



Investigating Bhattacharya Hypothesis about the Effect of Dividend Signal on Information Asymmetry Risk: An Earnings Transparency Approach

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ABSTRACT

Information asymmetry in stock market can increase the risk of investment which in turn increases the capital cost of firms. Bhattacharya (1979) proposed a hypothesis that states dividend can act as a powerful signal in order to solve information asymmetry problem. We measured information asymmetry by lack of earnings transparency. Therefore we examine the effect of earnings transparency on capital cost in two portfolios; the first with high dividend and the second with low dividend to test the above hypothesis. The results indicate that earnings transparency can only increase market component of expected return. In other words in the portfolio with low dividend signal there is a negative relation between earnings transparency and expected return (meaning that information asymmetry has not been solved). On the other hands in the portfolio with high dividend, the earnings transparency has no negative effect on capital cost; meaning that dividend signal solved information asymmetry problem.

Keywords:

Earnings Transparency, Capital Cost, Capital Cost Components



1. Introduction

Akerlof (1970) believed that uncontrolled information asymmetry in the market can lead to common balance and market crash. Meaning that investor perception of uncertainty and potential negative effects of miss investment defines his/her investment behavior (Monfared et. al 2014, Monfared et. al forthcoming). Therefore management of information asymmetry has become an important part of advanced corporate finance. Transparency of financial statements especially reported earnings, reduces information asymmetry about value of equity, and therefore decreases the risk of investment and consequently the expected return as the proxy of equity cost of capital. This prevents market crash caused by information asymmetry. So, We expect a negative effect of earnings transparency on capital cost (Barth, et. al 2013, Barth, et. al 2010, et. al 2009). This expectation is based on the known positive relation between information asymmetry and capital cost because of the negative relation between earnings transparency and information asymmetry.

Bhattacharya (1979) proposed one of the first hypotheses that dividend is a confidential management signal promising the future cash flow of the firm. Based on this hypothesis, having a high dividend signal decreases information asymmetry risk and removes the negative relation between earnings transparency and capital cost. In this paper we try to test this hypothesis using the effect of earnings transparency on the capital cost in two portfolios: first portfolio includes firms with high dividend and the second includes firms with low dividend. According to the dividend signaling hypothesis, managers who know more inside information about future corporate growth convey that information to external investors through dividend payout (Lin et. al 2017).

2. Literature review

Capital cost is the expected return or the minimum return to satisfy the firm's equity holders (Neveu, 1985). If a firm's return on assets is higher than its capital cost, the holders of bonds and preferred stock reach their expected profit and the excess will be divided between equity holders. This increases the demand for the firm's stocks in the capital market, the market value and consequently the wealth of equity holders. After the standard CAPM (Sharpe 1964) and

F-F three factor models (1993), Carhart (1997) proposed the following CAPM based model to calculate the capital cost for equity holders:

$$r_{i,t} = R_{f,t} + \beta_{R_m,R_f} (\overline{R_m - R_f}) + \beta_{SMB} \overline{SMB}_t + \beta_{HML} \overline{HML}_t + \beta_{MOM} \overline{MOM}_t$$

In this equation, $r_{i,t}$ is the equity expected return as the proxy of capital cost for firm i in year t , $R_{f,t}$ is the risk-free return, $(R_m - R_f)$ is the premium market risk in year t , SMB_t is the size, HML_t is the value, and MOM_t is the Momentum proxy in year t . All independent variables are predicted by their historical average. Based on this equation, capital cost consists of four components. One is the $\beta_{R_m,R_f} (\overline{R_m - R_f})$ component which we define as market component of the capital cost. This component increases when market beta or market premium increases, leading to increasing the capital cost. Another components include $\beta_{SMB} \overline{SMB}_t$ - the size, $\beta_{HML} \overline{HML}_t$ -the value, and $\beta_{MOM} \overline{MOM}_t$ the momentum component of capital cost.

