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The effect of tax avoidance and firm's life cycle on cash holdings: Evidence from Egyptian stock market

Abstract

This research aims to investigate the impact of tax avoidance and firm life cycle on cash holdings for a sample of 126 non-financials companies listed on the Egyptian stock market with 711 observations for the period 2012 – 2019. Tax avoidance, the first independent variable is measured by two proxies: the current effective tax rate (ETR), and book tax difference ratio (BTD). For the second independent variable, firm's life cycle, the cash flow approach is used to capture the five stages of the life cycle. Turning to the cash holdings as the dependent variable, two indicators are used. The first main indicator is Ln cash ratio calculated by taking the natural logarithm of cash and cash equivalents to total assets. The second indicator is used in the robustness test, which is calculated as the natural logarithm of cash and cash equivalents divided by total assets minus cash and cash equivalents. The results elaborated that there is a significant negative relationship between tax avoidance measured by the two proxies and cash holdings measured by the two indicators. Additionally, the findings displayed that the introduction stage of the firm's life cycle has a significant negative impact on cash holdings and a significant positive effect of shake-out stage on cash holdings while there is no relationship between the growth, mature and decline stages and cash holdings. The statistical tests are repeated for all variables using the second indicator of cash holding and the same results are obtained. Beyond these tests, for more analysis the research sample is divided into five subsamples presented the five stages of firm's life cycle. The results showed that higher negative impact of tax avoidance on cash holdings lies in the shake-out and the decline stages. On the other side, no impact of tax avoidance on cash holdings in the remaining stages.

Key Words: tax avoidance, firm life cycle, cash holdings.

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أثر التجنب الضريبي ودورة حياة الشركة على الاحتفاظ بالنقدية: دليل من سوق الأوراق المالية المصري

ملخص البحث

يهدف هذا البحث إلى اختبار أثر كل من التجنب الضريبي ودورة حياة الشركة على الاحتفاظ بالنقدية باستخدام عينة من 126 شركة غير مالية مقيدة بالبورصة المصرية بإجمالي 711 مشاهدة في الفترة من 2012 إلى 2019. وقد تم قياس التجنب الضريبي باعتباره المتغير المستقل الأول للبحث باستخدام مقياسين، حيث يتمثل المقياس الأول في المعدل الفعال للضريبة الحالية. ويتمثل المقياس الثاني في معدل الفروق الدفترية للضريبة. وبالنسبة للمتغير المستقل الثاني والمتمثل في دورة حياة الشركة، فقد تم الاعتماد على مدخل التدفقات النقدية لقياس هذا المتغير لتضمين المراحل الخمس لدورة حياة الشركة. وفيما يتعلق بالاحتفاظ بالنقدية باعتباره المتغير التابع، فقد تم الاعتماد على مؤشرين لقياسه: المؤشر الأساسي الأول هو اللوغاريتم الطبيعي لمعدل النقدية وما في حكمها إلى إجمالي الأصول. أما المؤشر الثاني فهو اللوغاريتم الطبيعي لمعدل النقدية وما في حكمها مقسوماً على إجمالي الأصول مطروحاً منها النقدية وما في حكمها وهو المؤشر المستخدم في تحليل الحساسية لاختبار مدى اتساق النتائج. وقد أسفرت النتائج عن وجود علاقة عكسية ومعنوية بين التجنب الضريبي مقاساً بمقياسيه والاحتفاظ بالنقدية بمؤشريه. أما بالنسبة لدورة حياة الشركة، فقد أشارت النتائج إلى وجود تأثير معنوي وعكسي لمرحلة الدخول إلى السوق على الاحتفاظ بالنقدية، ووجود تأثير معنوي طردي لمرحلة التراجع على الاحتفاظ بالنقدية. كذلك بينت النتائج عدم وجود تأثير لكل من مرحلة النمو والنضج والانسحاب على الاحتفاظ بالنقدية. وتدعيماً للنتائج التي تم الوصول إليها، تم إعادة الاختبارات الإحصائية لكل مقاييس المتغيرات باستخدام معدل النقدية وما في حكمها إلى صافي الأصول، وتم الحصول على نفس النتائج. ولمزيد من التحليل للتعرف على العلاقة بين التجنب الضريبي والاحتفاظ بالنقدية في ضوء المرحلة التي تمر بها الشركة، تم تقسيم عينة البحث إلى خمس عينات فرعية تمثل كل مرحلة من دورة حياة الشركة. وقد أشارت النتائج إلى وجود تأثير معنوي عكسي للتجنب الضريبي على الاحتفاظ بالنقدية في مرحلتي الانسحاب والتراجع، وعدم وجود تأثير للتجنب الضريبي على الاحتفاظ بالنقدية في باقي مراحل دورة الشركة.

الكلمات المفتاحية: التجنب الضريبي، ودورة حياة الشركة، والاحتفاظ بالنقدية.

1-Introduction

From the perspective of government, taxation is a very important tool used by countries to improve economic growth. Tax authorities encourage the business market to create values by charging low tax rates for special industries and giving some allowances for firms that start their operation. On the other side, from a business perspective, firms tend to minimize their costs including tax expense and maximize their profits. The higher net profits will be reflected in an increase in earnings per share and firm value in the stock market.

To solve this conflict, companies search for legal and acceptable tools and methods inside countries to enhance firm tax efficiency. Tax avoidance is considered as the relevant solution and a legal treatment to mitigate tax expenses and at same time abiding to the law and regulations of tax authorities. Tax is a motivating factor in many managements' decisions, as it is a major component of a firm's cash outflows. To compensate those cash outflows, firms hold cash as buffer to protect themselves against adverse cash flow shocks and uncertainty that might force them to forgo valuable investment opportunities due to costly external financing (Guney et al. 2007; Jacob et al. 2014; Mihai and Radu, 2015).

Determining the level of cash balance and liquid assets especially in the inefficient capital market is a critical and dynamic decision. This decision is affected by several internal and external factors such as the availability of financial resource, environment uncertainties, firm strategy, and firm's life cycle. Firm's life cycle is the main element of business success; it has a great effect on all activities with a dynamic pattern. Moreover, dealing with firm's life cycle is a very complicated issue and multi-dimensional term (Helfat and Peteraf, 2003; Dickinson, 2011; Drobotz et al. 2015; Habib and Hasan, 2019). This research merges between the firm's life cycle as an aspect of strategic management and tax avoidance and cash holdings, which represent important topics of financial accounting.

The core problem of the research is the existence of the different results' directions of previous studies. For the relationship between tax avoidance and cash holdings, some studies (e.g., Wang, 2015; Chang et al. 2016) reached significant positive relation between tax avoidance and cash holdings. On the other side,

some authors (e.g., Foley et al. 2007; Dhaliwal et al. 2011) found a negative impact of tax avoidance on cash holdings. On the contrary, a study conducted by Kurniawon and Nuryanah, (2017) did not find evidence supporting the relation between tax avoidance and cash holdings. Moreover, some others (e.g., Jacob et al. 2014; Wang, 2015) focused on one measure for tax avoidance.

Regarding the association between firm's life cycle and cash holdings, the results of previous studies are conflicted. For example, some studies (e.g., Saddour, 2006, and Faff et al. 2016) found a positive association, and others (e.g., Drobetz et al. 2015, and Alqahtani et al. 2022) found a negative relation between some stages of firm's life cycle and cash holdings.

Furthermore, measurement of firm's life cycle has no standard in the accounting literature. Additionally, some studies (e.g., Kim et al. 1998; Opler et al. 1999; 2001; Ozkan and Ozkan, 2004) tested the determinates of cash holding without testing neither tax avoidance nor firm's life cycle although they have a great impact on determining cash level. According to the knowledge of the researcher, no study tested the effect of both the tax avoidance and firm's life cycle on the firm's cash holdings.

From previous analysis, the research questions can be presented as follows: what is the effect of tax avoidance on cash holdings in the Egyptian companies? What is the direction of this relationship? Do results vary with using different proxies for both of the tax avoidance and the cash holdings? What is the impact of firm's life cycle on the cash holdings? Do all life stages have the same impact on the level of cash holdings? Does the difference in the stage that the company goes through affect its cash level? What is the relationship between tax avoidance and cash holdings across firm's life cycle?

This research aims to test the impact of both the tax avoidance and firm's life cycle on the cash holdings in the non-financial Egyptian companies using the theoretical and practical analysis. Furthermore, this study investigates the relationship between the study variables using different proxies suggested by previous studies to confirm the obtained results.

To achieve the research objectives, a large sample of non-financial firms listed in the Egyptian stock market is used. All data have been collected for a period of 8 years, 2012 – 2019. The final sample consists of 126 listed companies with 711 total observations. In addition, two proxies are applied for tax avoidance as well as cash holdings in order to overlap any bias or error of a single measurement (Hanlon and Heitzman. 2010). For the firm's life cycle, Dickinson, (2011) suggested the cash flow approach which is adopted in all the five stages of this study.

The research drives its importance from focusing on the critical topics related to the accounting literature that are tax avoidance, firm's life cycle and cash holding. These variables have a great influence on the government as well as business organizations. Adding to this point, it further benefits in testing the reflection of different life cycle stages on the determining of the cash level for the company. The research investigates the association between the study variables by focusing on a large sample of nonfinancial Egyptian companies in order to discover the impact of tax avoidance and firm's life cycle on cash holdings in the Egyptian market. Finally, this research adds value to the academic filed by minimizing the research gap through conducting a study applied in Egyptian stock market as an emerging market.

The scope of this research does not include neither banks nor financial institutions listed on the Egyptian stock market. Limited amounts of measurements were applied for each variable: Dickinson's approach only is used as a proxy for the firms' life cycle. The effective tax rate and the book tax difference are employed as indicators for tax avoidance, and finally for cash holdings, two measurements are applied depending on the natural logarithm of cash ratio. Moreover, the study focused on the period starting from 2012 to 2019.

The remainder of the study is organized as follows: section 2 illustrates literature review and hypotheses development. Section 3 discusses the research design. Section 4 presents the empirical results and discussion. Section 5 extends the robustness test. Section 6 addresses the conclusion.

2- Literature review and hypotheses development

2-1 Tax avoidance

The distinguishing between tax avoidance and tax evasion is a vital issue. Tax evasion is an illegal behavior through nonpayment or unrecording revenues in the financial statements. While tax avoidance is, a legal behavior aims to organize business activities and transactions to reduce the company's tax obligations in manner of complying with the tax law (Chaffee, 2019). Lee et al. (2015) argues that the deterrence model of tax evasion states that individuals try to maximize their benefits from tax evasion in the light of three main conditions: the level of their risk aversion, the penalty size, and chance available of being caught. All these conditions make tax evasion a costly and risky alternative.

Chaffee (2019) suggests that the collaboration theory defines firm as a collaboration between the government from one side, and individuals who organize, operate, and own this firm from the other side. Thus, tax and tax avoidance form the formal relation between both government and the firm. As a result, companies apply legal tax avoidance for the interest of different parties like managers and their incentives, shareholders and their returns, and governments and their tax revenues.

According to agency theory, there are some factors such as complexity of transaction, absence of oversight, and embolden of management which play an important role in decisions of tax avoidance and management diversion (Desai and Dharmapala, 2006; Moore et al. 2017). Managers tend to apply complicated transactions and hide some resources from tax authority. This managerial behavior helps managers in using these resources for personal purposes and increasing information asymmetry between shareholders and their agents. Thus, corporate governance could mitigate this behavior (Wang et al. 2020). Investors use tax avoidance as an indicator to make investment decision. Management enhances tax saving and maximizes firm value (Widodo and Firmansyah. 2021).

Motivations of tax avoidance include both financial interest motivation and social responsibility motivation. For the financial interest motivation, tax avoidance aims to keep financial resources inside the firm to maximize shareholders'

wealth through minimizing tax expense. It is considered as a tool for value creation. Social responsibility motivation has two approaches for explaining the relation between tax avoidance and social responsibility. The first approach focusses on paying tax as a commitment (citizen obligation) and firms try to reduce this tax to enhance their welfare. The second approach views tax avoidance as a resource generator that consists with social responsibility by using these taxes in creating new jobs and protecting the environment. (Wang et al. 2020)

In summary, three perspectives are presented for tax avoidance. The first perspective deals with tax avoidance as a less costly alternative of external source financing to substitute debt. While the second perspective emphasizes on agency theory as an activity of tax avoidance and is considered a tool of transferring value from government to stockholders (Desai and Dharmapala, 2009). The third perspective is a precautionary perspective for tax avoidance when firms use their cash in investment in case of absence of other sources of financing or is excessively costly (Santana and Rezende, 2016; Chang et al. 2016).

