Corporate Cash-Holding Decisions: Amman Stock Exchange

A Thesis Submitted for the Degree of Doctor of Philosophy

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Abstract

Using a panel data analysis of a sample of 80 listed non-financial Jordanian firms during the period from 2000 to 2011, we investigated the corporate cash-holding decision. The firm's decision to hold cash has come to the fore in last two or three years as a result of the recent global financial crisis, and the impact that this has had on the firms' ability to raise funds from external sources. There is evidence in the US, for example, that firms have increased their holdings of cash as a result of increasing constraints from external sources. This current study therefore examines this issue from the point of view of a developing economy.

We started by investigating the empirical determinants of corporate cash holdings; the results showed that firm size and growth opportunities have no significant effect on corporate cash-holding decisions, while firm's cash flow, leverage, and liquid assets substitute have a significant negative effect on cash-holding decisions, and profitability and cash dividends have a positive effect on cash-holding decisions.

Then we investigated empirically how cash-holding affects the value of corporate firms. Based on Fama and French's (1998) valuation model and Faulkender and Wang's (2006) model, the results showed that the marginal value of each Jordanian Dinar (JD) is valued at a discounted value of 0.41 JD; with higher leverage the marginal value of cash is declining, with a higher level of cash the marginal value of cash is increasing and, finally, cash dividends have no significant effect on shareholders' value.

We also investigated empirically how a group of explanatory variables affect a firm's debt ratio by focusing on the liquidity variable. Results showed that the total debt ratio is positively affected by firm size and is negatively affected by growth opportunities, profitability, assets tangibility and total liquidity, cash, and non-cash liquidity. The long-term debt ratio is positively affected by firm size, non-debt tax shield, asset tangibility, total liquidity, cash, and non-cash liquidity, while the long-term debt ratio is negatively affected by growth opportunities and profitability. For the short-term debt models, the debt ratio is negatively affected by firm size, asset tangibility, and liquidity in its different forms. An investigation into the speed of adjustment showed that Jordanian firms quickly adjusted the total and long-term debt ratio, while they do not have an optimal or target short-term debt ratio.

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Chapter 1: General Introduction

1.1. About the Amman Financial Market (AFM)

1.1.1. Establishment of the AFM

Issuing and trading in corporate stocks in Jordan goes back to 1930, when the first public shareholding company (Arab Bank) issued its stock to the public for the first time. In 1931, Jordan Tobacco and Cigarettes issued its stock, followed by Jordan Electric Power in 1938, and Jordan Cement Factories in 1951. Subsequently, many other corporate firms followed this trend and started issuing stock to the public. The first corporate bond was issued in Jordan in the early 1960s. All of this issuing and trading in stocks occurred in an unorganized security market. So, the Jordanian government tried to regulate the trading and dealing in securities in this unorganized securities market which was performed through non-specialist agents rather than brokerage firms. This action was taken in order to protect investors, ensure that the process of trading is easy and safe, and allow an appropriate mechanism to identify fair securities prices based on the laws of supply and demand. Since that time, the size of this unorganized market and the Jordanian economic system have both increased substantially.

With Jordanian government support, the central bank of Jordan, in collaboration with the World Bank's International Finance Corporation (IFC), set up the Jordanian securities market. Those efforts resulted in the Amman financial market (AFM) which was formed and initiated on 1st January 1978. The main roles assigned to this financial market are those of a securities and exchange commission and the traditional role of securities exchange. This financial market also aims to achieve other objectives including the following; encourage investors to invest in available securities in this market; support the national economy of Jordan; regulate trading and dealing in securities in a way that will protect all investors; make that process safe, easy and fast; and provide any required statistical information and data on this market to help the investors to take their investment decisions. When it was established on 1st January 1978, 66 firms were listed with a market capitalization of JD[1] 286 million.

[1] Each Jordanian Dinar (JD) = 1.41 US Dollars (the exchange rate between JD and $ is fixed)

1.1.2. The development of the AFM

Twenty years after the Amman financial market (AFM) was established, and based on the experience that the Jordanian government has accumulated, a new comprehensive reform policy has been adopted. The main goals of this reform policy are as follows: To improve the laws and regulations of the national securities market to reach international standards of financial markets; support, improve and enhance the private sector in the Amman financial market; and diversify and expand the national economy. By setting those reform policies and goals, the Jordanian government aims to achieve the following: make some changes in the capital market and its institutions in order to improve this capital market; introduce and use electronic rather than manual systems for trading, settlement and clearance; enhance and improve investment in the Amman financial market by eliminating any investment restrictions or obstacles that investors might face; improve the control and supervision of the financial market in order to create a stronger financial market with a high level of safety and transparency to create the best possible investment environment for securities trading; and enable interaction with other financial markets around the world, thus making it more global.

As a result of this reform policy, in 1997 the Temporary Securities Law No. 23 of the year 1997 was enacted. This Law was a major milestone for the Amman financial market as it aims to create an infrastructure for the financial market consistent with international standards, regulate and restructure the financial market in Jordan, and create a safe, secure, and transparent securities trading environment. According to the new Temporary Securities Law, the financial market in Jordan has been restructured in a way that will ensure the separation of the supervisory and legislative roles from the executive role. Under the new law, the Amman financial market will now be represented by three new institutions which will replace the Amman financial market. The three new institutions are the Amman Stock Exchange (ASE), Jordan Securities Commission (JSC), and Securities Depository Centre (SDC). The Amman Stock Exchange (ASE) and Securities Depository Centre (SDC) will be responsible for the executive role, while Jordan Securities Commission (JSC) will be responsible for supervisory and legislative roles.

1.1.2.1. The Amman Stock Exchange (ASE)

The Amman Stock Exchange (ASE) was established on 11th March 1999 as a private sector, non-profit organization with legal and financial autonomy as one of two institutions

responsible for the executive role beside the Securities Depository Centre (SDC). The ASE was the only authorized stock exchange market in Jordan according to the Temporary Securities Law, No. 23 of the year 1997. The new Securities Law number 76 for the year 2002 allows other stock exchanges. This new Securities Law also entails the formation of an independent investor protection fund, stricter ethical and professional codes, and a more stringent observance of the rule of law.

1.1.2.2. The Securities Depository Centre (SDC)

The SDC is the second institution responsible for the executive role in the Amman financial market. The SDC was established on 10th May 1999 as a private sector, non-profit organization with legal and financial autonomy. The aims of the SDC are as follows: ensuring safe custody of ownership of securities; transferring the securities ownership and registering the securities traded on ASE; and settling the prices of securities among brokers.

1.1.2.3. The Jordan Securities Commission (JSC)

This institution is responsible for supervisory and legislative roles among the three new institutions emerging from the Amman financial market's restructuring. The JSC is also a private sector, non-profit organization with legal and financial autonomy. The aims of the JSC are as follows: Supervising the issuance of and dealing in securities; regulating and monitoring the activities and operations of those organs falling under its supervision; and regulating and supervising the disclosure of information related to securities, issuers, insider trading, and major shareholders.

The JSC has a Board of Commissioners comprising five members who have the following roles: Drawing up draft laws and regulations on securities; approving the by-laws and regulations of the SDC and ASE; granting licenses issued under the Law; setting limits for commissions of financial services companies and members of the SDC; and adopting accounting and auditing standards for the organs falling under its supervision as well as standards for their qualified auditors.

1.1.3. Some statistics

Since it started, the ASE has been developed in many aspects. Table 1.1 shows the number of firms listed in the ASE, the market capitalization, the ratio of market capitalization to GDP,

the value of stock traded, the value of bonds traded, the market P/E ratio, the market P/BV, and the market dividend ratio from 2000 to 2011. Table 1.1 documents a very substantial increase in the market capitalisation of firms listed on the ASE, in part, but not exclusively driven by the significant increase in the number of firms listed on the market. The ratio of market capitalization to GDP shows quite substantial variation over a relatively short time period, and is currently somewhat lower than would be evident in a developed market such as the US or the UK, suggesting that the ASE still has some way to go in promoting market listing for firms. The value of stock traded on the market has fallen significantly over the last few years, since reaching a peak in 2008. At the same time, the value of bonds traded is very low, and indicated that the ASE does not yet provide firms with a liquid and effective market to raise capital through the issue of debt securities.

Table 1.1

Listed firms, their market capitalization, the ratio of market capitalization to GDP, value of stock traded, value of bond traded, market P/E ratio, market P/BV, and market dividend ratio for the period from 2000 to 2011.

Year	No. of listed firms	Market capitalization*	Market capitalization to the GDP	Value of Traded Stock*	Value of Traded Bonds*	P/E Ratio (Times)	P/BV (Times)	Dividend Yield Ratio %
2000	163	3,509.6	58.4%	334.7	7.2	14.8	1.1	3.6
2001	161	4,476.4	71.5%	668.7	7.2	15.3	1.4	2.7
2002	158	5,029.3	80.4%	950.3	9.7	13.0	1.2	3.2
2003	161	7,772.8	116.8%	1,855.2	11.4	21.7	1.9	2.4
2004	192	13,033.8	184.7%	3,793.2	6.0	31.1	2.7	1.7
2005	201	26,667.1	326.6%	16,871.0	3.1	44.2	3.2	1.6
2006	227	21,078.2	233.9%	14,209.9	1.9	16.7	2.9	2.3
2007	245	29,214.2	289.0%	12,348.1	3.8	28.0	3.0	1.8
2008	262	25,406.3	226.3%	20,406.3	0.6	18.8	2.2	2.5
2009	272	22,526.9	149.6%	9,665.3	2.5	14.4	1.8	2.8
2010	277	21,858.2	122.7%	6,690.0	0.1	26.3	1.7	2.7
2011	247	19,272.8	102.7%	2,850.3	0.6	22.6	1.5	3.3

* Numbers in millions.

Source: Amman stock exchange annual reports for several years.

In the ASE, the manner of calculating the market index has been changed several times in the last few years. By introducing new ways to calculate the market index, the true value of the market performance would be reflected. The first index used in the ASE was the Unweighted

Price Index; this then changed to the Weighted Price Index and, most recently, to the Free Float Weighted Index. Table 1.2 shows the value of those indices for the period from 2000 to 2011.

Table 1.2

Un-weighted Price Index, Weighted Price Index, and Free Float Weighted Index for the period from 2000 to 2011.

Year	Un-weighted Price Index	Weighted Price Index	Free Float Weighted Index
2000	575.6	1,330.5	813.3
2001	646.1	1,727.0	1,060.6
2002	691.7	1,700.2	1,090.9
2003	1,117.5	2,614.5	1,761.5
2004	1,535.9	4,245.6	2,729.1
2005	2,171.0	8,191.5	4,259.7
2006	1,608.1	5,518.1	3,013.7
2007	1,798.1	7,519.3	3,675.5
2008	1,235.5	6,243.1	2,758.4
2009	1,057.7	5,520.1	2,533.5
2010	834.4	5,318.0	2,373.6
2011	606.8	4,648.4	1,995.1

Source: Amman stock exchange annual reports for several years.

Un-weighted Index

The Un-weighted Index is calculated by giving an equal weight to the stock in the index sample regardless of market capitalization and price level. Only changes in the price will affect the index value. This index was introduced on 1st January 1980 at a level of 100 points, based on the data of 1st January 1980. In 1992 this index was modified, using the data of 31st December 1991 as the base period. The last change to this index occurred in 2004 when the base of this index changed to 1,000 points, as of 1st January 2004.

This index is calculated as;

$Index_t = e^{(\ln_{10} \times S) \times 1,000}$

Where;

S: Σ (Log $P_{ti}/P_{oi} \div n$).

n: sample size.

t: time.

e: exponential.

ln: the natural logarithm.

log: logarithm to the base of 10.

P_{ti}: price of the stock i at time t.

P_{ti}: price of the stock i at the base period.

Weighted Index

In this index the market capitalization is considered in order to calculate the value of the index. The data on 31st December 1991 was used as the base period at a level of 100 points changed to 1,000 on 1st January 2004. This index consists of 100 stocks representing about 90% of the total market capitalization of ASE.

This index was calculated as;

$Index_t = M_t/B_t \times 1{,}000$

Where;

$B_t = B_{t-1} \times M_t/M_{ad}$.

$M_{ad} = M_t - I_t - N_t + Q_{t-1}$.

t: time.

M_t: market capitalization at time t.

B_t: market capitalization at the base period.

M_{ad}: adjusted market capitalization at time t.

I_t: market capitalization for the new issued stocks.

N_t: market capitalization for the stocks added to the sample.

Q_{t-1}: market capitalization for the stocks removed from the sample.

Free Float Index

The Free Float index was introduced to better represent the price changes of the stocks that are traded in the market, avoiding the bias of large market capitalization stocks where relatively little stock is floated on the market. This index used a 1,000-point base system as of the 31st December 1999.

This index was calculated as;

$Index_t = \Sigma (P_{ti} \times S_{ti} \times F_{ti}) \div D_t$

Where;

P_{ti}: price of stock i at time t.

S_{ti}: the total number of stock listed at time t.

F_{ti}: factor takes a value between 0 and 1 and represents the total listed shares minus shares owned by the board of directors, investors who owned 5% or more, and any government ownership to the total authorized shares for stock i at time t.
D_t: divisor index at time t.

It is evident from Table 1.2 that there are some quite significant differences between the three alternative indices, particularly in terms of their variation over time. The difference between the weighted and un-weighted indices reflects what appears to be a greater increase in the price of the larger stocks, since these will have a greater weight in the weighted index, and this index has enjoyed a much more sustained increase during this period compared to the un-weighted index. Alternatively put, Table 1.2 suggests that the smaller stocks on the ASE have performed less well compared to the larger stocks.

1.1.4. Laws and regulations controlling the AFM

There are several laws and regulations controlling the financial market in Jordan. The main law that authorizes and controls the financial market in Jordan is the "The Securities Law No. 76 for the Year 2002". Here, we can find the definitions and explanation of the words and the phrases used in the law. It also defines what are considered securities and what are not, and when and in what circumstances this law should be applied. The law has established the legal framework of the JSC by giving it a legal identity with financial and administrative autonomy, and defines the aims, objectives, responsibilities, authority, and restrictions of this commission. Then it defines how the board of the JSC will be appointed, detailing their authority and responsibilities. The law also explains how the JSC deals with financial affairs and investor protection. Later, the law defines how firms can go public and explains the procedures for this process, as well as licensing, registration and monitoring for the brokers and financial services firms. Then the law establishes the legal framework of the ASE by giving it a legal identity with financial and administrative autonomy, and defines the responsibilities, authority, goals and objectives, as well as the members of the ASE. As well as the JSC and the ASE, the law also gives the SDC a legal identity with financial and administrative autonomy, and defines the responsibilities, authority, goals, and objectives of the SDC. Then the law defines the legal basis of the mutual funds and investment companies.

The law also has a section on violations and penalties. Finally, it deals with general and interim provisions[2].

Besides the "The Securities Law No. 76 for the Year 2002", other laws also control the financial market in Jordan. The "Internal By-Law of the Amman Stock Exchange of 2004" is one of the important laws defining and explaining the legal framework of the ASE. After the "Internal By-Law of the Amman Stock Exchange of 2004" defines the words and the phrases related to this and gives a legal identity and financial and the administrative autonomy to the ASE, it defines the goals, aims, objectives, responsibilities, and authority. Then the Law gives more details about the process of securities trading in the ASE, and identifies the members of the ASE, explaining how they have qualified to be members. The Law also explains how the general assembly should be held and provides all the details about it. Then it defines how the ASE board of directors is composed, how they manage the ASE, their responsibilities, and the authority of the board. The Law then presents information about inspections, investigations and penalties for ASE members. Finally, there is a section on financial affairs and some general laws[3].

Another law relating to the ASE is the "Administrative Internal By-Law" issued by virtue of Article (65) of the Securities Law No. 76 of the year 2002. This Law defines the organizational structure of the ASE and all other administrative issues[4].

One of the laws that control the ASE is the "Listing Securities Directives" which was issued by virtue of the provisions of Article 72 of the Securities Law No. 76 of 2002, by the decision of the Board of Commissioners of Jordan Securities Commission No. (149/2004), and amended by the decisions of the Board of Commissioners No. (257/2005), No. (41/2006), No. (196/2006), No. (45/2011) and No. (214/2011). (See section 1.1.5.)

"Trading Directives" is one of the laws that control securities trading in the ASE. It was issued in compliance with provisions of Article 67/c of the Securities Law No. 76 for 2002,

[2] Full code of the "The Securities Law No. 76 for the Year 2002" is available at http://exchange.jo/en/securities-law.
[3] Full code of the "Internal By-Law of the Amman Stock Exchange of 2004" is available at http://exchange.jo/en/internal-law.
[4] Full code of the "Administrative Internal By-Law" is available at http://exchange.jo/en/administrative-internal-law.

and amended upon a resolution by the Board of Commissioners of the Securities Commission No. (159/2009) of 16/3/2009. (See section 1.1.6.)

Other important laws, regulations and directives also control the ASE, as follows: "Directives for Internet Trading", issued by virtue of the provisions of Article 67/C of the Securities Law No. 76 for the year 2002 and article 24/B/1 of the Internal By-Law of the Amman Stock Exchange for the year 2004. "Disclosure Directives", issued by virtue of the provisions of Article 24/b/(3&4) of the ASE By-Laws of 2004. "By-Laws for Fees, Charges and Commissions", which specify the fees, commissions and charges applicable in the ASE. "Dispute Resolution Directives" which explain how to resolve any dispute arising between the members of ASE and their clients, and were issued by virtue of the provisions of Article 24/b/7 of the ASE By-Laws of 2004; and "Code of Ethics of ASE", which defines the ethical issues in the ASE, issued by virtue of the provisions of Article 26/e of the Securities Law No. 23 of 1997[5].

