REVERSION TOWARD THE MEAN OF CORPORATE REVENUES' GROWTH – A SECTORAL PERSPECTIVE

J. Welc

Uniwersytet Ekonomiczny we Wrocławiu
Wydział Gospodarki Regionalnej i Turystyki
Katedra Gospodarki Regionalnej
ul. Nowowiejska 3, 58-500 Jelenia Góra, Polska
jacek.welc@ue.wroc.pl

Abstract

Abundant research shows that the characteristic feature of corporate financial results is the long-term reversion of those results toward the levels average for the whole economy. In the case of revenues this means that companies which in a given period show above-average revenues' growth in the following periods express the tendency to show slower pace of this growth and companies which in a given period show below-average revenues' growth in the following periods express the tendency to show faster pace of growth. This paper presents the phenomenon of reversion toward the mean in the case of revenues' growth of individual industries in Poland in the period of 2006-2008. The research found that the relative revenues growth within the individual industries shows the tendency of reversion toward the mean.

1. Introduction

Forecasting corporate revenues' growth constitutes an essential element of most models of corporate financial analysis and valuation [Moyer, McGuigan, Kretlow 1995; Penman 2007; DePamphilis 2008]. Given that revenues' growth of individual companies is strongly dependant on the pace of growth of the industry in which these companies operate, predicting revenues' growth in the whole industry is important in evaluating the growth perspectives of the companies belonging to that industry [Palepu, Healy, Bernard 2004]. Abundant research shows that the characteristic feature of corporate financial results (measured by e.g. revenues' 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]. In the case of corporate revenues this means that the companies that in a given period show over-average (above-average) revenues' growth in the following periods express the tendency to show slower (faster) pace of this growth. It probably also means that the financial results of all individual industries express long-term reversion toward the economy-wide averages. The paper explores the phenomenon of reversion toward the mean in the case of revenues' growth of individual industries in Poland in 2006-2008 (the period of accelerated economic growth after the European Union' accession).

2. The applied analytical procedure

In the research the data concerning total revenues of Polish companies were used. The analysis was based on the data relating to the revenues' growth of 39 industries in 2006-2008. These data are shown in Table 1.

Table 1: Total revenues' growth of Polish industries in 2006-2008 years.

Industry	Revenues growth*			Industry	Revenues growth*		
	2006	2007	2008		2006	2007	2008
Mining of coal and lignite; extraction of peat	0,94	1,00	1,22	Manufacture of medical, precision and optical instruments, watches and clocks	1,22	1,18	1,17
Other mining and quarrying	1,10	1,27	1,16	Manufacture of motor vehicles, trailers and semi-trailers	1,17	1,14	1,06
Manufacture of food products and beverages	1,07	1,15	1,05	Manufacture of other transport equipment	1,06	1,06	1,08
Manufacture of tabacco products	1,06	1,18	0,72	Manufacture of furniture	1,10	1,11	0,97
Manufacture of textiles	1,04	1,10	0,95	Recycling	1,29	1,24	1,11
Manufacture of wearing apparel and furriery	1,12	0,99	0,95	Electricity, gas, steam and hot water supply	1,08	1,01	1,21
Manufacture of leather and leather products	1,15	1,18	0,94	Collection, purification, and distribution of water	1,08	1,02	1,09
Manufacture of wood and wood, straw and wicker products	1,07	1,23	0,97	Construction	1,21	1,31	1,15
Manufacture of pulp and paper	1,04	1,13	1,04	Sale, maintenance and repair of motor vehicles and motorcycles; retail of automotive fuel	1,14	1,22	1,06
Publishing, printing, and reproduction of recorded media	1,06	1,06	1,02	Wholesale and commission trade	1,17	1,12	1,12
Manufacture of coke, refined petroleum products	1,27	1,18	1,28	Retail trade; repair of personal and household goods	1,13	1,23	1,18
Manufacture of chemicals and chemical products	1,12	1,04	1,02	Hotels and restaurants	1,16	1,19	1,11
Manufacture of rubber and plastic products	1,19	1,19	1,06	Land transport; transport via pipelines	1,14	1,12	1,06
Manufacture of other non-metallic mineral products	1,17	1,23	1,07	Auxiliary transport activities; tourism organization	1,18	1,18	1,22
Manufacture of basic materials	1,29	1,14	0,99	Post and telecommunications	1,03	1,06	1,07
Manufacture of metal products	1,22	1,25	1,08	Real estate, renting and business activities	1,11	1,24	1,19
Manufacture of machinery and equipment	1,13	1,26	1,17	Education	1,20	1,32	1,26
Manufacture of office machinery and computers	0,96	1,46	1,84	Health and social work	1,20	1,25	1,43
Manufacture of electrical machinery and apparatus	1,19	1,15	0,94	Other community, social and personal service activities	1,06	1,23	1,36

Manufacture of radio, television and communication equipment and apparatus	1,16	0,99	1,10	

* previous year=1
Source: Central Statistical Office; author's calculations.