Tax avoidance achieves the most important objective to the firm through improving firm's performance by reducing tax burden. This improvement in performance reflects several benefits for many stakeholders: First, managers and employees gain rewards and incentives. Second, creditors will be fulfilled their debt obligations. Third, increasing share values and dividends for stockholders. Fourth, enhancing economic growth for the society and government (Chaffee, 2019). Fifth, multinational firms can use tax havens to transfer their profit from high-tax countries to low-tax countries (Dyreng et al. 2014).

2-2 Cash holdings

Cash reserves represent a high percentage of firm's resources (Dittmar and Mahrt-Smith, 2007). Most of firms work in an inefficient market with high level of complexity and uncertainty. These circumstances lead firms to hold cash, because of the absence of or the insufficient level of cash expose. Companies tend to abandon profitable opportunities of future investment and avoid high cost of external funding due to this reason (Saddour, 2006).

There are three main theories that can explain firm cash holdings, which they are free cash flow theory, trade-off theory, and pecking order theory. First, free cash flow theory states that managers keep cash more than current demand to gain more power and control the firm's assets. Managers prefer internal funds to avoid the disclosure of important information about corporate's projects. Second, according to the trade-off theory, it hypothesizes that firms compare between cost and benefit of holding cash to reach the optimal cash balance. Lastly, the pecking order theory categorizes sources of finance as follows: Retained earnings, external debt like loans, and issuing new stocks. Managers prefer internal financial resources for firm investments. Firms with higher investment opportunities or projects hold greater cash level to finance those investments (Ferreira and Vilela, 2004; Batuman et al. 2022).

Another important point related to determining cash level is the cash's motives. Five important motives exist for cash holdings. First, the transaction motive which is linked with costs of liquidating fixed asset and turns them into cash (Bates et al. 2009). Second, tax motive considers the perspective of multinational companies that tend to hold large cash reserves in countries with lower tax rate and therefore higher repatriation costs (Mihai and Radu. 2015).

Third, the precautionary motive states that firms hold cash to protect themselves from uncertainties and adverse events and to provide internal financing funds for their future investments when the external capital markets is costly. Opler et al. (1999) argued that the high cost of external borrowing source from outside market promotes firms to hold more cash as a buffer. In addition, this motive hypothesizes that firm holds more cash when it has large investments opportunities.

In addition to the precautionary motive of holding cash, Jensen (1986) argues that entrenched managers would rather retain cash than increase payouts to shareholders when their firms have poor investment opportunities (Gao et al. 2013). Fourth, as argued by Jensen (1986), the agency motive determinates that managers prefer to keep more cash than required for the motives of transactions and precautionary to reduce the stockholders' payouts notably when firm works

in a poor environment for investments opportunities. Under the existence of agency problems, managers hold more cash (Bates et al. 2009). Fifth, speculation motive declares that companies like banks and financial institutions hold more cash for speculation in the financial markets. But the most non-financial firms did not keep cash for this purpose (Mihai and Radu, 2015).

Cash holdings has numerous advantages, it mitigates the probability of financial problems when facing unpredicted circumstances, aids in achieving investment opportunities efficiently, reduces cost of debt by providing an internal financing source instead of being forced to use external financing sources (Ferreira and Vilela, 2004, Ozkan and Ozkan, 2004). In addition, it helps firms to avoid the transaction costs related to liquidating fixed assets or increasing funds and enables firms to finance its investment with reasonable costs instead of other expensive sources. Information asymmetry between shareholders and management increases costs of external financing sources (Opler et al. 2001; Ozkan and Ozkan, 2004).

Furthermore, companies hold cash to fulfill day-to-day operational activities and pay their current obligations and commitments. Moreover, it enables firms to gain trade discounts and catch profitable investments (Mihai and Radu. 2015). Adding to this point, cash is considered as a continuous safety buffer which allows firm to seize its growth opportunities (Saddour, 2006). Cash holding mitigates the probability of financial distress in the future (Chen et al. 2020), and allows company to gain a competitive advantage by selecting suitable projects (Amahalu and Bwatrice, 2017)

Contrariwise, cash holding's opportunity cost is high, because of its low return comparing with other investments opportunities. Adding to this, high level of cash holding increases managerial discretionary. Managers tend to hold more cash for personal purposes and waste profitable opportunities. As a result, the conflict increases between shareholders and management, which increases agency problems (Dittmar and Mahrt-Smith, 2007, Cao and Chen, 2014).

Overall, the optimal level of cash is a unique decision for each company, whereas each firm determines its cash level according to its current and future demands. The high or low level of cash does not matter, but the cash level should be matched in the light of demand and risk level (Chen et al. 2020). Kim et al. (1998) argue that cost of external borrowing, future volatility of cash flow, and earning of future opportunities increase the optimal level of cash. In addition, Bates et al. (2018) argues that competition, risk of credit market, firm's diversification policy affect the cash level.

2-3 The relation between tax avoidance and cash holdings

Two directions can interpret the relation between tax and cash holdings. The first direction suggests a positive relation between the two variables when tax saving are used as substitute for cash. The second direction hypothesizes a negative relation when tax saving diverts cash by limiting the flow of specific information (Dhaliwal et al., 2011). Previous debate concerning tax avoidance and cash holdings are reflected on the empirical studies across countries.

Some studies (e.g., Wang, 2015; Chang et al., 2016; Khuong, 2019) reached a significant positive relation between tax avoidance and cash holdings. Wang (2015) tested the impact of tax avoidance on cash holdings using a sample consisted of 9126 observations for Chinese companies over 1999– 2010. The results indicate that tax avoidance significantly positively associated with cash holdings, and this relation increases with market competition.

In USA, Chang et al. (2016) investigated the relationship between tax avoidance and cash holding from the perspective of corporate social responsibility using a sample of 6971 observations of American firms from 1991 to 2008. The results reported a positive impact of tax avoidance on cash holdings, and corporate social responsibility reduced the positive relation between tax avoidance and cash holdings. In Vietnam, Khuong et al. (2019) found a positive association between the two variables using a sample of 125 non-financial companies listed at Vietnam's stock market from 2010 to 2016.

On the other side, some authors (e.g., Foley et al. 2007; Dhaliwal et al. 2011; Di and Hanke, 2013; Faulkender et al. 2019) found that tax avoidance has a neg-

ative impact on cash holding. For example, Foley et al. (2007) analyzed the association between tax avoidance and cash holding using a sample of American firms from 1982 to 2004. Their results showed a negative association between the two variables and the tax costs associated with repatriations contributed to the magnitude of cash holdings.

Moreover, Dhaliwal et al., (2011) used a sample of non-financial American companies for the period 1985– 2008 to explain the effect of tax avoidance on cash holding. They found a significant negative relation between them. Di and Hanke (2013) also found a negative relation between tax avoidance and cash holding, particularly before the reduction in double taxation.

Jacob et al. (2014) investigated the relation between tax uncertainty, cash holdings and investments depending on 55214 observations of non-financial American companies for the period 1978 – 2012. The findings indicated that companies with high tax uncertainties hold a high level of cash. In addition, Faulkender et al. (2019) concluded that tax avoidance has a negative impact on cash holdings on cross-countries for the period 1998– 2008.

A study conducted by Kurniawon and Nuryanah (2017) did not find evidence support the relationship between tax avoidance and the level of cash holdings in public companies in Indonesia using a sample of 46 firms for the period 2009–2016 with a total number of observations of 368.

The researcher sees that when the firm tends to follow tax avoidance practices, it influences the income statement through decreasing tax expense and increasing net income and enhancing profitability. As a result, there is cash available for day-to day operations, so companies prefer to decrease cash reserves. Therefore, the first main hypothesis can be derived as follows:

H₁: Tax avoidance has a significant negative impact on cash holdings.

2-4 The relation between firm's life cycle and cash holdings

Measurement of firm's life cycle has no standard in the accounting literature. For example, ratio of retained earnings to total assets or retained earnings to total equity are taken as indicators for firm's life cycle (DeAngelo et al. 2006). While

Dittmar and Duchin (2010) used firm's age to measure life cycle. Because of the instability of business environment over different phases of firm's life, Dickinson (2011) suggested a model using signs of cash flow statement to capture all operating, financing, and investing activities as measurement for firm's life cycle. Stages of firm's life cycle highly correlates with actual and critical decisions and returns of any organization such as financial leverage, cash holdings and tax planning (Faff et al. 2016; Habib and Hasan, 2019).

To understand business growth, the stages of growth models or life cycle models view the firm as an accumulation of development stages over time (Stam and Verbeeten, 2017). The firm life cycle is dynamic. The theory of dynamic resource-based view states that the firm's resource enhances its competitive advantage differently over time. Firms pass by different stages from starting phase to the end. Habib and Hasan (2019) argue that firm life cycle strongly correlates with actual outcomes and decisions like cash holdings and tax planning.

Some studies (e.g., Hauser and Thornton Jr, 2016; Lin et al. 2022) focused on one stage only when testing the impact of firm's life cycle on cash holding. Moreover, Saddour, (2006) focused on two stages. Others (e.g., Alzoubi, 2019) depended on four stages. Faff et al. (2016) and Rehman et al. (2021) focused on the five stages.

In the United States, Drobetz et al. (2015) tested the relation using non-financial American firms for the period 1989–2013 with 77377 total observations. The results reported that firms in the starting stages and post mature hold high level of cash. When firms turned to mature stage, the cash level decreased. In addition, Hauser and Thornton Jr (2016) focused on the mature stage only of life cycle to test the relation between this stage and cash holdings using a sample of 58516 observations for American companies from 1982 to 2010. The findings indicated that young companies with high investments opportunities hold more cash, while mature or old companies with low opportunities decrease their cash balance.

In the same context, Faff et al. (2016) tested the relation between cash and life cycle using 12,000 American non-financial firms for long time from 1973 to

2014. They found increasing cash level in the introduction and growth, and a decrease in the remaining three stages. Consequently, Lin et al. (2022) conducted a study to test the relationship between firm's life cycle and cash holdings from the perspective of dual class ownership structure. Using 6077 non-financial American companies during 1994– 2002. The authors focused on the mature stage, which is only measured by firm's age. The results showed that cash level of dual class firms was less than single-class firms, and those firms decrease their cash level when moving to mature level comparing with other firms.

On the other hand, Saddour (2006) analyzed the determinants of the cash holdings for a sample of French firms over the period 1998– 2002. He focused on the growth and mature stages of life cycle. His findings showed that companies in the growth stage kept high levels of cash compared to companies in the mature stages. Moreover, growth firms had a negative relation between their cash levels and firm size, liquidity ratio and financial leverage, while there was a positive relation between cash holdings and size, investments, and dividend payout in mature companies. In addition, the growth firms exhibit a stronger positive association between cash holdings and firm value compared with mature firms.

In Chinese companies, Rehman et al. (2021), found higher cash level in the growth stages and lower cash level in the decline stages based on sample of Chinese firms from 2002 to 2018, with total observations 368391. In the Middle Eastern countries, Alzoubi (2019) conducted a study on a sample of 141 firms listed at Amman stock market from 2000 to 2016 to test the effect of firm's life stage on cash holdings. He focused on four stages of life cycle. The results indicated the existence of a negative relationship between both the mature and the decline stages and cash holdings, and no relation between cash holdings and both the introduction and growth stages.

While Alqahtani et al. (2022) tested the relation between busy directors and cash holdings from the perspective of firm's life cycle across 6 countries (Saudi Arabia, Oman, United Arab Emirates, Qatar, Bahrain, and Kuwait) using a sample of 1626 non-financial, publicly listed Gulf Cooperation Council (GCC)

countries over the period 2006–2016. The results showed that firms with high percentage of busy directors increased their cash levels. Distinctively, those directors increased cash level in the introduction, maturity and shakeout stages and reduced cash holdings in the decline stage. Chireka (2020) conducted a study in South Africa using a sample of 112 firms listed at Johannesburg stock market from 2011 to 2018. The results displayed no relation between the cash holdings and life cycle stages.

In summary, the results of previous studies are highly varied. For example, some studies (Saddour, 2006, and Faff et al. 2016) found a positive relationship between the introduction, the growth stages and cash holdings, and a negative relation in both of decline and shake-out stages. While Alqahtani et al. (2022) noticed an increase in cash level with the introduction, maturity and shakeout stages and a reduction in cash holdings in the decline stage. On the contrary, Al-zoubi, 2019 reached a negative relation between mature and decline stages with cash level, and no relation between cash holdings and both of introduction and growth stages. Moreover, Chireka, (2020) reported that there is no relation between the cash holdings and life cycle stages.

