

The Effect of Tax Avoidance on Investment Efficiency: The Mediating Role of Cash Holding— Evidence from Egypt

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Abstract:

This study aims to investigate the influence of tax avoidance on investment efficiency, while also examining the mediating role of cash holding in this relationship. Utilizing a sample comprising 321 firm-year observations from Egypt, we employ Ordinary Least Squares (OLS) regression to examine both the direct and indirect associations between tax avoidance and investment efficiency. The results revealed a significant positive effect of tax avoidance on cash holding and excess cash. Moreover, there are contrasting findings on the effect of cash holding on investment efficiency. Additionally, the study revealed a significant negative effect of tax avoidance on investment efficiency, with a positive effect on overinvestment and a negative effect on underinvestment. Furthermore, cash holding played a mediating role in the relationship between tax avoidance and investment efficiency. The insights gleaned from this study hold significant implications for various stakeholders in Egypt, including tax authorities, investors, and listed firms. Given the current economic instability in Egypt, where many firms resort to cash hoarding to mitigate potential future financial constraints, these findings offer valuable guidance for regulatory agencies, investors, and firms navigating uncertain economic conditions. This paper explores how tax avoidance influences cash holdings and investment efficiency in Egyptian firms, filling a gap in existing literature. It introduces a novel perspective by examining the mediating role of cash holdings between tax avoidance strategies and investment outcomes. By focusing on the specific context of Egyptian firms, it offers unique insights into the complex interplay between tax-related decisions, financial management, and firm performance. Overall, the study provides valuable contributions to understanding the dynamics of tax planning and its implications for corporate finance in emerging market economies.

Keywords: Tax avoidance, investment efficiency, mediation, cash holding, emerging markets.

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1. Introduction:

In the realm of corporate finance, the management of cash holdings has long been a topic of interest, with various factors influencing firms' decisions in this regard. According to Keynes (1936), one key advantage of cash holding is that it enables enterprises to pursue more valuable investments, and the importance of maintaining cash is influenced by firms' ability to access external capital markets. From an optimal perspective, firms might not need to hold cash under the assumption of a perfect capital market, as they could obtain any required amount of cash at any moment (Modigliani and Miller, 1958). However, in reality, perfect capital markets do not exist, necessitating firms to hold substantial amounts of cash. Previous research has identified various determinants influencing cash holdings, including macroeconomic policies (Lu and Han, 2013), agency costs (Luo and Hu, 2011; Jiang and Yu, 2013), operating strategy (Bates et al., 2009; Duchin, 2010; Wang and Song, 2012), and tax policy (Foley et al., 2007). Consequently, tax considerations have become a prominent factor driving cash holding decisions.

According to Myers and Rajan (1998), cash is considered a replaceable asset assumed to be easily accessible by management, and it can be quickly converted for their benefit by opportunistic managers. Consequently, surplus monetary resources may yield negative consequences if inefficiently employed by managers (Dittmar & Mahrt-Smith, 2007). Excess cash tends to be utilized not for operations or investment but rather as a powerful tool for securing private privileges (Fresard and Salva, 2010). This surplus cash is often determined by investors' beliefs regarding its future use. For investors, the value of a dollar may vary due to management's easy access and the discretionary nature of surplus cash. Additionally, if agency issues influence the optimal level of cash holding, investor confidence may be impacted by the firm's involvement in tax avoidance techniques, which are often associated with agency costs and information asymmetry, potentially leading to the misuse of corporate resources and a reduction in the value of excess cash (Benkraiem et al., 2022).

From the perspective of precautionary motive within firms, cash holdings often increase as a consequence of tax avoidance. While tax avoidance can lead to cost savings, potential audits and retrospective adjustments by tax authorities may necessitate future tax payments and penalties (Benkraiem et al., 2022). On the practical side, tax avoidance represents one of several high-risk investment options available to managers (Armstrong et al., 2015). Given the significance of cash flows resulting from tax avoidance as a capital financing source, this practice enables corporations to retain more funds for investment, potentially facilitating the handling of proceeds from projects with positive net present value. This argument aligns with the belief that tax avoidance can enhance firm value if the expected marginal profit exceeds marginal cost (Desai and Dharmapala, 2009).

Tax avoidance, on the contrary, may facilitate managerial opportunism by directing excess cash flow into unproductive investment decisions (Khurana et al., 2018; Khurana and Moser, 2013). Furthermore, corporations that engage in tax avoidance methods often develop opaque organizational structures, complicating shareholders' ability to evaluate management performance (Desai and Dharmapala, 2009).

Furthermore, in a perfect environment, corporations can save on tax expenditures without encountering frictions (Shackelford and Shevlin, 2001). However, recent research suggests that tax avoidance may increase firm risks (Mills, 1998; Chan et al., 2010; Kim et al., 2011; Rego and Wilson, 2012), leading to decreased firm transparency (Kim et al., 2011; Balakrishnan et al., 2012), and the induction of agency problems (Desai and Hines, 2002; Desai et al., 2007; Desai and Dharmapala, 2009). These factors elevate cash flow risks and exacerbate financial constraints, influencing the firm's cash-saving behavior in various ways.

In reality, micro-investors and institutional investors do not have equal access to the same information, thereby potentially distorting investment efficiency by constraining a company's financing options for anticipated projects, opting for projects with limited added value, or misappropriating resources (Stein, 2003). When skewed investments impact a firm's efficiency, the managerial perspective may compromise the firm's value (Chen and Lin, 2013). Recognizing that individual capabilities can contribute to success and enhance organizational performance, various behavioral managerial personality traits can influence decision-making (Foerstl et al., 2021), thereby exerting a significant impact on organizational success.

When a firm maintains high cash holdings, it generates excess free cash flow, enabling investments to be made with these surplus funds. However, excessive free cash flow poses moral risks, potentially resulting in overinvestment (Tran, 2020). With additional cash at their disposal, managers may pursue personal interests or use the funds to expand investments, thereby enhancing their earnings, power, and influence. Existing literature highlights the significant impact of cash retention on investment decisions, as excessive cash reserves can lead to agency challenges and inefficient cash utilization, ultimately contributing to investment inefficiency (Biddle et al., 2009; Sheu and Lee, 2012).