The sample under investigation was divided into two sub-samples. The first one embraced the period between 2006-2007 and the second one embraced 2007-2008. In each of the sub-samples we analyzed the reversion toward the mean of the industries' revenues growth. In the case of the first sub-sample all 39 industries were sorted in order of decreasing revenues' growth in 2006 (from the industry with the highest growth to the industry with the lowest growth). Then the sorted industries were divided into ten deciles so that the first decile embraced 10% of industries with the fastest revenues' growth in 2006 and the last decile embraced 10% of industries with the slowest revenues' growth in 2006. Because total number of observations cannot be divided equally into ten deciles we adjusted the number of observations in the last decile (it embraced 3 observations). For each of the deciles constructed in this way the median revenues' growth in 2006 was computed. Then the median revenues' growth in the following year was computed for the same deciles. The obtained medians of revenues' growth (in ten deciles) were normalized by dividing the median in the given decile by the median in all the industries. Analogous computations were made for the second sub-sample (comprising 2007-2008). The obtained normalized medians of revenues' growth enabled evaluation of the reversion toward the mean of the industries' revenues growth.

3. The results

Chart 1 presents the phenomenon of reversion toward the mean in the case of revenues' growth of industries in 2006-2008. The chart shows the averages of normalized medians of revenues' growth. For example, the value for the first decile in period T (where T is the year for which the initial sort of all the industries is made) constitutes the arithmetic average of two values of normalized medians obtained for the first decile in the first years of both sub-samples. Analogously, the value for the first decile in period T+1 (where T+1 is the year following the year for which the initial sort of all the industries is made) constitutes the arithmetic average of the two values of normalized medians obtained for the first decile in the second years of both sub-samples. As it can be seen in the chart, the 2006-2008 period was characterized by a significant reversion toward the mean of revenues' growth of Polish industries. In the periods under investigation the normalized median of revenues' growth in the first decile averaged 1,12. That means that the median revenues' growth in the first decile exceeded the median revenues' growth among all the industries by about 12%. The analogous value for the tenth decile averaged 0,85. That means that the median revenues' growth in the tenth decile was lower than the median revenues' growth among all the industries by about 15%. However, this difference starts to diminish in the following year. The distance between the highest and the lowest value of normalized median, that in year T averages 28 percentage points, in the following year declines to 10 percentage points. The observation of the normalized median revenues' growth in the remaining deciles brings similar findings. The distance between the second highest and the second lowest value of normalized median, that in year T averages 16 percentage points, in the following year declines to 10 percentage points. However, it should be noticed that despite the discernible reversion toward the mean, in year T+1 the relative revenues' growth in the first deciles remains on the above-average levels and the relative

revenues' growth in the last deciles remains on below-average levels. Therefore the total reversion to the mean takes more than just one year.

Chart 1: Normalized median revenues' growth* in ten deciles of Polish industries in 2006-2008.
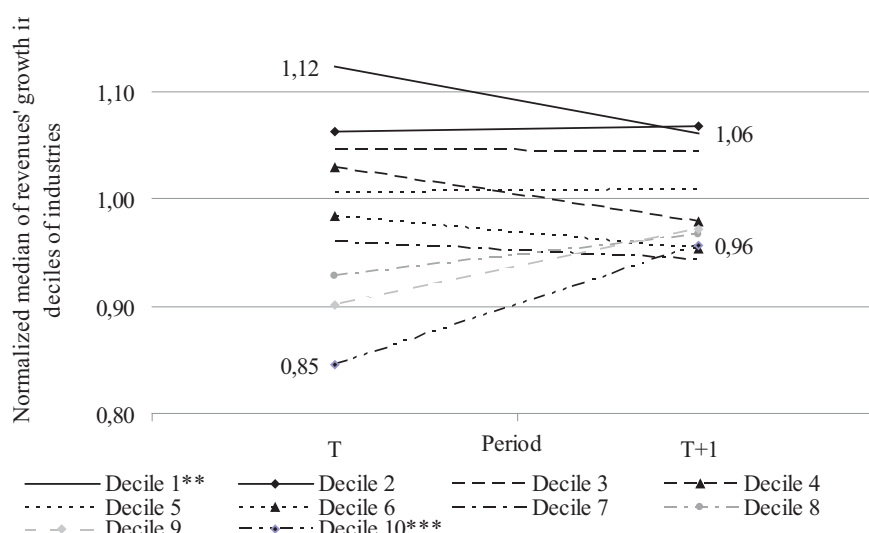
* normalized medians of revenues' growth were computed as the ratio of median revenues' growth in a given decile to the median revenues' growth among all the industries in the same period
** 10% of industries with the highest revenues' growth in year T
*** 10% of industries with the lowest revenues' growth in year T
Period T is the year for which the initial sort of all the industries is made and period T+1 is the year following the year for which the initial sort of all the industries is made.
Source: Central Statistical Office; author's calculations.