By analyzing results of previous studies, no clear direction is obtained for the relation between firm's life cycle as a whole and cash holdings. Thus, the main second hypothesis can be derived without determining any direction for the relationship between the two variables as follows:

H₂: Firm's life cycle has a significant association with cash holdings.

The researcher separates each stage in order to predict the association between cash level and each stage of firm's life, as follows:

2-4-1 The introduction phase

The introduction stage is affected by the size of the market, new number of entrants, and number of competitors for the same product (Gort and Klepper, 1982). It is a well-known fact that at the starting phase, firms have a few investments in assets, and this reflects lower profit and negative cash flow from operation (Habib and Hasan, 2019). As result, firms tend to consume all available sources of financing, especially internal funds such as cash to avoid the costly

fund of external source in order to enter the new market. They pay cash in several obligations like, product design and quality. Thus, it is expected to find a negative association between introduction stage and cash holdings

H_{2-a}: Introduction stage has a significant negative association with cash holdings.

2-4-2 The growth Phase

Firms in the growth phase continue in investments in their tangibles assets as well as intangible assets and that leads to positively improve their revenues and enhance their profits (Habib and Hasan, 2019). Consequently, firms do not need extra liquid assets, but they prefer investing in new investments instead of holding more cash.

H_{2-b}: Growth stage has a significant positive association with cash holdings.

2-4-3 The mature phase

This phase is considered as the final category of the previous phase. Moreover, no new entrants to the market and the market structure is expected to change sooner (Gort and Klepper, 1982). It is a stable phase for the company. At this stage, the company owns the higher amount of its investments and profitability. Firms in this phase have multiple financing sources and not suffering from cash flow volatility (Irawan and Afif, 2020).

H_{2-c}: Mature stage has a significant positive association with cash holdings.

2-4-4 The shake-out phase

This stage is called early decline. At this phase companies suffer from shortage in cash flows and investment opportunities in innovation. Moreover, firms face liquidation problems resulting from the decrease in profitability. As a result, firms tend to remove unprofitable products from the market and increase dividends paid to the stockholders to improve their financial position (Drake, 2012; Abbas et al., 2018).

H_{2-d}: Shake-out stage has a significant negative association with cash holdings.

2-4-5 The decline phase

The firm remains in this stage until important changes in production or technology launch a new product or entrepreneur in the market starting a new life cycle (Gort and Klepper, 1982). Firms try to reinvest in research and development activities to keep their market share (Habib and Hasan, 2019). Firms tend to keep more cash to face unstable cash flows, as well as the increasing demand for internal financing sources (Irawan and Afif, 2020).

H_{2-e}: Decline stage has a significant negative association with cash holdings.

2-5 The relationship between tax avoidance and cash holding across the firm's life cycle

Beyond these direct relationships, it may also be important to know how tax avoidance affects cash holdings across the different stages of the firm's life cycle. Following (Dickinson, 2011; Alqahtani et al. 2022), the researcher will test the association between tax avoidance and cash holding in each stage separately. The relationship between the two variables is expected to still negative across all stages. The main third hypothesis will be as follows:

H₃: Ceteris paribus, tax avoidance across life cycle stages has a negative impact on the cash holdings.

This hypothesis can be divided into the following sub-hypotheses

- **H_{3-a}: Ceteris paribus, tax avoidance across the introduction stage has a negative impact on the cash holdings.**
- **H_{3-b}: Ceteris paribus, tax avoidance across the growth stage has a negative impact on the cash holdings.**
- **H_{3-c}: Ceteris paribus, tax avoidance across the mature stage has a negative impact on the cash holdings.**

- **H_{3-d}: Ceteris paribus, tax avoidance across the shake-out stage has a negative impact on the cash holdings.**
- **H_{3-e}: Ceteris paribus, tax avoidance across the decline stage has a negative impact on the cash holdings.**

3- Research Design

3-1 Sample and data collection

The research sample comprises of all non-financial firms listed on The Egyptian stock market. All data have been collected for the period of 8 years from 2012 to 2019. The data are collected from the financial statements available on the website of Mubasher Misr and the websites of the listed firms. The following observations are excluded from the sample. First, all banks and financial institutions are excluded from the sample because of their different rules and regulations in the financial statements (Kolias and Koimanakos, 2022; Chen et al. 2020). Second, all firm-years with a negative pretax income because the negative effective tax rates are difficult to interpret (Dyreng et al. 2008; Brune et al. 2019; Benkvaïem et al. 2022). Third, all observations of firms that have missing values to compute the variables such as firms without cash value or tax expense. Fourth, Utility firms such as Gas Misr are eliminated, because they are subjected to special regulations for tax according to Egyptian tax authority. Fifth, the observations of current effective tax rate less than or over one is eliminated to avoid tax refunds (Ribeiro et al. 2015; Brune et al. 2019). The final sample consists of 126 non-financial companies falls under twelve segments of different industries with a total of 711 observations. The summary of the final research sample selection is presented in table (1):

Table 1: Research sample

Industries	No. Firms	No. Observations	Percentage
Basic resource	6	27	3.8%
Buildings and materials	18	105	14.7%
Chemicals	9	56	7.9%
Energy and support	1	8	1.1%
Food and beverage	24	123	17.3%
Health care and pharmaceuticals	13	73	10.2%
Industrial goods	13	76	10.7%
IT, Media, Communications	2	16	2.2%
Personal and household	7	42	6%
Real estates	19	121	17%
Trade and distributors	5	36	5.1%
Travel and Leisure	9	28	4%
Total	126	711	100%

3-2 Variables measurements

3-2-1 The independent variables

3-2-1-1 Tax avoidance measurement

Previous studies depended on different financial indicators for measuring tax avoidance. These indicators are grouped in two main categories: First, the effective tax rate (ETR) which is the percentage of tax expense over income before tax (Kolias and Koumanakos, 2022). Second, the book tax difference (BTD) which is related to measuring the gap between income before tax and estimated taxable income. Both categories have different advantages and disadvantages. In order to capture the advantages of the two types, this study applies the two indicators.

First measurement for tax avoidance is the current effective tax rate (ETR). This measurement provides information about the tax system through collecting a statistical brief for accumulated impact of different tax incentives and changes in tax rates (Richardson and Lanis, 2007). It is calculated by the ratio of total tax expense minus deferred tax expense or current tax expense divided by pre-income tax (Khuong et al. 2019; li et al. 2020; Han et al. 2021). Deferred tax is related to temporary difference that are included in the reported income (Laux, 2013). The effective tax rate is an inverse indicator, meaning that higher value of effective tax rate reflects lower level of tax avoidance. To make the interpretation

easier, ETR is multiplied by negative one, so greater values of ETR reflects higher tax avoidance (Chen et al. 2016; Jin et al. 2022).

Second measurement for tax avoidance is the book tax difference. Following the literature (Gallemore and Labro, 2019; Khuong et al. 2019; Wen et al. 2020), BTD is calculated as the difference between income before tax, and taxable income then, scaled by ending balance of total assets. Taxable income is calculated as current tax expenses divided by tax rate. The Egyptian companies are subject to tax rate of 22.5% according to the article no. 49 from act 91 for 2005 profit for legal persons¹ (EGT, 2018). $BTD = [\text{pre income tax} - (\text{current tax}) / .225] / \text{total assets}$. The higher value of BTD indicates higher tax avoidance.

3-2-1-2 Firm life cycle

This study uses cash flow as a proxy for firm life cycle. Following the model suggested by Dickinson (2011) for measuring firm's life cycle with cash flow statement approach, this model has two main benefits: First, it contains more information regarding firm activities compared with other models that depend on one measurement for life cycle such as firm's age and retained earnings. Second, it discloses the actual position of different phases of firm's life (Shahzad et al. 2022). It is a robust tool that has applications in analysis, and it was adopted in previous studies (e.g., Abbas et al. 2018; Mangoting and Onggarra, 2019; Irawan and Afif, 2020).

No stage of life cycle is excluded. Introduction phase is measured as a dummy variable equals one if both of cash flow from operation and financing activities are negative, and cash flow from investing activity is positive, and zero otherwise. Growth phase is measured as a dummy variable equals one if both of cash flow from operation and investing activities are positive, and cash flow from financing activity is negative, and zero otherwise. Mature phase is measured as a dummy variable equals one if both of cash flow from financing and investing ac-

¹ The article no. 49 from this act states that tax on profits of legal persons shall be subjected to tax at rate of 22.5% of the net annual profits. With the exception of the rate mentions the profits of central bank, Suez Canal authority, general petroleum corporation, oil, gas exploration, and production companies are subject to another tax, so these companies are excluded from the research sample.

tivities are negative, and cash flow from operating activity is positive, and zero otherwise. Decline phase is measured as a dummy variable equals one if cash flow from operating activity is negative, and cash flow from financing activity is positive, while cash flow from investing is zero or positive or negative, and zero otherwise. Finally, Shake-out phase is measured as a dummy variable equals one if none of the previous cases can be applied to the life cycle, and zero otherwise.

3-2-2 The dependent variable

3-2-2-1 Cash holdings

Following literature (e.g., Gao et al. 2013; Chen et al. 2020; So and Zhang, 2022) the natural logarithm of cash and cash equivalents divided by total assets is used as a proxy for cash holdings. Using the natural logarithm of the measurement ratio helps in correcting the skewness of the variables and mitigate the effect of the outlier (Lau and Block, 2012; Chen et al., 2020). For the Robustness test, an alternative measure for cash holdings is used which is the natural logarithm of cash and cash equivalents scaled by total assets minus cash and cash equivalents (Dhaliwal et al. 2011; Kurniawon and Nuryanah, 2017; Benkvaem et al. 2022; Cai et al. 2022).

3-2-3 The control Variables

This paper focuses on eight control variables that are considered as the main determinants of cash holdings. The first variable is the net working capital ratio as a proxy for Liquidity (NWR), which is measured by the difference between current assets and current liabilities minus cash and cash equivalents scaled by total assets (Ozkan and Ozkan, 2004). Companies with higher level of liquidity reflected higher level of cash. Positive relationship is envisioned between liquidity ratio and cash holdings.

The second variable is, the Tangibility (Tang.) which is measured by the fixed assets of the firm scaled by ending total assets. Companies use cash in investing in fixed assets. It is predicted to observe a negative relationship between fixed assets ratio and cash holdings (Khounq et al. 2019). Third variable is ratio of operational cash flow (CFO), which is measured by dividing cash flow from operating activity on total assets (Gao et al. 2013; Khounq et al. 2019). Increasing operational

cash flow reflects sufficient levels of cash, so it is more likely to find a positive relationship between operational cash flow ratio and cash holdings (Kim et al. 1999; Bates et al. 2009; Bates et al. 2019; Batuman et al. 2022).

While the fourth variable is profitability, which can be measured, by return on assets (ROA) calculated as income before tax divided by ending total assets (Ribeiro et al. 2015; Shams et al. 2022). Like the relation of cash flow from operation, more profitable companies hold more level of cash for investment decisions. In addition, the fifth variable is dividends which is measured as a dummy variable equals one if the company has paid cash dividend to the shareholders and 0 otherwise. It predicts that when company paid cash dividends, its cash balance should be decreased. Therefore, a negative relation between cash dividend and cash holdings is expected.

The sixth variable is firm age (Age) which is measured by number of years that company is operating in the market. It is predicted that old firm has more cash holdings. Financial leverage (Lev) is the seventh variable and is calculated by the ratio of total liabilities divided by shareholders' equity (Alexander, 2019; Widodo and Firmansyah, 2021). Companies with high level of debt comparing with equity prefer to borrow from external source of cash. Some researchers (e.g., Ozkan and Ozkan, 2004; Guney et al. 2007; Alexander, 2019) supported the negative relation that financial leverage can act as a substitute of cash. It is foreseen to find a negative relationship between financial leverage and cash holdings. Finally, the eighth variable is the logarithm of total assets as a proxy for Firm size. It is predicated to have a positive relation between firm size and cash holdings. Larger firms keep more available cash for different and complicated tasks related to their transactions.

For controlling the fixed effect of year and industry, a dummy variable is used for both year and industry categories. The fixed effect of years is excluded from the regression model because of the existence of multicollinearity problem. The fixed effect of industry only is entering to the main regression model.

