those medians in year T+1 relative to year T.

| | Period | | Change from T to T+1* |
|-----------|--------|------|-----------------------|
| | T | T+1 | |
| Decile 1 | 1.68 | 1.20 | 0.71 |
| Decile 2 | 1.26 | 1.06 | 0.84 |
| Decile 3 | 1.15 | 1.08 | 0.94 |
| Decile 4 | 1.08 | 1.03 | 0.96 |
| Decile 5 | 1.03 | 1.01 | 0.98 |
| Decile 6 | 0.98 | 0.99 | 1.00 |
| Decile 7 | 0.94 | 0.96 | 1.03 |
| Decile 8 | 0.89 | 0.94 | 1.06 |
| Decile 9 | 0.81 | 0.89 | 1.10 |
| Decile 10 | 0.65 | 0.94 | 1.45 |

* median normalized sales growth in a given decile in year T+1 divided by median normalized sales growth in the same decile in year T

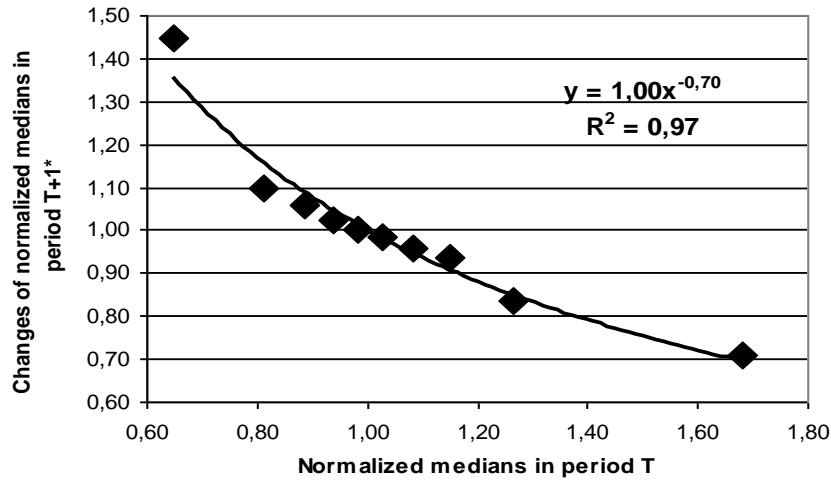
Source: parkiet.com.pl; author's calculations.

In the analyzed 2001-2009 years the median sales growth of companies making the first decile exceeded the median sales growth of all the companies in the period T by about 68%. However, only after one year the median of normalized sales growth in this decile decreased by the average of 29%. Similar situation occurs in the case of 2nd, 3rd, 4th and 5th decile (i.e. the deciles composed of companies with the above-average sales growth in year T). The opposite situation occurs in the case of 6th, 7th, 8th, 9th and 10th deciles (i.e. the deciles composed of companies with the below-average sales growth in year T). The median normalized sales growth of companies making the 10th decile averages only about 65% of median sales growth of all the companies in year T. However, in the following year the significant reversion toward the mean occurs (median normalized sales growth in the last decile rises by an average of 45%). It should be noted that the changes of the median normalized sales growth in the deciles (shown in the last column of Table 3) rise monotonically with the movement from the highest deciles to the lowest deciles.

The data from the second and the last column of Table 3 enabled the quantification of the pace of reversion toward the mean. Chart 3 presents the non-linear relationship between the averaged values of median normalized sales growth in individual deciles (these are data from the second column of Table 3) and the changes of those medians ensuing in the following year (these are the data from the last column of Table 3). In the analyzed periods there was the significant negative relationship between the companies' relative sales growth in period T and later (in period T+1) changes of this relative growth. This negative relationship is statistically significant and very strong (given the coefficient of determination equaling 0.97). This confirms that companies with the above-average (below-average) sales growth in any given year tend to experience the decrease (increase) of this relative growth toward all-the-companies average levels in the following year.