To sum up, tax avoidance literature presents contrasting views on its consequences. Traditional perspectives consider tax avoidance as a value-enhancing practice, facilitating the transfer of funds from the government to enterprises and shareholders. However, this overlooks modern corporate dynamics, such as the separation of ownership and control, which incurs agency costs due to adverse selection and moral hazard (Chen et al., 2010; Desai and Dharmapala, 2006). Consequently, tax avoidance may not always benefit shareholders as anticipated, as it can involve sophisticated arrangements aimed at concealing motives and evading tax authorities (Kim et al., 2011). This leads to the potential extraction of rents by managers through the retention of excess cash levels.

Recently, Egyptian tax authorities have intensified efforts by issuing more tax legislations to boost tax revenues and combat tax evasion. However, many Egyptian firms are grappling with financial constraints due to the country's challenging economic conditions, including currency fluctuations and inflation. Consequently, these economic challenges may compel firms to prioritize tax avoidance in order to hoard cash and make investments, potentially compromising the main focus of this research.

Building upon the preceding discussion, we extend our research by delving into the relationship between tax avoidance practices and investment efficiency, with a focus on the mediating role of cash holding. This study makes several noteworthy contributions to the existing literature. Firstly, it expands upon prior research on cash holdings by exploring how firms utilize tax avoidance as a primary mechanism for cash retention and investment. Notably, this study is the first, to our knowledge, to investigate the mediating influence of cash holding between tax avoidance and investment efficiency. Secondly, our research complements existing literature on the consequences of tax avoidance, which has predominantly examined its effects on firm value, stock-price crash risk, and firm risk, while overlooking its crucial role in the relationship between cash holding and investment efficiency. Lastly, by leveraging data from Egyptian firms, our study provides additional empirical evidence on whether cash holding mediates the association between tax avoidance and investment efficiency, further enriching the scholarly discourse in this field.

The subsequent sections of the paper are organized as follows: In Section 2, we delve into the theoretical background and hypothesis development. Section 3 provides a description of the data, sample construction, and variable measurement. Section 4 is dedicated to presenting the main empirical results. Lastly, in Section 5, we report the findings and conclude the paper.

2. Literature Review and Hypothesis Development:

2.1. Tax Avoidance and Cash Holding

The responsibility of the firm's board of directors includes monitoring and evaluating the firm's strategy, as well as approving appropriate investments. In corporate governance, their function involves supervising management, providing recommendations, and vetoing unfavorable actions (Weisbach, 1988). Achieving this responsibility satisfactorily requires board members to operate with a high degree of integrity (Kaptein, 2003). However, a problematic director may prioritize protecting their reputation, leading to decisions with self-serving characteristics and the use of discretionary power to influence cash management strategies. Consequently, the presence of problem directors on the board may undermine strong corporate governance and hinder the board's effectiveness in fulfilling its duties. As noted by Fich and Shivdasani (2007), "tainted directors" are lenient monitors who may facilitate CEOs in engaging in actions that destroy value.

Problematic directors contribute to poor corporate governance and exacerbate agency conflicts (Habib & Bhuiyan, 2016). According to Dittmar, Mahrt-Smith, and Servaes (2003), inadequate corporate governance, characterized by a lack of manager monitoring, encourages firms to hold excessive cash. However, this strategy may not maximize shareholder value, leading to an agency dilemma. Firms with high cash holdings are more susceptible to encountering agency issues that result in inefficient use of surplus cash, such as empire-building plans that lead to over-investment (Biddle, Hilary, & Verdi, 2009; Blanchard, Lopez-de-Silanes, & Shleifer, 1994; Sheu & Lee, 2012). The ease with which directors can use excess cash for personal gain, compared to other assets, exemplifies the agency dilemma (Lie, 2000; Sun, Yung, & Rahman, 2012). Consequently, problematic directors may exploit cash through their discretionary power. According to agency theory, poor director oversight of entrenched managers can result in cash being held rather than distributed to shareholders as dividends (Dittmar et al., 2003; Jensen, 1986), or self-interested directors may advocate spending cash rather than distributing it as dividends, resulting in smaller cash reserves (Dittmar et al., 2003; Jensen, 1986).

A variety of factors have been identified as influencing company cash holding behavior. Boubakri, El Ghouli, and Saffar (2013) suggest that politically connected directors may advocate for lower cash holdings compared to their non-political counterparts. Orens and Reheul (2013) propose that an individual's tenure, age, education, and perception of market competitiveness affect their risk preferences and cash holding behavior. Amir, Kallunki, and Nilsson (2009) call for further research on board members with criminal records or exposure to fraudulent behavior to enhance understanding of corporate governance's role in decision-making and subsequent performance and risk-taking. Amess, Banerji, and Lampousis (2015) recommend exploring individual director characteristics as determinants of cash holding behavior. We take a different approach by investigating the impact of tax avoidance on cash holding and the relationship between cash holding and investment behavior.

Several studies have demonstrated that tax avoidance amplifies a firm's tax risk. Mills (1998) uncovers, based on clandestine data from tax returns and audit outcomes, that as book income surpasses taxable income, the audit adjustments escalate. Chan et al. (2010), utilizing data from Chinese publicly traded enterprises, reach similar conclusions. Additionally, prior research suggests that equity risk incentives can drive corporations to pursue more aggressive tax avoidance strategies, mirroring their behavior in investment, financing, and other projects. These findings support the notion that corporate tax avoidance correlates positively with cash volatility. Rego and Wilson (2012) examine the link between corporate tax risk and stock returns and earnings volatility, revealing a positive association between corporate tax risk and both stock return volatility and earnings before tax standard deviation, providing direct

evidence of tax avoidance's impact on cash flow volatility. As cash flow volatility directly influences a firm's cash holdings, Opler et al. (1999) demonstrate that firms with higher cash flow volatility exhibit higher cash-to-non-cash-asset ratios. Similarly, Bates et al. (2009) observe a doubling of the average cash-to-assets ratio for industrial firms in the US from 1998 to 2006, attributing this trend to increases in firms' cash flow volatility rather than changes in agency conflicts within firms. Based on a review of these studies, it is evident that an escalation in business cash flow volatility may engender uncertainty in cash payments, prompting firms to maintain higher cash reserves in response to unforeseen events. Consequently, an increase in a firm's tax aggressiveness is likely to elevate its cash flow volatility, leading to higher cash reserves held for precautionary reasons, and consequently, an increase in the cash savings ratio.