3-3 Regression models

3-3-1 Model (1): The relationship between tax avoidance and cash holdings

The researcher follows the previous literature by using ordinary least square (OLS) regression to estimate the relation between tax avoidance and firm life cycle from one side and cash holdings from other side. The following is the first model used to test the impact of tax avoidance on cash holdings:

$$\text{Cash1}_{it} = \alpha_0 + \alpha_1 \text{Tax}_{it} + \alpha_2 \text{NWR}_{it} + \alpha_3 \text{Tang}_{it} + \alpha_4 \text{CFO}_{it} + \alpha_5 \text{ROA}_{it} + \alpha_6 \text{DIVI}_{it} + \alpha_7 \text{Age}_{it} + \alpha_8 \text{LEV}_{it} + \alpha_9 \text{FS}_{it} + \alpha_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (1)

$$\text{Cash1}_{it} = \alpha_0 + \alpha_1 \text{ETR}_{it} + \alpha_2 \text{NWR}_{it} + \alpha_3 \text{Tang}_{it} + \alpha_4 \text{CFO}_{it} + \alpha_5 \text{ROA}_{it} + \alpha_6 \text{DIVI}_{it} + \alpha_7 \text{Age}_{it} + \alpha_8 \text{LEV}_{it} + \alpha_9 \text{FS}_{it} + \alpha_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (1-1)

$$\text{Cash1}_{it} = \alpha_0 + \alpha_1 \text{BTD}_{it} + \alpha_2 \text{NWR}_{it} + \alpha_3 \text{Tang}_{it} + \alpha_4 \text{CFO}_{it} + \alpha_5 \text{ROA}_{it} + \alpha_6 \text{DIVI}_{it} + \alpha_7 \text{Age}_{it} + \alpha_8 \text{LEV}_{it} + \alpha_9 \text{FS}_{it} + \alpha_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (1-2)

Whereas:

α_0 : Constant

$\alpha_1 - \alpha_{10}$: are coefficient of the regression variables.

ε = error term

it= firm *i*, year *t*

Cash₁= cash holdings= Ln (cash and cash equivalents /total assets).

Tax= tax avoidance measured by ETR and BTD. ETR= (total tax expense – deferred tax expense)/ pre-income tax. BTD = [pre income tax – (current tax)/.225]/total assets.

NWR= net working capital ratio= (current assets – current liabilities – cash and cash equivalents)/ total assets.

Tang. = tangibility is the fixed assets of the firm /ending total assets.

CFO= cash flow ratio= cash flow from operating activity/ total assets

ROA= return on assets = income before tax ÷ ending total assets.

DIVI= dividend= is a dummy variable equals one if the company has paid cash dividend to the shareholders and 0 otherwise.

Age= firm age = number of years that company is operating in the market.

Lev= Financial leverage = (Lev) total liabilities ÷ shareholders' equity

FS= firm size= logarithm of total assets.

IND²= industry, is a dummy variable for each category of industry as a fixed effect.

3-3-2 Model (2): The impact of tax avoidance and firm's life cycle on cash holdings

The second regression model is the main model that includes both the tax avoidance and the firm's life cycle. It is derived as follows:

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{Tax}_{it} + \beta_2 \Sigma \text{FLC}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2)

To test the relationship between tax avoidance using the two measurements and cash holding from one side and the association between different phase of firm's life cycle and cash holdings from other side, the following sub-models are used.

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Intro}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-1)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Grow}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-2)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Mature}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-3)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Shake}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-4)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Decl.}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-5)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Intro}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-6)

² The fixed effect of industry only is included in the regression model, while the fixed effect of the year is excluded because of the existence of multicollinearity problem.

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Grow}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-7)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Mature}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-8)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Shake}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-9)

$$\text{Cash1}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Decl.}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (2-10)

Whereas:

β_0 : Constant

β_1 : β_{11} . are coefficient of the regression variables.

ε = error term

FLC= Firm's life cycle measured by 5 dummy variables presented 5 phases (Intro, Gro, Mature, Shake, and Dec.) according to the relationship among cash flow from operation (CFO), cash flow from investment (CFI), and cash flow from financing (CFF) respectively. Intro: take 1 if (-, -, +) and 0 otherwise. Gro: take 1 if (+, -, +) and 0 otherwise. Mature, (+, -, -) and 0 otherwise. Shake: take 1 if existence of the remaining case from the other four phases and 0 otherwise. Dec: take 1 if [-, +, (+, or 0)] and 0 otherwise.

The measurements of other variables as mentioned before.

3-3-3 Model (3): The impact of tax avoidance on cash holdings across firm's life cycle

The third regression model is used to test the impact of the tax avoidance on the cash holdings across the firm's life cycle. It is derived as follows:

$$\text{Cash1}_{it} = \gamma_0 + \gamma_1 \text{Tax}_{it} + \gamma_2 \text{NWR}_{it} + \gamma_3 \text{Tang}_{it} + \gamma_4 \text{CFO}_{it} + \gamma_5 \text{ROA}_{it} + \gamma_6 \text{DIVI}_{it} + \gamma_7 \text{Age}_{it} + \gamma_8 \text{LEV}_{it} + \gamma_9 \text{FS}_{it} + \gamma_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (3)

The main sample is divided into five sub-samples that covered all firm's life cycle. Then this main model is divided into sub-models according to the two proxies of tax avoidance. Each sub-model is used to test the sub-samples covering the five stages of firm's life cycle.

$$\text{Cash1}_{it} = \gamma_0 + \gamma_1 \text{ETR}_{it} + \gamma_2 \text{NWR}_{it} + \gamma_3 \text{Tang}_{it} + \gamma_4 \text{CFO}_{it} + \gamma_5 \text{ROA}_{it} + \gamma_6 \text{DIVI}_{it} + \gamma_7 \text{Age}_{it} + \gamma_8 \text{LEV}_{it} + \gamma_9 \text{FS}_{it} + \gamma_{10} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (3-1 a: e)

$$\text{Cash1}_{it} = \gamma_0 + \gamma_1 \text{BTD}_{it} + \gamma_2 \text{NWR}_{it} + \gamma_3 \text{Tang}_{it} + \gamma_4 \text{CFO}_{it} + \gamma_5 \text{ROA}_{it} + \gamma_6 \text{DIVI}_{it} + \gamma_7 \text{Age}_{it} + \gamma_8 \text{LEV}_{it} + \gamma_9 \text{FS}_{it} + \gamma_{10} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (3-2 a: e)

3-4 Statistical tests

Pearson Correlation is used as a parametric test to measure correlation relation between research variables using SPSS version 23 to proceed required statistical analysis for actual data collected from financial reports of research samples companies to get statistical results that support or reject the research hypotheses.

4-Empirical results and discussion

4-1 Descriptive statistical results

Table (2) shows descriptive statistics for continuous variables related to regression model of the study. The data include mean values for all sample observations. As shown from the results ETR's mean equals -0.213 and both the minimum and maximum are negative values because of multiplying ETR by negative one. Moreover, these values vary from zero to one according to previous restriction of research sample. The standard deviation of ETR = 0.102.

In addition, BTD's mean, minimum and maximum are 0.009, -0.156, and 0.429 respectively. Its standard deviation= .06 which is greater than its mean value, that reflects dispersion of values for a large sample of different size companies which is expected of this variable. According to the percentage of cash level holed by Egyptian companies, it is 11.9% of total assets and 17.2% of the net assets. The minimum and the maximum of cash ratio are (0.004% and 72% respectively). The standard deviation for both the natural logarithm for cash ratio and cash net ratios are 1.7 and 1.8 respectively.

Table 2: Descriptive Statistics for continuous variables

Variables	N	Minimum	Maximum	Mean	Std. Deviation
ETR	711	-0.946675	-000024542	-.21315700	0.10237133
BTD	711	-0.156995	0.42976698	0.00988130	0.06120805044
NWR	711	-1.32481190	0.952914856	0.1332075384	0.2314917723
Tangibility	711	0.000119	0.821499827	0.185513923	0.173513722
CFO	711	-0.683687	0.687233682	0.0737359922	0.132219214
ROA	711	0.000262980	0.549616203	0.11627448722	0.0923078023
Age	711	1.0	113	33.124	19.3911
Leverage	711	0.01571398	28.909951	1.498868891	2.617588028
Firm size	711	6.724521	10.8148718	8.8645769	0.641657583
Ln (Cash/TA)	711	-9.969533	-0.326295608	-3.02470045	1.7619729601
Ln (Cash/net Ass.)	711	-9.969486	0.9523714592	-2.88836955321	1.8873594449
Cash/TA	711	0.0000468044	0.72159184	0.119664398	0.012968959
Cash/net assets	711	0.0000468066	2.5918488	0.1721349870	0.262950646

Table (2) shows values for the control variables. For example, liquidity ratio recorded 23% as a mean value. The ratio of tangibility was 17% that reflect preference of investing in short term assets compared with long-term assets. Cash flow ratio and return on assets are approximately 7% and 11% respectively. While financial leverage varied between 0.015 and 28.9 with mean equals 1.4, that indicating increasing in total liabilities as an external source of financing comparing with shareholder equity as an internal source of financing.

For the age variable, the youngest age was one year and the oldest one was 113 years with average value equals 33 years. The firm size recoded mean value with 8.8. According to cash holdings as a dependent variable, the mean of the natural logarithm for ratio of cash to total assets was 3 and 2.8 for the ratio of cash over net assets.

Table 3: Distributions Statistics for dummy variables

Variables	Frequency of 0	Frequency of 1	Total Frequency	Percent of 0	Percent of 1	Total percent
Introduction	645	66	711	90.7%	9.3%	100%
Growth	626	85	711	88.1%	11.9%	100%
Mature	389	322	711	54.7%	45.3%	100%
Shake-out	538	173	711	75.7%	24.3%	100%
Decline	646	65	711	90.9%	9.1%	100%
Total (Life cycle)		711			100%	
DIVI	160	551	711	22.5%	77.5%	100%

Table (3) presents frequencies for the dummy variables, firm life cycle with five main stages as the second independent variable and dividend as a control variable. The research sample includes 66 (9.3%) companies in the introduction stage, 85 (11.9%) companies in the growth stage, 322 (45.3%) companies in the mature stage, 173 (24.3%) companies in the shake-out stage and finally, 65 (9.1%) companies in the decline stage. The majority (45.3%) of Egyptian companies lies on mature stage that reflect the market's stability of Egyptian market. In general, most of the Egyptian companies are in the mature and shake-out stages. For dividends variable, 551(77.5%) companies paid cash dividends comparing with 160 (22.5%) companies did not pay dividends.

4-2 Pearson correlation results

Table (4) displays the correlation between all variables, It is noticed that the correlation between the two measurements of tax avoidance indicators (ETR and BTD) equal 0.668 which is significant at the 1% level, demonstrating a positive and high correlation with each other, showing that those two measurements are similar in their ability to include important and consistent information. In addition, the two measurements of the dependent variable cash 1 and cash 2 have a correlation with most of the independent and control variables, which indicates the importance of those variables selected in the regression model.

