IS EXCESS FREE CASH FLOW OVER-INVESTED? EVIDENCE FROM BORSA İSTANBUL

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Abstract

In a perfect capital market, investments should not be related to cash flows of the firm. Investments should only be determined by the amount of renewal investments required and growth opportunities available to the firm. Contrarily, due to the conflicts of interest between the managers and the shareholders, the theory on agency costs and free cash flow hypothesis propose that managers are inclined to over-use free cash flow, which is in excess of value-adding investments. It is claimed that firms invest their extra free cash flow on projects with returns below cost of capital of the firm. Some prior studies made on the topic implied the validity of this hypothesis. In other words, firm's resources might be wasted by means of over-investing. This study, based on a panel data of 154 Borsa Istanbul firms observed between 2005-2015, confirmed that firms over-invest when there is free cash flow available in excess of growth opportunities and dividends. Prior studies have used mostly regression models or Tobin's q to estimate investment prospects of the firm. However, this study adopted a direct method to estimate investment opportunities available to the firm.

Keywords: Free cash flow hypothesis, Agency theory, Agency costs, Over-investment, Excess investment.

JEL Classification: G31, G32, G34.

ŞİRKETLER İHTİYAÇ FAZLASI NAKDİ KARSIZ YATIRIMLARDA MI KULLANIYOR? BORSA İSTANBUL ÜZERİNE BİR ÇALIŞMA

Özet

Etkin çalışan sermaye piyasalarında, şirketin yarattığı nakit ile yatırımları arasında ilişki olması beklenmez. Yatırım miktarı, ihtiyaç olan yenileme yatırımları ve şirketin önündeki yatırım fırsatları ile belirlenir. Ancak, vekiller ve hissedarlar arasındaki çekişmelerden dolayı, vekâlet teorisine göre vekiller şirketin içinde kalan kullanım fazlası nakdi, karlı olmayan projelere yatırarak ziyan etmeye meyil ederler. Şirketlerin ihtiyaç fazlası nakdi sermaye maliyetinin altında getiri sağlayan projelere yatırdıkları

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öne sürülmektedir. Literatürdeki bazı çalışmalar bu tezin doğruluğunu teyit etmiştir. Diğer bir deyişle, şirketler gereğinden fazla yatırım harcaması yaparak ihtiyaç fazlası nakdi ziyan edebilmektedirler. Bu çalışma, 154 Borsa Istanbul şirketinin 2005-2015 yılları arasındaki verilerini panel analizinde kullanarak, dağıtılan kar payı ve karlı yatırım fırsatlarının üzerinde yaratılan nakdin gereğinden fazla miktarda yatırım harcamasında kullanıldığını göstermiştir. Literatürdeki önceki çalışmalar şirketlerin yatırım fırsatlarını regresyon ve Tobin's q oranını kullanarak hesaplamıştır. Bu çalışma farklı olarak karlı yatırım fırsatlarını direkt olarak tahmin etmeye çalışmıştır.

Anahtar Kelimeler: Serbest nakit akışı hipotezi, Vekâlet teorisi, Temsil maliyeti, Fazla yatırım.

JEL Sınıflaması: G31, G32, G34.

1. Introduction

An extension of the theory on agency costs, free cash flow hypothesis (Jensen, 1986), has long been accepted valid, but not enough verification has been proposed till today. The hypothesis suggests that excess free cash flow of the firm may be squandered by the management unless it is withdrawn by the shareholders. The payout of extra free cash flow is expected to decrease the amount of resources controlled by the management and serves to maximize the shareholder value. Verification of the concept is rather difficult because there is no direct way to observe the amount of funds wasted in low return projects. Nevertheless, there has been few studies on the topic which implied the validity of the hypothesis that, firm's resources might be wasted by means of over-investing such as Stulz [1], Strong and Meyer [2], Hubbard [3], Richardson [4], Chen et al. [5] But there are also some studies which suggested invalidity of free cash flow hypothesis in certain conditions [6].

Firm has to invest only on projects with returns above its cost of capital. Investing in lower return projects means wasting the resources of the firm. To determine whether an investment is beneficial or not, one has to disclose the opportunity set of the firm. One way to estimate it is, as

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[1] Stulz, R. (1990). Managerial discretion and optimal financing policies. *Journal of financial Economics*, *26*(1), 3-27

[2] Strong, J. S., and Meyer, J. R. (1990). Sustaining investment, discretionary investment, and valuation: a residual funds study of the paper industry. In *Asymmetric Information, Corporate Finance, and Investment* (pp. 127-148). University of Chicago Press.