Tax avoidance, conversely, can render enterprises more financially constrained, thereby influencing cash holding policies. According to Balakrishnan et al. (2012), organizations engaging in aggressive tax planning tend to have less transparent information environments. They illustrate that tax avoidance can augment an organization's financial complexity, potentially leading to transparency issues if this increased complexity is not adequately communicated to external parties. Their investigation into the relationship between a newly developed measure of tax avoidance and information asymmetry, analysts' forecast errors, and earnings quality suggests that tax avoidance diminishes corporate transparency. Due to information asymmetry, enterprises may face financial constraints arising from adverse selection by external investors (Myers and Majluf, 1984). Additionally, financially constrained enterprises often need to maintain higher cash reserves to meet future investment demands (Almeida et al., 2004; Wang and Zhu, 2013), resulting in an increase in the cash savings ratio when firms encounter financial restrictions due to tax avoidance.

Previous research has identified two contrasting views on tax avoidance strategies, shedding light on why managers opt to retain cash. On one hand, tax avoidance is perceived as a value-enhancing activity that facilitates the transfer of funds from the government to firms. Given the significance of tax costs to both corporations and their shareholders, strategies aimed at tax avoidance are often favored by shareholders (Chen et al., 2010). By minimizing their tax obligations, firms generate greater tax savings, which can subsequently be reinvested in the business or distributed to shareholders. According to this perspective, investors may attribute a higher value to the excess cash retained by tax-avoiding companies.

The traditional perspective on tax avoidance tactics, however, overlooks a critical aspect of modern corporations: the separation of ownership and control. Previous research has linked tax avoidance to challenges related to information asymmetry and agency costs, potentially leading to managerial misuse of corporate resources. According to agency theory, tax avoidance activities may divert managers' focus away from maximizing shareholder value, particularly when agency problems are exacerbated. To evade detection by tax authorities, such operations typically exhibit two key characteristics: complexity and obfuscation (Desai and Dharmapala, 2006; Chen et al., 2010). In line with this reasoning, engaging in tax avoidance necessitates companies to increase financial and organizational complexity, thereby diminishing financial reporting transparency (Balakrishnan et al., 2019). Tax avoidance strategies can serve as a means for managers to extract rents from the firm within a low-information environment (Desai and Dharmapala, 2009). Contrary to this assertion, Kim et al. (2011) demonstrate that tax avoidance practices heighten uncertainty surrounding the valuation of tax-avoidant firms, leading to a notable likelihood of stock price crashes. Similarly, De Simone et al. (2020) argue that managers adjust their tax avoidance strategies in response to changes in the financial performance of their firms. They discovered that companies with unprofitable affiliates utilize transfer pricing tactics to transfer income to these unproductive affiliates, thereby reducing their overall tax liability.

As previously noted, corporate tax avoidance can increase cash flow volatility, reduce information transparency, and obscure insider rent extraction activities, all of which impact the marginal value of a firm's cash holdings. Consequently, companies engaging in tax avoidance may face heightened uncertainty regarding tax penalties due to the presence of tax audit risk, leading them to allocate more cash reserves to meet future obligations. Failure to maintain adequate cash reserves could result in missed investment opportunities, as demonstrated by Fazzari et al. (1988), particularly for firms facing financial constraints from external investors and lacking sufficient internal capital. Additionally, internal capital can facilitate the coordination of cash flow and investment opportunities, which is crucial for market competition or strategy implementation (Duchin, 2010). Therefore, tax-aggressive firms may need to hold more cash in response to increased cash flow volatility. From this perspective, the value of cash for highly tax-aggressive enterprises may be perceived as higher.

Moreover, tax avoidance may diminish a company's transparency (Balakrishnan et al., 2012). There are two opposing views on how corporate transparency influences the value of cash. According to pecking order theory (Myers and Majluf, 1984), a decrease in corporate transparency raises the cost of external capital, making internal financing more attractive, thus increasing the value of cash. Conversely, according to an alternative interpretation of free cash flow theory (Jensen, 1986), reduced corporate transparency may exacerbate moral hazard among firm managers, as cash becomes a fungible resource for personal gains (Myers and Rajan, 1998), leading to a decrease in the value of cash. Drobetz et al. (2010) find that the value of cash is lower in countries with higher information asymmetry, supporting free cash flow theory, based on a sample of over 8,500 firms from 45 countries spanning from 1995 to 2005. Frésard and Salva (2010) investigate the cash holdings of firms cross-listed in the United States and found that stronger legal norms and transparency requirements in the US lead to higher valuations of cross-listed firms' cash holdings, further supporting free cash flow theory. Overall, free cash flow theory provides stronger explanatory power, suggesting that the value of cash decreases as corporate transparency declines.

Finally, corporate tax avoidance efforts, such as the pursuit of offshore tax havens, often involve highly intricate transactions. The complexity of such tax avoidance makes it easier for managers or family owners to conceal rent extraction or withhold bad news (Desai et al., 2007; Chen et al., 2010; Kim et al., 2011). If investors believe that these activities can be hidden through tax avoidance, they may not favor firms holding more cash, thus facilitating managers' rent extraction actions (Jensen, 1986). Dittmar and Mahrt-Smith (2007) assess the marginal cash value in poorly and well-governed firms and found that governance significantly affects cash value: \$1.00 of cash in a poorly managed firm is valued at \$0.42, whereas it is valued at \$0.88 in a well-governed firm. This suggests that a higher level of corporate governance may lead to a higher cash value and vice versa. Harford et al. (2008) reached a similar conclusion. Overall, tax aggressiveness reduces the value of firm cash holdings in an agency situation. In summary, previous research has shed light on changes in cash holdings, indicating that firms facing increased tax uncertainty store more cash to meet potential future demands (Hanlon et al., 2017). Thus, the following hypothesis is developed:

H₁: Tax avoidance has a positive significant impact on cash holding.

2.2. Cash Holding & Investment Efficiency

Excessive cash holdings can lead to various negative outcomes for businesses and shareholders, including lower return on assets (Eljelly, 2004), increased cost of capital (Jensen, 1986), and diminished firm value (Pinkowitz, Stulz, & Williamson, 2006). Additionally, research by Retzl (2011) supports the notion of precautionary savings,

suggesting that firms with greater investment opportunities tend to increase their cash reserves.