Table 4: Pearson correlation coefficients matrix

	ETR	BTD	Intro	Growth	Mature	Shake	Decline	NWR	Tang.	CFO	ROA	Div1	Age	Lev.	F.S	Cash1	C2
ETR (P_Correl)	1																
Sig. (2-tailed)																	
BTD (P_Correl)	.668 ^{***}	1															
Sig. (2-tailed)	.000																
Intro (P_Correl)	-.015	-.033	1														
Sig. (2-tailed)	.693	.379															
Growth (P_Correl)	-.014	-.034	.118 ⁻⁻⁻	1													
Sig. (2-tailed)	.713	.359	.002														
Mature (P_Correl)	-.009	.017	-.291 ⁻⁻⁻	-.335 ⁻⁻⁻	1												
Sig. (2-tailed)	.805	.648	.000	.000													
Shake (P_Correl)	-.005	-.020	-.181 ⁻⁻⁻	-.209 ⁻⁻⁻	-.516 ⁻⁻⁻	1											
Sig. (2-tailed)	.898	.590	.000	.000	.000												
Decline (P_Correl)	-.023	.073 ⁻⁻⁻	-.101 ⁻⁻⁻	-.117 ⁻⁻⁻	-.289 ⁻⁻⁻	-.180 ⁻⁻⁻	1										
Sig. (2-tailed)	.547	.053	.007	.002	.000	.000											
NWR (P_Correl)	-.039	-.097 ⁻⁻⁻	-.050	-.113 ⁻⁻⁻	-.085 ⁻⁻⁻	.038	.167 ⁻⁻⁻	1									
Sig. (2-tailed)	.298	.010	.182	.002	.023	.305	.003										
Tang. (P_Correl)	.083 ⁻⁻⁻	.019	-.064 ⁻⁻⁻	.117 ⁻⁻⁻	.251 ⁻⁻⁻	-.188 ⁻⁻⁻	-.221 ⁻⁻⁻	-.388 ⁻⁻⁻	1								
Sig. (2-tailed)	.027	.618	.086	.002	.000	.000	.000	.000									
CFO (P_Correl)	-.008	.062	-.356 ⁻⁻⁻	.010	.422 ⁻⁻⁻	-.004	-.375 ⁻⁻⁻	-.242 ⁻⁻⁻	.230 ⁻⁻⁻	1							
Sig. (2-tailed)	.828	.101	.000	.797	.000	.911	.000	.000	.000								
ROA (P_Correl)	.090 ⁻⁻⁻	-.261 ⁻⁻⁻	-.114 ⁻⁻⁻	-.108 ⁻⁻⁻	-.162 ⁻⁻⁻	.016	-.068 ⁻⁻⁻	-.035	.100 ⁻⁻⁻	.443 ⁻⁻⁻	1						
Sig. (2-tailed)	.018	.000	.002	.004	.000	.661	.068	.355	.008	.000							
Div1 (P_Correl)	-.070 ⁻⁻⁻	-.044	-.025	-.071 ⁻⁻⁻	.193 ⁻⁻⁻	.055	-.145 ⁻⁻⁻	-.105 ⁻⁻⁻	.184 ⁻⁻⁻	.282 ⁻⁻⁻	-.184 ⁻⁻⁻	1					
Sig. (2-tailed)	.061	.244	.507	.057	.000	.139	.000	.144 ^{***}	.005	.000	.000						
Age (P_Correl)	.071 ⁻⁻⁻	.004	-.027	.043	-.004	.020	-.043	-.025	.023	.013	.051	.154 ⁻⁻⁻	1				
Sig. (2-tailed)	.059	.910	.475	.256	.905	.600	.257	.506	.532	.735	.173	.000					
Lev. (P_Correl)	-.080 ⁻⁻⁻	-.048	.058	-.025	-.070 ⁻⁻⁻	.050	.016	-.178 ⁻⁻⁻	-.137 ⁻⁻⁻	-.025	-.197 ⁻⁻⁻	-.138 ⁻⁻⁻	-.076 ⁻⁻⁻	1			
Sig. (2-tailed)	.033	.198	.125	.502	.063	.179	.674	.000	.506	.000	.000	.044					
Fsize (P_Correl)	.110 ⁻⁻⁻	-.137 ⁻⁻⁻	-.034	.036	.024	-.027	-.007	-.333 ⁻⁻⁻	.029	.066 ⁻⁻⁻	-.157 ⁻⁻⁻	.091 ⁻⁻⁻	-.194 ⁻⁻⁻	.046	1		
Sig. (2-tailed)	.003	.000	.362	.345	.525	.478	.851	.000	.443	.079	.000	.015	.000	.219			
Cash1 (P_Correl)	-.082 ⁻⁻⁻	.011	-.166 ⁻⁻⁻	-.039	.127 ⁻⁻⁻	.070 ⁻⁻⁻	-.111 ⁻⁻⁻	-.214 ⁻⁻⁻	.018	.297 ⁻⁻⁻	-.353 ⁻⁻⁻	-.261 ⁻⁻⁻	.081 ⁻⁻⁻	-.100 ⁻⁻⁻	-.130 ⁻⁻⁻	1	
Sig. (2-tailed)	.030	.769	.000	.294	.001	.063	.003	.000	.531	.000	.000	.000	.031	.008	.001		
Cash2 (P_Correl)	-.080 ⁻⁻⁻	.020	-.171 ⁻⁻⁻	-.039	.124 ⁻⁻⁻	.077 ⁻⁻⁻	-.113 ⁻⁻⁻	-.227 ⁻⁻⁻	.016	.316 ⁻⁻⁻	-.368 ⁻⁻⁻	-.266 ⁻⁻⁻	.082 ⁻⁻⁻	-.105 ⁻⁻⁻	-.129 ⁻⁻⁻	.998 ⁻⁻⁻	1
Sig. (2-tailed)	.033	.589	.000	.295	.001	.040	.003	.000	.673	.000	.000	.000	.029	.005	.001	.000	

***, **, * Correlation is significant at the 0.01, .05, 0.10 level (2-tailed), respectively

As shown in table (4), the first measurement of cash holdings is correlated negatively and significantly (p - value < 0.05) with the introduction and the decline stages, whereas it is correlated positively and significantly with mature stage. While the second measurement of cash holdings is correlated negatively and significantly with the introduction and the decline stages, whereas it is correlated positively and significantly with the mature and the shake-out stage at confidence level= 95%.

No correlation exists between the two proxies of tax avoidance and all stages of life cycle at confidence level = 95%, but there are significant correlations between the five stages of the firm's life cycle, and this supports the separation of test each stage alone. For the relationship between the two proxies of cash holdings and the control variables, there is a significant negative correlation between leverage and the cash holding with its two proxies. While the two proxies of cash

holdings are correlated positively and significantly with NWR, CFO, ROA, Divi, Age, and firm size.

4-3 Statistical results of the regression models

4-3-1 Test of multicollinearity

Before analyzing the results, the Variance inflation factor (VIF) used to detect the severity of multicollinearity in the ordinary least square (OLS) regression analysis. It is clear from table (5) that no multicollinearity problem exists among all research's variables across all the regression models used in the study. The values of VIF are less than 10 for all variables.

Table 5: The variance inflation factor (VIF) for the main sample

	Tax avoidance only		Tax and Introduction		Tax and Growth		Tax and mature		Tax and shake-out		Tax and decline	
	Model 1-1	Model 1-2	Model 2-1	Model 2-6	Model 2-2	Model 2-7	Model 2-3	Model 2-8	Model 2-4	Model 2-9	Model 2-5	Model 2-10
Tax proxy	ETR	BTD	ETR	BTD	ETR	BTD	ETR	BTD	ETR	BTD	ETR	BTD
Tax avoidance	1.123	1.234	1.124	1.237	1.123	1.124	1.123	1.134	1.123	1.234	1.123	1.143
Introduction			1.214	1.216								
Growth					1.102	1.103						
Mature							1.395	1.396				
Shake-out									1.103	1.103		
Decline											1.278	1.287
NWR	1.753	1.764	1.753	1.765	1.760	1.772	1.779	1.791	1.759	1.771	1.278	1.764
Tangibility	1.499	1.482	1.499	1.482	1.506	1.490	1.548	1.531	1.553	1.536	1.753	1.493
CFO ratio	1.403	1.405	1.607	1.610	1.404	1.406	1.665	1.667	1.404	1.405	1.510	1.589
ROA	1.554	1.666	1.561	1.675	1.583	1.692	1.562	1.674	1.559	1.672	1.591	1.682
Dividend	1.262	1.271	1.262	1.271	1.279	1.289	1.291	1.301	1.264	1.273	1.578	1.273
Age	1.208	1.208	1.210	1.211	1.213	1.213	1.211	1.211	1.212	1.212	1.265	1.210
Leverage	1.236	1.232	1.248	1.243	1.241	1.237	1.236	1.232	1.236	1.232	1.220	1.233
F-size	1.421	1.424	1.422	1.425	1.422	1.426	1.430	1.429	1.432	1.432	1.237	1.424

Dependent variable Ln (cash and cash equivalents/ total assets)

4-3-2 Results of the impact of tax avoidance on cash holdings

The first regression model is used to test the impact of tax avoidance measured by ETR and BTD on the cash holdings. The two models are significant (P value < .05). The adjusted R² for models one and two are (28% and 28.2%). That means the independent variables can explain 28% (28.2%) of the changes and the variations of the dependent variable in the model 1-1 (model 1-2).

The findings showed a negative association between Tax avoidance and cash holdings with ETR (p= 0.006 and Beta= -1.602), and with the BTD (p= 0.003 and Beta= -3.046). As shown from table (6), the same results are obtained for the

control variables regardless of the measurement of tax avoidance. These results support the acceptance of the first hypothesis. Furthermore, there is a negative impact of both of net working capital and tangibility on cash holdings. While the results report positive effect of CFO ratio, ROA, and dividends paid on the level of cash holdings, and no association is found between age, leverage and firm size and cash holdings.

Table 6: Coefficients of Regression of tax avoidance and cash holdings

Variables	Model (1-1) ETR			Model (1-2) BTD		
	Beta	Sig.	t	Beta	Sig.	t
Constant	-5.012	.000	-5.194	-4.368	.000	-4.733
ETR	-1.602	.006				
BTD			-2.759	-3.046	.003	-2.998
NWR	-1.611	.000	-5.020	-1.676	.000	-5.213
Tangibility	-1.346	.001	-3.401	-1.463	.000	-3.722
CFO ratio	1.872	.000	3.724	1.853	.000	3.687
ROA	4.669	.000	6.162	5.088	.000	6.492
Dividend	.482	.001	3.194	.464	.002	3.069
Age	.004	.176	1.353	.004	.224	1.216
Leverage	-.046	.054	-1.929	-.043	.074	-1.792
F-size	.087	.407	.830	.092	.377	.885
Adjusted R²	28.0%			28.2%		
Model Significant	.000			.000		
N	711			711		
F-statistic	14.826			14.924		
Industry effect	Yes			Yes		
Year effect	No			No		

Dependent variable Ln (cash and cash equivalents/ total assets)

As a next step, the second independent variable is added to the regression model. When entering all the five stages of firm life cycle in SPSS, mature stage was excluded from the independent variables, so each stage was separately entered in the regression. Furthermore, because of the existence of multicollinearity problems for the fixed effect of the year's observations, they are excluded from the model.

As shown by table (7), all regression models for the five stages of firm life cycle are highly significant with p-value= 0.000. The adjusted R² varies from 27.9% to 29%. There is strong evidence for tax avoidance's impact on cash holdings in all

stages of the firm's life cycle. Regarding the impact of life cycle on cash holdings, –as indicated in the table– there is a significant negative relation between the introduction stage and cash holdings while there is a significant positive relationship between the shake–out stage and cash holding. The remaining life stages are not related to the cash holdings. There is a significant negative relationship between cash holdings and tax avoidance measured by ETR in all stages of the firm's life cycle. The unstandardized beta coefficient reported (-1.657, -1.1602, -1.602, -1.609, and -1.599 respectively) with p -value amounted 0.004 in the introduction model and 0.006 for the remaining four models. Those results assured the acceptance of the first hypothesis.

Table 7: Regression's results for firm life cycle stages and tax avoidance (ETR)

Variables	Introduction Model			Growth Model			Mature Model			Shake out Model			Decline Model		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant			-4.829			-5.190			-5.179			-5.452			-5.159
ETR	-1.657	.004	-2.873	-1.602	.006	-2.757	-1.602	.006	-2.757	-1.609	.006	-2.753	-1.599	.006	-2.753
Introduction	-0.686	.001	-3.247												
Growth				.001	.997	.004									
Mature							.008	.950	.063						
Shake-out										.308	.025	2.251			
Decline													-.083	.707	-.377
NWR	-1.634	.000	-5.126	-1.611	.000	-5.006	-1.613	.000	-4.988	-1.567	.000	-4.890	-1.611	.000	-5.019
Tangibility	-1.335	.001	-3.397	-1.346	.001	-3.390	-1.351	.001	-3.356	-1.177	.004	-2.929	-1.359	.001	-3.418
CFO	1.255	.019	2.349	1.872	.000	3.720	1.858	.001	3.392	1.862	.000	3.715	1.803	.001	3.366
ROA	4.827	.000	6.401	4.669	.000	6.102	4.672	.000	6.147	4.578	.000	6.051	4.704	.000	6.158
DIV1	.483	.001	3.225	.482	.002	3.171	.480	.002	3.147	.495	.001	3.288	.479	.002	3.169
Age	.004	.222	1.222	.004	.178	1.349	.004	.176	1.354	.004	.220	1.228	.004	.182	1.337
Leverage	-.039	.104	-1.626	-.046	.055	-1.924	.046	.054	-1.927	-.047	.051	-1.958	.046	.053	-1.938
F-size	.076	.466	.729	.087	.407	.829	.086	.410	.824	.105	.315	1.005	.087	.405	.832
Adjusted R2	29.0%			27.9%			27.9%			28.5%			27.9%		
Model Sig.	.000			.000			.000			.000			.000		
N	711			711			711			711			711		
F-statistic	14.818			14.100			14.100			14.445			14.110		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ total assets)

For the introduction stage, there is a significant negative relationship between cash holdings and introduction stage. The unstandardized beta coefficient is (-.686) with p -value amounted (0.001) which is less than 0.05. This supports the hypothesis (H_{2-a}). At the same time, for the shake–out stage, results showed 0.308 as beta coefficient with p–value less than 0.05 (0.025), which means the existence of significant positive impact of this stage on cash holdings. So, the hy-

pothesis (**H_{2-d}**) is supported. On the other hand, the results reported no significant relationship between the stages of the growth, the mature, and the decline and cash holdings. This means rejecting the remaining hypotheses (**H_{2-b}**; **H_{2-c}**; and **H_{2-e}**).