Beside the laws and regulations that were discussed earlier, another important factor plays a significant role in Jordan are the Islamic regulations.[6] According to the Islamic regulations, it is forbidden to deal with interest, either by paying or accepting that interest. Although it is forbidden to deal with interest, many firms and individuals are still accepting interest, either because they do not apply religious rules too strictly or because they have to deal with interest because there is no other option available. Based on this fact, we believe that this Islamic rule might affect the firm's decisions either directly or indirectly, especially those concerning its capital structure.

1.1.5. Securities listing in the ASE

According to "Listing Securities Directives", any security can be registered in the ASE as long as the following apply: The relevant securities are registered with the JSC; the relevant securities are deposited with the SDC; there are no restrictions on the transfer of ownership of relevant securities; there is an Audit Committee at the Issuer, in the sense used in the Securities Law in force; and the Issuer has signed the Listing Agreement with the ASE, which determines the rights and obligations of the two parties in relation to listing of securities. Then

[5] Full code of the "Code of Ethics" is available at http://exchange.jo/en/code-ethics.
[6] Islam is the formal religion of Jordan where more than 90% of the population follow the Islamic religion.

the Issuer must fill out an application with the relevant documents including the following: (1) A report issued by the Company's board of directors that contains the following: a summary about the Company's foundation, its major objectives and other objectives, as well as its relationship with other companies, be they mother, subsidiary or affiliate (if any); a description of the securities issued by the Company and those that the Company wishes to have listed; the board of directors' evaluation, supported by figures and statistics, of the Company's performance, the level at which it stands and accomplishments achieved, for comparison with the set plan of action; significant occurrences in the Company or those impacting it between the date of its establishment and the date of submission of the listing request; the names of the large owners of securities issued by the Company and the number of securities owned by each of them where such constitutes 5% or more of the issued securities; the Company's future plan for the next three years; names of the members of its board of directors, and names and positions of the top executive personnel, any securities owned by any of them or any of their relatives, and the membership of any of them in any board of directors of other companies; a list of the names of the Company's shareholders, the number of shares owned by each of them, and the percentage of non-Jordanian shareholding in the Company. (2) The Company's Articles of Association, Charter and Prospectus (if any). (3) The Company's Annual Report for the last fiscal year (if any), which includes the board of directors' report, the Company's financial statements and the Company auditors' report. (4) Transitory financial statements reviewed by the Company's auditor covering the period from the end of the fiscal year preceding the date of the listing application till the end of the last quarter preceding the date of the listing application (if any). (5) Any other information that the ASE deems necessary to make its listing decision. Also, the Issuing Company whose securities are approved for listing by the ASE shall declare its annual and interim fiscal data and a summary of the board of directors' report that was submitted for the purpose of listing. The Company shall make the declaration at least three days prior to the start of trading and include the following: Balance Sheet Statement, Income Statement, Cash Flow Statement, Stockholders’ Equity Statement, and any necessary notes or clarifications to said statements. When it is approved for listing, the relevant securities will be listed in the Second Market.

After it is listed in the Second Market, relevant securities can qualify for listing in the First Market if it meets the following conditions: It must be listed for a full year, at least on the Second Market; the Company's Net Shareholders' Equity must not be less than 100% of the paid-in capital; the Company must make net pre-tax profits for at least two fiscal years out of

the last three years preceding the transfer of listing; the Company's Free Float to the subscribed shares ratio by the end of its fiscal year must not be less than 5% if its paid-in capital is 50 million JD or more and 10% if its paid-in capital is less than 50 million JD; the number of Company shareholders must not be less than 100 by the end of its fiscal year; the minimum days of trading in the Company shares must not be less than 20% of overall trading days over the last twelve months; and at least 10% of the Free Float shares must have been traded-in during the same period.

Alternatively, securities listed in the First Market will be transferred to the Second Market if the following apply: the Net Shareholders' Equity decreased to less than 75% of the paid-in capital; the Company accounts show losses in the last three fiscal years; the Company's Free Float ratio shares drop to less than 5% when its paid-in capital is 50 million JD or more and 10% when its paid-in capital is less than 50 million JD by the end of its fiscal year; the number of Company shareholders drops to less than 75 by the end of its fiscal year; the days of trading in Company shares over the last twelve months drop to less than the 20% of overall trading days; the percentage of traded Free Float during the last twelve months drops to less than 10% by the end of its fiscal year. The transfer between the two markets can occur once a year when the companies provide their financial statements. Capital-increase shares will be listed once the issuing procedures are completed, and the issued shares are distributed to their owners. As a result of this distinction between the two markets, there should be a significant difference between the firms listed within each market. We would expect that firms listed on the first market will be relatively profitable firms with shares that are frequently traded. On the other hand, firms listed on the second market will be less liquid and less profitable.

Listed shares will be suspended in all cases determined by the JSC as follows: issuance of a decision by the general assembly of a company approving a reduction in the Company's capital, as of the date of notification of the ASE of the decision to reduce the capital, until the procedures of capital reduction are over and the letters of approval by the concerned official authorities are issued, except for companies which do so by purchasing shares issued by them from the market; merger of companies as of the date of notification of the ASE of the decision of merger which is approved by the Minister of Industry and Trade, and any contingency that substantially affects the sound trading in securities or the financial position of the Company, until the procedures of disclosure to the community of traders are completed. If suspension is for a period of no more than two days, this shall be by virtue of a decision from the CEO; if it

is for more than two days, this shall be by virtue of a resolution by the Board of Directors, upon the request of the Board of Directors of the listed Company with a clarification of the reasons for said request. This shall be by virtue of a resolution by the Board of Directors and for the period it deems appropriate. In cases of interruption of normal business of the Company for a period exceeding three months without clarification of the reasons for said interruption this shall be by virtue of a resolution by the Board of Directors and for the period it deems appropriate, issuance of a General Assembly resolution to have a voluntary liquidation of the Company, submittal of a statement of action before a competent court for the compulsory liquidation of the Company, on the date of the General Assembly meeting of the company, and if so required under the legislation in force, upon a justified cause by the Issuer, or in any of the cases deemed necessary by the ASE to protect investor interests. Suspended securities can be re-listed once the reasons for suspension cease to exist, by virtue of a decision issued by the same party which issued the decision of suspension.

Listed shares will be de-listed if the Company's legal status changes, or in the event a final decision is passed to liquidate and wind-up the company, or by a decision to liquidate the Company by board of directors of the Company, and if its listed shares have been suspended for more than two years.

The ASE has attempted to ensure that firms provide both regulators and investors with sufficient information to ensure that the market is well informed and that there is sufficient transparency regarding the firm's performance and prospects. Listed Companies on the ASE should provide the ASE with the following: the Company's annual report which includes the board report, the financial statements and the auditors' reports, within three months of the end of its financial year; semi-annual reports with a comparison with the same period of the previous fiscal year within one month of its semi-financial year; any decisions or information which might affect the share price; the agenda of its general assembly meetings and the decisions passed by this general assembly; a report indicating the Company's Free Float shares and how they have been calculated, to be provided at the same time the Company provides its annual report; and any other information or statements considered necessary by the ASE. If the company is classified in the First Market it must provide the ASE with quarterly reports reviewed by its auditors and compared with the same period of the previous financial year besides the annual and semi-annual reports.

In any case of breaches of this law made by the securities issuer, the ASE has the right to impose one or more of the following sanctions: A warning; a fine of not less than 100.00 and not more than 5,000.00 JD; transferring the listed shares from the First to the Second Market; securities suspension; and securities de-listing[7].

1.1.6. Securities trading in the ASE

The "Trading Directives" explain and regulate the securities trading in the ASE. Trading in securities takes place through contracts and between brokers for their own accounts or for their clients' accounts. All of those contracts must be recorded and documented either manually or electronically. All of the transactions and the uses of clients' funds must be in compliance with the rules and regulations in the ASE; a client's funds will only be used for his/her account and the broker is not allowed to use those funds for any other client.

With each agreement, the broker should include the following information: the name and the address of the client and the broker him/herself; a description of the service that the broker will provide to their client; an illustration of the commissions that the client will be charged; and any type of authorization which allows the broker to act on behalf of the client. In all cases the agreement must not exempt or restrict the broker's responsibility as stated by law.

The broker must have authorization from his/her clients including written, telephone, or e-mail authorization. The broker must be able to prove that he/she has this authorization at any time, including the name of the client, the type of security, type of transaction, number of securities, the time and the date of the transaction, and valid authority. All of this information must be documented since it will be subject to ASE monitoring and control.

The broker must inform his/her clients about all executed and unexecuted transactions immediately or as the contract between the broker and the client states. The broker must inform his/her clients if the broker was part of the transaction or as stated by the contract. The broker is also not allowed to execute any transaction on a specific security for his/her own benefit or for clients whose investments he/she manages if the broker has already attempted a

[7] Full code of the "Listing Securities Directives" is available at http://exchange.jo/en/listing-securities-directives.

financial consultancy related to that specific security until this financial consultancy is published for at least one day.

The broker is prohibited from undertaking any transaction or financial consultancy based on insider information. It is also prohibited to give any misleading information about the price or quantity of the security which might affect the supply and demand of that security. The ASE officers have the right to cancel any buying or selling orders on any security if such orders were meant to hamper trading in that security. The ASE's CEO or any other authorised employee has the right to adjust the closing price if it has been discovered that the price when the last transaction occurred was meant to manipulate the price of that specific security. Also The ASE's CEO or any other authorised employee has the right to cancel any order (1) if the broker made a mistake by sending a wrong order as long as the broker contacted the ASE within 10 minutes and before the market closed and if the other party involved in this transaction agrees to cancel; (2) if there is any technical failure.

All transactions in the ASE take place according to the time and the phases of trading which are set by the ASE board of directors, every day except weekends[8] and public holidays. The ASE must inform the brokers immediately about any changes in the timetable of the trading sessions as a result of any extraordinary event. Securities trading occurs through the various pricing groups and on the basis of one security and its multiples unless stated otherwise. The ASE board of directors set the minimum quantity of securities that the broker can display in the buying and selling orders. The ASE board of directors also set the minimum time that may elapse for the placing of buying and selling orders, before the broker is able to change or cancel those placed orders.

Securities traded in the ASE can be priced in JD or any other currency. Securities priced in JD must be priced in multiples of ten Fils[9]. The ASE board of directors will determine the monetary multiples of the securities that are traded in other currencies. The ASE board of directors define the percentage limit of the price increases and decreases for any security compared to that security's reference price. The ASE board of directors have the right to exclude some block transactions from the upper and lower price limit in the following cases: if the government or any public institution is a party to the block transactions; if the market

[8] Weekend in Jordan is on Friday and Saturday.
[9] 1 Fils = 0.001 JD.

capitalization of the block transactions is not less than the minimum limit set by the board of directors; and in any other case where the ASE board of directors is convinced that the parties involved in the transaction are both satisfied with the price of this block transaction[10].

As a result, Jordanian firms face a comprehensive set of regulations concerning the listing of their shares on the ASE. These regulations are designed to ensure that market participants are provided with the fullest possible information, and that manipulation of the price by the firm or by other investors, is curtailed. It still remains that in comparison to stock markets in the developed economies, the ASE is a relatively illiquid market, and is characterised by restricted free float and the presence of significant blockholder ownership.

Table 1.3 summarize the new stock issued in ASE including Initial Public Offering (IPO) and Secondary Public Offering (SEO) for the period between 2001 and 2012.

Table 1.3 new issued stocks in ASE between 2001 and 2012

	Number of IPO	Number of SEO	IPO and SEO	Average Size of Issue (JD)
2001	0	3	3	3,500,000
2002	0	4	4	2,662,344
2003	3	2	5	5,425,459
2004	26	45	71	11,013,109
2005	13	82	95	6,139,208
2006	26	94	120	13,333,333
2007	18	55	73	10,958,904
2008	17	50	67	12,904,753
2009	10	37	47	6,382,978
2010	5	33	38	7,894,736
2011	2	22	24	8,627,367
2012	0	8	8	6,261,609

Source: Amman stock exchange annual reports for several years.

From Table 1.3 we can notice some interesting observations about the number and the average size of the new stock issuing; in the last 12 years the new issuing can be grouped into three groups, at the earlier stage from 2001 to 2003 both the number and the average size of those issues were small, this can be explained as at that time ASE has just finished the reform process, where the amount of information for the investors on the previous years was limited, which make the ability of the firms to raise funds more difficult due to a higher information asymmetry. Then, from the year 2004 to the year 2008 we can notice that the number and the average size of the new stock issuing have been increased significantly, as at that stage ASE

[10] Full code of the "Trading Directives" is available at http://exchange.jo/en/trading-directives.

has been able to provide the market with better database which reduce the information asymmetry and helped the firms to raise more funds from stock issuing. This database also helped the investors to obtain more information about those firms that they are willing to buy their stock. The final stage is between 2009 and 2012 where the new issuing has been decreased in both number and average size of issuing, as this decreases can be explained by the effect of the financial crisis; where it is become more difficult to the firm to obtain external funds. Table A1 in appendix A shows more details information about the SEO for the Jordanian firms during the period from 2000 to 2012.

1.2. Methodology

The data available for empirical analysis can take different forms; if the unit (individual, company, country, etc.) under investigation is analyzed over different periods of time (days, weeks, months, quarters, or years) this data analysis is called time series data analysis. If the analysis takes place at a certain point in time for more than one unit (individual, company, country, etc.) then it is called cross-sectional data analysis. However, if we investigate more than one unit (individual, company, country, etc.) over different periods of time (days, weeks, months, quarters, or years) this is called panel data analysis or longitudinal analysis.

1.2.1. The advantages of using panel data

Using panel data analyses has several advantages; among others, Hsiao (1986) mentions some advantages of using panel data over both time series and cross-sectional analysis: (1) it increases the efficiency of the econometrics estimation by giving the researcher a larger number of data points (observations) which will help to increase the degree of freedom and also reduce the collinearity between the explanatory variables; (2) it allows the researchers to analyze certain hypotheses and questions they could not analyze with time series and cross-sectional analysis; (3) unlike cross-sectional data, panel data make it much easier to investigate the dynamic change; and (4) it allows researchers to test and construct more complicated models. Baltagi (2001) lists six advantages of panel data analysis compared to time series and cross-sectional analysis: (1) it controls for heterogeneity; (2) panel data are more efficient, more informative, have more degrees of freedom, and have less collinearity; (3) panel data are better for studying the dynamic adjustment; (4) they are better than time series and cross-sectional data for measuring and identifying certain kinds of effects; (5) they

allow the study and examination of more complicated models; and (6) they are usually gathered in micro units such as individuals, firms, and countries, which helps to eliminate the biases of aggregation. Brooks (2008) mentions three advantages of panel data: (1) panel data allow researchers to address and tackle more complex problems compared to cross-sectional or time series data analysis; (2) panel data allow for dynamic change, which is more difficult with time series alone since it requires a long run of data; by using panel data, which combine time series and cross-sectional data, the degree of freedom will increase and enhance the power of the test; another benefit of this combination of time series and cross-sectional data is to reduce the multicollinearity between the variables, which can be more obvious in time series analysis alone; and (3) the appropriate panel model can help to remove the effect of omitted variables bias from the regression results. Gujarati (2003) mentions six advantages of panel data: (1) panel data estimation techniques can take into consideration the heterogeneity in the units under investigation by allowing for those units' specification; (2) panel data combine time series and cross-sectional data, which will increase the efficiency, reduce the collinearity, increase the degree of freedom, and make the data more informative; (3) studying the dynamic change with panel data is better; (4) compared to cross-sectional data, panel data are better for measuring and detecting the effects of research variables; (5) panel data allow researchers to study more complicated models compared to what is possible with time series and cross-sectional data; and (6) panel data help to minimize the bias that might occur with large, aggregated amounts of data for several units under investigation. Many others have identified very similar advantages of panel data, such as Fress (2004).

1.2.2. How panel data work

The methodology that will be used in this research is panel data analysis, including three alternative panel data models: pooling ordinary least squares model, fixed-effect model, and random effect model. We will apply those three models available under the panel data analysis, and then check which one of them is the most appropriate, using it as the research model. First, we will explain the panel data analysis in the forms of pooling ordinary least squares model, fixed-effect model, and random effect model; then we will explain the test that we will use in order to decide which one of them is the most appropriate.

1.2.2.1. Pooling ordinary least squares model

The simplest form of panel data model is the pooling ordinary least squares model. This model can be written as follows:

$$Y_{it} = \alpha + \beta_k X_{it} + u_{it} \qquad (1.1)$$

$$i = 1, 2, \ldots, N. \qquad t = 1, 2, \ldots, T. \qquad k = 1, 2, \ldots, K.$$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

Where i is the unit under investigation identifier, t is the time identifier, k is the parameter identifier, N is the maximum number of unit under investigation, T is the maximum number of period, and K is the maximum number of parameter.

Under the pooling ordinary least squares model all the data from all units will be pooled together (listed on top of each other), with the assumption that the constant terms including the intercept α and the slope coefficients β_k are the same over time for all units.

1.2.2.2. Fixed-effect model

The fixed-effect model, which is also called the least square dummy variable (LSDV), can be considered a generalized form of the pooling ordinary least squares model (Hsiao 1986). In this model we take into account the individual effect of each unit by allowing for intercept α to vary for each unit but not over time, while we do not allow the slope coefficients β_k to vary and we still assume they are constant; by allowing the intercept α to vary for each unit it can capture the special effects of the unit under investigation such as learning curve, managerial philosophy, management skills, etc. This model can be written as follows:

$$Y_{it} = \alpha_i + \beta_k X_{it} + u_{it} \qquad (1.2a)$$

$$i = 1, 2, \ldots, N. \qquad t = 1, 2, \ldots, T. \qquad k = 1, 2, \ldots, K.$$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

Note how the intercept term is written as α_i compared to α in the pooling ordinary least squares model (equation 1.1) in order to capture the special effect of the unit under investigation over the whole period of investigation. The fixed-effect model can also allow

the intercept term to vary over time as well as cross-sectionally. This model can be written as follows:

$$Y_{it} = \alpha_{it} + \beta_k X_{it} + u_{it} \qquad (1.2b)$$

$i = 1, 2, \ldots, N.$ $t = 1, 2, \ldots, T.$ $k = 1, 2, \ldots, K.$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

Note how the intercept term is written as α_{it} compared to α in the pooling ordinary least squares model (equation 1.1) and α_i in the fixed-effect model (equation 1.2a) in order to capture the special effect of the unit under investigation, as well as the time effect.