The visual inspection showed that the reversion toward the mean was present in revenues' growth of Polish industries in 2006-2008. It means that if in any year some industry experiences above-average (below-average) revenues' growth, this relative revenues' growth usually declines (rises) in the following year toward the all-the-industries average. Given the fact that the total reversion toward the mean takes more than one year the analysis of the pace of this reversion was conducted. The upper part of Table 2 presents the normalized median revenues' growth in the first years of both sub-samples (i.e. in periods that constituted the basis for dividing the given sub-sample into deciles). The last column of the table (in the upper part) presents the arithmetic averages of both normalized medians (from both sub-samples). In order to evaluate the pace of reversion toward the mean we computed (for each decile in both sub-samples) the ratio of normalized median in the second year to the normalized median in the first year. These data are shown in the bottom part of Table 2.

In the analyzed sub-samples the median revenues' growth of industries making the first decile exceeded the median revenues' growth of all the industries by about 12%. However, only after one year the normalized median revenues' growth in this decile decreased by the average of 5% (it should be noted, however, that this finding is not unambiguous for both sub-samples). The opposite situation occurs in the case of 8th, 9th and 10th deciles. The median revenues' growth of industries making the 10th decile averaged about 85% of median revenues' growth of all the industries. However, in the following year the significant reversion toward the

mean occurred (normalized median revenues' growth in the last decile rose by an average of 13%).

Table 2: Normalized medians of revenues growth* in year T and the changes of those medians in year T+1.

Deciles of industries	Sub-sample		Arithmetic average in both sub-samples
	2006-2007	2007-2008	
Normalized medians of revenues' growth in period T			
Decile 1**	1,13	1,11	1,12
Decile 2	1,07	1,06	1,06
Decile 3	1,05	1,04	1,05
Decile 4	1,03	1,02	1,03
Decile 5	1,01	1,00	1,01
Decile 6	0,99	0,98	0,98
Decile 7	0,97	0,95	0,96
Decile 8	0,94	0,92	0,93
Decile 9	0,93	0,87	0,90
Decile 10***	0,85	0,84	0,85
The changes in normalized medians of revenues' growth in period T +1****			
Decile 1**	0,88	1,01	0,95
Decile 2	1,01	1,00	1,01
Decile 3	0,94	1,05	1,00
Decile 4	0,94	0,96	0,95
Decile 5	1,01	1,00	1,00
Decile 6	0,97	0,97	0,97
Decile 7	0,93	1,03	0,98
Decile 8	1,07	1,01	1,04
Decile 9	1,01	1,15	1,08
Decile 10***	1,05	1,21	1,13

* normalized medians of revenues' growth were computed as the ratio of median revenues' growth in a given decile to the median revenues' growth among all the industries in the same period
** 10% of industries with the highest revenues' growth in year T
*** 10% of industries with the lowest revenues' growth in year T
**** normalized median revenues' growth in a given decile in year T+1 divided by normalized median revenues' growth in the same decile in year T
Source: Central Statistical Office; author's calculations.

Data from the last column of Table 2 enabled the quantification of the pace of reversion toward the mean. Chart 2 presents the relationship between the average (in the first years of both sub-samples) values of median revenues' growth in individual deciles and the changes of those normalized medians ensuing in the following year. In the analyzed periods there was quite a significant negative relationship between the industries' relative revenues' growth in period T and later (in period T+1) changes of this relative growth. Industries with the above-average (below-average) revenues' growth in a given year tend to experience the decrease (increase) of this growth toward all-the-industries average in the following year.

