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Cost of capital and US investment: Does financing matter after all?

Banu Simmons-Süer*

KOF Konjunkturforschungsstelle/Swiss Federal Institute of Technology, Leonhardstrasse 21, 8092 Zurich, Switzerland

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ABSTRACT

This paper attempts to explain what drives the US gross fixed capital formation at the aggregate level. The focus of this paper is the role of the cost of capital and the importance of the type of financing. While the bulk of the investment literature concentrates on company level Tobin's *q* to explain company level investment, we calculate an aggregate Tobin's *q* for the US non-farm, non-financial corporate sector to analyze how the cost of capital, dividends and leverage affect the relationship between investment and '*q*'. Our findings challenge the concept that the type of financing of new capital is irrelevant to the investment process.

1. Introduction

The US corporate sector normally dis-saves in the sense that capital expenditure usually exceeds cash flows from operations. Since 1952, it has been only during recessions that the US corporate surplus, i.e., the difference between cash-flows from operations (net of taxes and dividends) and capital expenditure, was positive[1]. Based on the US Census Bureau's financial survey data of US manufacturing, one can see that since 2001, the ratio of dividends to the value of capital stock has trended upwards (see Fig. A1 in Appendix A). A long sustained shift of the US corporate sector away from capital expenditure towards dividends is detrimental to aggregate investment and economic growth, especially when debt-financing, made attractive through low interest rates and tight corporate spreads is used for increasing dividend payouts and share buyouts, instead of being spent on new machinery and equipment.

Tobin's (1969) seminal work on investment implemented the Keynesian view where changes in investment plans of firms depend on their perception of the 'marginal efficiency of capital'. Tobin developed a concept '*q*' that is defined as the ratio of the value of the company to the replacement cost of its capital stock, i.e., the cost of purchasing equipment and structures. The value of the firm is supposed to reflect how the market (shareholders) perceives the investment opportunities available to the firm.

The relationship between investment, *q* and the cost of capital has been analyzed in many empirical studies using company level data. Starting with Fazzari, Hubbard, and Petersen (1988), these studies have not found a significant relationship between investment and q, or the cost of capital, whereas variables that are not supposed to appear in investment equations, such as cash-flows and income are found to have positive significant effects on investment. Usually, the explanation for such results relates to measurement error in *q* at firm-level data, as stock price movements are not always driven by fundamental changes in future profitability.

The concept of measurement error in *q* led to the development of investment models with financial constraints. Kiyotaki and Moore (1997) develop a model where shocks to the economy are amplified by credit restrictions, leading to prolonged business cycles. Hennessy, Levy, and Whited (2007), developing a *q* theory of investment under collateral constraints on new borrowing, find that the financial constraint plays an important role in explaining observed companies' behavior in investment decisions. Lorenzoni and Walentin (2007) argue that financial frictions in a company controlled by managers can lead to the breakdown of the one-to-one correspondence between investment and average *q*.

The bulk of empirical research on the determinants of investment focuses on firm-level analysis, where cross-sectional regressions are estimated for firm-level data on investment and

* Corresponding author. Tel.: +41 446323079.
E-mail address: Simmons-suer@kof.ethz.ch

[1] *Source*: US Federal Reserve, Flow of Funds data.

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average q. There have been a few empirical studies that explored the determinants of aggregate investment:

Caballero and Engel (1994) derive a model of aggregate investment from the lumpy microeconomic behavior of companies facing stochastic fixed adjustment costs. They argue that mapping from Tobin's q to investment depends exclusively on the adjustment cost function. They point out that aggregate investment obtained from adding up the actions of companies is highly non-linear and emphasize that many of the problems of the empirical investment literature are attributable to the difficulties of constructing a proper measure of the cost of capital. Palestrini, Delle Gatti, and Gallegati (2004) analyze investment decisions in a binary choice context and model the investment decisions of a company in probabilistic terms. They find that changes in the real interest rate are the main source of the changes in the macroeconomic regime that explain the behavior of the Italian fixed investment.