Panel data can also be used where we assume that all constant terms including the intercept term α and the slope coefficients β_k vary over units, or if all constant terms vary over units and time together. Those models can be written as follows:

$$Y_{it} = \alpha_i + \beta_{ki} X_{it} + u_{it} \qquad (1.2c)$$

$i = 1, 2, \ldots, N.$ $t = 1, 2, \ldots, T.$ $k = 1, 2, \ldots, K.$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

$$Y_{it} = \alpha_{it} + \beta_{kit} X_{it} + u_{it} \qquad (1.2d)$$

$i = 1, 2, \ldots, N.$ $t = 1, 2, \ldots, T.$ $k = 1, 2, \ldots, K.$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

According to Hsiao (1986), models (1.2a) and (1.2b) are widely used in analyzing panel data while models (1.2c) and (1.2d) are used in variable coefficient models. Variable coefficient models are used when the data under investigation need to be analyzed when the hypotheses about the coefficients are not constant over the analysed time period while the research variables still have a proper relationship. In this case we need to use a variable coefficient model that accounts for inter-individual heterogeneity, inter-period heterogeneity, or both, by allowing the parameters to vary cross-sectionally, over time or both.

1.2.2.3. The random-effect model

In the previous models the intercept term α was treated as a fixed constant; however, in the random effect model (sometimes called error components model) the intercept term α will be considered a random variable. This model can be written as follows:

$$Y_{it} = \alpha_i + \beta_k X_{it} + u_{it} \quad (1.3)$$

$i = 1, 2, \ldots, N.$ $t = 1, 2, \ldots, T.$ $k = 1, 2, \ldots, K.$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

Where the intercept term α is now a random variable rather than being assumed to be fixed. The random intercept term α_i for a given unit is given as;

$$\alpha_i = \alpha + \varepsilon_i \quad (1.4)$$

$i = 1, 2, \ldots, N.$

Where ε_i is a random error term $\varepsilon_i \sim NIID\ (0, \sigma^2)$

By substituting (1.4) in (1.3) and rearranging;

$$Y_{it} = \alpha + \beta_k X_{it} + u_{it} + \varepsilon_i \quad (1.5)$$

$i = 1, 2, \ldots, N.$ $t = 1, 2, \ldots, T.$ $k = 1, 2, \ldots, K.$

$u_{it} \sim NIID\ (0, \sigma^2)$, $\varepsilon_i \sim NIID\ (0, \sigma^2)$

$E(\varepsilon_i u_{it}) = 0$, $E(\varepsilon_i \varepsilon_j) = 0$ $(i \neq j)$

$E(u_{it} u_{is}) = E(u_{it} u_{jt}) = E(u_{it} u_{js}) = 0$ $(i \neq j, t \neq s)$

1.2.3. Pooling ordinary least squares model, fixed-effect model, or random effect model

Having introduced the three panel models - pooling ordinary least squares model, fixed-effect model and random-effect model - we need to determine which one of them we should use to analyze our data; in other words, which provides the most accurate or most appropriate results? In order to answer this question, further tests and analyses should be conducted. The first test we can use is the Likelihood ratio test which is used to compare between the pooling ordinary least squares model and fixed-effect model; the second test is the Hausman test which is used to compare between the fixed-effect model and the random effect model.

1.2.3.1. Likelihood ratio test

The likelihood ratio test is a statistical test used to compare between two models in order to decide which one of them is more appropriate. By comparing the likelihood function of two models where one of them is restricted and the other one is not restricted, the likelihood test can tell which one of them is the more fitting model. The likelihood ratio can be calculated as;

$$\lambda = \frac{\max likelihood\ function\ for\ the\ restricted\ model}{\max likelihood\ function\ for\ the\ unrestricted\ model}$$

$$\lambda = -2\ [\ln L_R - \ln L_U] \qquad (1.6)$$

Where L_R is the likelihood function for the restricted model and L_U is the likelihood function for the unrestricted model.

The natural logarithm of the likelihood function L for a regression model such as $Y_i = \alpha_i + \beta_k X_i + u_i$ will be as follows:

$$\ln L = -\frac{n}{2}\sigma^2 - \frac{n}{2}\ln(2\pi) - \frac{1}{2\sigma^2}\Sigma\,(Y_i - \alpha_i - \beta_k X_i)^2$$

The results of the likelihood ratio test follow the χ^2 distribution with degrees of freedom equal to the number of restrictions. If the result of the likelihood ratio test is significant, the restricted model is the fit model; otherwise the unrestricted model is the fit model.

1.2.3.2. Hausman test

The Hausman test is a statistical test used to compare between two models in order to decide which one of them is preferable. This test can be used to compare between the fixed-effect model and the random effect model. The Hausman test is conducted to determine whether the intercept term α and the explanatory variables X_i are independent. The basic assumption of the random effect model is that the intercept term is a random variable which is not correlated with the other explanatory variables. So, if the Hausman test shows a significant result, that means the intercept term is correlated with one or more explanatory variables and it is not a random variable as the random effect model assumed. Therefore, the fixed-effect model is the appropriate model; otherwise, if the Hausman test shows an insignificant result the random effect will be the appropriate model. As with the likelihood ratio test, the Hausman test results follow the χ^2 distribution with degrees of freedom equal to the number of explanatory variables.

1.2.4. Dynamic panel model (Generalized Method of Moments model or GMM model)

Occasionally the panel data model will include the lagged dependent variable Y_{it-1} as an independent variable along with the other explanatory variables X_{it}. This regression model, which includes the lagged dependent variable as one of the independent variables, is called the dynamic model. This model can be written as follows:

$$Y_{it} = \alpha_i + \beta_k X_{it} + \gamma Y_{it-1} + u_{it} \qquad (1.7)$$

$$i = 1, 2, \ldots, N. \qquad t = 1, 2, \ldots, T. \qquad k = 1, 2, \ldots, K.$$

$u_{it} \sim NIID\ (0, \sigma^2)$

Running this kind of model (i.e. the dynamic model) using the previous techniques, including pooling ordinary least squares model, fixed-effect model and random effect model or what are called static models, will be biased since the explanatory variables which should be exogenous and uncorrelated are now no longer uncorrelated. As the lagged dependent variable becomes one of the independent variables there will be a correlation between this lagged dependent variable and the rest of the explanatory variables. To avoid this bias problem, the dynamic model should be run using another technique. This dynamic model can be run by using the Generalized Method of Moments model (GMM model).

The GMM model uses the estimators rather than parametric assumptions, thus making this model more robust for the process of generating data compared to static panel data models. The estimation process in the GMM model is based on an assumption about the equation disturbance; it is assumed that this disturbance is uncorrelated with a group of instrumental variables. It selects parameters that make the correlation between those instrumental variables and the equation's disturbance as close as possible to zero. In this way, the GMM model will make the estimation robust against heteroscedasticity, autocorrelation, or both.

1.3. Research Motivation

Many researchers have investigated the firm's decision to hold cash, the vast majority applying their research on developed countries. Very few researchers have studied the cash holding issue in developing country by grouping several countries together. By grouping

many developing countries into one group, this process is likely to ignore any special characteristics that could be related to those countries.

By covering the literature about cash holding decisions, we have discovered some important issues; (1) most of the research has been conducted on developed countries with only a minimal focus on developing countries. Even when developing countries have been investigated, a disparate group of countries have often been aggregated together. (2) When several researchers studied the effect of cash flow generated by the firm, they found that this factor has a dual effect; in some cases it has a negative relationship with cash holding as this cash flow can be considered as a source of liquidity, implying that firms do not need to hold a higher level of cash. When they find a positive relationship, their explanation of this positive relationship is that firms which generate more cash flow are more profitable and therefore depend on their internal source of financing by holding more cash. (3) Investigating the cash holding value has considered many factors such as the level of investor protection and the strength of the corporate governance system, but there is no research that considers the most recent issue of the financial crisis. (4) Many researchers investigated the determinants of cash holding and the value of cash holding but there was no such focus on how cash holding could affect firms' decisions regarding their capital structure, investments, or other corporate issues.

After identifying these gaps in the literature, we are going to study the following issues; (1) what are the determinants of the cash holding decision in a developing country such as Jordan by considering whether those determinants are different from other developed or developing countries due to any speciality of the market in Jordan. (2) Provide a clearer view about how firm's profitability and firm's ability to generate cash flow internally affects the cash holding decision, by using two separate variables to measure profitability and operational cash flow rather than only one variable as used in the literature. (3) Investigate the value of cash holding in a developing country where investor protection is weak and the corporate governance system is poor, and then extend the study to consider the possible effect of the financial crisis on the value of cash. (4) Investigate the determinants of capital structure not only by considering the traditional variables such as firm size, profitability, tangibility, etc but by including the liquidity variable as the total liquidity, and then consider a deeper analysis using cash and non cash liquidity, also studying the speed of debt ratio adjustment using a dynamic model.

Jordan has been chosen as the research sample for two reasons; firstly, besides being a developing country where market conditions are different from developed countries, where most the cash holding researches have been carried. Jordan has an extra issue which is the effect of religion. Jordan is an Islamic country, and the rules of Islam are expected to have an effect on the cash holding and the capital structure decisions; since interest is forbidden in Islam we expect that it will affect the capital structure decision by making firms depend less on long-term debt which involves the payment of interest, and depend more on internal sources of fund such as cash or even equity financing. Secondly, observing Jordanian firms either by analysing their annual reports or the board of directors' reports showed that there is no clear understanding of how these firms and their managers made the cash holding decisions and how the managers need to understand how to manage the cash based on their firm characteristics, the characteristics and the condition of the market, the value associated with holding this cash, and how this cash will affect other corporate decisions.

To summarise, many researchers have investigated cash holding decisions, most being conducted on developed countries, and only a very few on developing countries where many countries has been grouped together into one sample. This is likely to mean ignoring the characteristics of some countries, especially when their sample size is small compared with other countries. This research focuses on one developing country in order to better understand whether the special situation regarding Islamic rules affect the cash holding decision. It also aims to understand how profitability and operating cash flow separately affect cash holding decisions, as this issue has never been studied before. The existing research has included only one variable for the cash flow, and based on the results they achieved they explain it either as profitability or as the ability to generate cash internally. Another aim of this research is to understand whether corporate governance, agency problems, and investor protection affect the value of cash held by Jordanian firms in the same way as firms in both developed and developing countries, and then to investigate whether other factors such as the financial crisis has any effect on the value of cash holding as this issue has not been investigated when other researchers studied the value of cash holding. Finally, this research investigates how cash holding might affect the firm's capital structure decision by decomposing the liquidity variable into cash and non-cash liquidity, and then analyses how cash liquidity affects the firm's debt ratios.

1.4. Contribution

This research aims to provide an analysis of the cash holding decision that is of particular relevance to researchers and financial managers with an interest in developing countries. There has been a surge in interest in this topic in developed countries, driven in part by the recent financial crisis and the resulting importance for firms to retain cash at a time when their ability to raise funds from the external markets has become very limited, especially for the smaller, less well known firms. Specifically, the research aims to investigate how firms might manage the cash available to the firm in the most cost effective and efficient way; by determining the factors that affect the cash-holding decisions, financial managers will be able to understand, based on the characteristics of their firms, what is the right amount of cash to hold, when they should accumulate cash and when they should not. If their firms have a high cash dividend policy then they need to hold more cash, but if their firms have more liquid assets substituted then they do not need to hold higher levels of cash as this cash represents an opportunity cost for their firms, it also showed that using separate measurement for profitability and operating cash flow give more clear understanding on how those two characteristics determine firm's cash holding decision rather than just use measurement for cash flow alone.

It also provides financial managers with ideas on how shareholders evaluate the cash that is held by the firm, and how this value might increase or decrease; this should help the financial managers to work in such a way as to improve the value of cash or to reduce the cash level to the minimum level if that cash has a low valuation from the point of view of their shareholders. Finally, this research shows how cash-holding can affect the debt ratio by studying how cash liquidity as a special type of liquidity affect the debt ratios to help the financial managers plan their capital structure decisions.

This research also aims to add to the financial literature by investigating cash-holding decisions in a developing country such as Jordan; although no other researchers have focus their studied on Jordan, some researchers have included Jordan in their samples when studying developing countries, but these samples are extremely small and as a result we believe that this size of sample does not represent the situation for firms in Jordan. For example, Chen and Mahajan (2010) included only 4 firms with 11 firm-year observations, while Dittmar et al. (2003) included only one firm. As those samples are very small and

cannot be used to generalize results about Jordan, we believe it is important to investigate cash-holding decisions in Jordan using a larger sample which will reflect any special characteristic about Jordan such as the effect of Islamic rules to help us to have a better understanding on how Jordanian firms deal with cash and whether cash-holding decisions in Jordan are different from other countries, including both developed and developing countries.

Chapter 2: The determinants of corporate cash-holding decisions: Evidence from the Jordanian capital market

2.1. Introduction

There has been considerable interest in, and attention to, the reasons and motives for why firms might want to hold liquid assets, and in particular cash. This is principally driven by the fact that shareholders could hold these liquid assets themselves, whereas it is assumed that firms raise capital from the external capital markets to invest in productive assets. In 1936 Keynes introduced three motives for why firms might want to hold liquid assets. Those three motives are the transaction motive, the precautionary motive, and the speculative motive. In simple terms, the transaction motive means that firms hold liquid assets in order to conduct their daily operations; also, this balance of cash will reduce the cost involved in the process of selling other kinds of assets. The precautionary motive means that firms hold liquid assets in order to meet any future financing needs, while the speculative motive means that firms hold liquid assets to achieve some interest income by investing in short-term interest-bearing assets; this liquidity can also be used to invest in future high-income projects.

Since Keynes, a number of other works have focused on the transaction motive and the precautionary motive. Baumal (1952), Tobin (1956), Tobin (1958), William and Frazer (1964) and others have studied the transaction motive while Whalen (1965), Miller and Orr (1966), Frenkel and Jovanovic (1980) and others have studied both the transaction motive and the precautionary motive. Whalen (1966), Sprenkly (1967), Han and Qiu (2007), Boileau and Moyen (2009) and others have focused more on the precautionary motive.

In the late 90s, researchers started to focus on other elements of cash-holding, including the determinants of cash-holding. They started to investigate the specific reasons and variables for holding cash, and how those variables will affect the corporate cash-holding decision. Several variables were considered by different authors, such as the firm's size, firm's cash flow, firm's profitability, firm's growth, and other related variables.

From those variables investigated by previous researchers, we pick up the following: firm's size, firm's cash flow, firm's growth opportunities, firm's profitability, firm's leverage, firm's

cash dividend, and firm's liquid assets substitutes. These variables have been chosen because they have been important in explaining the level of cash held by firms. Also, these variables have been selected by many of the researchers in the literature as important variables to explain the firm's decision on cash-holding.

Many of the financial theories present explanations for why firms hold cash, and how certain situations or certain variables will affect the corporate cash-holding decisions. The pecking order theory suggests that, to obtain funds, firms usually follow a specific order, starting with the internal sources of funds such as cash balances that have been accumulated over time; then they will obtain any necessary extra funds from the external sources funds which include debt and equity financing. Firms will then progress with the debt financing since it is cheaper and also because it has the tax shield benefit; then, as the final source of financing, they can use the equity to finance their projects.

The trade-off theory suggests that firms base their decision on holding cash on the trade-off between the cost and the benefits of holding cash; the cost of holding cash is the opportunity cost of holding that cash with no return, or with very low return associated with the cost of losing purchasing power due to inflation; the benefits of holding cash include the reduction in transaction costs, and keeping a certain level of cash as a precautionary source of funding to meet future investment needs. By this trade-off between the cost and the benefits of cash-holding, firms can derive the optimal cash level to hold. On the other hand, financial hierarchy theory suggests that there is no optimal level of cash to hold, based on the argument that cash can be considered as negative debt, since that cash will be used to pay off the debt; it then follows that since there is no optimal amount of debt, there is no optimal amount of cash that firms should hold.

In situations with high levels of information asymmetry between a firm's managers and outside investors, the firm might need to hold a higher level of cash because, when it needs to obtain funds from external sources, the information asymmetry will make it difficult to do so since the outside investors do not have as much information about the firm as the firm's managers do. Those investors may think that the securities the firm is trying to sell are overpriced, because they assume that the firm would not sell them if they were underpriced. So, even if they buy those securities, they will buy them at a discount, which will make the cost of external funds more expensive for the firm.

The agency problem occurs due to the separation between the ownership and management. Managers work as agents on behalf of the shareholders, and the primary goal of those managers should be to work for the best interests of the shareholders and to maximize the shareholders' wealth. On the other hand, those managers might put their own interest above the shareholders' interest and try to obtain personal benefits which will affect the shareholders negatively. Shareholders incur agency costs associated with the monitoring costs involved in ensuring that managers are maximising shareholders' wealth, or the costs associated with providing managers with the motivation and remuneration to act in the interests of shareholders. As part of this agency problem, a free cash flow problem might also arise. This occurs when the firm has free cash flow, which is not required for undertaking the investments that the firm has identified, and this therefore creates an associated agency problem. The firms' managers might use this free cash flow inefficiently, and in particular might try to expand the assets under the firm's control, which in turn will increase the managers' remuneration. Alternatively, they may spend it on personal benefits or perks that benefit themselves, but are effectively paid for by the shareholders. Both of these will negatively affect the shareholders and is likely to lead to a decrease in their wealth. The same argument on free cash flow can be applied to the cash and liquid assets that are available to the firm.