However, if directors are incentivized to squander cash holdings, such as on "value-reducing investments," this could lead to decreased shareholder returns (Lee & Powell, 2011, p. 550). Problematic directors may promote over-investment by accumulating excess capital that is then invested in projects with a negative net present value. A vigilant board can play a vital role in monitoring managerial decisions regarding investment and providing enhanced protection for shareholders (Opler et al., 1999). Nonetheless, directors focused on maximizing their own wealth may make investments that do not align with shareholders' interests (Biddle et al., 2009).

Researchers have unearthed empirical evidence indicating that corporations with substantial surplus cash tend to overpay for mergers and acquisitions, thereby diminishing the value of the investment (Harford, Humphery-Jenner, & Powell, 2012; Malmendier & Tate, 2008). Considering that governance procedures are linked to investment efficiency (Biddle et al., 2009), over-investment may become more pronounced in the presence of a problematic director on the board who exhibits lower reliability in effective monitoring, thereby impacting capital investment efficiency. Thus, the following hypothesis is formulated:

H₂: cash holding has a negative significant impact on investment efficiency.

2.3. Tax Avoidance & Investment Efficiency

Tax avoidance, in general, entails a series of tax planning measures implemented by a firm's management to decrease the firm's taxable income (Garca-Meca et al., 2021). The management is adept at utilizing legal tax strategies to minimize tax liabilities. Moreover, the management's experience in designing tax avoidance strategies may influence their ability to control and determine the effectiveness of their firm's investments. Previously, Edwards et al. (2016) discover that enterprises with a higher level of tax avoidance may accumulate additional cash by reducing their current reported taxable income. Since tax expenditure is one of the firm's major costs, tax avoidance tactics can serve as an internal funding source for firms. Therefore, tax avoidance may be advantageous for businesses.

Because high levels of tax avoidance are associated with higher cash flow (Bailing and Rui, 2018), enterprises must possess excellent managerial competence and effective corporate governance to manage surplus cash and ensure investment efficiency (Khurana et al., 2018). Management should consider both the benefits and costs of tax avoidance. They may engage in tax planning at a lower level of tax avoidance to achieve larger cash flow with less risk (Armstrong et al., 2015). Previous studies suggest that the tax-cutting technique is less likely to have a negative impact on the firm's operations.

Earnings obtained through tax avoidance tactics, particularly, serve as a key source of finance for the firm. This can occur when a corporation pursues alternative funding sources other than debt and equity financing, which can be more expensive or complex, especially for firms with limited financial resources (Edwards et al., 2016). According to the traditional view, tax avoidance is a value-maximizing activity for firms because it allows the firm to transfer wealth from the government to shareholders, but only if the expected marginal benefit exceeds the marginal cost (Desai & Dharmapala, 2009; Khurana & Moser, 2013). Furthermore, loss-making firms engage in tax evasion tactics to enhance their worth (McGuire et al., 2012). Firms that engage in extensive tax evasion may also invest in costly activities to conceal their actions from government authorities (Desai et al., 2007). They would use the extra cash flow from their tax avoidance actions to invest in initiatives with a positive net present value (Balakrishnan et al., 2019; Khurana et al., 2018).

Therefore, if enterprises can efficiently manage the money from tax evasion activities and invest them in projects, value addition could enhance investment efficiency. Thus, the following hypotheses are developed:

H₃: Tax avoidance has a negative significant impact on investment efficiency.

H₄: Cash holding has a mediating role in the relationship between Tax avoidance and investment efficiency.

3. Research Design

3.1. Sample Selection

The research encompassed all listed firms on the Egyptian Stock Exchange (ESE) over a six-year period from 2017 to 2022. Firms were selected based on specific criteria: exclusion of those affiliated with investment firms, financial intermediaries, holdings, banks, and leasing, inclusion of those with changes in fiscal year or activity, and commencement of the dataset in 2017 to avoid economic events related to currency float in 2016 in the Egyptian environment. Following these criteria, the dataset covered Egyptian listed firms over the specified period, with further refinement excluding financial and banking sector firms, those with missing variables, and firms in service sectors such as tourism and media. The final sample comprised 321 firm-year observations.

3.2. Variables Measurements

3.2.1 Tax avoidance

We utilize the measurement approach established in previous studies (e.g., Atwood et al., 2012; Kanagaretnam et al., 2018; Atwood and Lewellen, 2019):

$$\text{Tax_Avoid}_{it} = 1 + \frac{\sum_{t-2}^t (\text{PTEBX} \times \tau)_{it} - \sum_{t-2}^t \text{CTP}}{\sum_{t-2}^t (\text{PTEBX} \times \tau)_{it}}$$

Where PTEBX denotes pre-tax earnings before exceptional items, τ is the statutory corporate income tax rate in the home nation, and CTP denotes current tax paid.

This measure reflects the extent to which corporations can reduce their tax payments compared to what they would owe based on the statutory tax rate in their home country (referred to as the "unmanaged tax amount"). Nevertheless, we argue that evaluating corporate tax avoidance within a limited timeframe is flawed. Corporate tax payments typically encompass payments to tax authorities and refunds, which may also involve additional taxes resulting from the resolution of tax disputes spanning several years (Dyreng et al., 2008).

3.2.2 Cash holding

We estimate cash holding using two different measures. Firstly, CASH is calculated as the sum of monetary funds and short-term investments divided by total assets at the end of the period. Secondly, excess cash (XCASH) can be estimated using the following equation (Bhuiyan & Hooks, 2019):

$$\text{LN(CASH)}_{i,t} = \alpha_0 + \alpha_1 \text{SIZE}_{i,t} + \alpha_2 \text{CFO}_{i,t} + \alpha_3 \text{NWC}_{i,t} + \alpha_4 \text{MKT_BK}_{i,t} + \alpha_5 \text{CAPEX}_{i,t} + \alpha_6 \text{LEV}_{i,t} + \alpha_8 \text{DIV}_{i,t} + \varepsilon_{i,t}$$

LN(CASH) represents the natural logarithm of the sum of cash and marketable securities. SIZE is defined as the natural logarithm of total assets. CFO represents cash flow from operational activities multiplied by total assets. Net working capital is calculated as the difference between current assets and current liabilities. MKT_BK refers to the company's market-to-book ratio, defined as the market value of its stock divided by the book value of its equity. CAPEX stands for total capital expenditure multiplied by total assets. Firm leverage is determined as the sum of total debt and total assets. DIV is a dummy variable with a value of 1 if the firm-year declared and paid a dividend, and 0 otherwise.