Chart 2: The relationship between the normalized medians of revenues' growth in deciles of industries in year T and the changes of this growth in the same deciles in year T+1.
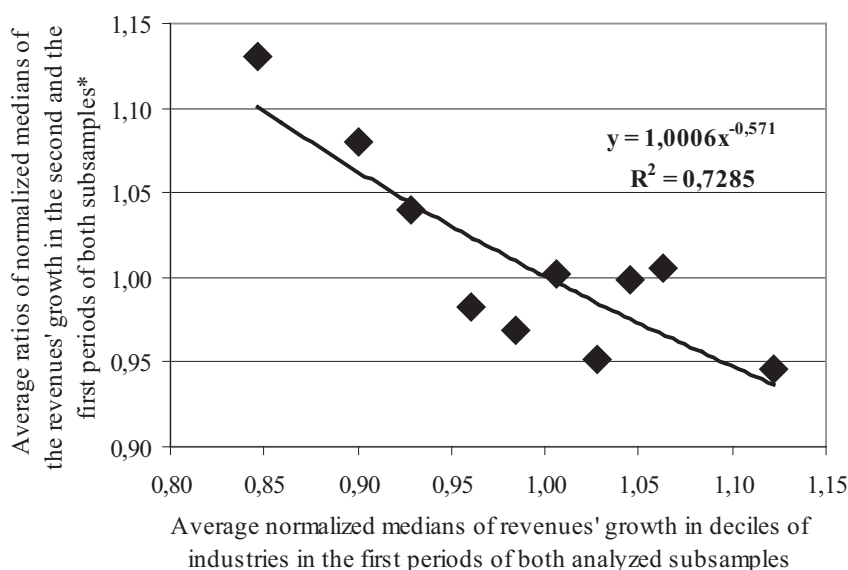
* ratio of the normalized median in year T+1 to the normalized median in year T
Source: Central Statistical Office; author's calculations.

Chart 3: Ten-year reversion curves of normalized revenues growth* of Polish industries simulated on the basis of estimated log-linear regression.
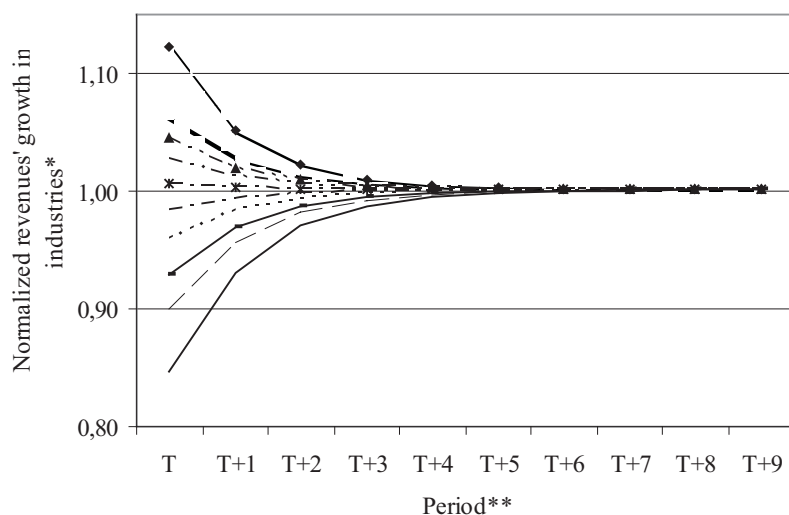
* the ratio of revenues' growth in a given industry to median revenues growth for all industries
** yearly periods (T means the basic year and T+n means following years)
Source: Central Statistical Office; author's calculations.

The log-linear regression shown in Chart 2 enabled the simulation of the relative revenues' growth of industries in ten-year timeframe. The estimated regression enables the calculation of the expected scope of next-year reversion toward the mean for each initial value of normalized revenues' 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-curve (on the assumption that in all those years the regression coefficients are stable).

Chart 3 presents the trails of the reversion of industrial revenues' growth simulated for the ten initial values (these were the values of medians for the ten deciles shown in the last column of Table 2). The chart shows that according to the estimated regression describing reversion of revenues' growth of industries toward the mean, this reversion takes on average 4-5 years in Poland (on the assumption, that the regression coefficients are stable). Industries with above-average (below-average) revenues' growth in a given year tend to show lower (higher) relative revenues' growth in the following years. The initial above-average (below-average) pace of revenues' growth in the following years systematically approaches all-the-industries average level. However, according to the estimated log-linear regression, this process takes on average about 4-5 years.