According to Modigliani and Miller (1958), firms should not hold cash since cash has high opportunity costs; cash will not generate any return for the firm, and even if the firm uses cash equivalents (marketable securities) to obtain some return, this return will still be too low compared to the return on the other investments or financial assets available. So, why do firms in Jordan or other markets around the world continue to hold relatively large amounts of cash or cash equivalents?

The aim of this chapter is to determine the variables and the factors that are important in firms' holding cash and cash equivalents, and to ascertain whether firms in developing markets such as the Amman stock exchange have the same reasons to hold cash as the firms in developed markets. It is also aims to contribute by studying the firm's profitability and operational cash flow as separate variables to identify how these two variables affect the cash holding decisions. By studying and investigating these issues it will help the firm's managers to hold the right amount of cash based on the characteristics of their firms. As discussed in the

previous chapter, the poorly developed debt market and the influence of Islamic finance provide an interesting framework in which the cash holding decision can be analysed, and therefore allows us to identify the extent to which this framework impacts on the firm's cash decision.

The rest of this chapter is organized as follows: Section 2.2 reviews the literature on this topic, while section 2.3 explains the data and methodology. Section 2.4 provides the results and analysis, while section 2.5 presents the conclusion.

2.2. Literature review

2.2.1. Motives for cash-holding

Keynes (1936) defines three motives for holding money: (1) transaction demand; (2) precautionary demand; and (3) speculative demand. He then combined the first two demands and called it the transaction demand for money. These demands are interest-elastic. Keynes explained how the interest rate is the main reason that will reduce the willingness to hold cash. Liquidity preference depends on three motives: the transaction motive, which represents businesses' and people's demand for liquidity in business and personal transaction exchange; the precautionary motive, which is the demand for liquidity to be able to finance future needs; and the speculative motive, which is the demand for liquidity to generate some interest income.

Management of cash-holding by firms started in the early 1950s, when Baumol (1952) introduced a model for managing cash and physical inventory of assets. Baumol was trying to analyse cash-holding as a purpose of the transaction motive, since holding cash plays a significant role in minimizing transaction costs for corporate firms; his work was based on the model of managing inventory by Whitin (1952). He found that firms hold cash because they can use that cash at the right time in exchange for other types of assets in order to minimize the transaction cost (Baumol 1952).

After Baumol's work, economists and other researchers conducted many studies on managing the physical inventory of assets; however, they did not place similar focus on firms'

management of cash-holding, and the model introduced by Baumol was used as the starting point and the main model to analyse the cost of cash transaction.

Tobin (1956) tried to support the argument that the source of cash demanded by firms is based on the need for transactions to match the time between receiving the cash and spending it. This transaction motive is considered independent of the interest rate, and if there is any relationship it will be uncertain or inelastic. This argument is based on Hanson (1949) who argued that the transactions balance will not become interest-elastic until it exceeds a certain level and becomes high enough. He guesses that holding cash balances will significantly depend on the interest rate. Tobin argues for the transaction motive on the basis of a simple example: if someone receives a certain amount of money at the beginning of each month, then the amount of cash that person will hold will vary between that amount and zero at the end of the month, with an average value of ½ of that amount. If that person decides to use other types of assets that can generate a return and then switches back to cash when it is needed, this process will generate some return but at the same time will involve a cost. A higher investment in cash will reduce both the return and the cost, but the final decision on the combination of cash and other types of assets will depend on both return and cost; so, when the return (interest) on the other types of assets reaches a certain level and becomes relatively high, a smaller amount of cash will be held.

This argument was developed further by Tobin (1958), who states that there are two main reasons for households, firms or governments to hold cash. The first is the transaction reason: since there is no match between the money expended and received in the short run, economic units need to have a cash balance to meet this need for money when the expenditures exceed the received money. The interest rate also supports the transaction reason since the interest received on cash invested in short-term earning assets can offset the transaction cost. The second reason is the investment reason: unlike the previous reason, here we deal with the long run, and cash will be held if firms have an expectation that the value of other assets will fall. Tobin also examined the sources of liquidity preference and found that there are two sources of liquidity preference. The first is inelasticity of interest rate expectations, where the investor will choose between cash and other types of assets (assets that generate interest income such as consols) by comparing the yield from those consols, including both interest income and capital gain, with zero; this is the return on cash, and they can then invest everything in the one with the higher yield. The other source of the liquidity preference is uncertainty about the

future interest rate; when the future interest rate is uncertain, the risk of investing in consols will be higher since it will affect the capital gain and loss for this investment, and the decision of investing in cash or consols will depend on the risk and return.

William and Frazer (1964) studied the effect of firm size on the financial structure using a linear regression on a sample of manufacturing corporations which have 5 million dollars of assets or more based on quarterly financial reports for the period 1956-1961. These data were collected from the U.S. Federal Trade Commission (FTC) and the U.S. Securities and Exchange Commission (SEC). The main results showed that the larger firms depended less on bank loans, held more non-cash liquid assets such as government securities, and had lower cash balances. They also found that, when the size of the firm increases, it will decrease the demand for cash as a precautionary action. Finally, there is a trend towards understanding why the precautionary motive has become stronger in money demand analyses.

Whalen (1965) conducted an empirical study to determine whether the assumptions of the Baumol-Tobin traditional cash management theory provide a better explanation of firm behaviour in managing cash; he used a cross-sectional study of non-financial firms, connecting the cash balance with the sales volume for different firm sizes. The first test assumed that all firms within the same industry are homogeneous but different in the size of operation. The results show that the Baumol-Tobin approach does not hold since they only deal with the transactions motive in their analysis. The second test supports the view that an increase in the operation size of the firm means that all the assets as well as the cash are likely to increase more than the increase in the sales amount. These results did not show a fair relationship between cash balance and sales; thus, this relationship remains ambiguous because the Baumol-Tobin approach ignores precautionary and liquidity preference motives for holding cash, and only uses the transaction motive to understand cash-holding. So, when a firm's operations size increases, the transaction motive for holding cash might be offset by the liquidity preference motive.

Miller and Orr (1966) analyse how to find a policy for optimal cash management. They depend on the Baumol (1952) model and note that the decision-maker has two kinds of assets to hold; the first kind is the assets that can generate income such as bonds, while the second kind is assets without returns such as cash. Transfers between these two kind of assets are allowed but with specific cost in both directions. The idea is to invest in the earning asset type

and transfer it to the non-earning type when it is needed. The size of the transaction will affect the firm significantly, since if the size is large the process of transfer will not be regular; the average balance of cash in each period will be high and the firm will lose the income from the earning assets. If the amount of the transfer between the two kinds of assets is small, the income lost from the idle fund will be lower, but the transaction cost will be higher and will erode the earnings. Their results show that the demand for money as a transaction motive remains unresolved because the existing cross-sectional studies did not present significant results about the economies of scale of cash-holding for different firm size classes, and also because the model used is most applicable only for the large firms.

Whalen (1966) considers the precautionary motive for cash-holding. He starts from Keynes' (1936) definition of precautionary cash balances, since Keynes states that the reason to hold precautionary cash balances is "to provide for contingencies requiring sudden expenditure and for unforeseen opportunities of advantageous purchases, and also to hold an asset of which the value is fixed in terms of money to meet a subsequent liability in terms of money." He adds to that definition, saying that they are also held to meet unexpected receipts: when the firms' future expenditures and receipts are not certain, and the firm might face a situation where the expenditure exceeds the receipts, then it is recommended that firms hold a certain amount of cash to meet that shortage in liquidity. The main problem that firms face is to determine the optimal level of cash to be held as a precautionary cash balance. Whalen mentions three factors that affect the optimal precautionary cash balance: (1) the cost of illiquidity; this means the seriousness of the situation when firms underestimate the need for holding cash and the consequences of this shortage of cash balance. This cost will be very high if the shortage of cash leads to potential insolvency or bankruptcy. This cost will be reduced if the firm has available credit to use, and this will still depend on whether the source of credit is cheap and reliable. (2) The opportunity cost of holding precautionary cash balances; cash by itself does not generate any income, so holding cash rather than investing in other types of assets which generate income represents an opportunity cost for the firm, and this cost will increase as the amount held for precautionary cash balance increases. (3) The average volume and variability of receipts and disbursements; for any given period of time in which the firm has expected expenditures and receipts, the difference between those two amounts represents the net need for precautionary cash balance; this need has a probability distribution which assumes that it has a zero mean and a standard deviation determined by both the average volume and the pattern of the firm's expenditures and receipts. As this

standard deviation increases, higher precautionary cash balances will be required to protect against a lack of cash on hand. The total cost of precautionary cash balance is equal to the cost of illiquidity plus the opportunity cost of precautionary cash balance.

Sprenkle (1967) tries to explain why, for some firms, uncertainty has a negative relationship with the precautionary demand for liquidity, as this statement seems to be implausible. Sprenkle found that large firms tend to require less money for precautionary demand with uncertainty; this finding does not match what the precautionary demand for cash suggests, since firms should hold more cash in case of uncertainty to meet any unexpected need for cash. Large firms tend to hold short-term securities rather than simply holding cash in order to reduce the opportunity cost of just holding the cash, and are still able to meet their liquidity needs. Sprenkle explains this by stating that uncertainty causes firms to over-invest in short-term securities, at the same time lowering the average amount of their deposits.

The inventory approach, which is the basis of the Baumol (1952) and Tobin (1956) approaches to studying cash-holding, ignores the fact that there may be an interdependent relationship between the variables of money demand function. Barro and Santomero (1970) study this issue and conclude that transaction costs will not stay the same when other factors are changing, but they did not find the solution to this problem (Karni 1973).

Since the Baumol (1952) and Tobin (1956) approaches did not provide any empirical evidence, Karni (1973) studies the interrelation between the variables that affect the cost of transaction by studying the sensitivity of the cash held by firms with respect to their income. He found that this relationship depended on both the size of the transaction and how the income might change. He also studies the sensitivity of the cash held by firms with respect to the interest rate and how the interest rate will be changed according to the size of the transaction, and he puts greater focus on the change of the transaction size and whether that will affect the rate of wages (which is a measure of the value of time). Results show interest elasticity has smaller absolute value for the change than real interest change, and that will affect both the opportunity cost of holding cash and the real income, while the expected change in inflation rate will affect the opportunity cost but not the real income. For the rate of wages, results show that there is no similar effect on cash withdrawal cost related to change in hours worked or property income.

Frenkel and Jovanovic (1980) analyse both the precautionary and the transaction motives for cash-holding by developing a stochastic model based on the works of Baumol (1952), Tobin (1956), and Miller and Orr (1966). They derived the optimal level of cash-holding in relation to several factors, which are the interest rate, average rate of net disbursement, the cost of adjusting firms' portfolio and the variance of the stochastic process governing net disbursements. They then used a traditional approach and the steady-state distribution to analyse the cash-holding in order to find the optimal inventory of cash under the steady-state approach. They do this by considering two types of cost; the first one is forgone earnings on inventory holdings and the second one is the adjustment cost of inventories when it reaches an undesirable lower bound. The first type of cost can be reduced by investing a smaller portion in cash and a higher portion in interest-bearing assets, while the second type of cost can be reduced by holding sufficient cash and liquid assets. The optimal level of cash and liquid assets can be obtained by reducing those two types of cost together. The result showed that there is a significant difference between the two approaches.

Myers and Majluf (1984) suggest that, when firms have modest investment requirements, this can limit the dividend to shareholders, and they should invest those funds in high liquid assets to provide financial slack. This statement is consistent with the precautionary motive for cash-holding as, by holding more highly liquid assets in order to meet investment requirements, firms try to provide financial slack and reduce the chance of uncertainty risk.

Jensen (1986) notes that, when a firm finances its projects using internal sources, it will avoid the chance of the funds' unavailability, or the cost of external financing; pecking order theory suggests that firms should start with internal sources of financing, then debt-financing and finally equity-financing. The main reason for this is that the internal source of financing is the cheapest source, while both debt- and equity-financing involve costs; for debt-financing, bankruptcy costs will arise, and for equity-financing, the asymmetry of information between investors and managers means that investors are unable to discern the correct value of the new issue, and will believe that firms issue equity only when it is overvalued. Although both debt- and equity-financing involve costs, debt-financing will still be cheaper than equity-financing because of the tax shield of the debt-financing, and because debt-financing has lower information costs associated with it.

For mature and well-known firms, financial structure is irrelevant to their investment decisions; for other firms, however, financial factors have a substantial effect on that external capital financing. External capital financing is not the best replacement for internal sources of financing, especially in the short term. When there is an asymmetry of information between management and investors, the external sources of financing to meet any opportunity to invest will become very costly and, in the worst situation, will become impossible. That will make the opportunity cost of internal financing significantly lower than the cost of issuing new stocks or bonds. (Fazzari 1988)

Whited (1992) mentions that, when a small firm has a low balance of cash or liquid assets, it will face limited access to borrowing on the debt markets since it does not have the necessary collateral to support its borrowing. When a firm has liquidity restrictions, this will make the investment's marginal opportunity cost for investing today higher than if it delays it until a future time. Also, when firms need to exchange their capital goods for cash, they will incur a loss. These results were based on the sample of firms listed on both NYSE and AMEX during the period 1972-1986, but since the model used in the study needs the lagged value for some variables and the change in the value for other variables, the actual data used are for the period 1975-1986. The total number of manufacturing firms used in the research sample was 1,362 and, after excluding firms with missing data, firms with inconsistent data, or firms involved in mergers, the total number of firms remaining was 325; those other firms have been excluded from the sample to maintain the consistency in the variables over time.

Fazzari and Peterson (1993) argue that firms that try to maintain a certain level of fixed investment will find it costly to change the level of fixed investment. Those firms can provide liquidity by changing their working capital, which may lead to negative working capital, especially when the external source of funding is expensive.

Dittmar et al. (2003) study a sample of more than 11,000 firms from 45 countries using Pooled Cross-Country Regression. They found that firms hold significantly more cash in cases of shareholders having less protection. This amount is about the twice the amount held by other firms when shareholders have more protection; the other reasons that are mentioned in the literature for holding cash, such as investment opportunities and asymmetric information, are less important in those countries where the protection for shareholders is lower. They found that, in countries where shareholders have less protection, firms hold more

cash even when it is easier to access funds, since shareholders cannot force managers to disgorge the cash balances, as the agency cost theory suggests.

Han and Qiu (2007) study the precautionary motive for holding cash by analysing how cash flow volatility affects the decision on holding cash, based on firms' financial constraints on a large sample of publicly traded firms during the period 1997-2002. They found that cash-holding by financially constrained firms increases as the volatility of cash flow increases, but for unconstrained firms this relationship becomes unsystematic. Their paper provides an analysis of Keynes' (1936) precautionary motive for holding cash and liquid assets, exploring the implications of cash flow volatility for firm investments, and they show that the financial constraint could affect the relationship between cash flow volatility on one side and cash holdings and investments on the other side. The model they used assumed no hedging for future cash flow, as introducing hedging will decrease the incentive for precautionary cash-holding since hedging and precautionary motive can be seen as substitutes for each other. The optimal ratio between the hedging and precautionary motive will be determined when the marginal benefit of hedging is the same as the marginal benefit from the precautionary motive. This optimal ratio will also depend on the correlation between future investments and future cash flows.

Boileau and Moyen (2009) found that the precautionary motive for holding cash increases because of various taxes that will increase the costs for the firm and make the risk higher, which causes firms to hold more cash. Also, when a firm faces liquidity constraints, this will increase the risk for the firm and cause it to hold more cash.

2.2.2. Determinants of cash-holding

After looking at the motives for cash-holding which can be considered as the main reasons or the drivers for holding cash, we can consider those motives as the starting point for understanding why firms need to hold cash in the first place. Now we can move on to the question of which determinants of cash-holding can be considered as the more specific reasons for firms' actual need to hold cash.

Kim et al. (1998) used a sample of 915 industrial firms that were able to yield at least 10 years of data during the studied 20-year period from 1975 to 1994 to investigate empirical and

theoretical reasons why firms hold liquid assets. They developed a model to optimize the level of liquid assets that should be held by firms, after considering certain criteria, which are the low return from the liquid assets and the benefit of having a cheap source of funds for future investment, especially when the cost of financing is high. They studied the effect of the cost of external financing, cash flow uncertainty, current and future investment opportunity, and other control variables on the corporate liquidity by studying variables such as firm size, growth opportunity as market-to-book ratio, cash flow, variability in cash flow, return spread between physical assets and risk-free asset, average cash cycle, cash cycle variability, debt ratio, and bankruptcy predictor. The main findings of their research are as follows. When the cost of financing from external sources is high, firms invest more in liquid assets. If the future cash flows have high variance, firms also invest more in liquid assets. Firms hold more liquid assets if the expected return from the future investment is high (growth opportunities), but the level of cash held will decrease when the rate of return on physical assets is relatively different from the rate of return on liquid assets. Market-to-book ratios (growth opportunities) have a positive relationship with the amount of liquid assets, while size of the firm has a negative relationship with liquid assets held by firms. When the earnings fluctuate (variability in cash flow) and the return on physical assets is low compared to the return on liquid assets, the firm will hold more liquid assets. Finally, they found that liquidity has a positive relationship with the measure of future economic conditions.