According to the control variables, results indicate significant negative impact of the liquidity and tangibility on cash holdings. In all firm's life cycles, Egyptian companies used both of net working capital and fixed assets ratio as an alternative financing source, and this explains the negative relation between those two variables and cash holdings. In contrast, cash flow ratio, profitability and dividends are parallel with the cash level, while both of age, leverage and firm size are insignificant with cash holdings over the different stages of firm life cycle.

For testing the alternative proxy of tax avoidance, the analysis is replicated with BTD indicator as a second measurement for tax avoidance. As reported in table (8) all models of BTD with all stages of firm life cycle are significant (p-values=.000). Consistent with the results of ETR models, tax avoidance has a significantly negative impact on cash holdings in all firm life cycle models. The higher impact in the introduction stage records 29.2% as an adjusted R² with beta coefficient =-3.213, then the adjusted R² for shake-out stage =28.6% with beta = -3.011. For the remaining three stages reports adjusted R² 28.1% for the growth, mature and decline, and the same p-value = 0.003. Finally, beta's coefficients for those three stages are (-3.048, -3.048, and -3.033 respectively).

Table 8: Regression's results for firm life cycle stages and tax avoidance (BTD)

Variables	Introduction Model			Growth Model			Mature Model			Shake out Model			Decline Model		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
constant	-4.200	.000	-4.578	-4.367	.000	-4.729	-4.712	.000	-4.971	-4.979	.000	-5.237	-4.707	.000	-4.961
BTD	-3.213	.002	-3.180	-3.048	.003	-2.997	-3.048	.003	-2.997	-3.011	.003	-2.970	-3.033	.003	-2.972
Introduction	-.702	.001	-3.321												
Growth				-.015	.933	-.084									
Mature							.013	.924	.095						
Shake-out										.299	.029	2.190			
Decline													-.034	.877	-.154
NWR	-1.704	.000	-5.335	-1.678	.000	-5.204	-1.680	.000	-5.183	-1.633	.000	1.771	-1.676	.800	-5.209
Tangibility	-1.457	.000	-3.731	-1.461	.000	-3.704	-1.470	.000	-3.677	-1.299	.001	1.536	-1.469	.000	-3.719
CFO	1.219	.023	2.283	1.854	.000	3.686	1.832	.001	3.345	1.844	.000	1.405	1.824	.001	3.413
ROA	5.277	.000	6.764	5.080	.000	6.428	5.093	.000	6.478	4.991	.000	1.672	5.099	.000	6.472
DIVI	.464	.002	3.089	.463	.002	3.036	.462	.003	3.018	.478	.002	1.273	.463	.002	3.058
Age	.003	.283	1.075	.004	.224	1.218	.004	.223	1.219	.003	.274	1.212	.004	.227	1.209
Leverage	-.035	.140	-1.476	-.043	.074	-1.792	-.043	.074	-1.790	-.043	.069	1.232	-.043	.073	-1.794
F-size	.082	.430	.790	.093	.376	.886	.092	.381	.876	.109	.295	1.432	.092	.377	.884
Adjusted R2	29.2%			28.1%			28.1%			28.6%			28.1%		
Model Sig.	.000			.000			.000			.000			.000		
N	711			711			711			711			711		
F- statistic	14.945			14.193			14.193			14.520			14.194		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ total assets)

Additionally, results confirmed the previous analysis of the second independent variable. Both the introduction and the shake-out stages have a significant effect on the cash holdings with p-value =0.001 and 0.029 respectively. The introduction stage has negative impact on cash holdings (-0.702), while the shake-out stage has a positive impact (0.299) on cash holdings. These results indicate that the Egyptian companies use cash balance in investing in the new market and in spending more expenses in advertising to inform customers with the new product, leading to a decrease cash holdings. On the contrary, in the shake-out stage, companies tend to leave the market, so they sold the fixed assets to save a lot of costs, and that is reflecting an increase in the cash level.

Moving to the other life cycle stages, no significant impact existed for the growth, the mature and the decline stages. However, liquidity and tangibility have a significant negative relationship with cash holdings while CFO and ROA ratios, and dividend increase cash significantly. Remaining control variables (age, leverage, and firm size) have no effect on cash holdings.

To test the relation between tax avoidance and cash holdings across different stages of the firm's life cycle and testing the hypotheses (H_{3a-e}), the research sample is divided into five subsamples and reapply separate regressions for each life cycle stage. This approach provides a deeper power of the statistical results. At the beginning, the researcher tests for the multicollinearity problems for all the five sub-samples for the firm's life cycle. As shown by table (9), all variables' values are less than ten.

Table 9: The variance inflation factor (VIF) for the sub- samples

	Introduction sample		Growth sample		mature sample		shake-out sample		decline sample	
	Model 3-1a	Model 3-2a	Model 3-1b	Model 3-2b	Model 3-1c	Model 3-2c	Model 3-1d	Model 3-2d	Model 3-1e	Model 3-2e
Tax proxy	ETR	BTD	ETR	BTD	ETR	BTD	ETR	BTD	ETR	BTD
Tax avoidance	1.548	1.399	1.408	1.723	1.155	1.324	1.351	1.295	1.549	3.256
NWR	1.957	1.977	2.122	2.173	1.902	1.923	1.915	1.916	2.060	2.017
Tangibility	2.546	2.001	2.059	2.100	1.457	1.433	2.179	2.175	1.547	1.686
CFO ratio	1.757	1.758	2.551	2.796	1.837	1.832	1.467	1.479	2.092	2.198
ROA	1.357	1.374	1.944	1.926	2.144	2.242	2.013	2.046	2.353	4.583
Dividend	1.407	1.517	1.424	1.467	1.280	1.283	1.845	1.825	1.422	1.462
Age	2.405	2.404	1.744	1.794	1.462	1.459	1.413	1.427	1.320	1.421
Leverage	1.838	1.892	1.845	1.759	1.273	1.272	1.532	1.506	1.446	1.439
F-size	3.475	3.407	1.908	1.866	1.626	1.648	2.095	2.159	1.742	1.716

Dependent variable Ln (cash and cash equivalents/ total assets)

As reported in table (10) the whole sample consists of 711 observations including 66 observations in the introduction stage, 85 observations in the growth, 322 in the mature stages, 173 observations in the shake-out stage, and finally, 65 observations in the decline stage.

Table 10: Regression results for sub-samples of firm life cycle with ETR

Variables	Introduction sample			Growth sample			Mature sample			Shake-out sample			Decline sample		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant	-12.462	.006	-2.898	-2.796	.377	-.889	-4.455	.003	-3.019	3.200	.176	1.361	11.470	.001	-3.514
ETR	1.875	.412	.828	.337	.870	-.165	-.472	.568	.572	-2.076	.019	-2.363	-4.779	.009	-2.724
NWR	-.391	.723	-.356	-1.639	.071	-1.836	-2.068	.000	-4.134	-.958	.164	-1.397	-1.284	.253	-1.157
Tangibility	-.601	.824	.123	-1.544	.220	-1.237	-1.355	.009	-2.614	-4.863	.000	-3.950	-1.228	.628	-.488
CFO	.452	.871	-.224	1.194	.688	.403	.740	.479	.709	2.295	.032	2.170	-1.227	.591	-.541
ROA	.040	.917	.163	7.637	.022	2.344	5.168	.000	4.296	2.832	.087	1.722	8.816	.008	2.794
DIVI	.016	.965	.104	.928	.036	2.140	.119	.648	.457	1.400	.000	4.003	.816	.067	1.876
Age	-.011	.299	-1.051	-.008	.512	-.659	.010	.045	2.017	-.008	.213	-1.251	.008	.474	.722
Leverage	-.264	.011	-2.632	-.047	.776	-.286	.027	.462	.736	-.079	.065	-1.861	-.051	.464	-.738
F-size	1.050	.028	2.269	-.076	.822	-.226	.092	.529	.585	-.700	.009	-2.662	.529	.071	1.847
Adjusted R ²	23.5%			24.1%			27.9%			38.2%			33.2%		
Model Sig.	.021			.004			.000			.000			.003		
N	66			85			322			173			65		
F-statistic	2.110			2.481			7.218			6.319			2.764		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ total assets)

Overall, as presented in table (10), all models for the five samples are significant. The highest significance level is observed for both the mature and the shake-out stages (P value= .000), Then the decline and the growth stages (P-value = .003, and .004 respectively) and lastly the introduction stage reported p-value= .021. The highest adjusted R² = 38.2% for the shake-out sample, then 33.2% for the decline sample. The values of adjusted R² for the mature, the growth and the introduction = 27.9%, 24.1%, and 23.5% respectively.

The significant negative impact of tax avoidance on cash holdings clearly appears on the decline and shake-out samples (p-values = 0.009 and 0.019 respectively). The negative association between the two variables (beta coefficients = -4.779 and -2.076 respectively) provide additional evidence on the relation between tax avoidance and cash holdings.

Moreover, in the other samples in table (10), there is no effect for tax avoidance on cash holdings in the introduction, growth, and mature stages³. Liquidity measured by net working capital ratio has a significant negative impact on cash holdings for the companies in the mature stage only. Tangibility affects cash holdings negatively in the mature and the shake-out samples. While CFO ratio has a positive impact on cash holdings in the shake-out sample. Additionally, ROA has a positive significant impact on cash holdings with the growth, the mature and the decline samples.

Dividends affect positively cash holdings through the growth and the shake-out samples. Furthermore, firm's age has a positive impact on cash level with the mature stage only. Leverage affects cash holdings negatively with introduction stage. Firm size has a positive impact on cash balance in the introduction sample and negative effect in the shake-out sample.

Table 11: Regression results for sub-samples of firm life cycle with BTD

Variables	Introduction sample			Growth sample			Mature sample			Shake-out sample			Decline sample		
	Beta	Sig	t	Beta	Sig	t	B	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant	-13.530	.002	-3.325	-2.793	.356	-.929	-3.685	.010	-2.592	1.166	.604	.520	-9.152	.005	-2.970
BTB	8.379	.170	1.393	7.108	.186	1.723	-1.565	.230	-1.203	-5.974	.006	-2.799	16.188	.002	-3.271
NWR	-.186	.865	-.171	-1.417	.116	-1.591	-2.125	.000	-4.231	-.835	.222	-1.226	-1.834	.091	-1.729
Tangibility	.645	.687	.405	-1.785	.156	-1.435	-1.389	.007	-2.707	-5.105	.000	-4.180	-2.663	.302	-1.045
CFO	-.780	.770	-.294	-.049	.987	-.016	.735	.480	.707	2.135	.045	2.025	.158	.944	.070
ROA	-.086	.975	-.031	8.091	.014	2.527	5.440	.000	4.430	3.186	.055	1.934	15.756	.001	3.685
DIVI	.166	.674	.423	1.047	.019	2.410	.104	.688	.402	1.432	.000	4.146	.656	.132	1.532
Age	-.011	.284	-1.084	-.010	.383	-.879	.010	.044	2.021	-.011	.101	-1.649	.002	.852	.188
Leverage	-.292	.006	-2.903	-.008	.957	-.054	.027	.739	.739	-.070	.099	-1.662	-.050	.460	-.745
F-size	1.114	.017	2.464	-.074	.821	-.227	.112	.480	.708	-.586	.028	-2.212	.504	.131	1.537
Adjusted R ²	25.5%			26.1%			28.2%			39.1%			37%		
Model Sig.	.014			.002			.000			.000			.001		
N	66			85			322			173			65		
F-statistic	2.234			2.645			7.301			6.518			3.091		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ total assets)

³ The researcher focuses on 95% confidence level only. Some variables are significant at 90% level.