4. Conclusions

The research presented in this paper (based on data concerning revenues' growth of Polish industries in 2006-2008) found that the relative revenues' growth of industries tends to revert toward the mean. In the analyzed sample of 39 industries the significant negative relationship between the relative (i.e. in relation to the average for all the industries) revenues' growth in a given year and the change of this relative growth in the next year was detected. It means that industries characterized by above-average (below-average) revenues' growth in any year usually experience significant decrease (increase) of this 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 4-5 years.

References

[1] Bajaj M., Denis D. J., Sarin A.: *Mean Reversion in Earnings and the Use of E/P Multiples in Corporate Valuation.* Journal of Applied Finance. Vol. 14. Chicago 2004.
[2] DePamphilis D. M.: *Mergers, Acquisitions and Other Restructuring Activities.* Academic Press Advanced Finance Series. London 2008.
[3] Fama E. F., French K. R.: *Forecasting Profitability and Earnings.* Center for Research in Security Prices Working Papers. Chicago 1999.
[4] Hwang M., Keil M., Smith G.: *Shrunken Earnings Predictions are Better Predictions.* Applied Financial Economics. Vol. 14. London 2004.
[5] Moyer R. C., McGuigan J. R., Kretlow W. J.: *Contemporary Financial Management.* West Publishing Company. St. Paul 1995.
[6] Murstein B. I.: *Regression to the Mean: One of the Most Neglected but Important Concepts in the Stock Market.* The Journal of Behavioral Finance. Vol. 4. Jersey City 2003.
[7] Palepu K. G., Healy P. M., Bernard V. L.: *Business Analysis & Valuation Using Financial Statements.* Thomson South-Western. Mason 2004.
[8] Penman S. H.: *Financial Statement Analysis and Security Valuation.* McGraw-Hill. New York 2007.

REVERSION TOWARD THE MEAN OF CORPORATE REVENUES' GROWTH
– A SECTORAL PERSPECTIVE

KONVERGENZ DER DYNAMIK DES EINKOMMENS VON UNTERNEHMEN ZU EINEM DURSCHNITTSNIVEAU – ERFASSUNG NACH SEKTOREN

Charakteristisch für die finanziellen Jahresergebnisse von Unternehmen ist eine langfristige Konvergenz dieser Ergebnisse zu einem durchschnittlichen Niveau für die gesamte Wirtschaft. Im Fall der Erträge bedeutet dies, dass die Unternehmen, die in einem bestimmten Zeitraum eine überdurchschnittlich hohe (niedrige) Dynamik zeigen, in späteren Perioden eine Tendenz zur Minderung (Zunahme) aufzeigen. Im Rahmen dieser wissenschaftlichen Arbeit hat man das Phänomen der Rückkehr zum Mittelwert im Falle der sektoralen Dynamik der Erträge in Polen im Zeitraum 2006-2008 untersucht. Die Studie zeigte, dass die relative Dynamik der Erträge der einzelnen Sektoren eine Tendenz zur Rückkehr zum Mittelwert aufzeigt.

REWERSJA DO ŚREDNIEJ DYNAMIKI PRZYCHODÓW PRZEDSIĘBIORSTW – UJĘCIE SEKTOROWE

Cechą charakterystyczną wyników finansowych przedsiębiorstw jest długookresowa rewersja tych wyników do poziomów przeciętnych dla całej gospodarki. W przypadku przychodów oznacza to, iż przedsiębiorstwa wykazujące w danym okresie ponadprzeciętnie wysoką (niską) ich dynamikę, w okresach kolejnych wykazują tendencję do spadku (wzrostu) tej dynamiki. W artykule zbadano zjawisko rewersji do średniej w przypadku sektorowej dynamiki przychodów w Polsce w latach 2006-2008. Przeprowadzone badanie wykazało, iż relatywna dynamika przychodów poszczególnych sektorów wykazuje tendencje rewersji do średniej.

NÁVRAT K PRŮMĚRU V PŘÍPADĚ DYNAMIKY PŘÍJMU PODNIKÁNÍ – SEKTOROVÝ PŘÍSTUP

Charakteristické znamení finanční výkonnosti podniků je dlouhodobé navrácení těchto výsledků na úroveň průměru za celou ekonomiku. V případě příjmu, to znamená, že firmy v daném období, které vykazují nad průměr vyšší (nižší) dynamiku, v následujících obdobích ukazují tendenci k poklesu (nárůstu) v této dynamice. Článek se zabývá fenoménem návratu k průměru v případě sektorové dynamiky příjmů v Polsku v letech 2006-2008. Výzkum ukázal, že relativní dynamika příjmu jednolitvých sektorů, má tendenci navrácení se k průměru.