3.2.3 Investment Efficiency

In this investigation, Richardson's (2006) model, as described in Equation (2), is utilized. The model incorporates measures of growth prospects, leverage, firm age, firm size, cash balance, industry-fixed effects, and annual fixed effects as investment factors. The residuals between total investment and expected investment were then employed to derive non-expected investment.

$$\text{INV}_{i,t} = \gamma_0 + \gamma_1 \text{Q}_{i,t-1} + \gamma_2 \text{Cash}_{i,t-1} + \gamma_3 \text{Age}_{i,t-1} + \gamma_4 \text{Size}_{i,t-1} + \gamma_5 \text{Lev}_{i,t-1} + \gamma_6 \text{Return}_{i,t-1} + \gamma_7 \text{INV}_{i,t-1} + \varepsilon_{i,t-1}$$

INV represents total investment, calculated as the sum of fixed assets, construction in process, intangible assets, and long-term investments, scaled by total assets, reflecting total investment expenditure. Qt-1 denotes the growth prospects of the previous year, expressed through Tobin's Q. Casht-1 represents the deflated balance of cash and short-term investments divided by total assets at the beginning of the year. Age-1 indicates the company's age since listing, while Siset-1 represents the size of the company, given as the natural logarithm of total assets at the beginning of the year. Lev-1 represents the financial leverage of the previous year, expressed as the total debt ratio, and Return-1 signifies the rate of stock returns for the year preceding the investment year. The dummy variables account for industry and year variations. Richardson (2006) categorized corporate total investment into expected and unanticipated investment, with overinvestment representing inefficient investment. OverINV, indicating inefficient investment, is determined as the difference between total investment and expected investment, with positive residuals, minus the bottom 25%. UnderINV, representing inefficient investment, is the absolute value of negative residuals between total investment and projected investment, minus the bottom 25%.

3.3. Empirical Model

We utilize Ordinary Least Squares (OLS) regression in our analysis. Models 1 and 2 below are formulated to test the first hypothesis. They include the Tax avoidance measure along with controls for established predictors of corporate cash holdings (Dittmar & Mahrt-Smith, 2007; Opler et al., 1999) to examine the impact of Tax avoidance (Tax_Avoid) on cash holdings (Cash & XCash).

$$\text{Cash} = \beta_0 + \beta_1 \text{Tax_Avoid} + \beta_2 \text{Size} + \beta_3 \text{Lev} + \beta_4 \text{Roa} + \beta_5 \text{Cap} + \beta_6 \text{Nwc} + \beta_2 \text{Tobin's Q} + \varepsilon \quad (1)$$

$$\text{XCash} = \beta_0 + \beta_1 \text{Tax_Avoid} + \beta_2 \text{Size} + \beta_3 \text{Lev} + \beta_4 \text{Roa} + \beta_5 \text{Cap} + \beta_6 \text{Nwc} + \beta_2 \text{Tobin's Q} + \varepsilon \quad (2)$$

Models 3 and 4 test the second hypothesis in our investigation. They include the dependent variable, investment efficiency (INV), and independent variable cash holding (Cash & XCash), along with other control variables.

$$\text{INV (OverINV \& UnderINV)} = \beta_0 + \beta_1 \text{ CASH} + \beta_2 \text{ Size} + \beta_3 \text{ Lev} + \beta_4 \text{ Roa} + \beta_5 \text{ Cap} + \beta_6 \text{ Nwc} + \beta_2 \text{ Tobin's Q} + \varepsilon \quad (3)$$

$$\text{INV (OverINV \& UnderINV)} = \beta_0 + \beta_1 \text{ XCASH} + \beta_2 \text{ Size} + \beta_3 \text{ Lev} + \beta_4 \text{ Roa} + \beta_5 \text{ Cap} + \beta_6 \text{ Nwc} + \beta_2 \text{ Tobin's Q} + \varepsilon \quad (4)$$

Model 5 analyzes the effect of Tax avoidance (Tax_Avoid) on investment efficiency (INV) measures for overinvestment and underinvestment. The model treats investment efficiency (INV) as the dependent variable and incorporates the Tax avoidance measure as the independent variable, alongside control variables.

$$\text{INV} = \beta_0 + \beta_1 \text{ Tax_Avoid} + \beta_2 \text{ Size} + \beta_3 \text{ Lev} + \beta_4 \text{ Roa} + \beta_5 \text{ Cap} + \beta_6 \text{ Nwc} + \beta_2 \text{ Tobin's Q} + \varepsilon \quad (5)$$

Following Arianpoor and Mehrfard (2022), we utilize the Sobel Test to assess the mediating role of cash holding in the relationship between tax avoidance and investment efficiency. The Sobel test, also known as the Sobel-Goodman test, is a statistical method used to assess the significance of the indirect effect of an independent variable (e.g., tax avoidance) on a dependent variable (e.g., investment efficiency) through a proposed mediator variable (e.g., cash holding) (Preacher and Leonardelli, 2001).

4. Results and discussion

4.1. Descriptive statistics

The sample makeup and descriptive statistics for the main variables are presented in Table 1. The results demonstrate that the average tax avoidance rate is 15.1%, which is comparable to other related studies (See: Benkraiem et al., 2022; Kanagaretnam et al., 2016). The means of cash and excess cash are 0.181 and 0.092, respectively, which are similar to the means reported by Benkraiem et al. (2022) and Liu & Loang (2023) which are 0.179 and 0.077. The investment efficiency score is 0.387, which is similar to the 0.335 obtained by Arianpoor and Mehrfard (2022). Tobin's Q can be interpreted as a score greater than one indicating that the firm is creating value, and a score less than one indicating that the firm is destroying wealth. The mean value variable (Tobin's Q) in this study is 2.521, indicating that the companies produce value, and this value corresponds to the 2.787 stated by Arianpoor and Mehrfard (2022).