Information asymmetry usually refers to inequality amount of information (such as earnings fundamentals) held by different market participants. (Armstrong et al., 2010; Bhattacharya et al., 2013). Uncertainty of firm value increases BY informational asymmetry (Chauhan et. al 2016). So, based on information asymmetry theory (Fabozzi et. al 2012) we expect a positive relation between equity capital cost and information asymmetry because of the risk of trade with informed investor. In the literature one can find several documents about measuring information asymmetry using earnings transparency (Barth et. al 2008, Barth et. al 2009, Frutos et. al 2002). Bushman, Piotroski and Smith (2004) consider information transparency of a firm to be a situation in which the available information is pervasive, easily accessible, relevant, reliable, and timely. Nielsen and Modsen (2009) believe that in the presence of transparency, information user has enough knowledge about all the activities at any given time and can make riskless decisions. Fodenberg et. al (1995) believe that management agendas or accounting standards can lead to the smoothing of the earning after a certain time. Therefore it cannot show a correct progress of the firm leading to reduced value of earnings information and lack of earnings transparency (Leuz et.al 2002).

Investigating the earnings transparency literature shows a relation between earnings transparency and financial situation of the firm (Chiu, Chi 2009, Pizarro, Veronica, Mahenthiran, and Cademartori 2007). Verdi (2006) believes in companies with financial constraints earnings transparency gains increased importance due to its role in signaling the investors about new positive cash flows. In other hands the firms with unsuitable situation avoid transparency to prevent market value crash (Stein, 2003). Therefore one expects the lack of transparency in the earnings to cause the investors to feel more information asymmetry and so increased risk due to the inability of making accurate predictions (Barth, Konchitchki, and Landsman 2009, 2010, and 2013).

Due withheld information, managers and informed investors have information advantage regarding real and potential value of the firm compared to equity holders and creditors (Gordon 2002).

Akerlof (1970) refers to labor market and believes that signals (such as training) can reduce the risk of decision and solve the problem of information asymmetry. Bhattacharya (1979) proposed one of the first hypotheses to interpret dividend as a confidential signal sent to the market regarding increasing cash flows of the firm. The main basis of Bhattacharya hypothesis is as follows: (Ogden et. al 2002)

There are two types of companies, good companies and bad companies. The expected net cash flow of a good firm is higher than that of a bad firm. Managers know the net cash flow of their firm (which means they know whether their firm is a good or a bad one). However the market is unable to distinguish between good and bad companies. Also the assumption is that a) The cost of external financing is higher than that of internal financing, b) companies always fully pay the promised dividend and c) the wealth of a manager is directly related to the share value of the firm. Under these conditions, Bhattacharya shows that a) only the manager of good firm promises to pay dividend and b) the cost of dividend is enough to discourage the manager of a bad firm from paying Dividend cover. The important aspect of this hypothesis is the fact that while the advantage of paying dividend is similar for every firm, the cost of paying dividend for a bad firm is

larger than the cost for a good firm. This means that the possibility of lack of enough cash for paying dividend in a bad firm is higher than a good firm. Therefore the bad firm is more likely to be forced to use external financing for paying dividend. Therefore a bad firm is not likely to promise paying dividend (Joseph, Jen & O'Connor, 2002). Therefore when a manager decides to pay dividend, the investors consider this to be a good policy and thus buy the firm's stock (Copeland, Westo & Kuldeep, 2005). Therefore the market is able to decide the correct value of a firm based on its dividend policy which causes independent symmetry and reduces information asymmetry.

Based on our measure of information asymmetry (earnings transparency), since it is the competitive advantage of informed investors, we expect its risk to affect importantly uninformed investors decisions which (In contrast to informed investors which trade based on profit fundamental information) trade based on market direction because of lack of access to profit fundamental information (park et. al 2014). So, we define the Bhattacharia hypothesis as the effect of earnings transparency on the market component of capital cost. Accordingly our hypotheses are as follows:

- 1) Earnings transparency has a significant negative effect on market component of capital cost for the portfolio with no dividend signal (low dividend firms).
- 2) Earnings transparency has not a significant negative effect on market component of capital cost for the portfolio with dividend signal (high dividend firms).

