STUDYING THE EFFECT OF INCOME SMOOTHING ON SYSTEMATIC RISK: EVIDENCE FROM IRAN

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ABSTRACT

In this research, income smoothing of Tehran Stock Exchange’s listed companies is measured and for this purpose, the method of coefficient of income variation to coefficient of sales variation ratio is utilized. This research aims to study the effect of income smoothing on systematic risk in time period between 2002 and 2011 based on a sample including 650 year-company among listed companies of Tehran Stock Exchange. In following, relation between the factors affecting income smoothing behavior and systematic risks studied such as company size, liquidity ratio, liability contract, income variability and industry type. Using simple linear regression and multiple regressions, research results indicated that income smoothing reduces systematic risk. Also, company size, liquidity ratio, liability contract, income variability and industry type have significant relation with systematic risk.

Keywords: Income smoothing, systematic risk, Eckel model
1. INTRODUCTION

Since a firm’s market risk is measured by its stock yield fluctuations, and stock price is also related to stock income of each company, then firms tend to decrease yield fluctuations by decreasing income fluctuations of each stock, and to eventually affect thoughts of investors and creditors about firm’s risk. Therefore, they perform income smoothing to create consistent flow of reported income’s growth. Although income smoothing in recent decades, is extensively studied in accounting and financial literature, but its informational effect on stock risk is not recognized well. Income smoothing is a conscious action which is performed by management in accounting and via special tools to decrease income fluctuations. In other words, income smoothing is achieved in limited area of accounting’s accepted standards and principles. Income smoothing follows a certain purpose i.e. creating a consistent flow of dividend growth (Hepworth, 1953). Investors believe consistent income compared to fluctuated income, guarantees higher dividend payment. Moreover, income fluctuation is considered as main criterion of firm’s general risk and companies with smoother income have fewer risks. Investors are more interested into these companies and they think such firms are more appropriate for investment. Hence, investors try to invest their financial resources in firms with higher yield and lower risk. Therefore, along with focus on income, companies must manage the risk as limiting factor of maximizing the yield as well. Unlike yield, risk is a subjective and non-quantitative concept. So, efforts of most economic and financial experts are concentrated on identifying and measuring risks.

According to novel portfolio theory, risk is divided into two parts: first part is systematic risk which is related to whole market. Second part, is unsystematic risk which depends on specific situation of each stock.

Beta is one of the most accepted tools of financial economists and market experts to evaluate and manage risk. Income smoothing might be considered as income fluctuations’ intentional decrease, and one important topic in capital market is awareness of firms’ risk level, especially systematic risk which can play tremendous role in decision-makings. Effect of financial reports on stock market trend, is the main axis of research in accounting. Lots of researches are developed about the effect of financial information on securities’ price.

Diverse factors such as income smoothing, influence systematic risk. Eventual purpose of this research is to study the effect of income smoothing on systematic risk of Tehran Stock Exchange listed companies’ common stock through years 2002 to 2011.

2. LITERATURE REVIEW AND BACKGROUND

Hepworth (1953) was the first one who brought up income smoothing suggestion as an accounting topic. He emphasized that in accounting accepted principles, there are lots of action freedom in interpreting period income determination methods. This freedom allows the management to perform income
smoothing. He claimed that improving the relationships with creditors, investors and workers are motivations of income smoothing. Beidleman (1973) believed companies must do income smoothing to decrease yield deviation with respect to market and hence to create a uniform flow in income. Barni et.al. (1975) believed managers have to perform income smoothing to reduce net income fluctuations and also to improve investing ability for estimating future cash flows.

Beaver and Manegold (1975) have studied the relation between net income to common stock market value ratio, assets return ratio and common shareholders yield ratio with systematic risk. Results showed there is a weak significant relation between research variables and systematic risk.

Elgers and Murra (1982) have studied the relation between accounting variables and systematic risk. Variables includes earning distribution, growth, financial leverage, income variability and size which by using information of 294 firms through years 1963-1977 they have resulted that there is a significant relation between selective accounting variables and systematic risk.

Abdelghany (2005) have investigated the relation between market risk and several accounting risk variables. These variables are leverage ratio, assets size, current ratio, income variability, income growth, dividends payable and income beta. Results indicated that assets size, current ratio, income growth and dividends payable ratio have a significant relationship with systematic risk and other variables have a weak relationship with systematic risk.