Table 1. Summary statistics

Variable	N	Mean	Std. Dev.	Min.	Max.
TAX_AVOID	321	0.151	0.227	-0.351	0.556
CASH	321	0.181	0.128	0.023	0.622
XCASH	321	0.092	0.412	0.013	1.952
INV	321	0.387	0.127	0.057	0.793
SIZE	321	14.321	1.416	13.005	25.459
LEV	321	0.457	0.216	0.055	0.921
ROA	321	0.071	0.035	-0.115	0.315
CAP	321	0.111	0.066	0.098	0.287

NWC	321	0.037	0.156	-0.319	0.512
TOBIN'S Q	321	2.521	6.371	0.125	18.421

4.2. Pearson Correlation Matrix

Table 2 reveals significant positive correlations between tax avoidance and cash holding, measured by both cash and excess cash. Moreover, tax avoidance demonstrates a positive association with the total investment score, driven mainly by increased overinvestment and reduced underinvestment. Similarly, cash holding positively impacts investment efficiency by fostering overinvestment and mitigating underinvestment. However, further regression analysis is required to definitively confirm these findings. Notably, all coefficients are below 0.8, indicating no multicollinearity issues. Additionally, a variation inflation factor (VIF) analysis was conducted, with VIF values less than 5 indicating no multicollinearity.

Table 2. Pearson Correlation Matrix

	TAX_AVOID	CASH	XCASH	INV	OVERINV	UNDERINV	SIZE	LEV	ROA	CAP	NWC	TOBIN'S Q	VIF
TAX_AVOID	1												1.814
CASH	0.218***	1											1.272
XCASH	0.151***	0.195***	1										1.532
INV	0.187***	0.193***	0.149***	1									---
OVERINV	0.163***	0.151***	0.147***	0.187***	1								---
UNDERINV	-0.096**	-0.087**	-0.092**	-0.161***	-0.111***	1							---
SIZE	0.015	0.031	0.021	0.151***	0.217***	-0.521***	1						1.646
LEV	0.018	0.011	0.010	-0.183***	-0.125***	0.108***	-0.028	1					1.821
ROA	0.137***	0.153***	0.136***	0.153***	0.087**	0.131***	0.020	-0.022	1				1.391
CAP	0.022	0.211***	0.173***	0.186***	0.113***	0.025	0.024	-0.016	0.027	1			1.520
NWC	0.017	0.009	0.012	0.197***	0.051*	0.037	0.027	-0.029	0.033	0.026	1		1.603
TOBIN'S Q	0.033	0.027	0.022	-0.027	-0.035	0.097**	0.021	-0.018	0.020	0.019	0.028	1	1.526

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

4.3. Regression results

Model 1 in Table 3 (Panel A) illustrates the relationship between tax avoidance and cash without the inclusion of control variables, providing a baseline understanding of this relationship. Model 2, on the other hand, examines this relationship while accounting for all control variables, offering a more comprehensive analysis by considering potential confounding factors that may influence the results. In line with prior research (Balakrishnan et al., 2012; Khurana and Moser, 2013; Wang, 2015; Hanlon et al., 2017; Khurana et al., 2018), In both Model 1 and Model 2, tax avoidance exhibits a significant positive impact on cash holding ($\beta = 0.213$, $P < 0.01$ and $\beta = 0.235$, $P < 0.01$, respectively), even after accounting for all control variables.

Furthermore, as shown in Table 3, Panel B demonstrates the outcomes pertaining to the association between tax avoidance and excess cash. Model 3 examines this relationship without control variables, while Model 4 incorporates all control variables. In line with prior research (Benkraiem et al., 2022), the findings demonstrate a consistent and significant positive impact of tax avoidance on cash holding, as measured by excess cash ($\beta = 0.237$; $P < 0.01$). This relationship persists in Model 4 even after incorporating all control variables, with tax avoidance maintaining a significant positive effect on cash holding, measured by excess cash ($\beta = 0.242$, $P < 0.01$).

These findings show that when companies engage in higher levels of tax avoidance, they tend to have more cash on hand, including both regular cash holdings and extra cash reserves. This is likely because they face increased uncertainty in their tax payments, which can lead to more unpredictable cash flows. To prepare for unexpected financial challenges, firms feel the need to keep more cash available. Therefore, our study supports hypothesis H1.

According to agency theory, the positive relationship between tax avoidance and cash holding can be explained by the agency problem. In this context, managers may engage in tax avoidance strategies to maximize their own interests at the expense of shareholders. By accumulating cash reserves through tax avoidance, managers may have greater discretion over funds, which can potentially be misallocated for personal gain or empire-building activities rather than maximizing shareholder wealth. Furthermore, the findings are also consistent with the free cash flow theory, which posits that firms with excess cash may be more prone to agency conflicts and inefficient investment decisions. Tax avoidance strategies that lead to increased cash holdings can exacerbate the free cash flow problem by providing managers with surplus funds that may be used for value-destroying activities, such as wasteful acquisitions or excessive executive compensation. Additionally, the results align with the pecking order theory,

which suggests that firms prefer internal financing, such as retained earnings, over external financing to mitigate information asymmetry and adverse selection costs. Tax avoidance enables firms to accumulate cash reserves without relying on external financing, thus supporting the pecking order theory's preference for internal funding sources.

Table 3. The impact of tax avoidance on cash holding

Variables	Panel A: Cash holding				Panel B: Excess cash			
	Model 1		Model 2		Model 3		Model 4	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
TAX_AVOID	0.213***	2.421	0.235***	3.236	0.237***	2.587	0.242***	3.681
SIZE	--	--	0.063	1.102	--	--	0.058	0.936
LEV	--	--	0.015	0.336	--	--	0.009	0.117
ROA	--	--	0.151***	2.311	--	--	0.149***	2.427
CAP	--	--	0.137***	2.101	--	--	0.118***	2.222
NWC	--	--	0.023	0.542	--	--	0.031	0.683
TOBIN'S Q	--	--	0.037	0.763	--	--	0.039	0.777
Constant	0.055	0.958	0.049	0.881	0.047	0.821	0.042	0.810
N	321		321		321		321	
F-statistic	157.311***		202.437***		163.411***		226.931***	
Durbin-Watson	1.798		1.812		1.763		1.852	
Adj. R2	18.10%		22.50%		20.30%		26.90%	

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

Table 4, Panel A, displays Model 1, which presents the relationship between cash and overinvestment without control variables. Model 2, however, considers all control variables when examining this relationship. Consistent with previous studies (Bhuiyan & Hooks, 2019; Arianpoor & Mehrfard, 2022), Model 1 suggests that cash holding, measured by cash, has a significant positive effect on overinvestment ($\beta = 0.246$, $P < 0.01$). Furthermore, Model 2 confirms this result, with cash holding measured by cash also exhibiting a significant positive effect on overinvestment ($\beta = 0.281$, $P < 0.01$).