[3] Hubbard, R. G. (1997). *Capital-market imperfections and investment* (No. w5996). National Bureau of Economic Research.

[4] Richardson, S. (2006). Over-investment of free cash flow. *Review of Accounting Studies*, *11*(2-3), 159-189.

[5] Chen, X., Sun, Y., and Xu, X. (2016). Free cash flow, over-investment and corporate governance in China. *Pacific-Basin Finance Journal*, 37, 81-103.

[6] Chang, S. C., Chen, S. S., Hsing, A., and Huang, C. W. (2007). Investment opportunities, free cash flow, and stock valuation effects of secured debt offerings. *Review of Quantitative Finance and Accounting*, 28(2), 123-145, pp. 125-126.

done by the studies of Richardson [7] and Chen et al. [8], establishing a regression model and using residuals as excess or under investment. Another approach is to use Tobin's q as the proxy of the firm's opportunity set. Contrarily, this study adopts a direct approach and estimates opportunity investments of the firm from the rational that, an opportunity investment results in either an efficiency improvement or a capacity increase and should have a return above the cost of capital of the firm. In other words, opportunity investment is expected to bring some improvement on the cash generation of the firm. Any investment beyond renewal (sustaining) investments for the assets in place and opportunity investments is accepted as excess investment or over-investment. A statistically significant relationship substantiated between excess investment and the free cash flow available after dividends, renewal investments and opportunity investments, is expected to validate the hypothesis.^

2. Literature Review

The free cash flow hypothesis proposed by Jensen [9] underscores the conflicts between managers and shareholders. Theoretically, in a perfect capital market, firm's level of investments should not be related to the level of internally generated cash flows [10]. Degree of investments should only be determined by the opportunity set of the firm. Contrarily, some studies have shown a positive relation between investment expenditure and cash flow [11]. Presence of internally generated cash flow beyond the amount required to maintain existing assets and finance new positive net present value (NPV) projects, creates an exposure for misuse of these funds [12]. Firms with less amount of growth opportunities are found to be reducing their cash hoarding after dividend initiations. In other words, dividends reduce the agency costs of free cash flow. The market anticipates the reduced agency costs of free cash flow after dividend initiation announcements and reacts positively [13].

Free cash flow more than the financing need of all positive NPV projects and the need to maintain existing assets, is generally squandered by the management, unless it is returned to the shareholders as dividends or share repurchases. Jensen [14] suggests that managers commonly prefer to grow beyond the optimal firm size, since growth extends the managers' power by expanding the resources under their control. The agency cost explanation indicates that management is

[7]   Richardson, 2006

[8]   Chen, Sun, and Xu, 2016

[9]   Jensen, M. C. (1986). Agency cost of free cash flow, corporate finance, and takeovers. *Corporate Finance, and Takeovers. American Economic Review*,*76*(2), 323-329.

[10] Modigliani, F., and Miller, M. H. (1958). The cost of capital, corporation finance and the theory of investment. *The American Economic Review*, *48*(3), 261-297.

[11] Hubbard, 1997, pp. 38-41.

[12] Richardson, 2006, pp. 160.

[13] Officer, M. S. (2011). Overinvestment, corporate governance, and dividend initiations. *Journal of Corporate Finance*, 17(3), 710-724, pp. 24.

[14] Jensen, 1986

likely to invest in projects which are beneficial only from management's perspective, but may not be rewarding for corporate owners, especially when the monitoring of the management is weak [15]. Furthermore, firms with large cash flows and limited growth opportunities are more likely to engage in acquisitions that do not create shareholder value. Contrarily, firms with more investment opportunities use their internal cash generation more productively [16]. Stulz [17] revealed that managers under-invest when cash flow is low and over-invest when it is high. Management can derive perquisites from over-investment by running a bigger firm and expectedly, are inclined to invest as much as possible.

If free cash flow of the firm is not paid-out as dividends or used to repurchase stock, it can easily be invested in low-return projects and wasted. According to Jensen [18], firms with unused borrowing power and large free cash flows are prone to adopt value-destroying growth strategy that is, growing without creating any shareholder value. Morgado and Pindado [19] suggest that investment and value relation is not monotonic. Firm's value increases up to the optimal level of investments and decreases thereafter. Since firms will first undertake positive NPV investments, firm value will increase until those positive NPV projects are exhausted. Continuing investing means undertaking negative NPV projects. Eventually, market will start decreasing the value of the firm.