Schnure (1998) investigated new facts regarding firms' cash-holding by looking into the real characteristics of the firm based on the firm's size level. Then he looked at the motives for cash-holding decisions. Based on cross-sectional regressions using the data from 1995 for non-financial firms listed on COMPUSTAT, he found that the cash-holding decision depends on the firm size, the industry in which the firm operates, and the firm's ability to borrow from the bonds market. Small firms tend to hold a higher ratio of cash to total assets, while firms with factors that indicate a strong or large size, such as having access to financial markets, low volatility of cash flow and economy of scale, tend to hold a lower ratio of cash to total assets. Firms that issue bonds without ratings hold more cash, and there is a positive relationship between cash held by firms and proxies for agency problems (especially in the small firms with a high ratio of cash) and ability to issue stocks, and a negative relationship with acquisitions expenditures.

Opler et al. (1999) examine the determinants and implications of holding liquid assets, including cash and marketable securities, by applying time series and cross-sectional tests using publicly traded firms from the US, excluding financial firms, during the period from 1971 to 1994. They found that firms hold a high ratio of cash when they have good opportunities for growth and when their cash flow is more risky. On the other hand, a firm holds a low ratio of cash when the size of the firm is big, especially when the credit rating for that firm is high and it is able to access capital markets. Firms also have a tendency to hold more cash when they do well and achieve more than what the static trade-off model predicts. Finally they found that dividend to shareholders, spending, and capital expenditures are affected by the excess cash in the short run. In order to maximize the shareholders' wealth, managers should hold cash at a level that will make the marginal costs and benefits from holding that cash equal. Holding cash has costs of low returns and tax disadvantages, while the benefits from holding cash include reducing the transaction cost; furthermore, cash represents a cheaper source of funds to finance future investment when the cost of financing is high or unavailable. The point of view regarding the benefits and costs of cash-holding differs between shareholders and managers, since managers like to hold more cash as a precaution and to reduce the risks that the firm may face; the problem, however, is that managers tend to hold too much cash, thus prioritising the precautionary motive over the shareholders' wealth-maximizing goal. In other words, managers prefer safety over the wealth-maximizing interests of the shareholders, as the agency theory suggests.

Colquitt et al. (1999) study the differences across property-liability insurer firms' cash-holding. All transactions in the property-liability insurer firms occur in cash. All premiums and claims are received and paid by cash; on that basis, the cash amount held by insurers is critical for both the operations and the financial stability of those firms. They studied 1,400 property-liability insurers firms collected from the National Association of Insurance Commissioners (NAIC) for the period 1993-1995. They found that insurance firms that have access to the capital market tend to hold less cash, and firms with a high ratio of leverage also tend to hold less cash, but firms tend to hold more cash when the variance of cash flow is high since that is associated with higher uncertainty about the need of cash. Stock insurers hold more cash relative to cash held by mutual insurers. Finally they found that insurers who have high percentages of liquid assets tend to hold less cash than insurers who have a high percentage of non-liquid assets because insurers with high non-liquid assets need to have more cash to enhance their liquidity positions.

Faulkender (2002) studied the cash position of small firms and how this will be affected by financial distress, information asymmetry, agency costs, and taxes. He used the data from the 1993 National Survey of Small Business Finance conducted by the Federal Reserve. 2,808 corporations from the survey included, non-farm businesses for profit corporations with fewer than 500 employees have been used in this research after excluding S-Corporations, since taxes are calculated for this type of corporation as personal tax rates, not as corporate tax rates. He found that, when leverage increases, small firms hold more cash as a preventative action, and firms with greater asymmetric information tend to hold more cash if they anticipate needing cash in the future comparing to other firms with less asymmetric information. Older firms hold more cash although they should have better access to the capital market, firm size has a negative relationship with cash-holding, taxes have no impact on cash-holding, and firms which have access to credit hold less cash. Higher costs of financial distress cause firms to hold more cash.

Omet and Maghyereh (2003) studied the determinants of cash-holding for Kuwaiti firms during the period between 1996 and 2000 on a sample of 30 firms, using panel data analysis. They found that firm size, growth opportunities and profitability have no effect on cash-holding decisions while leverage has a negative relationship with a firm's cash-holding.

Ferreira and Vilela (2004) investigated the determinants of cash balances using firms in different EMU countries including Germany, France, Netherlands, Italy, Spain, Finland, Belgium, Austria, Ireland, Luxemburg, Greece and Portugal from 1987 to 2000, and found that the level of cash held by firms is positively affected by both cash flow and investment opportunities, and negatively affected by leverage, firm size and liquid asset substitutes. These results contradict the free cash flow theory since the result shows a negative relationship between cash-holding and investment opportunity set, which also suggests that agency conflict does not play a major role in determining cash-holding, but the results are consistent with both the pecking order and trade-off theories since the decision on holding cash by the firm is a trade-off decision between both costs and benefits of holding cash. Thus, the pecking order and trade-off theories can explain the cash-holding determinants in EMU countries. They also found that a significant negative relationship exists between the level of cash held by firms and bank debt, while there is a negative relationship between the development level of the financial markets and the cash level.

Ozkan and Ozkan (2004) used publicly traded UK firms to determine the reasons why firms hold cash, using data from 1984 to 1999 and employing a cross-sectional model and a panel data model. Their sample includes all the firms available on the Datastream database; all financial firms have been excluded, as have firms with missing years of observations and any firms with less than five continuous years of observations. Focusing on managerial ownership, including the structure of the board and company controllers, they found that a significant relationship exists between cash-holding and managerial ownership. This relationship is a non-monotonic relation, since they found that the relationship is negative when the ownership level is low but the relationship will be reversed and become positive with a high level of ownership. They also discovered that many factors are important in determining cash-holding, such as the following: bank debt, which shows a significant negative impact on cash-holding since, when firms have access to banks, they do not need to hold a lot of cash; leverage has a negative relationship as well for the same reason; growth opportunities have a positive impact on the cash-holding decision since firms need to hold cash to be able to finance any growth opportunity; liquid assets have a negative impact on holding cash since they can be considered a cash substitute; and cash flow has a positive impact on holding cash since firms that generate a large amount of cash tend to hold more cash since this kind of firm prefers internal over external sources of financing. There is no strong evidence that larger firms hold less cash. They also suggest that, considering the heterogeneity and endogeneity are essential in analysing firms' cash-holding, since shocks that affect cash-holding are very likely to affect the firm-specific characteristics such as equity market value, and also as the determinants affect the cash level, it is possible that cash will affect any of its determinants.

Pedro and Pedro (2004) study the determinants of cash holdings on a sample of 860 small and medium-sized firms in Spain during the period from 1997 to 2001, using both cross-sectional and panel data analysis. They argue that the problems of the market that affect firms include the following: asymmetric information, agency problem, financial difficulties, financial constraints and others, all of which affect the decision on cash-holding and become more serious for small and medium-sized firms, since the asymmetric information problem becomes worse. Also, the ownership structure in the small and medium-sized firms makes the agency problem more serious as well. There are also other problems such as financial difficulties, financial constraints and relatively higher transaction costs. They found that the

following factors will affect the decision on cash-holding. The first factor is growth opportunities. When a firm has more opportunities it tends to hold more cash to meet these investments. The second factor is the firm size. A large firm holds less cash based on the economies of scale for the firm transactions. On the other hand, small and medium-sized firms hold more cash not only because of the economies of scale issue but also because of the higher level of asymmetric information, greater agency problems, more financial difficulties, and more financial constraints relative to large size firm. The third factor is the relationship with financial institutions. When a firm has a good relationship with banks or other lenders, that will reduce both asymmetric information and the agency problem since the firm needs to disclose more; this causes the firm to hold less cash since it will allow the firm to access funds more easily and at lower cost. The fourth factor is the probability of financial distress, and there are two views on this factor. Some studies, such as those by Ferreira and Vilela (2004) and Ozkan and Ozkan (2004), suggest that it will cause firms to hold more cash, while others suggest that it will cause firms to hold less cash, such as Kim et al. (1998). The fifth factor is leverage; higher leverage will cause a reduction in cash levels because the cost of funds will be higher with a high level of leverage. The sixth factor is debt maturity structure; firms with short-term debt tend to hold more cash since the risk for renewal is higher. The seventh factor is cash flows generated by the firm; when a firm is able to generate more cash flow, it will tend to hold less cash. The last factor is liquidity; when the firm has other substitutes for liquid assets it tends to hold less cash.

Almeida et al. (2004) based their study on a sample of manufacturing firms during the period from 1971 to 2000, which consists of 29,954 firm-years observations. They investigated the impact of financial constraints on firm policies. Their main finding was that, in financially constrained firms, there is a positive relationship between cash-holding and cash flow. Financially constrained firms need to protect against future investment needs, and corporate liquidity is important in this case. On the other hand, for financially unconstrained firms the relationship between cash-holding and cash flow is not systematic.

Kytönen (2005) focuses upon the determinants of liquid assets held by corporations, using 67 Finnish firms listed on the Helsinki Stock Exchange in 2003. By using cross-sectional regressions, he found that a significant relationship exists between liquid assets-holding and the extent of internal financial reporting. He also found that there are many factors determining the decision of liquid asset-holding in Finnish firms, such as the following: the

size of the firm has a positive relationship with cash-holding and, although this result does not match the view that large firms tend to hold less cash, his explanation was that "there is no evidence of the economies of scale in the demand for liquid assets."; growth opportunities have a positive relationship with cash-holding as firms try to hold cash to protect themselves from financial distress probability; opportunity costs have a negative relationship with cash-holding as, when the return on assets (as measurement of the opportunity cost) is higher, this will send positive news to the market about the borrowing firm's creditworthiness and will reduce the agency cost and the information asymmetry, thus making access to external sources of funding cheaper for the firm; cash flows have a positive relationship with cash-holding, and this result is consistent with the pecking order theory since more profitable firms that generate more cash flow tend to depend on the internal source of financing so they will hold more cash; efficiency of working capital management has a negative impact on cash-holding as this working capital can be used to provide a cash substitute; leverage has a positive relationship with cash-holding - he did not give any reason for this result but mentioned that it is consistent with Opler et al. (1999) who explain that "highly leveraged firms find it difficult and expensive to raise additional funds."; dividend policy has a positive impact on cash-holding because firms that pay dividends hold more cash to avoid any shortfall of cash.

Niskanen and Niskanen (2007) examine the determinants of cash holdings on a sample of small and medium-sized Finnish firms based on a private survey which includes all firms in the mid-west of Finland except small service industry firms during the period from 1994 to 1997; the capital market there is based on banks and it is connected to a small number of banks or groups of banks that operate in the country. This system allows the banks to monitor the firms more closely, play an active role in firms' administration and own large amounts of firm capital. They found a significant impact of both managerial ownerships and lending relationships on cash-holding. They found a cubic relationship between cash-holding and managerial ownership for larger firms in their sample or for the firms that have borrowing relationships with two or more banks. For the relationship with the lender, they found that when the firm has a long-term borrowing relationship or when it has access to more than one bank it will hold less cash. Also, they found that when firms are large the level of cash-holding will be greater, when firms face financial constraints they will hold more cash, and when the ratio of debt to assets increases, the cash-holding will increase as well. They were

unable to check whether growth opportunities can affect the cash-holding decision because the data needed to measure this variable were not available for their sample.

Ramezani and Soenen (2007) investigate whether the cash-holding can be affected by the strategic growth opportunities (real option) for the firm. The data for this research have been taken from COMPUSTAT files for 11 years, between 1990 and 2000. The data include all firms except financials, utilities, governmental and unclassifiable firms, and firms with total assets, net sales and common equity of a total value of less than 1 million US dollars. For firms with missing data, those data have been replaced by the industry average; after all these exclusions and adjustments the final number of firms included in the sample was 4,251. They found that if firms have this opportunity it is more likely that they will hold more cash relative to other firms that do not have valuable growth opportunities. They also mention that holding cash will reduce the transaction cost in both directions, as well as reduce the financial distress cost. On the other hand, it involves an opportunity cost since the return on cash or high liquid assets is the lowest compared to other types of assets. They also confirm that size has a negative relationship with cash-holding since small firms tend to hold more cash in order to be able to finance their more valuable growth options.

Baum et al. (2008) investigate the relationship between uncertainty and the optimal level of cash-holding. They use quarterly data taken from COMPUSTAT for 700 non-financial US firms for the period from 1993 to 2002. They check two additional factors in the decision on cash-holding, which are uncertainty in the macroeconomic conditions and the idiosyncratic risk, to explain their role in the cash-holding decision. They formalize a model assuming that firms hold cash in order to maximize their value and reduce the cash flow shock. This model depends on several factors as follows: expected return on investments; expected return on loans; the finite bounds of the distribution of firms' cash flow to capture any shock in cash flow distribution and to capture the degree of uncertainty that firms might face; the possibility of the firm obtaining loans; and the firm's initial resources which is what the firm had originally and will distribute on either capital investment or cash-holding. They parameterized optimal cash holdings by firms and used the empirical data after splitting their sample into 4 groups to consider the differences between categories of firms. They found strong evidence that macroeconomic uncertainty is associated with the optimal level of liquidity, and when idiosyncratic uncertainty increases firms will increase the level of cash and liquid assets that they hold. In general they found that, when the situations and conditions around the firms are

ambiguous, firms tend to hold a higher ratio of liquid assets. The sensitivity of this decision on how much cash or liquid assets a firm should hold depends on firm characteristics such as firm size and leverage, how easy it is to predict the macroeconomic environment, and the level of idiosyncratic risk.

Duchin (2010) notices that, besides the increase in the cash ratio held by firms, during the period from 1990 to 2006 stand-alone firms held almost double the cash ratio held by diversified firms. By studying a sample of industrial firms from North America, he obtained data from both COMPUSTAT annual file and COMPUSTAT segment file; after excluding financial firms, utilities firms, and firms with missing data, he adjusted all the data to dollars. He suggests that diversification will make the cash flow smoother since firms' divisions are not perfectly positively related. This means that diversified firms will hold a lower cash ratio as precautionary cash. And that ratio will decline as the correlation between the divisions declines. His finding suggests that it is not the number of divisions that will make the cash ratio lower; rather, it is the lower investment opportunity correlation between the divisions. Also, when the correlation between cash flow and investment opportunities is high, the cash ratio will be low; furthermore, the cash ratio will be even lower when we take into consideration the financial gap (which is the correlation between investment opportunities and cash flows). His result is consistent with the precautionary motive for holding cash introduced by Keynes (1936), which suggests that firms will hold more cash to protect their current investment from liquidation when the external financing cost is high. This paper focuses on the operation risk of the investment, and how it will affect the decision on cash-holding taking into consideration both the internal capital market and firm diversification. The result was consistent with that of Modigliani and Miller (1958) who found that, in financially constrained firms, the correlation between the cash flow and investment opportunities is important. Also, it is consistent with Almeida et al. (2004) who found that cash flow and cash-holding are correlated only in financially constrained firms. He also found that an increase of one standard deviation in the firm's cross-divisional correlation will lead to an increase of 4.4% of firm average cash-holding and 9.1% in the median. He studies the interaction between a firm's cash-holding and the internal capital market and found that firms hold less cash when they have plenty of cash to transfer, and cash transfer has a positive relationship with the diversification in opportunity investment between the divisions. He found that the relationship between diversification and cash-holding becomes stronger in firms with greater corporate governance, since diversification reduces the need for high cash

balance; furthermore, when it is accompanied with good governance which will transfer funds to the more productive divisions in the firm, this will make the relationship stronger. Regarding the firm value, there was no evidence of whether diversification will affect the firm value either by creating or destroying that value.

Chen and Mahajan (2010) investigate cash-holding by firms in 15 European Union countries and 31 non-European countries during the period 1994-2004. They found that the introduction of the euro and establishment of the Economic and Monetary Union (EMU) decreased the level of cash-holding by the firms in European countries. In European countries, cash and debt are more substitutable in terms of financing than in non-European countries, and corporate governance variables such as creditor rights, anti-director rights, and closely-held shares are very important factors in determining corporate liquidity and should be taken into consideration when studying corporate liquidity for international firms. For European countries, they found that firms hold more cash when there are more investment opportunities in the future, and the size of the firm has a positive relationship with cash-holding. They suggest that this result is due to the presence of economy of scale, and cash flow has a positive relationship with cash-holding as firms that generate more income tend to hold and accumulate more cash for the precautionary motive. There is a negative relationship between cash-holding and net working capital as it can be used as a cash substitute. Capital expenditures have a positive relationship with cash-holding since firms tend to hold more cash in the event of growth opportunities. Leverage has a negative relationship with cash-holding because access to more debt can be considered a substitute source of cash. Finally, firms that pay cash dividends tend to hold more cash in order to meet this financial obligation.

Looking at the literature on cash holding we can see that there are two main areas for the analysis of cash-holding; the first area is the motives for cash-holding, and the second area is the determinants of cash-holding. In terms of the first area, the motives for cash-holding can be seen as the drivers of the decision on cash-holding. The literature mentions several motives for cash-holding. The first is the transaction motive, when firms hold cash in order to reduce the transaction cost of transferring between cash and other types of assets or investment in both directions. The second is the precautionary motive; according to this motive, firms tend to hold cash to be able to meet any future need for cash or liquidity in order to finance their future projects or to meet either the expected or unexpected need for cash. The third is the speculative motive, when firms hold cash to take advantage of this liquidity; for example

firms can obtain a discount on the purchasing of raw material. The fourth is the agency cost/ asymmetric information motive, when firms need to hold cash due to the asymmetric information between investors and managers of the firm that makes the external financing costly or even unavailable.

The second area is the determinants of cash-holding, which consider the specific reasons for cash-holding decisions. Many empirical papers consider the determinants of cash-holding; those papers cover countries from around the world in different time periods and consider several variables that could affect the corporate decision on holding cash. Many of these variables were common between those papers such as firm's size, cash flow, growth opportunities, cash dividend to share holders, and liquid assets substitute. Some papers mention other variables over the previous variables such as profitability, cash cycle, and bankruptcy expectation. The effects of those variables were almost the same but had some opposite effects in some papers due to the characteristics of the different samples.