Jolym (2000) and Stephen Tomas (2006) indicated there is direct correlation between dividends sustainability and stock return of firms in London stock exchange and there is a reverse direct correlation between dividends sustainability and systematic risk.

3. RESEARCH HYPOTHESES

Considering theoretical foundations and performed researches and obtained results, there are one main hypothesis and five secondary hypotheses to study income smoothing effect on systematic risks as follows:

Main hypothesis: There is a significant relationship between income smoothing and systematic risk.

Secondary hypothesis 1: In income smoother firms, there is a significant relationship between firm size and systematic risk.

Secondary hypothesis 2: In income smoother firms, there is a significant relationship between liquidity ratio and systematic risk.

Secondary hypothesis 3: In income smoother firms, there is a significant relationship between liability contract and systematic risk.
Secondary hypothesis 4: In income smoother firms, there is a significant relationship between income variability and systematic risk.

Secondary hypothesis 5: In income smoother firms, there is a significant relationship between industry type and systematic risk.

4. RESEARCH VARIABLES

Research variables are classified into two general categories: independent variables and dependent variable. In main hypothesis; income smoothing is independent variable, and dependent variable are systematic risk.

4.1. Income smoothing
The method of coefficient of income variation to coefficient of sales variation ratio and separating smoothing companies is utilized to measure income smoothing. Formula related to smoothing is discussed in statistical models section.

4.2. Systematic risk
In present research, beta (β) is systematic risk index which is collected via Iranian Rahavard Novin software for each considered company. The most common method of computing beta is to utilize capital assets pricing model in which there is a regression relation between firm stock return and total stock return.

4.3. Firm size
Criteria such as logarithm of total assets, stock market value or sales are used to measure firm size variable. In this research, stock market value is considered as firm value determination criterion and eventually its logarithm is used as firm size variable.

4.4. Liability contract
In present research, liability contract is achieved through dividing total liabilities by total assets.

4.5. Liquidity ratio
Liquidity is firms’ ability to perform short term commitments in maturity (Foster, 1986). Since firm’s potential in obtaining required production resources and creating growth opportunities depend on firm’s liquidity, it is expected that by increasing the liquidity, firm’s access to required resources, timely fulfilment of commitments to customers and creditors will increase. In this research, current ratio is used to measure liquidity ratio, since it shows firm’s liquidity power better.

4.6. Income variability
Based on Bior et.al. (1970), in present research, following relation is used to measure income variability:
Income variability = \[ \sum_{t=1}^{T} \left( \frac{E_{i,t}}{Q_{i,t-1} \times P_{i,t-1}} - \left( \frac{\bar{E}}{Q \times P} \right)^2 / T \right)^{1/2} \]

\[ \left( \frac{\bar{E}}{Q \times P} \right) = \left( \frac{\sum_{t=1}^{T} E_{i,t}}{\sum_{t=1}^{T} (Q_{i,t-1} \times P_{i,t-1})} \right) / T \]

\( E_{i,t} \): Common shareholders net income of firm i in period t

\( Q_{i,t-1} \): Common stocks of firm i in period t-1

\( P_{i,t-1} \): Price of each stock of firm i in period t-1

T: Quantity of research period years

5. SAMPLE AND STATISTICAL SOCIETY

In this research, year-firm information is used in sectional. Statistical population includes all listed companies of Tehran Stock Exchange from beginning of 2002 to end of 2011. Elimination method is used for sampling. Hence, firms must have following specifications to be considered as sample:

- Each company must have enough data through years 2002 to 2011, meaning it must be active in Tehran Stock Exchange through this period.
- Each company must be traded at least 9 months per year.
- Financial year of firms must ends in March 20\text{th} (end of Iranian fiscal year).
- Companies must not be part of financial mediation investment.
- Financial period of firms must not be changed.

Eventually, after observing conditions above, number of firms reached to 92 companies and in following, Eckel model is utilized to identify income smoother companies. Considering this model, 65 firms have had income smoothing in time-period between 2002 and 2012. So, final sample size includes 650 year-firm.