The present study aims to fill a gap in the existing empirical literature, by analyzing the interaction between US investment, the aggregate Tobin's q and some financing indicators in a VAR methodology setting. By treating the US corporate sector as a representative firm and calculating a 'weighted average cost of capital' (WACC) instead of using a simple discount rate approximated by the real interest rate, we hope to shed light on the question of whether the changes in financial factors, such as leverage, dividends and shareholders' return expectations, influence investment decisions. We provide evidence that the cost of capital is not adequately represented with the real interest rate, especially in an economy such as the US, where publicly-traded companies account for a big proportion of domestic investment[2]. It was argued by Blundell-Wignall and Roulet (2013) that a low-interest rate environment is not necessarily conducive to higher investment as it leads to borrowing by companies at low interest rates to finance equity buybacks, or dividends, rather than spending on investment. They point out that since the 'Great Recession' of 2007–2008, despite the efforts of central banks to keep interest rates at record low levels, and the significant amount of corporate borrowing, business investment did not pick up and companies in an attempt to reduce the cost of equity, chose to return cash-flow to shareholders in the form of dividends or retired some equity via share buybacks. If companies prefer retiring equity or increasing dividends to capital spending when the cost of debt-financing is falling, then interest rate cuts are unlikely to achieve the aim of spurring investment growth. The reluctance of companies with regard to equity-financing is a reflection of the imperfection in capital markets, challenging the Modigliani and Miller (1958) theory of 'irrelevance of capital structure'.

1.1. Data

We use quarterly data on real gross fixed capital formation and capital stock at replacement value for the estimation period 1987–2013, taken from Thomson Reuters Datastream (both at constant 2009 prices). Aggregate Tobin's q is calculated as the market value of non-farm, non-financial equity of the corporate sector divided by the replacement cost of capital at current prices (tangible assets of non-farm, non-financial US corporate sector). The cost of capital is calculated as a weighted average cost of debt and equity-financing, where weights are defined as the respective ratios of corporate debt and equity (also non-farm and non-financial) in the total market value. The dividend yield indicator is the dividend yield of the S&P 500 composite index. The cost of equity is the sum of the long-term earnings per share (EPS) growth of the S&P 500 companies and the dividend yield. The long-term EPS growth has been calculated by using the Hodrick–Prescott filter to smooth out fluctuations. The cost of debt is approximated with the yield on the Moody's Baa-rated bonds. As a business cycle indicator, we use the US Conference Board's leading economic indicators index. The leverage indicator is the ratio of non-farm, non-financial corporate debt to the market value of net worth. The credit risk on bank borrowing is measured by a delinquency rate, calculated as the average of 100 banks' delinquency rates on commercial and industrial loans. The real interest rate is the 20-year treasury yield adjusted for the growth in the CPI index[3].

2. Theory and the preliminary empirical analysis

The definition of the cost of capital is crucial in explaining the dynamics of real investment. The usual proxy for the cost of capital at a macro level is the long-term interest rate adjusted for the inflation rate. In reality, how capital expenditure is financed by companies cannot be adequately captured by real interest rates. Companies' investment decisions are very often motivated by the type of financing (equity versus debt) and the amount of leveraging, apart from the investment opportunities (Tobin's q) that are largely driven by the state of the economy.

Modigliani and Miller (1958) assert that the value of a company is dictated by its earning power. The company's capital structure, i.e., how its assets are financed, does not change the value of the company. This capital structure 'irrelevance principle' suggests that the cost of equity capital is an increasing function of leverage, which means companies cannot reduce their cost of capital by issuing debt even when that is a cheaper option. This is because shareholders view higher leverage as risky and demand a higher return on equity, thus raising the total cost of capital. In short, Modigliani and Miller argue that the type of instrument used to finance an investment is irrelevant for a company in judging the profitability of an investment project.

In a later paper, Miller and Modigliani (1961) extend the irrelevance problem to a company's dividend policy. They demonstrate that in perfect capital markets, there is no difference between a company financing its investment by reducing its dividends and relying on its retained earnings or by increasing its dividends and floating new shares.

Despite the later modifications, which included the tax shield of debt financing, Modigliani and Miller's theories were criticized for assuming perfect capital markets. Furthermore, information asymmetries make shareholders suspicious of managers' equity offerings, which make this instrument particularly costly for financing investment. The main criticism of the M&M theory came from Jensen (1986), who argued that because of the agency-cost problem, i.e., the value-destroying behavior of managers, a company's investment decisions are not independent of its debt–equity ratio. Jensen argues that especially the companies that generate high cash flows, increase dividends, repurchase stock to pay out cash that otherwise would be wasted in low-return investment projects. In other words, the existence of agency costs generally leads to lower investment, probably because the stock market rewards higher dividend payouts with increases in the share price.

There have been other critical studies that challenged the irrelevance of the capital structure in company valuation. Myers (1984) points out that due to adverse selection and asymmetric

[2] Although there are no data on the investment contribution of public companies in the US, the US Bureau of Census estimates the total share of US multinationals and the US affiliates of foreign companies in the US gross fixed capital formation at 24% (2011), which can be considered as a lower bound for public companies as not all public companies are multinational.

[3] Fig. A2 in Appendix A depict the historical development of some of these data variables.