Corporate debt may moderate the agency problem by shrinking the cash flow available to managers. However, it may also restrict the firm's ability to undertake positive net present value (NPV) projects. Strong and Meyer [20] claim that agency model does not coherently define cash flows and capital investment. They praise "residual funds" model for better capturing the "behavioral dimensions of corporate capital budgeting". The residual funds approach contends that capital investment is a function of the residual funds available after fulfilling preceding claims on the corporate cash flow. The funds unclaimed after debt service are used to pay dividends. Remaining funds after dividends are available for investments. However, if firm has positive NPV projects, which require equity financing due to leverage limitations, the firm either reduces dividends or issues new shares. In the absence of leverage limitation, dividends play an important role in reducing free cash flow available to the management for over-investment. Over-investment behavior predicted by free cash flow hypothesis is especially prevailing in large and low dividend firms [21].

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15   Chen, Sun, and Xu, 2016

16   Doukas, J. (1995). Overinvestment, Tobin's q and gains from foreign acquisitions. *Journal of Banking and Finance*, 19(7), 1285-1303.

17   Stulz, 1990

18   Jensen, 1986

19   Morgado, A., and Pindado, J. (2003). The underinvestment and overinvestment hypotheses: an analysis using panel data. *European Financial Management*, 9(2), 163-177.

20   Strong, and Meyer, 1990

21   Vogt, S. C. (1994). The cash flow/investment relationship: evidence from US manufacturing firms. Financial Management, 23(2), 3-20.

Strong and Meyer [22] divide investments into several different types in a hierarchical order. First, comes the investments on safety needs or pollution control equipment. Secondly, investment aiming efficiency increase is implemented. Third, new investments for current product lines are carried out, followed by investments for expanding into closely related products, and finally, the investments outside the existing lines of business are made. For a firm operating in a fast growing sector, free cash flow in a residual funds model might be negative. In the estimation of residual cash-flow, interest payments and taxes are subtracted from the operating cash flow. After the subtraction of dividends, sustaining investment amount is deducted from the remaining amount.

Decreasing profitability may be a sign of discretionary expenditures outside the firm's current operations, because discretionary expenditures are mostly negative net present value (NPV) investments. Discretionary investments are capital expenditures that are not required by the core business. Strong and Meyer [23] found a relationship between residual cash flows, discretionary investment, and financial performance which is consistent with agency hypotheses. Discretionary expenditures are, in general, negatively related to shareholder returns. Additionally, information and incentive problems [24] and financial factors in the capital market also affect level of investments as confirmed by Farazzi et al. [25] and Whited [26]. Investments of firms with weaker financial positions are less sensitive to internal cash flows [27].

Similar to "Residual Funds Approach", Richardson [28] defined free cash flow as cash flow beyond what is necessary to maintain assets in place and to finance expected new investments. He divided investments into two main categories.

(a) required investment expenditure to maintain assets in place, and
(b) new investments

Then decomposed new investments into

1. new investment on the firm's growth opportunities,
2. over-investment or excess investment in negative NPV projects

He used a regression model to estimate new investments and accepted the residuals of the model to be over-investment. In line with free cash flow hypothesis, he found a positive association between over-investment and free cash flow for firms with positive free cash flow. He also showed

22   Strong, and Meyer, 1990
23   Strong, and Meyer, 1990
24   Hoshi, T., Kashyap, A., and Scharfstein, D. (1991). Corporate structure, liquidity, and investment: Evidence from Japanese industrial groups. The Quarterly Journal of Economics, 106(1), 33-60.
25   Fazzari, S. M., Hubbard, R. G., Petersen, B. C., Blinder, A. S., and Poterba, J. M. (1988). Financing constraints and corporate investment. Brookings papers on economic activity, 1988(1), 141-195, pp. 142-143.
26   Whited, T. M. (1992). Debt, liquidity constraints, and corporate investment: Evidence from panel data. The Journal of Finance, 47(4), 1425-1460.
27   Allayannis, G., and Mozumdar, A. (2004). The impact of negative cash flow and influential observations on investment–cash flow sensitivity estimates. Journal of Banking and Finance, 28(5), 901-930.
28   Richardson, 2006.

that the majority of free cash flow is retained in the form of financial assets. He claimed that "there is little evidence that free cash flow is distributed to external debt holders or shareholders". On the other hand, Lang et al. [29] used Tobin's q to distinguish between firms that have good investment opportunities and those that do not. They found that in tender offers, bidder returns are significantly negatively related to cash flows for companies without good investments opportunities. But this negative relation is not valid for firms with good investment opportunities.