6. STATISTICAL METHODS AND RESEARCH MODEL

6.1. Measuring income smoothing

There are different methods for income smoothing. Some examined smoothing methods are changing depreciation method, extraordinary items, cost plus method, retiring costs, research and development cost, Roosen Boom coefficient, total commitment items, arbitrary commitment items and etc. In this research, Eckel model (1981) is utilized to identify income smoothing behavior. In this model, objective is to smooth the income artificially. Natural smoothing essentially is not related to any management decision or action. Real income smoothing represents an economic situation which is not in this research's investigation area. In contrast, dummy smoothing actually represents management intentional applying for smoothing time series of reported incomes which clearly leads to deviation in presenting economic facts. Eckel (1981) came to this result that income smoothing occurs when sale variations coefficient is more
than income variations coefficient. According to this model, the company is identified as smoother in which the ratio of income variations coefficient to sale variations coefficient for a period is less than 1.

6.2. Hypotheses testing
After computing firms’ income smoothing level, main and secondary hypotheses are studied. In this research, before model estimation via pooled data, it is necessary to decide on appropriate method of applying this kind of data in approximation. First, it must be determined whether it is necessary to considering panel data structure or it is possible to pool different firms’ data to use them in model estimation. Hence, Limer test is utilized to estimate appropriate model.

In assurance level of 95 percent, $H_0$ hypothesis is approved based on equality of all special effects of firms in chemical industry, food industry, cement industry, automotive industry, pharmacy industry, automotive industry and all smoother firms. This means in this model, constant effects of firms are the same and hence, it is possible to estimate models by pooling related data and with classic method.

Basis of work in main hypotheses is on majority linear regression. Majority linear regression means research variables are computed for whole research period as average and it is used for general result about hypothesis approving or rejection. Multiple linear regression is conducted for secondary hypotheses. All regressions were performed via pooling data method except automotive and pharmacy industry. Regressions are conducted via E-view software. This model is fitted in 5% significance level to determine the effects of each independent variable (income smoothing in main hypotheses and firm size, liquidity rate, liability contract, income variability, industry type in secondary hypotheses) on dependent variable i.e. systematic risk.

7. DESCRIPTIVE STATISTICS

In this section, descriptive statistics of research variables are shown. Figure 1 represents statistical quantities used in main models.

![Figure 1. Descriptive statistics of research variables for all observations](image-url)
8. RESULTS

Main and secondary hypotheses results are as follows:

**Main hypothesis:** There is a significant relation between income smoothing and systematic risk. According to stated statistical models, correlation of income smoothing and systematic risk for all firms through 10 years is separately measured. Results of E-views program are presented in figure 2.

**Figure 2.** Majority regression results in significance level of 5 %

<table>
<thead>
<tr>
<th>Effect level (coefficient)</th>
<th>Standard deviation (SD)</th>
<th>Sign t</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2.440</td>
<td>1.1076</td>
<td>-2.218</td>
<td>0.0270</td>
</tr>
<tr>
<td>326.415</td>
<td>Sum of squared residuals</td>
<td>0.443</td>
<td>Determination coefficient</td>
</tr>
<tr>
<td>2.025</td>
<td>Durbin-Watson sign</td>
<td>0.440</td>
<td>Adjusted determination coefficient</td>
</tr>
<tr>
<td>1.0437</td>
<td>standard deviation of dependent variable $Sd_{Y_i}$</td>
<td>-1.553</td>
<td>Average of dependent variable $E_{Y_i}$</td>
</tr>
</tbody>
</table>

In this regression, $X_i$ Income smoothing.

Results show a significance level less than 0.05. $t$ sign is 2.218. Hence, $H_1$ claim of first main hypothesis is approved. Negativity of $B_1$ is compatible with expected theory foundations and shows this fact that firms income smoothing reduces systematic risk in exchange market. Sd is in an acceptable level as well. Determination coefficient represents that in majority regression, 44 percent of systematic risk is determined by income smoothing variable.

**First secondary hypothesis:** In income smoother firms, there is a significant relationship between firm size and systematic risk. According to figure 3, considering $B_1$ coefficient, firm size variable has significant and negative relation with systematic risk. So, there is a significant relationship between firm size and systematic risk, then $H_1$ hypothesis is approved.

**Second secondary hypothesis:** In income smoother firms, there is a significant relationship between income variability and systematic risk. According to figure 3, considering $B_2$ coefficient, income variability variable has significant and positive relation with systematic risk. So, there is a significant relationship between income variability and systematic risk, then $H_1$ hypothesis is approved.