Similarly, results in table (11) showed the significance of all models using BTD proxy. The shake-out stages have the highest p-value (0.000), then the decline stage has a p-value = .003, and the growth stage with .004 p-value, and lastly, the introduction stage = .021 for its p-value. Regarding the adjusted R². The higher value of adjusted R² is 39.1% for the shake out stage, which means that 39.1 % of the changes of the cash holdings in the shake-out stages companies refer to the change in the tax avoidance. Then the adjusted R² value = 37 % for the decline stage sample. Next, the mature, the growth and the introduction stages have adjusted R² = 28.2%, 26.1% and 25.5 respectively.

Consistency with previous results, tax avoidance measuring with BTD affects cash holdings negatively in the decline and the shake-out stages (p value= 0.002 and 0.006 respectively). On the other hand, no relationship exists for tax avoidance on cash holdings in the introduction, the growth, and the mature samples. Regarding to the control variables, the findings are consistent with the ETR proxy of tax avoidance in general.

5- The robustness tests

To test the consistency of the previous results, the researcher reapplies all previous statistical tests using an alternative proxy of cash holdings, which is the natural logarithm of cash and cash equivalents divided by (total assets – cash and cash equivalents) (Dhaliwal et al. 2011; Kurniawon and Nuryanah, 2017; Benkvaïem et al.,2022; Cai et al. 2022)

5-1 regression models

5-1-1 Model (4): The relationship between tax avoidance and cash holdings

The following is the fourth model to test the impact of tax avoidance on cash holdings measured by the alternative proxy:

$$\text{Cash2}_{it} = \alpha_0 + \alpha_1 \text{Tax}_{it} + \alpha_2 \text{NWR}_{it} + \alpha_3 \text{Tang}_{it} + \alpha_4 \text{CFO}_{it} + \alpha_5 \text{ROA}_{it} + \alpha_6 \text{DIVI}_{it} + \alpha_7 \text{Age}_{it} + \alpha_8 \text{LEV}_{it} + \alpha_9 \text{FS}_{it} + \alpha_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (4)

$$\text{Cash2}_{it} = \alpha_0 + \alpha_1 \text{ETR}_{it} + \alpha_2 \text{NWR}_{it} + \alpha_3 \text{Tang}_{it} + \alpha_4 \text{CFO}_{it} + \alpha_5 \text{ROA}_{it} + \alpha_6 \text{DIVI}_{it} + \alpha_7 \text{Age}_{it} + \alpha_8 \text{LEV}_{it} + \alpha_9 \text{FS}_{it} + \alpha_{10} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (4-1)

$$\text{Cash2}_{it} = \alpha_0 + \alpha_1 \text{BTD}_{i,t} + \alpha_2 \text{NWR}_{it} + \alpha_3 \text{Tang}_{it} + \alpha_4 \text{CFO}_{it} + \alpha_5 \text{ROA}_{it} + \alpha_6 \text{DIVI}_{it} + \alpha_7 \text{Age}_{it} + \alpha_8 \text{LEV}_{it} + \alpha_9 \text{FS}_{it} + \alpha_{10} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (4-2)

Whereas:

Cash2_{it} = cash holdings= Ln (cash and cash equivalents /net assets) for firm i, at the current year t

The remaining measurements of variables as mentioned before.

5-1-2 Model (5): The impact of tax avoidance and firm's life cycle on cash holdings

The fifth regression model is the main model includes both the tax avoidance and the firm's life cycle. The main and the sub-models are as follows:

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{Tax}_{it} + \beta_2 \Sigma \text{FLC}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (5)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Intro}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (5-1)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Grow}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (5-2)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Mature}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (5-3)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Shake}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (5-4)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{ETR}_{it} + \beta_2 \text{Decl.}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon.$$

..... (5-5)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Intro}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (5-6)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Grow}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (5-7)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Mature}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (5-8)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Shake}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (5-9)

$$\text{Cash2}_{it} = \beta_0 + \beta_1 \text{BTD}_{it} + \beta_2 \text{Decl.}_{it} + \beta_3 \text{NWR}_{it} + \beta_4 \text{Tang}_{it} + \beta_5 \text{CFO}_{it} + \beta_6 \text{ROA}_{it} + \beta_7 \text{DIVI}_{it} + \beta_8 \text{Age}_{it} + \beta_9 \text{LEV}_{it} + \beta_{10} \text{FS}_{it} + \beta_{11} \Sigma \text{IND}_{it} + \varepsilon$$

..... (5-10)

5-1-3 Model (6): The impact of tax avoidance on cash holdings across firm's life cycle

The sixth regression model is testing the impact of the tax avoidance on the cash holdings across the firm's life cycle. The main and the sub-models are as follows:

$$\text{Cash2}_{it} = \gamma_0 + \gamma_1 \text{Tax}_{it} + \gamma_2 \text{NWR}_{it} + \gamma_3 \text{Tang}_{it} + \gamma_4 \text{CFO}_{it} + \gamma_5 \text{ROA}_{it} + \gamma_6 \text{DIVI}_{it} + \gamma_7 \text{Age}_{it} + \gamma_8 \text{LEV}_{it} + \gamma_9 \text{FS}_{it} + \gamma_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (6)

$$\text{Cash2}_{it} = \gamma_0 + \gamma_1 \text{ETR}_{it} + \gamma_2 \text{NWR}_{it} + \gamma_3 \text{Tang}_{it} + \gamma_4 \text{CFO}_{it} + \gamma_5 \text{ROA}_{it} + \gamma_6 \text{DIVI}_{it} + \gamma_7 \text{Age}_{it} + \gamma_8 \text{LEV}_{it} + \gamma_9 \text{FS}_{it} + \gamma_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (6-1 a: e)

$$\text{Cash2}_{it} = \gamma_0 + \gamma_1 \text{BTD}_{it} + \gamma_2 \text{NWR}_{it} + \gamma_3 \text{Tang}_{it} + \gamma_4 \text{CFO}_{it} + \gamma_5 \text{ROA}_{it} + \gamma_6 \text{DIVI}_{it} + \gamma_7 \text{Age}_{it} + \gamma_8 \text{LEV}_{it} + \gamma_9 \text{FS}_{it} + \gamma_{10} \Sigma \text{IND}_{it} + \varepsilon$$

..... (6-2 a: e)

Firstly, the researcher tests for the multicollinearity problems by applying the VIF test, and same results reported at table (5 and 9) are obtained. Table (12)

presents the regression results for the second measure of cash holdings with tax avoidance measured by ETR and BTD. The two models are significant (p value <.05). Both models have the same adjusted $R^2 = 30.1\%$. The results show that the tax avoidance is negatively associated with cash holdings (P= .007 and .006) and Beta coefficients are (-1.663 and -2.983) for ETR and BTD respectively.

At 5% significant level, net working capital ratio, tangibility and leverage are negatively associated with cash holdings in the two models. While CFO ratio, ROA and dividend have a positive relation with the cash holdings with the two proxies of tax avoidance. But the firm's age and size haven't any effect on cash holdings regardless of the different measurements of tax avoidance.

Table 12: Coefficients of Regression of the impact of tax avoidance on cash holdings

Variables	ETR			BTD		
	Beta	Sig.	t	Beta	Sig.	t
Constant	-4.654	.000	-4.568	-3.986	.000	-4.089
Tax avoidance	-1.663	.007	-2.713	-2.983	.006	-2.778
NWR	-1.916	.000	-5.656	-1.979	.000	-5.826
Tangibility	-1.610	.000	-3.852	-1.731	.000	-4.168
CFO ratio	2.195	.000	4.137	2.181	.000	4.110
ROA	5.132	.000	6.416	5.528	.000	6.677
Dividend	.503	.002	3.160	.488	.002	3.058
Age	.005	.128	1.525	.005	.164	1.394
Leverage	-.056	.026	-2.231	-.053	.037	-2.094
F-size	.058	.598	.528	.062	.575	.561
Adjusted R2	30.1%			30.1%		
Model Significant	.000			.000		
N	711			711		
F-statistic	16.278			16.304		
Industry effect	Yes			Yes		
Year effect	No			No		

Dependent variable Ln (cash and cash equivalents/ net assets)

Table (13) displays the regression results for the whole model capturing the tax avoidance measured by ETR and the five stages of life cycle. As shown by the table, all the five models are significant and have the same p-value = 0.000. The highest adjusted $R^2 = 31\%$ for the introduction model, then the shake-out model = 30.6%. The remaining life stages' models' have the same adjusted $R^2 = 30\%$.

Table 13: Regression's results for firm life cycle stages and tax avoidance (ETR)

Variables	Introduction Model			Growth Model			Maturity Model			Shake out Model			Decline Model		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant	-4.185	.000	-4.212	-4.350	.000	-4.351	-4.663	.000	-4.568	-4.966	.000	-4.852	-4.638	.000	-4.542
ETR	-1.721	.005	-2.825	-1.663	.007	-2.711	-1.663	.007	-2.711	-1.671	.006	-2.735	-1.661	.007	-2.708
Introduction	-.717	.001	-3.213												
Growth				-.002	.993	-.008									
Mature							-.024	.864	-.172						
Shake-out										.348	.016	2.409			
Decline													-.060	.797	-.257
NWR	-1.940	.000	-5.764	-1.916	.000	-5.641	-1.909	.000	-5.590	-1.866	.000	-5.519	-1.916	.000	-5.653
Tangibility	-1.599	.000	-3.851	-1.609	.000	-3.839	-1.597	.000	-3.758	-1.419	.001	-3.346	-1.619	.000	-3.857
CFO	1.550	.006	2.749	2.195	.000	4.133	2.234	.000	3.864	2.184	.000	4.130	2.145	.000	3.794
ROA	5.298	.000	6.654	5.132	.000	6.353	5.123	.000	6.385	5.030	.000	6.301	5.158	.000	6.395
DIVI	.505	.001	3.191	.503	.002	3.136	.507	.002	3.149	.518	.001	3.262	.501	.002	3.141
Age	.005	.163	1.397	.005	.129	1.522	-.005	.131	1.514	.005	.164	1.393	.005	.131	1.514
Leverage	-.048	.054	-1.932	-.056	.026	-2.226	-.056	.026	-2.231	-.057	.024	-2.264	-.056	.026	-2.237
F-size	.047	.670	.426	.058	.598	.527	.059	.591	.538	.079	.475	.715	.058	.597	.529
Adjusted R2	31.0%			30.0%			30.0%			30.6%			30.0%		
Model Sig.	.000			.000			.000			.000			.000		
N	711			711			711			711			711		
F-statistic	16.204			15.481			15.483			15.887			15.485		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ net assets)

The results indicate that tax avoidance is negatively associated with cash holdings across the five stages of life cycle, and the impact is greater in the introduction stage ($p= 0.005$), then the shake-out stage ($p=0.006$) and the remaining stages have the same rank ($p=0.007$). Moving to the relation between firm's life cycle and cash holdings, table (13) indicates that the introduction stage is negatively associated with cash holdings (p value = 0.001 and $Beta = -0.717$), while the shake-out stage is positively associated with cash holdings (p -value = 0.016 and $Beta=0.384$). Furthermore, no effect for the growth, the mature and the decline stages on cash holdings measured the alternative proxy. These results are consistent with the previous analysis using the main measurement for cash holdings.

Net working capital ratio, and tangibility are associated negatively with cash holdings in the five models, but leverage is associated negatively with cash holdings in the all models except the introduction stage model. While CFO ratio, ROA and dividend have a positive relation with the cash holdings across the five

models of firm's life cycle. On contrast, the firm's age and size have no effect on cash holdings across all stages of firm's life cycle.