Although no empirical approach, estimating the relationship between cash flow and investment, is flawless [30], reliability of Richardson's over-investment estimation is heavily dependent on the perfectness of the first model. To estimate over-investment accurately, a precise model estimating total investment is needed. When the first model is flawed, incorrect estimation of residuals is possible. In other words, it is not possible to decide whether residuals stem from the imperfections in the model or really from the excess investments. Additionally, as Bergstresser [31] also points out, the model does not distinguish over-investments or under investments as the residuals have zero mean.

Adhering to the methodology of Richardson [32], Chen et al. [33], confirmed that over-investment is sensitive to current free cash flow, and that firms with higher free cash flow are associated with higher over-investment which is consistent with the agency cost explanation.

3. Methodology

In testing free cash flow hypothesis, estimation of over-investment still remains to be the key issue. As there is no way to directly observe it, you have to devise a model to estimate it. In line with prior studies of Richardson [34] and Chen et al. [35], in this study, total investments are decomposed into its components as maintenance investments, investments related to firm's opportunities and investments in excess of these, which is called excess investments or over-investment. So the firm's total investments are expressed as in equation (1).

$$I_{total,it} = I_{maintenance,it} + I_{opportunity,it} + I_{excess,it} \qquad (1)$$

Total investments are directly observable from the financials of the firm. However, in order to estimate others, an approximation is required. Similar to prior studies, depreciation is used as the proxy of maintenance investments. It is assumed that depreciation of assets fairly reflects the

[29] Lang, L. H., Stulz, R., and Walkling, R. A. (1991). A test of the free cash flow hypothesis: The case of bidder returns. *Journal of Financial Economics*, *29*(2), 315-335.

[30] Bergstresser, D. (2006). Discussion of "Overinvestment of free cash flow". *Review of Accounting Studies*, 11(2-3), 191-202, pp. 201.

[31] Bergstresser, 2006, pp. 194.

[32] Richardson, 2006

[33] Chen, Sun, and Xu, 2016

[34] Richardson, 2006

[35] Chen, Sun, and Xu, 2016

actual wear-out in the existing tangible assets of the firm. Firms are assumed to make this amount of investment every year to preserve the functionality of existing assets. In order to estimate investments related to opportunities of the firm, in contrary to prior studies which used regression residuals, a direct approach is adopted. The studies of Chang et al. [36], Doukas [37], and Officer [38] used Tobin's q, which is defined as the ratio of the market value of a firm to the replacement costs of its assets, to estimate growth opportunities of the firm. However, Tobin's q reflects all future growth opportunities and the average return of these opportunities anticipated by the market, thus may be a poor predictor of investments [39]. For estimating excess investments in a certain time period, we need to find investment opportunities available in that time period. Secondly, Tobin's q indicates only the investment opportunities disclosed to outsiders. Investment opportunities known only by the insiders are not included in q ratio. To avoid this shortcoming of Tobin's q, Carpenter and Guariglia [40] included contractual obligations for future new investment projects as an additional proxy. This variable was expected to capture information about opportunities available only to insiders. They suggested that when this new proxy was used together with Tobin's q, it might have resulted in better measurement of investment opportunities.

Maintenance investments aim to preserve the current level of cash generation. Conversely, opportunity investments aspire improvement in the current level of cash generation. Therefore, opportunity investments should be expected to enhance future cash flow of the firm. The improvement on cash generation may either stem from efficiency increase or capacity expansion. However, that does not make any difference as long as there is an investment and a corresponding improvement in the cash generation of the firm.

It is generally accepted that value of the firm is the sum of all its future cash flows discounted with weighted average cost of capital. In value calculations, firm's expected life time is assumed to be infinite. Thus, firm with perpetual and constant cash flow is simply valued by using below equation

$$MVA = \frac{EBIT(1-t)}{R_{WACC}} \qquad (2)$$

In which MVA is the market value of assets, R_{WACC} is the weighted average cost of capital, $EBIT$ is earnings before interest and tax, or the operating cash flow, and t is the tax rate. When above equation is re-arranged, it becomes

$$R_{WACC} = \frac{EBIT(1-t)}{MVA} \qquad (3)$$

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[36]   Chen, Sun, and Xu, 2016

[37]   Doukas,1995

[38]   Officer, 2011

[39]   Gugler, K., Mueller, D. C., and Yurtoglu, B. B. (2004). Marginal q, Tobin's q, cash flow, and investment. *Southern Economic Journal*, 70(3), 512-531.