The above hypotheses means that dividend signal can solve information asymmetry problem for market component of capital cost, but not for other components because information symmetry encourages uninformed investors to follow market direction in contrast to earnings fundamentals, not the other systematic factors. It's due to lack of analysts database and lack of up to date knowledge (to use F-F 3 factor or Carhart model) among non-analyst investors in Tehran Stock Exchange.

3. Methodology

Barth et.al (2013) model was used in order to calculate the earnings transparency. Capital cost was calculated following Carhart (1997) model (there is no need to describe the details of model estimates and computing of capital cost). In order to investigate the effect of dividend on the relationship between capital cost and earnings transparency, the firms were allocated into four portfolios based on their dividend quartiles. The effect of earnings transparency on capital cost was investigated in the first quartile (e.g. firm with highest dividend) and fourth quartile portfolio (e.g. firms with lowest dividend). Difference in beta coefficient of these two portfolio shows that dividend affects the relation between capital cost and earnings transparency; confirming the Bhattacharia hypothesis.

The statistical population of this study consisted of all companies listed in Tehran Stock Exchange that meet the following requirements: 1) They have to be listed in the Exchange before March 2005 and their stocks must have been available for trading since listing date, 2) The trading of their stocks shouldn't have been stopped between years 2009 and 2013, 3) The end of their fiscal year must be March of each year (end of Iranian solar year) and their fiscal year needs to have remained unchanged between years 2009 and 2013. The main reason behind these criteria is to control the effects of time on the research findings. For example if some financial or political factor were to occur in a certain year, the effects will certainly be visible if the fiscal year ends at March 20th while the effects might not be considered if the fiscal year ends in December 21st (Note that Iranian year starts at March 21st compared to Georgian calendar), 4) in order to information homogeneity, selected companies should not be in the list of financial and investment industries, 5) The book value of equity must be positive during the investigated period (Because of using Carhart model) ,and finally 6) The selected industry needs to at least include 10 companies which all meet the above criteria. Finally, 46 companies were studied in the time period of 2009 to 2013.

The following equations were used in order to investigate the effect of earnings transparency on capital cost and its components. The first for baseline results and the others for robustness analysis.

Model 1:

$$\beta_{R_m, R_f} \overline{(R_m - R_f)} = \alpha_1 + \beta_1 \text{TRANS}_{i,t} + \beta_2 \text{DBTA}_{i,t} + \varepsilon_{i,t}$$

Model 2:

$$\text{ECC}_{i,t} = \alpha_1 + \beta_1 \text{TRANS}_{i,t} + \beta_2 \text{DBTA}_{i,t} + \varepsilon_{i,t}$$

Model 3:

$$\beta_{\text{SMB}} \overline{\text{SMB}_t} = \alpha_1 + \beta_1 \text{TRANS}_{i,t} + \beta_2 \text{DBTA}_{i,t} + \varepsilon_{i,t}$$

Model 4:

$$\beta_{\text{HML}} \overline{\text{HML}_t} = \alpha_1 + \beta_1 \text{TRANS}_{i,t} + \beta_2 \text{DBTA}_{i,t} + \varepsilon_{i,t}$$

Model 5:

$$\beta_{\text{MOM}} \overline{\text{MOM}_t} = \alpha_1 + \beta_1 \text{TRANS}_{i,t} + \beta_2 \text{DBTA}_{i,t} + \varepsilon_{i,t}$$

The independent variable is earnings transparency which is divided into two components similar to the studies by Barth et.al (2013), Barth, M. E. Konchitchki, Y, And W.R. Landsman (2010) and Barth and Landsman (2003). The first component shows the earnings transparency for each industry and is called industrial transparency. The second part shows the earnings transparency for all companies regardless of industries and is called general component.