Furthermore, Table 4, Panel B, showcases Model 3, illustrating the relationship between cash and underinvestment without control variables,

while Model 4 delves into this relationship with the inclusion of all control variables. In line with prior research (Aksar et al., 2022; Arianpoor & Mehrfard, 2022), Model 3 indicates a significant negative impact of cash holding, measured by cash, on underinvestment ($\beta = -0.311$, $P < 0.01$). Moreover, when incorporating all control variables in Model 4, consistent results are observed ($\beta = -0.327$, $P < 0.01$), confirming that cash holding, measured by cash, continues to exert a significant negative effect on underinvestment.

Overall, these findings collectively affirm the adverse association between cash holding and investment efficiency, as evidenced by effects on both overinvestment and underinvestment. To bolster these conclusions, we conduct additional analysis using an alternative measure of cash holding, namely excess cash, as presented in Table 5.

Table 4. The impact of Cash Holding on investment Efficiency

Variables	Panel B: Overinvestment				Panel B: Underinvestment			
	Model 1		Model 2		Model 3		Model 4	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
CASH	0.246***	2.431	0.281***	2.623	-0.311***	-3.181	-0.327***	-3.451
SIZE	--	--	0.188***	2.381	--	--	-0.391***	-3.657
LEV	--	--	-0.115***	-2.107	--	--	-0.157***	-2.201
ROA	--	--	0.061**	2.042	--	--	0.097**	2.136
CAP	--	--	0.193***	2.451	--	--	0.026	0.742
NWC	--	--	0.047	1.751	--	--	0.033	0.835
TOBIN'S Q	--	--	0.025	0.987	--	--	0.041	0.871
Constant	0.041	0.483	0.058	0.588	0.045	0.663	0.052	0.981
N	321		321		321		321	
F-statistic	331.527***		392.691***		396.115***		461.615***	
Durbin-Watson	1.681		1.911		1.825		1.915	
Adj. R2	21.70%		29.10%		32.30%		46.20%	

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

In Table 5, Panel (A) presents Model 1 and Model 2, which respectively depict the relationship between excess cash and overinvestment, with and without the inclusion of control variables. Consistent with previous studies (Bhuiyan & Hooks, 2019; Arianpoor &

Mehrfard, 2022), Model 1 observes that cash holding, measured by excess cash, has a significantly positive effect on overinvestment ($\beta = 0.267$, $P < 0.01$). Model 2 which includes all control variables has consistent results ($\beta = 0.293$; $P < 0.01$), indicating a significant positive effect of cash holding measured by excess cash on overinvestment. In contrast to prior research findings (Aksar et al., 2022; Arianpoor & Mehrfard, 2022), when examining the relationship between excess cash and underinvestment in Model 3 and Model 4 in Table 5, no significant effect is observed. These contrasting results prompt us to reject the second hypothesis, which posited a significant negative impact of cash holding on investment efficiency. One plausible explanation for these contrasting results could stem from the unique economic landscape and business environment prevalent in Egypt. Egypt's economy, characterized by its distinct regulatory framework, cultural factors, and market conditions, may introduce nuances that influence the behavior of firms regarding cash management and investment decisions. For instance, political instability, currency fluctuations, and governmental policies could significantly impact firms' liquidity preferences and investment strategies.

Table 5. The impact of Cash Holding on investment Efficiency)

Variables	Panel A: XCASH & OVERINV				Panel B: XCASH & UNDERINV			
	Model 1		Model 2		Model 3		Model 4	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
XCASH	0.267***	2.683	0.293***	2.997	-0.115	-1.563	-0.122	-1.769
SIZE	--	--	0.171***	2.723	--	--	-0.415***	-4.108
LEV	--	--	-0.127***	-2.296	--	--	0.187***	2.524
ROA	--	--	0.062*	2.097	--	--	0.063	1.326
CAP	--	--	0.095**	2.185	--	--	0.031	0.837
NWC	--	--	0.031	0.927	--	--	0.045	0.981
TOBIN'S Q	--	--	-0.018	-0.517	--	--	0.059	1.218
Constant	0.048	0.821	0.061	1.101	0.063	1.187	0.051	1.142
N	321		321		321		321	
F-statistic	312.413***		377.483***		327.824***		399.427***	
Durbin-Watson	1.737		1.863		1.812		1.967	
Adj. R2	22.30%		31.50%		21.20%		46.20%	

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

In Table 6, Model 1 and Model 2 in Panel (A) illustrates the relationship between tax avoidance and overinvestment. Consistent with prior research (Mayberry, 2012; Goldman, 2016; Bailing & Rui, 2018; Rahimi & Forughi, 2020; Ngelo et al., 2022), Model 1 and Model 2 suggest that tax avoidance has a significant positive effect on overinvestment ($\beta = 0.235$; $P < 0.01$) and $\beta = 0.327$; $P < 0.01$), respectively.

Additionally, Model 3 and Model 4 in Panel (B) tests the relationship between tax avoidance and underinvestment. Consistent with prior research (Mayberry, 2012; Goldman, 2016; Bailing & Rui, 2018; Rahimi & Forughi, 2020; Ngelo et al., 2022), tax avoidance exhibits a significant negative effect on underinvestment in Model 3 and Model 4 ($\beta = -0.215$; $P < 0.01$) and ($\beta = -0.236$; $P < 0.01$), respectively. These results suggest that increasing tax avoidance leads to more overinvestment and less underinvestment, ultimately decreasing investment efficiency. According to Desai and Dharmapala (2009), Khurana and Moser (2013), and Edwards et al. (2016), this indicates a value-maximizing activity for firms, emphasizing the importance of strategic wealth-transferring from the government to shareholders, including increasing investment levels using alternative financing sources to maintain high investment levels in projects without positive net present value and build a positive image with stakeholders. Consequently, we can accept the third hypothesis (H3), suggesting a significant negative effect of tax avoidance on investment efficiency.