[40]   Carpenter, R. E., and Guariglia, A. (2008). Cash flow, investment, and investment opportunities: New tests using UK panel data. *Journal of Banking and Finance*, 32(9), 1894-1906, pp. 3.

Assuming firm's cost of capital is constant, that is, it is not changing with the level of investments, then, when firm augments its cash flow with $\Delta EBIT$ it adds ΔMVA to current level of firm value (equation 4). Therefore, ΔMVA is the maximum amount of capital expenditure a firm can undertake for the given level of improvement in its cash flow in order not to decrease firm value. In equation 4, it is assumed that increase in operational cash flow stemming from investments are perpetual.

$$\Delta MVA = \frac{\Delta EBIT(1-t)}{R_{WACC}} \tag{4}$$

Cost of capital can be estimated from equation (3). When firm improves its operating cash flow, its value of assets is expected to increase to preserve current level of cost of capital. In other words, if $EBIT(1-t)$ comes out to be less than anticipated by the market, then the market reduces value of equity to preserve the level of cost of capital. Contrarily if the improvement in operational profit is more than expected, the market value of the equity increases and the level of cost of capital is preserved.

Firms invest to create value and value of the firm, theoretically, is the sum of discounted future cash generation of the firm. An investment that does not improve operational cash generation and has a return below current cost of capital, consequently, not augmenting shareholder value may be accepted as over-investment or excess investment. It is excess investment, in the sense that the firm actually wastes its capital in a low return project.

To accept an investment as a growth opportunity, return of the investment must be at least as much as the average current return of the firm, which is cost of capital of the firm. Assuming that the return on the opportunity investment is perpetual, the maximum level of investment for the given level of cash flow improvement can be defined as in equation (5).

$$I_{opportunity,it} < \frac{\Delta Operating\ Cash\ Flow_{it}}{Current\ Return\ on\ Investmenst_{it}} \tag{5}$$

Assuming book value and market value of liabilities do not differ significantly, current return on firm's already existing investments (before tax) can be defined as in equation (6) where MVE is the market value of equity or market capitalization.

$$Current\ Return\ on\ Investments_{it}\ (ROI) = \frac{Operating\ Cash\ Flow_{it}}{MVE_{it} + Liabilities_{it}} \tag{6}$$

Operating cash flow is the current level of return on total investments of the firm before tax. When the improvements on operating cash flow is divided by ROI (return on investments), the maximum level of opportunity investment which corresponds to the specific level of operating cash flow improvement is found. Current return on investments reflects the real cost of capital. When the return on an investment is below cost of capital, the market will reduce the firm's market value, and the denominator in equation (6) will decrease. However, the current level of the required return which is determined by the risk level of the firm, is kept constant.

Free Cash Flow available after maintenance and opportunity investments may be defined as in equation (7).

$$FCF_{it} = OP_{it} + Dep_{it} - Interest_{it} - Tax_{it} - \Delta NWC_{it} - I_{maintenance,it} - I_{opportunity,it} \tag{7}$$

Where;

$$OP_{it} = operating\ profit\ of\ firm\ i\ in\ year\ t$$

$$Dep_{it} = deprecition\ of\ firm\ in\ in\ year\ t$$

$$Interest_{it} = interest\ payments\ of\ firm\ i\ in\ year\ t$$

$$Tax_{it} = corporate\ tax\ paid\ by\ firm\ i\ in\ year\ t$$

$$\Delta NWC_{it} = change\ in\ net\ working\ capital\ of\ firm\ i\ in\ year\ t$$

$$I_{maintenance,it} = maintenance\ investments\ in\ firm\ i\ in\ year\ t$$

$$I_{opportunity,it} = opportunity\ investments\ in\ firm\ i\ in\ year\ t$$

Since interest payments are generally made with quarterly installments, annual interest payments and annual financial charges may be assumed to be close in magnitude. The dividend payments lessen the cash available for further investments. Therefore, Equation (7) can be simplified into equation (5) after the addition of dividend payments.

$$FCF_{it} = Net\ Profit_{it} + Dep_{it} - \Delta NWC_{it} - I_{maintenance,it} - I_{opportunity,it} - Dividends_{it} \tag{8}$$

If "the free cash flow hypothesis" is valid, then the free cash flow defined by equation (8) should have some explaining power in determining the level of excess investments which is given by equation (9).

$$I_{excess,it} = I_{total,it} - I_{maintenance,it} - I_{opportunity,it} \tag{9}$$

In other words, firms which still have some extra cash flow after meeting all of its obligations, investing for maintenance, opportunities and paying the dividends, should be observed as squandering this extra cash flow in excess investments. Another basic assumption of this model is that firms are not changing their debt level significantly. New debt and debt repayments are ignored in the model. When under-investment is observed, that is, when excess investments are calculated as negative by the equation (9), amount of excess investments is accepted as zero. The objective of the study is to explain the relation between over-investment and free cash flow. The dynamics of under-investments and over-investments is believed to be different.