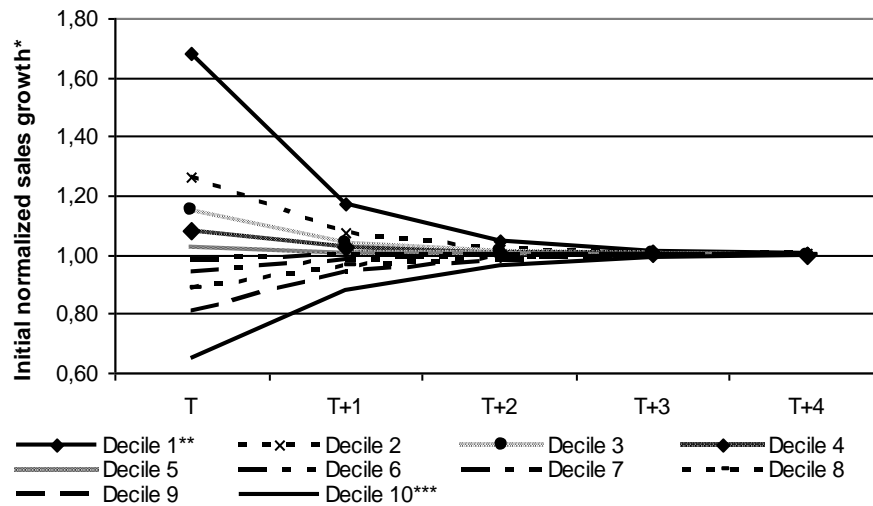
The log-linear regression shown on Chart 3 enabled the simulation of the path of relative sales growth of companies from different deciles in a five-year timeframe. The estimated regression enables the calculation of the expected scope of next-year (i.e. T+1) reversion toward the mean for any initial (i.e. in year T) value of normalized sales growth. Recalculation (on the basis of the same regression coefficients) made for the further years (after year T+1) permits obtaining a long-term reversion-curves (on the assumption that in all those years the regression coefficients are constant).

Chart 3: The relationship between the medians of normalized sales growth in ten deciles of companies in year T and the changes of these medians in the same deciles in year T+1.



* median normalized sales growth in a given decile in year T+1 divided by median normalized sales growth in the same decile in year T
 Source: parkiet.com.pl; author’s calculations.

Chart 4: Five-year reversion curves of normalized sales growth* of the companies listed on the Warsaw Stock Exchange simulated on the basis of estimated log-linear regression.



* the ratio of sales growth of a given company to median sales growth for all the companies listed on the Warsaw Stock Exchange
 ** 10% of companies with the highest sales growth in year T
 *** 10% of companies with the lowest sales growth in year T
 Source: parkiet.com.pl; author’s calculations.

Chart 4 presents the paths of the reversion of corporate sales growth simulated for the ten initial values (these were the actual values of the medians for the ten deciles shown in the second column of Table 3). The chart shows that according to the estimated regression (describing reversion of corporate sales growth toward the mean) this reversion takes on average 3-4 years in the case of companies listed on the Warsaw Stock Exchange (on the assumption, that the regression coefficients are stable). Companies with above-average (below-average) sales growth in any given year tend to show significantly lower (higher) relative sales growth in the following years. The

initial above-average (below-average) pace of sales growth in the following years systematically approaches all-the-companies average levels. However, according to the estimated log-linear regression, this process takes on average about 3-4 years.

4. CONCLUSIONS

The research presented in this paper (based on the data concerning sales growth of the companies listed on the Warsaw Stock Exchange in 2001-2009 years) found that the relative corporate sales growth tends to revert toward the mean. In the analyzed sample of public companies the significant negative relationship between the relative (i.e. in relation to the average for all the companies) sales growth in a given year and the changes of this relative growth in the following years was detected. It means that companies characterized by above-average (below-average) sales growth in any year usually experience significant decrease (increase) of this relative growth toward the economy-wide levels in the following years. However, according to the obtained estimates, the process of total reversion to the mean takes about 3-4 years.

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