**Third secondary hypothesis:** In income smoother firms, there is a significant relationship between liability contract and systematic risk.
According to figure 3, considering $B_3$ coefficient, liability contract variable has significant and positive relation with systematic risk. So, there is a significant relationship between liability contract and systematic risk, and then $H_1$ hypothesis is approved.

**Fourth secondary hypothesis**: In income smoother firms, there is a significant relationship between liquidity ratio and systematic risk. According to figure 3, considering $B_4$ coefficient, liquidity ratio variable has significant and negative relation with systematic risk. So, there is a significant relationship between liquidity ratio and systematic risk, and then $H_1$ hypothesis is approved.

**Fifth secondary hypothesis**: In income smoother firms, there is a significant relationship between industry type and systematic risk. According to figure 3, there is a significant relationship between industry type and systematic risk, and then $H_1$ hypothesis is approved.

**Figure 3.** Results of majority multiple regression for income smoother firms

\[
Y_i = \alpha_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + \varepsilon
\]

<table>
<thead>
<tr>
<th>Variables</th>
<th>Effect level (coefficient)</th>
<th>Standard deviation (SD)</th>
<th>Sign t</th>
<th>Significance level</th>
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<tbody>
<tr>
<td>Firm size</td>
<td>-0.009</td>
<td>0.000</td>
<td>-14.970</td>
<td>0.000</td>
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<tr>
<td>Income variability</td>
<td>0.036</td>
<td>0.039</td>
<td>5.372</td>
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<tr>
<td>Liability contract</td>
<td>0.025</td>
<td>0.006</td>
<td>4.089</td>
<td>0.000</td>
</tr>
<tr>
<td>Liquidity ratio</td>
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<td>0.003</td>
<td>-9.150</td>
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<td>Pharmacy industry</td>
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<tr>
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<tr>
<td>Chemical industry</td>
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<tr>
<td>Food industry</td>
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</tr>
<tr>
<td>Cement industry</td>
<td>-0.051</td>
<td>0.012</td>
<td>-4.288</td>
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<tr>
<td>Machine industry</td>
<td>-0.632</td>
<td>0.019</td>
<td>-31.704</td>
<td>0.000</td>
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</table>

4359.408

Sum of squared residuals | 0.424 | Determination coefficient |
1.917

Durbin-Watson sign | 0.424 | Adjusted determination coefficient |
0.468

standard deviation of dependent variable $Sd_{Y_i}$ | -0.662 | Average of dependent variable $E_{Y_i}$ |

In this regression, $Y_i$ is systematic risk variable.

According to above results, significance levels of all variables are less than 0.01. So, $H_1$ hypothesis is approved for all secondary hypotheses. Determination coefficient represents that in majority regression, 42 percent of systematic risk is determined by independent variables.
According to figure 4, results of testing hypotheses in different industries are different. In main hypothesis, by comparing sextuple industries’ determination coefficient, results show that automotive industry has weaker results.

Model estimation results for pharmacy industry shows computed $t$ and assurance level of 95 percent. Hence, there is a positive and significant relation between income variability variable and liability contract. Liquidity ratio also has a negative and significant relation with systematic risk in income smoother firms. Determination coefficient represents that in majority regression, 25 percent of systematic risk in pharmacy firms is determined by independent variables.

Model estimation results for automotive industry shows computed $t$ and assurance level of 99 percent. Hence, there is a positive and significant relation between firm size variable and liability contract. Liquidity ratio also has a negative and significant relation with systematic risk in income smoother firms. Determination coefficient represents that in majority regression, 13 percent of systematic risk in automotive industry firms is determined by independent variables.

Model estimation results for chemical industry shows computed $t$ and assurance level of 90 percent. Hence there is a positive and significant relation between firm size variable and liability contract. Liquidity ratio also has a negative and significant relation with systematic risk in income smoother firms. Determination coefficient represents that in majority regression, 14 percent of systematic risk in chemical industry firms is determined by independent variables.

Model estimation results for food industry shows computed $t$ and assurance level of 90 percent. Hence there is a positive and significant relation between firm liability contracts. Liquidity ratio also has a negative and significant relation with systematic risk in income smoother firms. Determination coefficient represents that in majority regression, 42 percent of systematic risk in food industry firms is determined by independent variables.