4. Empirical Findings

In this study, 11 years of balanced data for 154 firms is employed (between 2005 and 2015). The sample includes only non-financial Borsa Istanbul (BIST) firms which have 11 years of consecutive data available. Financial firms are excluded. Investments in tangible assets are not vital for financial firms. All firms within BIST fulfilling this criterion are included in the sample.

There is always a lag between the investment and the related return of the investment. The lag values of investments are, as expected, found to be highly correlated (Table 1). Firms' investment cycles generally extend over a year. Since they are highly correlated, to avoid multicollinearity problem, the lag value which has the strongest impact on the operational cash flow is used in the regression. Majority of the effects of lag values can be incorporated into the calculations by including a single lag value.

Table 1: Pearson Correlations

	INVESTMENTS	INVESTMENTS (-1)	INVESTMENTS (-2)
INVESTMENTS	1	0.763	0.801
INVESTMENTS (-1)	0.763	1	0.734
INVESTMENTS (-2)	0.801	0.734	1

To estimate opportunity investments more precisely, the lead time between investment and operational improvement is estimated. The impact of lagged values of investments on operational cash flow (ch_EBITDA) is given in Table 2. In the dataset, firms seem to collect most of the rewards of investment with one year lead time. Investment with a year lag has the biggest coefficient among the other lag values included. So opportunity investments are estimated with single year lag (Equation 7).

$$I_{opportunity, t-1} = \frac{EBITDA_t - EBITDA_{t-1}}{ROI_t} \tag{7}$$

Table 2: Estimation of Lead Time between Investment and Its Return

Method	Panel Least Squares	2-way Fixed Effects	Panel EGLS (Cross-Section Random Effects)	Panel EGLS (Time Random Effects)
Dependent Variable: ch_EBITDA (change in the operational cash flow of the firm)				
Intercept	31547912	36231285	33982237	31547912
	(7.048)***	(8.929)***	(5.165)***	(7.045)***
INVESTMENTS	0.047259	0.038459	0.047277	0.047259
	(2.999)***	(2.705)***	(3.622)***	(2.998)***

INVESTMENTS(-1)	0.067371	0.072534	0.074650	0.067371
	(4.390)***	(5.060)***	(5.864)***	(4.388)***
INVESTMENTS(-2)	0.044349	0.000226	0.021782	0.044349
	(2.056)**	(0.012)	(1.213)	(2.056)**
Adj. R^2	0.248044	0.556684	0.148657	0.248044
F-statistic	71.04***	5.94***	38.08***	71.04***
Hausman Test (χ^2)			15.306	4.363
			(0.0016)	(0.2249)
Breusch-Pagan(LM) Test				105.4815
				(00000)
Observations	638	638	638	638

- Regressions are estimated with the sample between 2006 and 2014 for positive change in EBITDA.
- Values in parenthesis are t-values with significance
*** $p<0.01$, **$p<0.05$, *$p<0.10$

Variables which are conjectured to explain excess investments are given in Table 3. Size, leverage, and market value-book value ratios are also used by Richardson [41] and Chen et al [42]. Close monitoring of shareholders is generally believed to mitigate the agency problem. Amount of free floating shares may increase monitoring level of shareholders and have some impact on excess investments made by the firm. So, a variable representing the ratio of free floating shares are included in the estimations as well.