Table 14: Regression's results for firm life cycle stages and tax avoidance (BTD)

Variables	Introduction Model			Growth Model			Mature Model			Shake out Model			Decline Model		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant	-3.811	.000	-3.931	-3.985	.000	-4.085	-4.338	.000	-4.332	-4.629	.000	-4.610	-4.327	.000	-4.317
BTD	-3.156	.003	-2.956	-2.985	.006	-2.777	-2.981	.006	-2.774	-2.942	.006	-2.749	-2.978	.006	-2.761
Introduction	-.731	.001	-3.276												
Growth				-.017	.927	-.091									
Mature							-.020	.887	-.142						
Shake-out										.339	.019	2.351			
Decline													-.012	.958	-.052
NWR	-2.008	.000	-5.950	-1.981	.000	-5.815	-1.973	.000	-5.762	-1.930	.000	-5.689	-1.979	.000	-5.822
Tangibility	-1.724	.000	-4.180	-1.729	.000	-4.148	-1.721	.000	-4.073	-1.546	.001	-3.666	-1.733	.000	-4.154
CFO	1.521	.007	2.695	2.182	.000	4.108	2.214	.000	3.826	2.172	.000	4.106	2.171	.000	3.844
ROA	5.726	.000	6.945	5.519	.000	6.611	5.520	.000	6.647	5.418	.000	6.555	5.533	.000	6.646
DIVI	.488	.002	3.077	.487	.003	3.024	.492	.002	3.042	.504	.002	3.162	.488	.002	3.051
Age	.004	.209	1.256	.005	.163	1.396	.005	.167	1.384	.004	.206	1.265	.005	.165	1.391
Leverage	-.045	.075	-1.784	-.053	.037	-2.095	-.053	.037	-2.094	-.053	.034	-2.124	-.053	.037	-2.094
F-size	.051	.641	.466	.062	.573	.564	.063	.569	.569	.081	.461	.738	.062	.575	.561
Adjusted R2	31.1%			30.0%			30.0%			30.6%			30.0%		
Model Sig.	.000			.000			.000			.000			.000		
N	711			711			711			711			711		
F- statistic	16.258			15.506			15.507			15.893			15.505		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ net assets)

Using the BTD as the second proxy of tax avoidance and rerunning the regression model for the two independent variables, the same results are obtained. Table (14) represents the results, all models are significant ($p < 0.05$). The values of adjusted R^2 the same with ETR, except the introduction model is 31.0% compared with 31.1%. Tax avoidance has a negative impact on cash holdings across all stages of firm's life cycle. The higher impact is observed in the introduction stage ($p= 0.003$ and $B= -3.156$), then the remaining four stages with the same p -value = 0.006, and beta = -2.985 , -2.981 , -2.942 , and -2.978 for the growth, the mature, the shake-out and the decline stages respectively.

According to the impact of firm's life cycle on cash holdings, -as shown by table (14) - the introduction stage affects cash holdings negatively ($p = .001$ and $\beta = -.731$), while the shake-out stage affects cash holdings positively ($p = .019$ and $\beta = .339$). There is no relationship between cash holdings and the remaining three stages. The impact of the introduction stage is higher than the shake-out stage.

To confirm the previous results related to the sub samples of each stage, the regression is repeated for every stage separately. Table (15) presents the results of the relation between tax avoidance measured by ETR and cash holdings across the five stages of life cycle. The table elaborates that all models are significant ($p < 0.05$), The highest significance models are the mature and the shake-out samples ($P = 0.000$), then the decline and the growth have p values = $.002$ and $.004$ respectively. The lowest significant model is the introduction sample ($P = 0.023$). The shake-out sample reported the highest Adjusted R^2 equals 41.2%. Then the decline (34.6%), the mature (29.9%), the growth (24.2%), and the introduction (22.9%) respectively.

The negative impact of tax avoidance on cash holdings is higher in the decline sample ($p = .008$ and $B = -5.031$) comparing with the shake-out sample ($p = .015$ and $B = -3.364$). There is no significant association between tax avoidance and cash holdings in the introduction, the growth, and the mature stages.

Table 15: Regression results for sub-samples of firm life cycle with ETR

Variables	Introduction sample			Growth sample			Mature sample			Shake-out sample			Decline sample		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant	-12.534	.008	-2.789	-2.031	.549	-.602	-4.222	.007	-2.707	4.172	.003	1.691	11.706	.001	-3.443
ETR	1.792	.453	-.757	.327	.882	-.149	-.345	.693	-.395	-3.364	.015	-2.462	-5.031	.008	-2.752
NWR	-.497	.667	-.433	-1.987	.042	-2.076	-2.382	.000	-4.503	-1.328	.067	-1.846	-1.425	.224	-1.232
Tangibility	.339	.859	.178	-2.023	.135	-1.511	-1.610	.004	-2.939	-5.335	.000	-4.129	-.932	.724	-.356
CFO	-.638	.821	-.227	1.308	.682	.412	1.043	.345	.946	2.810	.012	2.532	-1.239	.603	-.524
ROA	.601	.836	.208	7.911	.027	2.264	5.770	.000	4.537	3.091	.075	1.790	9.225	.007	2.806
DIV1	.059	.883	.148	.979	.039	2.106	.128	.643	.464	1.443	.000	3.931	.874	.060	1.929
Age	-.012	.287	-1.077	-.008	.523	-.642	.012	.032	2.161	-.008	.237	-1.187	.009	.456	.751
Leverage	-.281	.010	-2.675	-.088	.618	-.501	.022	.578	.557	-.095	.036	-2.116	-.059	.421	-.811
F-size	1.061	.033	2.194	-.126	.728	-.350	.075	.654	.449	-.788	.005	-2.856	.652	.072	1.838
Adjusted R ²	22.9%			24.2%			29.9%			41.2%			34.6%		
Model Sig.	.023			.004			.000			.000			.002		
N	66			85			322			173			65		
F-statistic	2.072			2.489			7.847			7.030			2.883		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ net assets)

There are some differences are obtained for the control variables. By accepting 5% significance level, net working capital ratio negatively associated with cash holdings in the growth and the mature samples. Tangibility has a negative effect on cash level in the mature and the shake-out stages. While CFO ratio affects cash holdings positively in the shake-out stage only. Furthermore, ROA has a positive impact on cash holdings in the growth, the mature and the decline samples.

In addition, dividends increase cash holdings in the growth and shake-out samples, but leverage decrease cash level in the introduction and the shake-out stages. Firm age has a positive impact on cash holdings in the mature sample only. Finally, firm size has a positive effect on cash in the introduction sample and a negative impact in the shake-out sample.

In summary, the difference between these results and the main results are obtained with the first proxy of cash holdings related to net working capital ratio and leverage. The ratio of net working capital is significant in the mature sample only in the main test, but it is significant in the growth and the mature sample in the robustness test. Similarly, for the leverage, it is significant in the introduction sample only in the main analysis, while it is significant in the introduction and the shake-out samples in the current analysis.

Next, the same analysis is replicated for each stages using BTD measure of tax avoidance. Table (16) records the significance for all models ($p < 0.0$), the higher significance levels are observed in the mature and the shake-out samples ($p=0.000$), then the decline sample ($p=0.001$), and the growth sample ($p=0.002$), Finally, the introduction sample ($P=0.016$). The table shows that the highest and the lowest value of Adjusted R^2 are for the shake-out sample (42.2%) and the introduction sample (24.6%) respectively. Tax avoidance is significantly and negatively associated with cash holdings in the decline and the shake-out samples. Table (16) indicates that tax avoidance is insignificantly associated with the introduction, the growth, and the mature stages.

Table 16: Regression results for sub-samples of firm life cycle with (BTD)

Variables	Introduction sample			Growth sample			Mature sample			Shake-out sample			Decline sample		
	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t	Beta	Sig	t
Constant	-13.557	.003	-3.185	-2.012	.534	-.625	-3.344	.027	-2.223	2.012	.394	.856	-9.259	.006	-2.907
BTD	8.300	.193	1.319	7.751	.178	1.360	-1.068	.438	-.776	-6.621	.004	-2.960	-17.552	.001	-3.431
NWR	-.295	.797	-.259	-1.743	.072	-1.825	-2.420	.000	-4.553	-1.192	.097	-1.671	-2.016	.074	-1.830
Tangibility	.730	.663	.438	-2.287	.091	-1.715	-1.635	.003	-3.011	-5.600	.000	-4.375	-2.539	.340	-.964
CFO	-.814	.771	-.293	-.055	.987	-.017	1.042	.344	.947	2.630	.019	2.379	-.271	.908	.116
ROA	.071	.980	.025	8.416	.017	2.452	5.952	.000	4.580	3.489	.045	2.021	16.868	.000	3.817
DIV1	.186	.654	.451	1.110	.020	2.384	.118	.668	.430	1.477	.000	4.080	.698	.122	1.577
Age	-.012	.274	-1.108	-.011	.389	-.867	.012	.031	2.162	-.011	.110	-1.608	.002	.858	.180
Leverage	-.308	.005	-2.928	-.045	.790	-.267	.022	.576	.559	-.084	.057	-1.916	-.056	.420	-.813
F-size	1.123	.022	2.374	-.126	.722	-.357	.088	.600	.525	-.662	.018	-2.383	.520	.132	1.535
Adjusted R ²	24.7%			26.2%			30.0%			42.2%			39.4%		
Model Sig.	.016			.002			.000			.000			.001		
N	66			85			322			173			65		
F-statistic	2.187			2.660			7.881			7.280			3.309		
Industry effect	Yes			Yes			Yes			Yes			Yes		
Year effect	No			No			No			No			No		

Dependent variable Ln (cash and cash equivalents/ net assets)

The same results are obtained by using the two proxies of tax avoidance across the five stages of firm's life cycle. For the control variables, the same results are obtained between the ETR and BTD models except some differences for the net working capital ratio, ROA, and leverage. Net working ratio is significant in the mature sample only with BTD comparing with the growth and the mature in the ETR models.

For ROA ratio, it is significant in all samples except the introduction sample in the BTD models comparing except for the introduction and the shake -out samples in the ETR models. Lastly, leverage is significant in the introduction and the shake-out samples in the ETR models comparing with the significance in the introduction sample with BTD models. To sum up, all results for the independent and the dependent variables with their different proxies are consistent in the main statistical tests and in the robustness test.

6- Conclusion

In this study, the researcher provides empirical evidence on the impact of corporate tax avoidance and firm's life cycle on cash holdings level. Using a large sample of non-financial Egyptian companies listed in the Egyptian stock market as one of the emerging markets for the period 2012- 2019. To determine the effect of tax avoidance on cash holding, two measurements are employed for tax avoidance and cash holdings in order to overlap any bias or error for a single measurement (Hanlon and Heitzman. 2010). For the firm's life cycle, cash flow approach is applied in this study (Dickinson, 2011). This study took in consideration all the five stages of this approach.

By investigating the significance of the relationship between research variables, regression results showed that tax avoidance significantly associated negatively with cash holdings. The same results are reported by Dhaliwal et al. (2011), Di and Hanke, (2013); Faulkender et al. (2019). It can be explained by increasing tax avoidance, which resulted in decreasing tax expense, that decrease firm obligations, thus no need for more cash holdings. These results are opposing to the findings that were obtained by Faff et al. (2016)

The current findings of firm's life cycle suggest that the firms in the introduction stage prefer to decrease their cash level. Moreover, firms in the shake-out stage hold more cash, and this is in line with (Alqahtani et al. 2022). Whereas no relationship exists between the cash holdings and the growth, the mature and the decline stages. The findings are robust to the alternative proxies of tax avoidance and cash holdings. The sub-sample tests report that the negative relation of tax avoidance with cash holdings is significantly high in both the shake-out and the decline firms.

This paper contributes to accounting literature in several points: First, this study merges between strategic management by testing firm's life cycle with its five stages from one side, and accounting by testing tax avoidance and cash holding from other side. Second, in previous studies, they focused on investigating one variable only (tax avoidance or firm's life cycle) with cash holdings. This study combines the two variables together. Third, to the knowledge of the researcher there is a shortage in the studies that are conducted in the Middle East in

general, and specifically in the Egyptian market. Fourth, this research applies more than one measurement for tax avoidance and cash holding to validate the results.

Fifth, taking in consideration the complexity of collecting data in Egypt, this study depends on all non-financial firms' information available in Egyptian market for 8 years to make the research sample representative for the Egyptian population. Sixth, it provides empirical evidence for policy maker, especially financial regulation authority and tax authority about cash holdings level and tax avoidance.

This paper indicates that tax avoidance and firm's life cycle are important determinants of cash level for the Egyptian firms. The research findings can be beneficial for different stakeholders like governments, firms, banks, and investors. The government -like the Egyptian tax authorities- could review the allowances for firms regarding tax avoidance practices. Firms must take into their consideration the different factors and determinates of the cash balance in the line of the results of this study. Banks and creditors should study the borrowing requirements and the credit conditions according to the cash balance. Additionally, investors can evaluate their potential investment by considering the important characteristics of firms in order to preserve their wealth.

Finally, for future research, it is recommended to use larger samples, longer time, alternative measurements for tax avoidance, cash holdings and firm's life cycle and conduct studies in the financial institutions to capture conclusive results in the Middle East and in the Egyptian market.

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