Equation 1:

$$\text{TRANS}_{i,t} = \text{TRANSI}_{j,t} + \text{TRANSIN}_{p,t}$$

In this equation, $\text{TRANSI}_{j,t}$ is the industrial earnings transparency component of firm i in year t and $\text{TRANSIN}_{p,t}$ is the portfolio earnings transparency of firm i in year t . Also $\text{TRANS}_{i,t}$ is the earnings transparency of firm i in year t . the earnings transparency of each industry (TRANSI) is equal to the coefficient α_1 calculated by estimating the following model:

Equation 2:

$$R_{i,j,t} = \alpha_0 + \alpha_1 E_{i,j,t} / P_{i,j,t-1} + \alpha_2 \Delta E_{i,j,t} / P_{i,j,t-1} + \varepsilon_{i,j,t}$$

In this equation, $R_{i,j,t}$ is the annual yield of firm i belonging to industry j in year t (calculated using Rahavard-e-Novin software for years 2009 to 2013), $E_{i,j,t}$ is the earning per share before extraordinary announcement of firm i from industry j in year t (extracted from companies' financial statements), $\Delta E_{i,j,t}$

is the change in the earnings per share before extraordinary announcement between years t and t-1, $P_{i,j,t-1}$ is the share value of firm i from industry j at the end of year t-1 and ϵ is the residual of the regression model. Before calculating industry transparency component, all companies are allocated into different industries then if an industry includes at least 10 active companies, equation 2 will be calculated for that industry.

Before calculating the general component of the transparency, first all companies are divided into four portfolios. The basis of this classification is the value of ϵ (model residual) which will be determined after calculating the industry transparency component. First portfolio contains companies with the most negative ϵ values while the fourth portfolio contains companies with the most positive ϵ value from all industries. This means that each portfolio has equal observations for every industry. Finally the regression equation 3 will be calculated for each of the four portfolios.

Equation 3:

$$R_{i,p,t} = \alpha_0 + \alpha_1 E_{i,p,t} / P_{i,p,t-1} + \alpha_2 \Delta E_{i,p,t} / P_{i,p,t-1} + \epsilon_{i,p,t}$$

The earnings transparency component (TRANSIN) is the adjustment factor of this equation.

Capital cost and its components have been calculated using the equation 4 following Carhart (1997).

Equation 4:

$$ECC_{i,t} = R_{f,t} + \beta_{R_m R_f} (\overline{R_m - R_f}) + \beta_{SMB} \overline{SMB}_t + \beta_{HML} \overline{HML}_t + \beta_{MOM} \overline{MOM}_t$$

In this equation, $ECC_{i,t}$ is the firm i equity cost in in year t, $R_{f,t}$ is the risk-free rate of return (equal to rate of return on government participation bonds in year t),

$(\overline{R_m - R_f})$ is the 60 months average of market risk premium ended to year t, \overline{SMB}_t is the 60 months average of size factor ended to year t, \overline{HML}_t is the 60 months average of value factor ended to year t and \overline{MOM}_t is the 60 months average of the momentum factor ended to year t. To calculate the coefficients of equation 4, model 6 was estimated for each firm by time series data in the past 60 months.

Model 6:

$$R_{i,t} - R_{f,t} = \beta_0 + \beta_{R_m R_f} (R_{m,t} - R_{f,t}) + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{MOM} MOM_t + \epsilon_{i,t}$$

In this equation $R_{i,t} - R_{f,t}$ is the excess return of the firm i in month t, $(R_{m,t} - R_{f,t})$ is the excess market return in each month, SMB_t is the size factor, HML_t is the value factor, and MOM_t is the momentum factor of month t. Calculations are followed to Carhart (1997).

Capital cost is divided into four components including market component ($\beta_{R_m R_f} (\overline{R_m - R_f})$), size component ($\beta_{SMB} \overline{SMB}_t$), value component ($\beta_{HML} \overline{HML}_t$) and momentum component ($\beta_{MOM} \overline{MOM}_t$).

4. Results

In order to investigate the Bhattacharya hypothesis about the effect of dividend signal in solving information asymmetry problem, the first to fifth models were estimated in both portfolios (high dividend and low dividend). Initially we use F-test to select between panel and pooled data, Hetttest test to investigate variance heterogeneity, and Voldrich test to investigate the autocorrelation. The results of all three models in companies with low and high dividend are shown in table 1.