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[41]   Richardson, 2006
[42]   Chen, Sun, and Xu, 2016

Table 3: Independent Variables

EXPLANATORY Variables	Estimation of the Variable
FCF_{it}	$Net\ Profit_{it} + Dep_{it} - \Delta NWC_{it} - I_{maintenance,it} - I_{opportunity,it} - Dividends_{it}$
$Leverage_{it}$	$\dfrac{Total\ Liabilities_{it}}{Total\ Assets_{it}}$
ME_BE_{it}	$\dfrac{Market\ Value\ of\ Equity_{it}}{Book\ Value\ of\ Equity_{it}}$
$Assets_{it}$	$Total\ Assets$
$Float\_ratio_{it}$	$\dfrac{Number\ of\ Free\ Floating\ Shares_{it}}{Number\ of\ Outstanding\ Shares_{it}}$

The regression equation estimated is given in equation (8)

$$Excess\_investments_{it} = \beta_0 + \beta_1 FCF_{it} + \beta_2 leverage_{it} + \beta_3 ME\_BE_{it} + \beta_4 assets_{it} + \beta_5 float\_ratio_{it} + \varepsilon_{it} \tag{8}$$

Estimations for the observation with positive free cash flow (after opportunity and maintenance investments) under different panel approaches are given in Table 4. Although the coefficients are varied slightly, in all the panels, free cash flow is highly significant with a coefficient of around 0.15 – 0.18. The model seems to explain more than almost 20% of excess investments.

Breusch - Pagan Test [43] suggests that error terms are independently and identically distributed (p>0.05), thus, the data seem to be appropriate for pooling. Additionally, Hausman Test [44] implies correlation between random effects and regressors (p<0.05, Table 3). So, random effects model is not appropriate and pooled panel model seems better fitting to our dataset. Yet in all approaches, coefficient of FCF is highly significant and in the rage of 0.15 to 0.19. (Table 4).

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[43] Breusch, T. S., and Pagan, A. R. (1980). The Lagrange multiplier test and its applications to model specification in econometrics. *The Review of Economic Studies*, *47*(1), 239-253.

[44] Hausman, J. A., and Taylor, W. E. (1981). Panel data and unobservable individual effects. *Econometrica: Journal of the Econometric Society*, 1377-1398.

Table 4: Estimations with Different Panel Approaches

Dep. Variable: Excess_Investments

Method	Panel Least Squares	Two-way Fixed Effects	EGLS with cross-section random effects	EGLS with period random effects
Intercept	-26103376	-72777996	-26103376	-26103376
	(-1.8481)*	(-1.8964)*	(-1.7832)*	(-1.8512)*
FCF	0.186259	0.151000	0.186259	0.186259
	(6.5680)***	(4.3778)***	(6.3374)***	(6.5791)***
LEVERAGE	9098240	37132207	9098240	9098240
	(0.4086)	(0.5855)	(0.3943)	(0.4093)
ME_BE	-489353	1995672	-489353	-489353
	(-0.2369)	(0.5192)	(-0.2286)	(-0.2373)
ASSETS	0.010470	0.025949	0.010470	0.010470
	(4.6033)***	(4.6399)***	(4.4416)***	(4.6111)***
FLOAT_RATIO	527703	754299.8	527703	527703
	(2.0478)	(1.0819)	(1.9759)**	(2.0513)**
Adj. R^2	0.268152	0.217636	0.268152	0.268152
F-statistic	46.8738***	2.068338***	46.8737***	46.8737***
Hausman Test (χ^2)			25.577	9.3218
			(0.0001)***	(0.0969)*
Breusch-Pagan(LM) Test	0.042983			
	(0.8358)			
Observations	627	627	627	627

Variables:

$$FCF_{it}FCF_{it} = Net\ Profit_{it} + Dep_{it} - \Delta NWC_{it} - I_{maintenance,it} - I_{opportunity,it} - Dividends_{it}$$
$$Net\ Profit_{it} + Dep_{it} - \Delta NWC_{it} - I_{maintenance,it} - I_{opportunity,it} - Dividends_{it}$$

$$LEVERAGE_{it} = \frac{Total\ Liabilities_{it}}{Total\ Assets_{it}}$$

$$ME\_BE_{it} = \frac{Market\ Value\ of\ Equity_{it}}{Book\ Value\ of\ Equity_{it}}$$

$$FLOAT\_RATIO_{it}FLOAT\_RATIO_{it} = \frac{Number\ of\ Free\ Floating\ Shares_{it}Number\ of\ Free\ Floating\ Shares_{it}}{Number\ of\ Outstanding\ Shares_{it}\ Number\ of\ Outstanding\ Shares_{it}}$$

- Regression are estimated with the sample between 2006 and 2014 for positive FCF
- Values in parenthesis are t-values with significance, *** p<0.01, **p<0.05, *p<0.10