2.2.3. Research hypotheses

Large-sized firms are more able to access financial markets to obtain external sources of financing and also have the advantage of economies of scale; compared to small-sized firms they have less asymmetric information, and therefore will not need to hold as much cash as smaller firms. Larger Jordanian firms are more likely to be able to obtain more debt and equity financing from external sources, which means they tend to hold less cash as compared to smaller sized firms.

H_1: there is a negative relationship between a firm's size and a firm's cash-holding.

Firms that are able to generate more cash from their operations tend to hold smaller amounts of cash, since those firms are less likely to suffer from cash shortages. The increased reliance on internally generated cash flow in Jordan means that firms able to generate sufficient cash flow from their operations provides these firms with a source of funds which allows them to reduce the level of cash they need to hold, and therefore reduces the opportunity cost associated with cash holding.

H_2: there is a negative relationship between a firm's cash flow and a firm's cash-holding.

Firms that have future opportunities for growth are more willing to accumulate cash as a precautionary action to ensure that they have cash available. Firms will also be willing to accumulate cash in order to be able to invest in those projects or investment opportunities that will be available in the future, and therefore will not feel pressured by investors to return the cash to shareholders. Firms in Jordan expecting growth in the future will be more willing to hold cash to meet those growth expectations especially in light of the fact that debt financing is less preferred as it includes the payment of interest, which is forbidden according to Islamic rules.

H_3: there is a positive relationship between a firm's growth opportunity and a firm's cash-holding.

Pecking order theory suggests that more profitable firms tend to depend more on the internal sources of financing. Therefore, profitable firms tend to hold more cash as an internal source of financing, and will be less dependent on external funding. Since debt financing is less preferred in Jordan due to the influence of the Islamic rules, firms will depend more on equity financing than on debt financing, and since equity financing is more expensive than internal financing, profitable firms in Jordan are expected to hold more cash to reduce their dependency on expensive equity financing.

H_4: there is a positive relationship between a firm's profitability and a firm's cash-holding.

Firms with higher debt ratios are more able to access debt markets, which means those firms tend to hold less cash since they can obtain the funding they need from the debt market. However, we note that it is also possible that firms with a high debt ratio have used up their debt capacity and can no longer borrow, in which case such firms would be more likely to hold cash. In the case of Jordan, although debt financing is less preferred, some firms may choose not to follow the Islamic rules and obtain a cheaper source of financing by benefitting from the tax saving. These firms will tend to hold less cash as they have other sources of funding.

H_5: there is a negative relationship between a firm's leverage and a firm's cash-holding.

Firms that pay cash dividends need to have a sufficient amount of cash to meet these financial obligations, which means that, whenever the firm decides to pay a cash dividend, it needs to hold more cash to meet the financial obligation. Since investors prefer a fairly stable flow of

dividends over time, holding cash will ensure that firms can continue to make dividend payments even when faced with temporary falls in earnings.

H_6: there is a positive relationship between a firm's cash dividend and a firm's cash-holding.

Firms that have other sources of liquidity do not need to hold high levels of cash; those other sources of liquidity can be used as a substitute to enable the firm to obtain the funding that it needs. So, as long as firms have other sources of liquidity, they do not need to hold a large amount of cash.

H_7: there is a negative relationship between a firm's liquid assets substitute and a firm's cash-holding.

2.3. Data and Methodology

2.3.1. Research sample

To find the determinants of corporate cash-holding decisions, a sample of publicly traded corporate firms from the Amman stock exchange will be used. This sample will include all of the firms listed on the Amman stock exchange, with the exception of financial firms, for the period between 2000 and 2011 based upon the firms' annual data. The reason for excluding the financial firms from the sample is that financial firms must hold a certain level of cash as part of their business, so this will affect the result of this research. Any new firms will be excluded from the sample, and any firm that does not have a full set of observations for the studied period will be excluded as well. The reason for excluding the new firms which have missing observations for the first year or first few years is that those new firms have a high level of cash generated from the selling of their stock to the public through the initial public offering (IPO), or from the cash that firms obtain from their owners, or as loans from banks or other financial institutions. That cash is not yet fuelling the firms' operations, so including those firms might affect the results of this study. On the other hand, firms with missing observations in the last year or the last few years represent firms that are either going out of business or have already done so and have started the liquidation process; thus, either there will be no cash since it has been paid to the creditors or the other stakeholders who have any claim on the firms' assets, or there will be a certain level of cash generated from selling the firms' assets as part of the liquidation process. In both cases the level of cash for the firms with missing observations in the last year or the last few years is misleading, since it does not

come from the firms' operations, and if we include those firms the result of the study might be affected. Some of the researchers that we discussed earlier excluded firms with missing data, such as Ozkan and Ozkan (2004).

From the 247 firms listed on the Amman stock exchange in 2011, after excluding financial firms which amount to 109, and firms with missing observations either at the beginning or at the end of the study period which amount to 58, we are able to retain 80 firms with 12 years' data for each firm; this means that 960 observations are available for the empirical test. Although this number of observations is less than the number of observations in many of the studies discussed in the literature review section, those studies were conducted on more developed markets such as the US market, which was also established much earlier than the Amman stock exchange. Some of the studies were conducted on samples drawn from more than one country. So, in view of the small size of the Amman stock exchange and since it is a relatively new market, this number of observations is the best we can get. On the other hand, some researchers used a smaller sample than ours to study the determinants of cash-holding. For example, Kytönen (2005) used 67 Finnish firms for only one year (2003); in another study which has considered a country in the same region as Jordan (i.e. another middle-eastern country) Omet and Maghyereh (2003) used a sample of 30 Kuwaiti firms during the period 1996-2000.

2.3.2. Research variables

In this research all possible variables that affect cash-holding decisions will be included. After reviewing the literature on the cash-holding decision and the literature on the determinants of cash-holding, a number of variables that affect the cash-holding decision have been identified. From those variables we included the following: firm's size, cash flow, growth opportunities, profitability, leverage, dividend, and liquid assets substitute; these variables are the most important variables affecting the decision on cash-holding as those variables have been used by the vast majority of researchers in their studies about the determinants of cash holding. The other reason for choosing those variables is that the other variables that have been mentioned in the literature cannot be measured because of the unavailability of the data. One of these variables is the cash cycle; when we calculated the values of this variable we found that this variable is unreliable as it has a significant number of abnormal values at both ends of the distribution. Retaining those outliers in the estimations will affect the results of the study, and

since those outliers represent a large part of the data removing them will affect the sample size significantly. Other variables, such as the variability in the cash flow, have not been included; this particular variable needs to be calculated as the standard deviation of the cash flow using observations for several years to get one standard deviation, which means we will need many observations per firm. As our sample size is not very large, we could not include this variable as it would have reduced the sample size. Other variable we could not include is the effect of corporate governance on cash holding decisions as the index of corporate governance in not available for Jordanian firms and the components needed to measure this variable are also not available.

The dependent variable in this research is the cash ratio (CASH), which is measured as cash plus cash equivalents to total assets. Based on the literature that has been covered, almost all of the researchers used cash plus marketable securities to total assets as the measurement of the cash ratio, such as Kim et al. (1998), Ozkan and Ozkan (2004) and others. On the other hand, Opler et al. (1999) and Ferreire and Vilela (2004) used cash plus marketable securities to net assets (net assets is total assets minus cash and marketable securities), while Pedro and Pedro (2004) used both methods to measure the cash ratio. As the literature review section showed, using different ways to measure the dependent variable did not appear to affect the results.

The independent variables of this research are measured as follows:
The firm's size (SIZE), measured by its total assets, will be calculated as the natural logarithm of the total assets at the book value of each firm. It is expected that cash-holding will have a negative relationship with firm size, since large size firms have a greater ability to access financial markets to increase their capital, which means they do not need to hold a large amount of cash. Also, large firms have lower marginal transaction costs since they can obtain benefits from the economies of scale, and with larger size the asymmetric information is likely to be reduced, which will make the external sources of funds cheaper and more accessible. The vast majority of the researchers who include this independent variable, such as Opler et al. (1999), Ferreire and Vilela (2004), Ozkan and Ozkan (2004) and others, used the natural logarithm of the total assets at the book value as the measurement of the firm size. Kim et al. (1998) used the natural logarithm of the total assets at the market value. Kytonen (2005) used the net sales as measurement of the firm size, while Pedro and Pedro (2004) used

the natural logarithm of the sales and the natural logarithm of the total assets at the book value as two alternative ways to measure the firm size.

Cash flow (CF) will be measured as earnings plus taxes, interest and depreciation expense divided by total assets. There is expected to be a negative relationship between a firm's cash flow and its cash-holding because when the firm is able to generate cash flow from its own operations it will tend to hold a lower amount of cash or cash equivalents. Different ways have been used in the literature to measure this variable; one way is to take the earnings before depreciation, interest, and taxes to total sales, as done by Kim et al. (1998) and Kytonen (2005). Chen and Mahajan (2010) calculated it as earnings before depreciation, interest and taxes to total assets. Ozkan and Ozkan (2004) and Pedro and Pedro (2004)[11] used the pre-tax profit plus depreciation to total assets. Opler et al. (1999) and Ferreire and Vilela (2004) used earnings after tax plus depreciation to net assets.

Growth opportunities (GO) (market-to-book value) will be measured as the ratio of book value of total assets, minus the book value of equity, plus the market value of equity to book value of assets. When the firm expects to have future projects and investment opportunities or when it expects to have a chance of growth, it will need to finance those growth opportunities. So, it is expected that it will hold more cash, especially when it is difficult to get outside financing or when the cost of external financing from outside sources is expensive due to asymmetric information between the investors and firms' managers. The relationship between cash-holding and growth opportunities is expected to be positive. Many of the researchers used the market-to-book value of the firm assets, such as Kim et al. (1998), Opler et al. (1999), Ozkan and Ozkan (2004) and others. Niskanon and Niskanon (2007) and Pedro and Pedro (2004)[12] used the growth in sales, while Colquitt et al. (1999) used the average growth rate in assets in the last three years.

Profitability (P) will be measured as return on assets (ROA). When the firm is more profitable, pecking order theory suggests that firms will depend more on the internal sources of financing than on the external sources of financing. So, more profitable firms tend to accumulate more cash in order to use this cash as an internal source of financing. So, the relationship between firms' profitability and cash-holding is expected to be positive. Although

[11] They also calculate it as earnings before depreciation, interest, and taxes to sales.
[12] They also calculate it as depreciation to total assets.

this is a very important variable to explain cash-holding decisions, most researchers did not include it as separate variable in their studies; they used the cash flow as an indication of profitability. Omet and Maghyereh (2003) studied this variable and used return on assets (ROA) as a measurement of profitability.

Leverage (LEV) will be measured as the ratio of total liabilities to total assets. If the firm has a high leverage, that might mean it has good relations with banks and other financial institutions, and it can thus obtain more funds from loans; this means that such firms do not need to hold a large amount of cash since they are able to access external sources of financing. The relationship between cash-holding and leverage is expected to be negative. All of the literature that we covered used the total liabilities to total assets to measure the leverage or the debt ratio, except the research by Pedro and Pedro (2004) which used total liabilities to total equities as the debt ratio.

Dividend payout ratio (DIV) will be measured as total cash dividend to total assets. When a firm decides to pay a cash dividend to its shareholders, it needs to hold more cash to be able to meet this financial obligation, which means that the relationship between the dividend payout ratio and cash-holding is expected to be positive. Opler et al. (1999), Ferreira and Vilela (2004) and Chen and Mahajan (2010) used a dummy variable to measure the payment of a dividend, rather than the size of the dividend. Kytonen (2005) measured it as the ratio of dividend to earnings.

Liquid assets substitutes (LIQ) will be measured as net working capital minus cash to total assets. When firms have substitutes for cash, they hold less cash, since they have other sources of liquidity. The relationship between liquid asset substitutes and cash-holding is expected to be negative. All of the literature that we covered was consistent in its use of net working capital minus cash to total assets to measure this variable.

2.3.3. Methodology

The methodology used in this research is panel data analysis, including three alternative panel data models: pooling ordinary least squares model, fixed-effect model, and random effect model. Panel data analysis has many advantages which we have already mentioned in chapter 1. The ordinary least squares model can be obtained by finding an approximate straight line

which best represents the line of the data set, where the sum of square destination between each observation and that line is at the minimum. The fixed-effect model is designed in such a way as to take into consideration the changes within each entity (in our case each firm). Each entity has its own characteristics; those characteristics might affect the predictor variables and could lead to bias in the results, so we need to control for those characteristics. The model will give a dummy variable for each entity to capture those characteristics. The fixed-effect model assumes that the constant (which varies over time and cross-sectionally) of the model and the entity's error term are not correlated. The same technique can be applied to the time to capture the characteristics related to the time as well as the entity. The random effect model is similar to the fixed-effect model except that the constant is a random value which varies cross-sectionally but is constant over time.

We will apply these three models in the panel data analysis, and will then check which one of them is the most appropriate for use as the research model. The first test is the likelihood ratio test; this test will be used to compare between the ordinary least squares model and the fixed-effect model. As we mentioned in chapter 1, this test compares between two models: restricted and unrestricted models; by calculating the log-likelihood function and comparing those values under chi-square distribution, we can decide which model is better - if the value is significant then we should use the fixed-effect model rather than the ordinary least squares model. The second test is the Hausman test, which compares the efficiency of the two models. The null hypothesis under the Hausman test is that the coefficients estimated by the random effects estimator are the same as the ones estimated by the fixed-effect estimator. If we obtain significant values under chi-square distribution, it means that the fixed-effect model is more efficient than the random effects model.

2.3.4. Research models

The models of this research will be as follows:

Pooled Ordinary Least Square

$$CASH_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it} \quad (2.1)$$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

Fixed-Effect Model

$$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it} \quad (2.2)$$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

Random Effect Model

$$CASH_{it} = \alpha_i + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it} \quad (2.3)$$

The error term $u_{it} \sim NIID\ (0, \sigma^2)$

$$\alpha_i = \alpha + \varepsilon_i$$

$$i = 1, 2, \ldots, N.$$

Where ε_i is a random error term $\varepsilon_i \sim NIID\ (0, \sigma^2)$

Where:

$CASH_{it}$: Cash ratio.

SIZE : Firm size.

CF : Cash flow.

GO : Growth opportunities.

P : Profitability (earning after tax).

LEV : Leverage.

DIV : Dividend payout ratio.

LIQ : Liquid asset substitutes.

μ : Unobservable individual specific effect.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7$:variables betas.

Finally, to summarize this section, table 2.1 shows the research variables. It also shows the expected sign of each of those variables, how we measured them, and an explanation of our expectations about the likely relationships.

Table 2.1

Research variables summary

(CASH) cash ratio, (SIZE) firm's size, (CF) firm's cash flow, (GO) growth opportunities, (P) Profitability, (LEV) leverage, (DIV) dividend payout ratio, (LIQ) liquid assets substitutes.

Variable	Measurement	Expected Sign	Explanation
CASH	$\frac{Cash + Cash\ Equivalents}{Total\ Assets}$	NA	Dependant Variable
SIZE	$\ln(Total\ Assets)$	–	Larger size firm has better access to financial markets, economics of scale Advantage, and less asymmetric information
CF	$\frac{Earnings + Taxes + Interest + Depreciation}{Total\ Assets}$	–	Firms that generate higher cash flow are less likely to have the problem of cash shortage.
GO	$\frac{Assets\ Market\ Value}{Assets\ book\ Value}$	+	For precautionary reason, firms that have more growth opportunities are more willing to accumulate cash.
P	$ROA = \frac{Earning\ after\ Tax}{Total\ Assets}$	+	Profitable firms tend to depend more on the internal sources of financing (Pecking order theory).
LEV	$\frac{Total\ Liabilities}{Total\ Assets}$	–	Firms with higher debt ratio indicate that those firms are more ability to access debt market to obtain the needed fund.
DIV	$\frac{Cash\ dividend}{Total\ Assets}$	+	Firms that paying cash dividend need to hold more cash to meet that financial obligation.
LIQ	$\frac{Net\ Working\ Capital - Cash}{Total\ Assets}$	–	When firms have other sources of liquidity, then they do not need to hold a large amount of cash.

Source: Financial theories and literature.

2.4. Results and Analysis

2.4.1. Descriptive analysis

Firstly, we will present the descriptive analysis of the research variables. Table 2.2 shows descriptive statistics of the research variables. From table 2.2, we can make a number of observations. The mean of the cash ratio for the research sample is 9.38%, which is about one tenth of the total assets. Both standard deviation and maximum value are relatively high at 11.62% and 81.19% respectively, which means that cash ratio varies considerably between firms in Jordan. While this variation might be a concern, removing the outliers will reduce the sample size which already is not large. Also, retaining those observations will reflect the real situation in Jordon which we believe is better to help us understand the motivation for Jordanian firms to hold cash. Firms included in this sample generate cash flows ranging between -57% and 53% of their total assets, with an average value of about 8%. Firms in this sample have an average debt-to-assets ratio of 32%, which is not too high. The average liquid assets substitutes for the firms in this sample are about 12%, which means that firms in this sample have about one eighth of their assets in non-cash working capital, which can be used as liquid assets substitutes. For more details, we can consult table 2.3 which shows the descriptive statistics for the research variables year by year, for the year 2000 to the year 2011. From table 2.3 we can see that the research variables are stable over the research period and we can see only small changes as cash ratio is relatively higher in the last few years; this may be due to the effects of the financial crisis, when firms started to accumulate more cash. Debt ratio has also increased in the last few years, and this will be explained in more detail in the fourth chapter, which is concerned with the debt ratio. Cash flow, profitability, and cash dividend have decreased in the last few years as firms' profits have declined, possibly because of the financial crisis.