Table 1: Propositions for regression models

Model	Dividend	Sig. for Lymer F	Sig. for Hetttest test	Sig. for Voldrich test	Sig. for Hosman test	Sig. for LR test	Analysis method
1	High	0.6329	0.3637	0.006	-	-	GLS
	Low	0.9394	0.0000	0.2506	-	-	GLS
2	High	0.182	0.3736	0.007	-	-	GLS
	Low	0.4512	0.0011	0.000	-	-	GLS
3	High	0.0321	-	0.0000	0.0451	1.0000	GLS
	Low	0.0690	0.2972	0.0002	-	-	GLS
4	High	0.4707	0.2140	0.0591	-	-	GLS
	Low	0.1628	0.0001	0.3506	-	-	GLS
5	High	0.0092	-	0.0065	0.9147	0.0329	GLS
	Low	0.0639	0.009	0.0003	-	-	GLS

In order to test the hypothesis for market component of capital cost, model 1 was estimated for high and low dividend portfolio and the results were compared in order to determine the effect of dividend signal on the effect of earnings transparency (negative information asymmetry) on market component of capital cost. Table 2 shows the model estimation results. In this case the negative and significant relation for low dividend portfolio has also converted to positive and significant coefficient for companies with high dividend. This shows the effect of dividend signal on the effect of earnings transparency on market component of the capital cost; meaning that dividend signal solved information asymmetry problem.

The table shows the results on the comparison between high and low dividend portfolios about the effect of earnings transparency on the market component of capital cost. The dependent variable is market component of capital cost and the independent

variable (trans) is the earnings transparency as the negative proxy of information asymmetry.

The results show a positive effect of earnings transparency on market component of capital cost for the portfolio with high dividend (dividend signaling portfolio) while this effect is negative and significant for the portfolio with low dividend (no dividend signaling portfolio). Therefore it can be concluded that information asymmetry will be solved in equity market of the firms with high dividend which send dividend signal to the market. On the other hand in equity market of the firms with low dividend that don't send dividend signal to the market, the logical negative relation between earnings transparency and capital cost is sustained; meaning that information asymmetry has not been solved. Therefore by confirming our first and second hypotheses, Bhattacharya hypothesis about the role of dividend signal in solving information asymmetry is confirmed.

Table 2: Summary of the results of estimations for the effect of earnings transparency on the market component of capital cost

$\beta_{R_m R_f} (\overline{R_m - R_f}) = \alpha_1 + \beta_1 \text{TRANS}_{i,t} + \beta_2 \text{DBTA}_{i,t} + \varepsilon_{i,t}$						
Variable	Companies with high dividend			Companies with low dividend		
	Pooled Model			Pooled Model		
	Estimated coefficients	z factor	Probability	Estimated coefficients	z factor	Probability
α_1	-0.3920919	-2.35	0.019	0.4487693	2.36	0.018
TRANS	0.611864	3.89	0.000	-0.4562759	-2.34	0.019
DBTA	0.0817333	0.10	0.923	1.226502	0.76	0.446
Chi2 value: 15.23			R ² =0.1584	Chi2 value: 6.47		R ² =0.1020
Chi2 Significance: 0.0005				Chi2 Significance: 0.0393		

Robustness analysis

So far we tested the Bhattacharia hypothesis for other components of capital cost including: total capital cost, value component, size component, and momentum component of capital cost. Table 3 shows the results of the tests.

The table shows the results on the comparison between high and low dividend firms about the effect of earnings transparency on the capital cost components otherwise market component. The dependent variable is presented in the first row for

each column and the independent variable (trans) is the earnings transparency as the negative proxy of information asymmetry. The numbers in the parenthesis are t statistics for each coefficient.