Model estimation results for cement industry shows computed $t$ and assurance level of 99 percent. Hence there is a positive and significant relation between firm size variable and income variability. Determination coefficient represents that in majority regression, 33 percent of systematic risk in cement industry firms is determined by independent variables.

Model estimation results for machine industry shows computed $t$ and assurance level of 99 percent. Hence there is a positive and significant relation between firm size variable and income variability and liability contract. Liquidity ratio also has a negative and significant relation with systematic risk in income smoother firms. Determination coefficient represents that in majority regression, 29 percent of systematic risk in machine industry firms is determined by independent variables.
Figure 4. Results of majority multiple regression for income smoother firms

\[ Y_i = a_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + \varepsilon \]

### Pharmacy industry

<table>
<thead>
<tr>
<th>Variables</th>
<th>Effect level (coefficient)</th>
<th>Standard deviation (SD)</th>
<th>Sign t</th>
<th>Significance level</th>
<th>R²</th>
<th>D-W</th>
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<tbody>
<tr>
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<td>0.248</td>
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<td>0.001</td>
<td>4.560</td>
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<td>Liquidity ratio</td>
<td>-0.124</td>
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<td>-5.185</td>
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### Automotive industry

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<th>R²</th>
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<tr>
<td>Firm size</td>
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<td>0.009</td>
<td>3.843</td>
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<td>-0.209</td>
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### Chemical industry

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<td>0.017</td>
<td>6.002</td>
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<td>0.030</td>
<td>0.023</td>
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<td>0.125</td>
<td>-7/962</td>
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### Food industry

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<tr>
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<td>0.003</td>
<td>-1.653</td>
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<td>0.150</td>
<td>-0.995</td>
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<td>1.911</td>
<td>0.057***</td>
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### Cement industry

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<td>7.656</td>
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<td>0.022</td>
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### Machine industry

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<tr>
<td>Liquidity ratio</td>
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<td>0.156</td>
<td>-6.785</td>
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</table>

*In significance level of 1 %, ** in significance level of 5 %, *** in significance level of 10 %
9. CONCLUSION

Research results approve research hypotheses. Main hypotheses indicated there is a significant relationship between income smoothing and systematic risk. Negativity of regression coefficient in figures 2 is compatible with theoretical foundations which state a sustained smooth income leads to shareholders satisfaction. This means firms income smoothing leads to increase in systematic risk of stock market. Hence, companies with smoother income have less investment risk. This is compatible with research of Markarian et.al (2012).

First secondary hypotheses indicated in income smooth firms, there is a significant relationship between firm size and systematic risk. Negativity of regression coefficient in figure 3 represents the fact that companies with a higher stock value have less systematic risk. Firm size has a relationship with systematic risk in other related research as well, such as Bior et.al. (1970), Brin and Lerner (1973) and Briml (2003).

Second secondary hypotheses indicated in income smooth firms, there is a significant relationship between income variability and systematic risk. Negativity of regression coefficient in figures 3 represents the fact that income variability has a positive relation with systematic risk. High income fluctuation might leads to high risk evaluation and decreases stock price and increases borrowing rate by firm. On the other hand, low income fluctuation might leads to low risk evaluation and increases stock price and decreases borrowing rate by firm. This is compatible with researches of Bior et.al. (1970) and Bildersi (1975).

Third secondary hypotheses indicated in income smooth firms, there is a significant relationship between liability contract and systematic risk. Negativity of regression coefficient in figures 3 represents the fact that liability contract has a negative relation with systematic risk. This is compatible with research of Hamada (1972).

Fourth secondary hypotheses indicated in income smooth firms, there is a significant relationship between liquidity rate and systematic risks. Negativity of regression coefficient in figures 3 represents the fact that liquidity ratio has a negative relation with systematic risk. This is compatible with researches of Citken et.al. (1995) and Gworge M et.al. (2006).

Fifth secondary hypotheses indicated in income smooth firms, there is a significant relationship between industry type and systematic risk. Industry type effect on systematic risk on commercial units can be justified by considering different situations of each industry. As relationships of different industries with systematic risk are shown in figure 4, Food industry has the highest risk, and automotive industry has lowest systematic risk.
10. REFERENCES

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