Table 2.2

Descriptive statistics whole sample

The dependent variable is (CASH) cash ratio which is assets and cash equivalent divided by total assets, the independent variables are; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earnings plus taxes, interest, and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. For the period from 2000 to 2011.

	CASH	SIZE	CF	GO	P	LEV	DIV	LIQ
Mean	9.38%	16.90	8.19%	149.10%	2.71%	32.47%	2.80%	11.73%
Median	4.88%	16.62	7.78%	133.05%	3.25%	28.93%	0.00%	10.51%
Maximum	81.19%	22.29	52.80%	619.79%	43.30%	94.47%	35.22%	78.02%
Minimum	0.00%	10.20	-57.28%	-67.21%	-60.01%	0.44%	0.00%	-71.66%
Std. Dev.	11.62%	1.66	10.43%	82.24%	9.70%	21.03%	4.15%	20.85%
Observations	960	960	960	960	960	960	960	960

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 2.3

Descriptive statistics year by year

The dependent variable is (CASH) cash ratio which is assets and cash equivalent divided by total assets, the independent variables are; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earnings plus taxes, interest, and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. For the period from 2000 to 2011 year by year.

		CASH	SIZE	CF	GO	P	LEV	DIV	LIQ
2000	Mean%	9.70%	16.34	8.74%	111.04%	1.95%	31.64%	2.28%	11.32%
	Median%	2.86%	16.11	8.51%	100.00%	2.30%	29.11%	0.00%	8.65%
	Max%	81.19%	20.08	31.13%	350.94%	27.43%	91.58%	13.94%	67.20%
	Min%	0.00%	14.31	-13.67%	15.73%	-20.67%	0.60%	0.00%	-39.83%
	SD%	14.93%	1.30	9.48%	59.46%	9.23%	20.11%	3.36%	19.86%
2001	Mean%	8.94%	16.37	9.63%	111.23%	2.83%	31.23%	3.00%	12.11%
	Median%	4.13%	16.18	8.97%	100.51%	3.56%	29.49%	0.00%	8.03%
	Max%	48.50%	20.18	31.65%	307.86%	22.76%	91.86%	18.48%	64.26%
	Min%	0.00%	14.06	-38.77%	8.88%	-46.16%	1.82%	0.00%	-39.02%
	SD%	12.13%	1.31	9.90%	55.55%	9.58%	19.53%	4.33%	20.57%

Table 2.3 Continued

		CASH	SIZE	CF	GO	P	LEV	DIV	LIQ
2002	Mean%	10.21%	16.37	9.71%	119.60%	3.43%	31.33%	2.82%	13.01%
	Median%	3.35%	16.20	8.86%	108.87%	2.98%	28.10%	0.00%	9.50%
	Max%	51.78%	20.14	31.52%	328.33%	22.21%	91.99%	17.83%	68.20%
	Min%	0.00%	13.97	-14.64%	0.66%	-18.91%	2.31%	0.00%	-28.69%
	SD%	13.14%	1.32	8.19%	58.61%	7.36%	21.24%	3.85%	20.27%
2003	Mean%	8.89%	16.40	9.30%	145.27%	3.42%	31.43%	2.64%	13.99%
	Median%	4.22%	16.27	8.94%	132.90%	3.34%	26.95%	0.00%	10.79%
	Max%	52.03%	20.15	33.57%	462.16%	25.15%	92.14%	18.11%	67.73%
	Min%	0.00%	14.03	-25.21%	33.54%	-37.94%	1.69%	0.00%	-46.90%
	SD%	11.03%	1.32	8.26%	72.28%	8.27%	20.69%	3.72%	21.28%
2004	Mean%	7.79%	16.56	11.37%	166.58%	5.66%	33.53%	3.41%	14.47%
	Median%	3.92%	16.39	9.46%	153.54%	5.27%	25.24%	1.57%	15.30%
	Max%	38.91%	20.00	38.45%	444.44%	28.00%	93.77%	22.02%	67.88%
	Min%	0.00%	14.25	-3.36%	20.98%	-11.22%	0.89%	0.00%	-65.03%
	SD%	9.61%	1.31	8.37%	74.42%	6.82%	24.00%	4.64%	23.24%
2005	Mean%	9.19%	16.67	10.87%	184.69%	5.87%	28.69%	3.07%	15.17%
	Median%	4.87%	16.53	9.40%	171.66%	5.07%	26.73%	0.00%	12.28%
	Max%	39.92%	20.12	41.60%	488.74%	34.12%	91.97%	35.22%	61.64%
	Min%	0.00%	14.06	-32.41%	25.43%	-32.52%	0.00%	0.00%	-52.37%
	SD%	10.44%	1.35	10.39%	79.52%	9.47%	19.21%	5.43%	20.60%
2006	Mean%	9.11%	16.71	7.62%	163.76%	2.51%	30.15%	3.16%	12.66%
	Median%	5.83%	16.62	7.30%	142.98%	3.40%	27.50%	2.31%	11.96%
	Max%	48.51%	20.21	33.19%	612.98%	29.47%	91.85%	16.86%	68.77%
	Min%	0.00%	14.05	-24.09%	65.93%	-26.01%	1.71%	0.00%	-31.53%
	SD%	9.80%	1.37	9.28%	82.00%	8.34%	18.77%	4.03%	19.22%
2007	Mean%	8.46%	16.79	8.90%	177.58%	3.90%	31.91%	3.09%	12.29%
	Median%	4.59%	16.71	9.30%	154.84%	4.88%	30.32%	1.67%	9.45%
	Max%	50.70%	20.31	36.93%	619.79%	29.38%	91.69%	19.12%	76.04%
	Min%	0.00%	14.01	-27.29%	55.84%	-30.85%	0.77%	0.00%	-30.79%
	SD%	10.01%	1.40	10.17%	92.49%	9.18%	18.86%	4.18%	19.51%
2008	Mean%	9.42%	16.89	6.69%	164.77%	1.80%	34.85%	2.59%	10.45%
	Median%	4.90%	16.74	7.49%	136.27%	3.34%	32.28%	0.00%	9.26%
	Max%	51.99%	20.59	52.46%	460.54%	43.30%	90.20%	24.09%	63.98%
	Min%	0.00%	13.83	-57.28%	35.92%	-60.01%	1.35%	0.00%	-32.06%
	SD%	11.82%	1.46	13.81%	88.22%	12.74%	21.62%	4.39%	19.38%
2009	Mean%	9.73%	16.87	5.24%	157.45%	0.84%	34.42%	2.40%	10.32%
	Median%	5.33%	16.79	6.51%	134.30%	2.32%	32.42%	0.00%	10.42%
	Max%	66.35%	20.60	39.20%	437.16%	36.02%	108.14%	19.24%	78.02%
	Min%	0.00%	13.76	-35.78%	15.36%	-43.69%	0.44%	0.00%	-36.78%
	SD%	11.86%	1.49	11.20%	92.15%	10.97%	22.90%	3.76%	20.36%

Table 2.3 Continued

		CASH	SIZE	CF	GO	P	LEV	DIV	LIQ
2010	Mean%	10.76%	16.86	5.72%	151.51%	0.76%	34.61%	2.75%	8.82%
	Median%	7.11%	16.69	6.19%	127.74%	2.02%	32.71%	0.82%	9.42%
	Max%	63.73%	20.73	37.98%	451.28%	35.51%	94.47%	18.34%	75.91%
	Min%	0.00%	13.35	-21.81%	-2.59%	-26.85%	1.25%	0.00%	-49.38%
	SD%	11.54%	1.54	10.18%	92.55%	9.93%	22.38%	4.08%	21.18%
2011	Mean%	10.33%	16.80	4.31%	135.95%	-0.72%	36.28%	2.35%	5.96%
	Median%	7.04%	16.70	4.88%	123.50%	0.96%	32.47%	0.00%	7.75%
	Max%	64.63%	20.92	38.76%	463.15%	31.47%	91.53%	15.12%	72.92%
	Min%	0.00%	13.22	-31.12%	-67.21%	-32.99%	0.47%	0.00%	-71.66%
	SD%	11.72%	1.54	12.00%	83.85%	11.53%	22.39%	3.43%	22.82%

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Secondly, table 2.4 shows the correlation matrix for the research variables. From this table we can see that most of the correlation coefficients between the research variables are low but there are still some relatively high correlations between some of those variables. Those correlation coefficients can be explained as follows. Cash ratio is correlated with growth opportunities as those growing firms tend to hold more cash to finance their rapid growth; cash ratio is also correlated to the profitability as the pecking order theory suggests that more profitable firms tend to depend more on their internal sources to finance themselves. Cash ratio is also correlated with dividend as the more cash the firm has, the more able and willing it is to pay dividends to its shareholders.

Size of the firm is correlated with leverage as larger firms are more able to access debt at a cheaper cost. Cash flow is correlated with the growth opportunities, profitability, and dividend for the same reasons as those between cash ratio and those variables. Growth opportunities are correlated with profitability and dividend, as growing firms are more profitable and are thus able to pay more dividends. Profitability is correlated with dividend as more profitable firms are more able and willing to pay dividends. Finally, leverage is negatively related to liquid assets substitutes as the firm can use those liquid assets substitutes as an alternative source of borrowing.

Although some variables have relatively high correlations with one another, the model did not suffer from multicollinearity. Brooks (2008) suggests that when the correlation coefficient

between the variables is high, it could indicate near multicollinearity. This near multicollinearity will make the standard error of the variables high which will make those variables insignificant. Another problem with multicollinearity is that the regression model will become very sensitive to any changes in the independent variables and adding or removing any variable will affect the model sharply. So, the coefficient and the significance of the other variable will be changed if we add or drop any variable to or from the model. That will make the parameter estimates very wide and lead to inappropriate conclusions. To check whether our model suffers from near multicollinearity or not, we run the model several times, dropping one variable each time and checking whether the other variables' coefficients, signs, or significance show any large changes (for more details, see section 2.4.4. Robustness test).

Having carried out this process, we found that no significant change had occurred to the other variables in the model when one variable at a time was dropped from the original model. This suggests that our model does not suffer from near multicollinearity even though we have high correlations between some of the explanatory variables. Should the multicollinearity remain present, Brooks suggests a number of solutions to the problem. The first solution is to ignore it, especially if the variables' coefficients have the correct sign and magnitude value. The second solution is to drop one of the collinear variables; unfortunately, sometimes the variables with high correlations are important for explaining the dependant variable, so we cannot drop any of them. The third solution is to transform the highly correlated variables into a ratio; this may be unacceptable, especially if the theory suggests that the relationship should be of a certain nature that does not include the variable as ratio.

For our model, all the independent variables are important for explaining the cash ratio; all of them are ratios, and the most important point is that the variables' coefficients have the correct sign as suggested by the theory, which means that the model does not appear to suffer from multicollinearity. For all of the previous reasons we chose the first solution proposed by Brooks (2008) and simply carried on with the current situation, especially since the results from the robustness test in section 2.4.4 showed that dropping the explanatory variables one by one or using a different way of measuring them did not affect the sign or the significance of the other explanatory variables.

Table 2.4

Correlation matrix for the research variables

The dependent variable is (CASH) cash ratio which is assets and cash equivalent divided by total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earnings plus taxes, interest, and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. For the period from 2000 to 2011.

	CASH	SIZE	CF	GO	P	LEV	DIV	LIQ
CASH	1.0000							
SIZE	0.0531	1.0000						
CF	0.2960	0.2996	1.0000					
GO	0.3282	0.2226	0.4881	1.0000				
P	0.3357	0.2789	0.9456	0.5253	1.0000			
LEV	-0.2804	0.3550	-0.2186	-0.2373	-0.2926	1.0000		
DIV	0.4821	0.2120	0.6114	0.5417	0.6142	-0.2693	1.0000	
LIQ	0.0630	-0.2834	0.1108	0.1114	0.2047	-0.4783	0.1259	1.0000

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

2.4.2. Model analysis

The estimated results for the research models are presented in table 2.5 which shows the resulting outputs for the three models: the pooling ordinary least squares model, the fixed-effect model, and the random effects model. We will start with an overview of the analysis of those three models and will then determine which model is the most appropriate to use, using the likelihood ratio test to compare between the pooling ordinary least squares model and the fixed-effect model, and the Hausman test to compare between the fixed-effect model and the random effects model.

From table 2.5 we can observe the following points. Firstly, under the three models cash flow (CF), profitability (P), leverage (LEV), cash dividend (DIV), and liquid assets substitutes (LIQ) are significant while size (SIZE) and growth opportunities (GO) are not significant. Secondly, all of the significant variables are consistent regardless of the variables' signs; in

more detail, cash flow (CF), leverage (LEV), and liquid assets substitutes (LIQ) have a negative relationship with cash ratio. Profitability (P) and cash dividend (DIV) have a positive relationship with cash ratio. Thirdly, those signs are consistent with what the theories suggest and many of the other researchers found, as we will discuss later. Finally, all of the models are significant overall at the 1% level, as the results of the F statistics show.

Now we need to apply the likelihood ratio test and the Hausman test to determine which model we should use. Starting with the likelihood ratio test, table 2.6 shows the output results of that test. From table 2.6 we find that the fixed-effect model is preferable to the pooling ordinary least squares model as the results showed significant values for this test; this means that the fixed-effect model (restricted model) is preferred to the ordinary least squares model (unrestricted model), as we explained earlier in chapter 1. Furthermore, table 2.7 shows the output results of the Hausman test. From table 2.7 we find that the fixed-effect model is preferable to the random effects model, as we explained in chapter 1. The Hausman test is testing whether the intercept term is correlated with one or more of the explanatory variables; if the result of this test is significant, it means that this intercept term is correlated with one or more of the explanatory variables, which clashes with the assumption of the random effect model that the intercept term is not correlated with any of the explanatory variables. So, if the Hausman test shows a significant value, the fixed-effect model is the preferred model.

To conclude, three panel models have been used to investigate the determinants of cash-holding. Those three models were consistent in their results. To determine which of the three models is most suitable, the likelihood ratio test and the Hausman test have been applied. The results suggest that the fixed-effect model is preferable. Thereby, the fixed-effect model will be adopted as the research model.

Table 2.5

Regression results (pooling ordinary least squares model, fixed-effect model, and random effects model)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earnings plus taxes, interest, and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction. For the period from 2000 to 2011.

	Pooling OLS	Fixed-effects	Random effects
α_0	0.1325** (2.5579)	0.2131 (1.2252)	0.1869*** (2.0390)
β_1 (SIZE)	-0.0020 (-0.6455)	0.0000 (-0.0014)	-0.0004 (-0.0755)
β_2 (CF)	-0.2993*** (-3.2077)	-0.3385* (-1.8616)	-0.3770*** (-3.0294)
β_3 (GO)	0.0098 (1.5150)	-0.0103 (-1.4665)	-0.0062 (-0.9715)
β_4 (P)	0.3171*** (2.9160)	0.4847*** (2.6083)	0.4796*** (3.5787)
β_5 (LEV)	-0.0892*** (-4.8894)	-0.2338*** (-7.9642)	-0.1810*** (-7.6708)
β_6 (DIV)	1.1790*** (8.9646)	0.6786*** (5.4955)	0.8514*** (6.9855)
β_7 (LIQ)	-0.0667*** (-3.4224)	-0.2705*** (-8.2467)	-0.2049*** (-7.5971)
Adjusted R square	26.77%	54.97%	20.73%
F statistic	51.0906***	13.0678***	36.8307***
Number of observations	960	960	960

Table 2.6

Likelihood ratio test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.3384	-79,862	0.0000
Cross-section Chi-square	544.9865	79	0.0000
Period F	0.9810	-11,862	0.4619
Period Chi-square	11.9435	11	0.3679
Cross-Section/Period F	7.6226	-90,862	0.0000
Cross-Section/Period Chi-square	562.0652	90	0.0000

Table 2.7

Hausman Test

Correlated Random Effects - Hausman Test

Equation: Untitled

Test cross-section and period random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	65.4704	7	0.0000

Having found our research model, we can now start on the main analysis. Looking back to Table 2.5 we can observe that the model is significant at the 1% level with an F statistic of 11.14. The adjusted R squared is higher than the other two models, with a value of 55% which means that the set of explanatory variables can explain 55% of the dependent variable.

As for the research variables, firm size has no significant effect on cash-holding for Jordanian firms. This result may seem unusual, since larger firms should have greater access to external sources of financing and would be expected to be able to obtain those funds at a cheaper cost, as the theory suggested, which means that those larger firms tend to hold less cash. Also, some of the literature showed a negative relationship between firm size and cash-holding, but Jordanian firms did not show this relationship; the most likely reason is that, for Jordanian firms, size has no significant role when firms attempt to obtain funds from external sources as the mechanism of raising capital in the Jordanian capital market is not affected directly by the

firms' size, and small or large firms can easily access the capital market to obtain the funds needed for their business regardless of their size. Table 1.3 summarize IPO and SEO for Jordanian firms between 2001 and 2012 and Table A1 in appendix A shows the secondary public offering (SEO) for the Jordanian firms during the period from 2000 to 2012, which shows that both smaller and larger firms can obtain external funds, in many cases more than once.

Omet and Maghyereh (2003) obtained the same result, finding that size has an insignificant positive relationship with the cash ratio. Kim et al. (1998) report that "the coefficient estimates on firm size are always negative, but are never significant". Ozkan and Ozkan (2004) and Pedro and Pedro (2004) also found that the relationship between cash-holding and size is not significant. Opler et al. (1999), Coloquitt et al. (1999), Ferreire and Vilela (2004), and Niskanen and Niskanen (2007) found a significant negative relationship between cash-holding and firm size while Kytonen (2005) and Chen and Mahajan (2010) found that this relationship is significantly positive.