This result aligns with the pecking order theory, which suppose the optimal cash level is an assumption cannot be achieved in the practice, as well as cash is most important resource for financing the investment requirements, hence tax avoidance will be the optimal source of cash to fund. But in the other side, information asymmetry inevitably existed according to free cash flow theory so internal funding in this case will be less costly than external, hence firms intended to generate more internal funds. In this context, tax avoidance could be used as an internal source of funding according to previous studies (See: Edwards et al., 2016; Leone, 2008). Thus, tax avoidable firms are capable to increase their values despite the existence of financial distress.

Table 6. Regression for testing H3 (the impact of tax avoidance on investment Efficiency)

Variables	Panel A: TAX_AVOID & OVERINV				Panel A: TAX_AVOID & UNDERINV			
	Model 1		Model 2		Model 3		Model 4	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
TAX_AVOID	0.235***	2.163	0.327***	2.921	-0.215***	-2.315	-0.236***	-2.487
SIZE	--	--	0.221	2.387	--	--	-0.315***	-3.411
LEV	--	--	-0.187***	-2.295	--	--	-0.188***	-2.481
ROA	--	--	0.095**	2.121	--	--	0.121**	2.187
CAP	--	--	0.216***	2.314	--	--	0.022	0.813
NWC	--	--	0.087*	2.102	--	--	0.035	0.887
TOBIN'S Q	--	--	0.012	0.981	--	--	0.042	0.912
Constant	0.055	0.547	0.063	0.611	0.038	0.618	0.047	0.751
N	321		321		321		321	
F-statistic	321.416***		388.433***		337.451***		412.186***	
Durbin-Watson	1.723		1.897		1.763		1.923	
Adj. R2	23.20%		27.80%		33.60%		42.90%	

Note: *, ** and *** indicate statistical significance at the 10, 5 and 1% levels, respectively

4.4. Sobel test

Table 4 presents the results of the Sobel test, which investigates the mediating role of cash holding. cash holding significantly increases overinvestment and decreases underinvestment (T-stat. > 2). Table 3 shows that tax avoidance significantly boosts cash holdings (T-stat. > 2). Thus, the Sobel test is employed to explore the mediating role of cash holdings in the relationship between tax avoidance and investment efficiency (Overinvestment & Underinvestment). The calculated mediator coefficients

of cash holding between tax avoidance and overinvestment are 0.050 (0.213×0.235) and 0.077 (0.235×0.327) for the baseline and full models, respectively. The Sobel test yields significance levels of 0.014 and 0.012, both below 0.05, indicating 95% confidence. These results suggest that cash holding amplifies the positive effect of tax avoidance on overinvestment by 5% and 7.7%, respectively, in the baseline and full models. Similarly, the mediator coefficients of cash holding between tax avoidance and underinvestment are -0.046 (0.213×-0.215) and -0.055 (0.235×-0.236) for the baseline and full models, respectively.

The Sobel test yields significant levels of 0.018 and 0.015, both below 0.05. These findings suggest that cash holding intensifies the negative effect of tax avoidance on underinvestment by -4.6% and -5.5%, respectively, in the baseline and full models. Thus, H4 can be accepted.

This result promotes us to pay attention to agency problems, Agency theory suppose always that managers seek to achieve their wealth in the expense of other stakeholders, so tax avoidance will be the most suitable strategy for doing this by increasing their surplus fund, which can be used in building their empires. In the same vein, the pecking order theory ensure that internal funding is less costly than external so cash savings from the tax avoidance strategies can be the most suitable source of fund to invest in more short term investments for improving their image opposite the other stakeholders and neglecting the long term effect of these investments on the firm value, hence moral hazard issues appear in this area and support the mediating role of cash holding which is achieved from the tax avoidance strategies and can be used in financing the short term investments that have negative present value.

5. Conclusion

This study utilizes a dataset comprising 321 firm-year observations derived from listed firms on the ESE spanning the period from 2017 to 2022. The findings suggest a clear positive link between tax avoidance and cash holding. However, the connection between cash holding and cash excess, as well as its impact on investment efficiency, presents a notable contrast. Furthermore, tax avoidance is found to have a significant negative impact on investment efficiency, affecting both overinvestment and underinvestment similarly. Additionally, the study underscores the mediating role of cash holding in shaping the relationship between tax avoidance and investment efficiency.

This research provides valuable insights for regulators, managers, investors, analysts, auditors, and other stakeholders regarding the interplay between tax avoidance, cash holding, and investment efficiency. Understanding the significant relationship between tax avoidance and cash holding, as well as the subsequent impact of cash holding on investment efficiency, can aid stakeholders in making informed decisions. Regulators may need to consider cash holding as a potential indicator of tax avoidance strategies when evaluating firm behavior. Managers can use this information to assess the implications of their tax planning measures on cash reserves and investment decisions. Investors and analysts should factor in cash holding when analyzing the effectiveness of tax avoidance strategies and their influence on investment efficiency. Moreover, auditors can incorporate cash holding assessments into their auditing procedures to better evaluate the financial health and risk profile of firms engaging in tax avoidance. Overall, recognizing the role of cash holding in mediating the relationship between tax avoidance and investment efficiency can lead to more comprehensive assessments and better decision-making by all stakeholders involved.

This study has several limitations. There is a generalizability issue, as the findings may not be readily applicable to other contexts due to the study's focus on Egyptian enterprises. Additionally, the conclusions drawn are influenced by the specific economic and business environment of Egypt. Moreover, the study does not address market anomalies that may lead to disparities in interest rates, impacting investor behavior and potentially affecting investment efficiency. For future research, it is recommended to conduct comparative studies across different countries or regions to assess the universality of the findings. Additionally, investigating the impact of market anomalies on investment efficiency could provide valuable insights into the relationship between tax avoidance and investment behavior.

Furthermore, exploring the mediating role of other factors, such as corporate governance mechanisms or financial reporting quality, could enhance our understanding of the complex dynamics involved.

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