In Table 5, regression results with inclusion of different independent variables are given. Single independent variable model (only with FCF) explained over 24% variation in excess investments. When other variables are also included in the model, R^2 slightly improves. In the determination of excess investment, besides free cash flow (FCF), size of the firm (which is proxied by assets) is significant. As free cash flow and size of the company increase, the amount of cash squandered in investments with returns below the cost of capital of the company increases. The coefficient of FCF suggests that almost quarter of free cash flow (between 19% to 28%) not used in sustaining(renewal) investments, opportunity investments or paid-out as dividends is invested in low return projects. In other words, when the cash flow is high, firm wastes significant portion of this cash flow. In the determination of excess investments, ratio of free floating shares, leverage and market-to-book equity ratio seem to be immaterial. The single most important factor which affects whether a firm makes excess investments is the availability of the funds. Whenever these excess funds are available to the management, management prefers to invest some of these funds whatever the return is. The findings actually confirm the findings of Richardson [45] and Chen et al. [46]. Richardson suggested that 20% of free cash is over-invested by firms whereas Chen et.al. offered 29% for the same relation.

When firm has cash flow above maintenance and opportunity investments, the firm has to return back this cash to the equity holders in the form of either dividends or share repurchases. When these excess funds are left in the company, as suggested by most of the prior of studies and the theory of agency cost, they may be misused by the management in attempts to enlarge their empire. Empire building can be avoided by close monitoring of the shareholders. Shareholders should monitor available opportunity investments, that is, investments with expected returns above cost of capital of the firm. When the firms' cash generation is more than the available investment opportunities, the excess free cash flow of the firm must to be demanded by the shareholders.

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[45] Richardson, 2006
[46] Chen, Sun, and Xu, 2016

Otherwise they will be invested in discretionary investments and wasted. Eventually, the firm's average return will decrease.

Table 5: Regressions with Different Number of Independent Variables

Dep. Variable: Excess_Investments (Pooled Panel Estimation)

Model	I	II	III	IV	V
FCF	0.279213 (14.200)***	0.277297 (14.071)***	0.277516 (14.056)***	0.185674 (6.5310)***	0.186259 (6.5791)***
LEVERAGE		28483068 (1.2957)	28170771 (1.2783)	18719933 (0.8579)	9098240 (0.4093)
ME_BE			-494684 (-0.2365)	-851759 (-0.4129)	-489353 (-0.2373)
ASSETS				0.010064 (4.4304)***	0.010470 (4.6111)***
FLOAT_RATIO					527703 (2.0513)**
Adj. R²	0.243933	0.243545	0.242398	0.264394	0.268152
F-statistic	201.6459***	101.7719***	67.7639***	57.2498***	46.8737***
Observations	627	627	627	627	627

Sample: 2006 2014 for the sample FCF>0

Variables:

$$FCF_{it}FCF_{it} = Net\ Profit_{it} + Dep_{it} - \Delta NWC_{it} - I_{maintenance,it} - I_{opportunity,it} - Dividends_{it}$$

$$LEVERAGE_{it} = \frac{Total\ Liabilities_{it}}{Total\ Assets_{it}}$$

$$ME\_BE_{it} = \frac{Market\ Value\ of\ Equity_{it}}{Book\ Value\ of\ Equity_{it}}$$

$$FLOAT\_RATIO_{it} = \frac{Number\ of\ Free\ Floating\ Shares_{it}}{Number\ of\ Outstanding\ Shares_{it}}$$

- Regression are estimated with the sample between 2006 and 2014 for positive FCF
- Values in parenthesis are t-values with significance, *** p<0.01, **p<0.05, *p<0.10

5. Conclusion

In a perfect capital market, firm's investments should not be related to internal cash generation. Investments are expected to be determined only by the available opportunities. However, this study, based on observations of 154 firms in Borsa Istanbul over a period of 11 years, found a strong relation between the free cash flow available after sustaining investments, opportunity investments, dividends and the over-investment, which is defined as investments on low-return projects. In contrary to previous studies, this study used a direct approach to estimate the opportunity set of the firm. The study assumed that for an investment to be defined as an opportunity investment, its return has to be at least as much as the cost of capital of the firm. As predicted by the theory on agency costs, any cash flow generated in excess of investments on opportunity set of the firm and dividend payments, found to be misused by the firms' management. Shareholders is better off if firms return back these excess flow to the shareholders instead of investing them on lower return projects. Shareholders should request higher dividend distribution, when the firm's cash generation is beyond the available investment opportunities. Otherwise, as proposed by this study, management is likely to misuse significant portion of these excess funds in low return projects and waste them.

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