As the results show, the coefficient of trans is positive and significant for total capital cost in dividend signaling portfolio, which is compatible with market component in the baseline results, showing that signaling has solved information asymmetry problem if it exists. But insignificant coefficient for no signaling portfolio means that information asymmetry has not affecting total capital cost. The other results

show that it's because of insignificant coefficients in no dividend signaling portfolio for the other components. Finally information asymmetry has no significant effect on other capital cost components; meaning that our claim presented following the

hypotheses has been confirmed; meaning that lack of use of Carhart model in Tehran Stock Exchange does not encourage uninformed investors to follow other factors of this model.

Table 3: Regression results for other components of capital cost

Variables	Model 2: Total capital cost		Model 3: Size component		Model 4: Value component		Model 5: Momentum component	
	Signal	No signal	Signal	No signal	Signal	No signal	Signal	No signal
	Pool	Pool	Fixed	Pool	Pool	Pool	Random	Pool
Constant	19.83 (9.61)	26.36 (11.44)	0.24 (2.15)	-0.08 (-0.82)	0.08 (0.77)	0.06 (0.69)	3.31 (1.89)	7.69 (4.23)
TRANS	6.51 (3.34)	-2.02 (-0.84)	-0.09 (-0.86)	0.07 (0.78)	0.004 (0.04)	-0.06 (-0.7)	2.321491 (1.41)	-2.18 (-1.17)
DBTA	-15.27 (-1.45)	26.368 (1.32)	-2.46 (-4.28)	-0.96 (-1.22)	-0.25 (-0.45)	-0.41 (-0.53)	-10.58055 (-1.19)	21.33 (1.38)
Chi2	14.48	2.67	18.47	2.31	0.1	0.71	3.79	3.63
probability	0.0007	0.2627	0.0001	0.3151	0.9005	0.7020	0.1504	0.1629
R ²	0.1918	0.04	0.2252	0.0696	0.0037	0.0092	0.0557	0.0526

5. Discussion and Conclusion

According to the results, dividend signaling solves information asymmetry problem in Tehran Stock Exchange and it is suggested for the companies facing with information asymmetry and with suitable financial capability to use cash dividend signals to solve information asymmetry problem and capital cost. According to Bhattacharya hypothesis, this enables us to distinguish between good and bad companies using dividend signal. This means that the examined firms don't have to cost for earnings transparency because cash dividend solves information asymmetry problem and removes its impact on capital cost. On the other hands bad firms (as defined by Bhattacharia), must make their earnings more transparent to reduce their capital cost. It can be concluded that earnings transparency only affects the market component of capital cost. Therefore using standard CAPM for calculating capital is the encouraging model for uninformed investors in Tehran Stock Exchange. Given the fact that the positive relation between earnings transparency and market component of capital cost has turned into a negative relationship for companies with low dividend (firms that cannot send dividend signal to the market), it can be concluded that lack of cash dividend signal can sustain information

asymmetry problem. On the other hand, cash dividend signal solves information asymmetry problem and changes the relation between earnings transparency and capital cost. So, both of our hypotheses has been confirmed. Finally as mentioned earlier we expected the effect of dividend signal just for market component of capital cost because we expect uninformed investors to decide based on market direction because of lack of fundamental information. As robustness results show, the discussed switch of negative to positive relation cannot be seen for the other components of capital cost; meaning that uninformed investors do not follow other factors of Carhart model.

One of the limitations of this study is that due to judgmental selection of the samples and time constraints, it is not possible to extend the results to the rest of companies listed in Tehran Stock Exchange. We suggest for future studies to conduct a similar study in a different time period and compare the results to this study. Also in this study other factors solving information asymmetry problem weren't identified. Therefore it is suggested that future studies concentrate on identification of other factors solving information asymmetry and affecting the relation between earnings transparency (or other proxies of information asymmetry) and capital cost. Finally this

study used Carhart model (1997) in order to calculate the capital cost and the results show that firm size, value and momentum components of capital cost are not followed by uninformed investors to solve their information weakness. Therefore it is suggested that future studies use CAPM model or five factors Fama and French (2015) model to calculate the capital cost and investigate the effect of dividend signaling.

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