Cash flow has a significant negative coefficient, which means that the relationship between cash-holding and a firm's cash flow is negative. This result is expected because, when firms are able to generate more cash from their operational activities, they may tend to hold less cash since they have a higher chance of preventing cash shortages; firms' ability to generate cash from their operations can be considered as a cash substitute. This result also matches those of Kim et al. (1998) and Ozkan and Ozkan (2004) who found a significant negative relationship between cash-holding and a firm's cash flow. Other researchers such as Opler et al. (1999), Ferreire and Vilela (2004) and Pedro and Pedro (2004) found that this relationship is positive; their explanation for the positive relationship is that firms with high cash flow are more profitable, so they will accumulate this cash flow to use it as an internal source of financing. In our research model we studied the effect of firms' profitability as a separate variable and found a positive relationship with cash-holding, as we will see later.

Growth opportunities are not significant in explaining cash-holding by Jordanian firms. The explanation of this result is similar to that of the effect of the firm's size among the Jordanian firms, as the Jordanian market is a small market, especially if we compare it to more developed markets such as the US or UK markets; the size of any potential growth will be small as well, as most of the firms are small firms and their type of business does not need a

very large amount of capital or funds, which means that financing their growth opportunities will not need a large amount of funds. These funds might be available inside the firm or can be obtained from external sources; as we mentioned earlier when we explained the firm size variable, any firm in Jordan can obtain external funds easily from the capital market. This means that, even when there is a growth opportunity for the firm, this growth can be financed by the cash or the cash substitute which is available inside the firm or can be obtained from outside sources since it is expected to be a relatively small amount. This result matches that of Niskanen and Niskanen (2007) who found no significant relationship between cash-holding and a firm's growth opportunities. Similarly, Omet and Maghyereh (2003) found that there was no significant effect of future growth opportunities on Kuwaiti firms' decision to hold cash. On the other hand, the vast majority of researchers who studied the effect of the growth opportunity on firms' cash-holding found this relationship to be significantly positive, such as Kim et al. (1998), Opler et al. (1999), Ozkan and Ozkan (2004) and others; to achieve more growth, firms need to have more funds to finance those opportunities, so many firms tend to hold a larger amount of funds to meet those financing needs, especially if it is difficult for them to obtain external funds, which may be expensive or take a long time to arrange.

Firm profitability is significantly positive for Jordanian firms. This positive relationship can be explained by the pecking order theory because, as a firm becomes more profitable, it will depend more on internal sources of financing rather than external sources; thus, it tends to hold and accumulate more cash to use that cash and funding as its internal source of financing. Omet and Maghyereh (2003) found that there is a positive significant relationship between cash-holding and firm profitability measured by the return on assets. Opler et al. (1999), Ferreire and Vilela (2004), Pedro and Pedro (2004) and others found a positive relationship between profitability and cash-holding; they used a firm's cash flow as a measurement of firm profitability since firms that can generate sufficient amounts of cash flow from their operations can be considered profitable firms.

Leverage has a significant negative coefficient. The explanation for this negative relationship is that, when the firm has the ability to obtain more debt, it does not need to hold a high level of cash; this result was also confirmed by the literature since the other researchers, such as Kim et al. (1998), Opler et al. (1999), Ozkan and Ozkan (2004), and others, who studied this variable obtained a negative relationship with cash-holding. In contrast, Pedro and Pedro (2004), Kytonen (2005) and Niskanen and Niskanen (2007) found the relationship between

leverage and cash-holding to be positive. The explanation for this positive relationship is that, as firms have more leverage, it becomes more difficult and costly to obtain more cash from external sources, so those firms tend to accumulate cash to use it as source of financing; another explanation is that firms with higher leverage ratios hold more cash to reduce the default risk.

The dividend payout ratio has a significant positive relationship with cash-holding. The explanation for this positive relationship between dividend payout and cash-holding is that, when firms need to pay a cash dividend to their shareholders, they need to hold more cash to avoid any cash shortage. Another explanation for the positive relationship between dividend payout and cash-holding is based on the agency theory; management may want to keep the cash inside the firm to use it for their best interests, so they might cut the cash dividend. On the other hand, they cannot keep accumulating cash for ever, especially when there are no more good projects in which to become involved (projects with a positive NPV). So, with a high level of cash-holding, firm managers will start to use some of cash as cash dividends to shareholders, which explains the positive relationship between dividend payout and cash-holding. Other researchers also found this kind of relationship between cash-holding and cash dividends, such as Opler et al. (1999), Kytonen (2005) and Chen and Mahajan (2010).

Liquid assets substitutes have a negative relationship with cash. This negative relationship occurs because, when the firm has any substitutes for cash, it tends to hold less cash since firms that have liquid assets substitutes can use these assets to cover any shortage in cash when necessary. So, if the firm has a sufficient amount of liquid assets substitutes, it does not need to hold too much cash since these liquid assets substitutes can be used as a backup for cash needs. This result is also confirmed in the literature. All of the researchers who included this variable found the relationship between cash-holding and liquid assets substitutes is negative, except for Niskanen and Niskanen (2007) who found this relationship to be positive. They explain this by stating that their sample of liquid assets is not seen as cash substitute.

An important issue we should consider is the endogeneity. Endogeneity issue occurs when there is a correlation between the error term and independent variables. The existence of the endogeneity will lead to a bias in the variables coefficients, this issue can be fixed by using two-stage least square model or by introducing instrumental variables to the model.

Testing for endogeneity in our model showed that there is no correlation between the error term and the independent variables, as Sargan test is 50.29 significant at 1% level which means there is no correlation between the error term and the independent variables.

2.4.3. Hypotheses analysis

The first hypothesis is H_1: there is a negative relationship between a firm's size and a firm's cash-holding. The results show that this relationship is not significant. We expect this relationship to be negative since larger firms find it easier to access capital markets to obtain funds and they do not need to hold high levels of cash; larger firms are also more able to obtain economies of scale and experience less asymmetric information. This result is not unusual, as other researchers also found this relationship not to be significant, as we discussed earlier.

The second hypothesis is H_2: there is a negative relationship between a firm's cash flow and a firm's cash-holding. The research model shows a negative relationship between cash flow and a firm's cash-holding; the coefficient was -0.27, a result that matches other researchers' findings. Firms that can generate cash from their own operations do not need to hold too much cash, since this generated cash flow can be considered as a cash substitute. On this basis, we can accept H_2.

The third hypothesis is H_3: there is a positive relationship between a firm's growth opportunity and a firm's cash-holding. Firms with growth opportunities tend to hold more cash to be able to finance those projects, especially if the external sources of financing are unavailable or expensive. The research model shows that the relationship between growth opportunity and firm's cash-holding is not significant. This result did not match the majority of the literature but other researchers also found this relationship is not significant. Based on our model result, growth opportunities cannot explain firms' cash-holding decisions.

The fourth hypothesis is H_4: there is a positive relationship between a firm's profitability and a firm's cash-holding. The result shows a strong positive relationship between profitability and a firm's cash-holding. This is line with what the pecking order theory suggests, as more profitable firms tend to accumulate cash to use this cash as an internal source of financing. According to the result we can accept H_4.

The fifth hypothesis is H_5: there is a negative relationship between a firm's leverage and a firm's cash-holding. Higher leverage indicates that firms are more able to obtain debt financing, which means that those firms do not need to hold high levels of cash. We can accept this hypothesis since the result shows that there is a negative relationship between a firm's leverage and a firm's cash-holding, which is highly significant.

The sixth hypothesis is H_6: there is a positive relationship between a firm's cash dividend and a firm's cash-holding. According to the result from the model used in this research we can accept H_6, since the result showed a strong positive relationship between a firm's cash dividend and a firm's cash-holding.

The seventh hypothesis is H_7: there is a negative relationship between a firm's liquid assets substitute and a firm's cash-holding. Firms with substitute liquid assets do not need to hold too much cash, as those substitute liquid assets can guard against cash shortages. H_7 can be accepted based on the result from the research model, which shows a significant negative relationship.

2.4.4. Robustness test

This section will provide a robustness test to confirm the previous results and to address any potential concerns about our model. To check the robustness of our results we will use different measurements of the research variables taken from the literature, as some researchers used different ways to measure those variables. We also include the dependent variable to check whether the results will still be consistent with what we found in our original model. Then we will drop the research variables one by one to check whether the results are still consistent or whether this process will affect the model results, especially since we found high correlations between some of the research variables.

Starting with our dependent variable, the cash ratio (CASH), we will provide alternative measurements to determine whether the results will be changed or not. Table 2.8 presents the results of the dependent variable ($CASH_1$) robustness test. In the first column A1 we present the original model results where we compute the cash ratio as cash plus cash equivalents to total assets. Then, in column A2, we used cash plus cash equivalents to sales as the first

alternative way to measure the cash ratio, which we denote as ($CASH_2$). Finally, column A3 presents the other alternative way to measure the cash ratio ($CASH_3$) as cash plus cash equivalents to net assets, where net assets is the total assets minus cash and cash equivalents. Comparing the results in columns A2 and A3 with the results in column A1, we can see clearly that they are highly consistent. All the variables that were significant under the original model are still significant in the two alternative models; furthermore, they still have the same sign, which means the relationship did not change. Results from table 2.8 suggest that using different ways to calculate the cash ratio did not affect the results of our model, and we can conclude that the dependant variable passes the robustness test.

Now we will move to the independent variables. We will apply the robustness test on those variables as we did for the dependent variable. The first variable is the firm's size (SIZE). In the original model we measured the size of the firm as the natural logarithm of the total assets book value ($SIZE_1$). Two other alternatives to measure firm's size will be used; ($SIZE_2$) is the natural logarithm of the total assets market value, and ($SIZE_3$) is the natural logarithm of the firm's sales. Then, we try to run the original model without including the firm's size. Table 2.9 presents the results of the robustness tests related to the size of the firm. Column B1 shows the results from the original model, while columns B2 and B3 show the results for the two alternative models. Column B4 presents the results of the model when we dropped the firm's size. Comparing the results in columns B2, B3 and B4 with the benchmark model in column B1 we can see clearly that the results are totally consistent. All the other variables still have the original signs, and the variables that were significant are still significant.

Table 2.8

Robustness test of the regression results (cash ratio (the dependent variable))

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio, which is the ratio of cash plus cash equivalents divided by the total assets ($CASH_1$) in column A1, cash plus cash equivalents to sales ($CASH_2$) in column A2, cash plus cash equivalents to net assets, where net assets is the total assets minus cash and cash equivalents ($CASH_3$) in column A3. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earnings plus taxes, interest, and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	A1	A2	A3
α	0.2131 (1.2252)	1.3518 (0.8014)	1.0068** (1.9829)
β_1 (SIZE)	0.0000 (-0.0014)	-0.0158 (-0.1517)	-0.0395 (-1.3628)
β_2 (CF)	-0.3385* (-1.8616)	-5.3391*** (-3.0824)	-1.4226** (-1.9785)
β_3 (GO)	-0.0103 (-1.4665)	0.0085 (0.1142)	0.0001 (0.0039)
β_4 (P)	0.4847*** (2.6083)	4.8776*** (3.0080)	1.6443** (2.2704)
β_5 (LEV)	-0.2338*** (-7.9642)	-1.2661*** (-4.2657)	-0.3616*** (-6.0287)
β_6 (DIV)	0.6787*** (5.4955)	2.7133* (1.6623)	1.2417*** (3.9721)
β_7 (LIQ)	-0.2705*** (-8.2467)	-1.2776*** (-4.3474)	-0.5246*** (-6.7292)
Adjusted R square	54.97%	24.54%	38.87%
F statistic	13.0678***	4.2154***	7.2855***
Number of observations	960	960	960

Table 2.9

Robustness test of the regression results (firm's size)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; ($SIZE_1$) firm's size which is the natural logarithm of the total assets, ($SIZE_2$) is the natural logarithm of the total assets market value, ($SIZE_3$) is the natural logarithm of the firm's sales, (CF) firm's cash flow which is earning after tax plus depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	B1	B2	B3	B4
α	0.2131 (1.2252)	0.3125** (2.4810)	0.2328** (2.2724)	0.2129*** (12.3717)
β_1 ($SIZE_1$)	0.0000 (-0.0014)			
β_1 ($SIZE_2$)		-0.0063 (-0.8055)		
β_1 ($SIZE_3$)			-0.0013 (-0.1964)	
β_2 (CF)	-0.3385* (-1.8616)	-0.3696** (-2.0518)	-0.3341** (-2.0336)	-0.3384** (-2.0383)
β_3 (GO)	-0.0103 (-1.4665)	-0.0069 (-0.7088)	-0.0104 (-1.5311)	-0.0103 (-1.4528)
β_4 (P)	0.4847*** (2.6083)	0.5268*** (2.8426)	0.4840*** (2.9156)	0.4847*** (2.9128)
β_5 (LEV)	-0.2338*** (-7.9642)	-0.2262*** (-7.7365)	-0.2323*** (-7.9754)	-0.2338*** (-7.9616)
β_6 (DIV)	0.6787*** (5.4955)	0.6777*** (5.5124)	0.6800*** (5.5346)	0.6787*** (5.5001)
β_7 (LIQ)	-0.2705*** (-8.2467)	-0.2691*** (-8.0969)	-0.2693*** (-8.1778)	-0.2705*** (-11.0793)***
Adjusted R square	54.97%	55.02%	54.97%	55.02%
F statistic	13.0678***	13.0925***	13.0697***	13.2192***
Number of observations	960	960	960	960

The second independent variable is the firm's cash flow (FC). We will check one alternative measurement of cash flow as earnings after taxes plus depreciation (CF_2). Then, we will run the model without cash flow. Results for the firm's cash flow alternatives are totally consistent with our original reference model, since all variables that were significant are still significant and have the same sign. The full results are presented in table 2.10. Column C1 shows the results for the original model, column C2 shows the alternative measurement for firm's cash flow (FC_2), and column C3 shows the results for the model where we drop the firm's cash flow.

Robustness tests for growth opportunities (GO) also showed that using alternative measurement of a firm's growth opportunities (GO_2) as $sales_t$ / $sales_{t-1}$ or even dropping it does not change the results at all; other variables did not exhibit any change in the signs or even the significance. The full results are presented in table 2.11. Column D1 shows the results for the original model, column D2 shows the alternative measurement for a firm's growth opportunities (GO_2), and column D3 shows the results for the model where we drop the firm's growth opportunities.

For firm profitability (P) we will use earnings to sales as an alternative measurement for profitability (P_2). Also, we will try to drop the profitability from the model to determine whether this will affect the results of the model. From table 2.12 we can see clearly that both the sign and the significance of the research variables are still consistent. The results are presented in table 2.12 where column E2 shows the alternative measurement of profitability and column E3 shows the results when we drop profitability.

For leverage (LEV), we used debt-to-equity ratio (LEV_2) as an alternative way of measuring leverage. We also tried the model when we dropped the leverage, just as we did with the previous variables. Again, results are consistent with the original model except for a minor change in the model: when we dropped the leverage, the firm's size become weakly significant at the 10% level; on the other hand, the size of the coefficient is very small (it is only -0.0191 which means that the relationship is very weak since the coefficient is very close to zero. So, even if it has weak significance, this is very small, and the rest of the variables are still the same in terms of their signs and significance. Results are presented in table 2.13. Column F1 shows the results for the original model, column F2 shows the results for the

alternative measurement for firm's leverage (LEV_2), and column F3 shows the results for the model where we drop the firm's leverage.

As for dividends (DIV), using a dummy variable as an alternative measurement (DIV_2) and dropping the dividends from the model provided very similar results as the original model except for cash flow, which become insignificant under the model when we dropped the dividend variable; although the cash flow variable has become insignificant, it is very close to being significant, with a p-value of 0.1068 which is very close to the significance limit, and it still has a negative sign. Table 2.14 shows the detailed results. Column G1 shows the results for the original model, column G2 shows the results for the alternative measurement for cash dividend (DIV_2), and column G3 shows the results for the model where we drop the cash dividend.

Finally, for liquid assets substitutes (LIQ), we only apply the model where we dropped the liquid assets substitutes, since the literature did not provide an alternative way of measuring liquid assets substitutes. Again, the results are totally consistent with our original model; all variables have the same sign and the variables that were significant are still significant. Results are presented in table 2.15. Column H1 shows the results for the original model, and column H2 shows the results for the model where we drop the liquid assets substitutes.

Table 2.10

Robustness test of the regression results (cash flow)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF_1) firm's cash flow which is earning plus tax, interest and depreciation expense divided by total assets, (CF_2) earnings after taxes plus depreciation divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	C1	C2	C3
α	0.2131 (1.2252)	0.1575 (1.1862)	0.1213 (0.7803)
β_1 (SIZE)	0.0000 (-0.0014)	0.0025 (0.3103)	0.0049 (0.5202)
β_2 (CF_1)	-0.3385* (-1.8616)		
β_2 (CF_2)		-0.3050* (-1.8983)	
β_3 (GO)	-0.0103 (-1.4665)	-0.0008 (-1.0506)	-0.0102 (-1.4431)
β_4 (P)	0.4847*** (2.6083)	0.4287*** (2.6551)	0.1513*** (3.7159)
β_5 (LEV)	-0.2338*** (-7.9642)	-0.2525*** (-9.8197)	-0.2569*** (-8.8912)
β_6 (DIV)	0.6787*** (5.4955)	0.6258*** (5.8023)	0.6355*** (5.1068)
β_7 (LIQ)	-0.2705*** (-8.2467)	-0.2688*** (-11.1753)	-0.2709*** (-8.2200)
R square	54.97%	54.85%	54.67%
F statistic	13.0678***	13.0094***	13.0485***
Number of observations	960	960	960

Table 2.11

Robustness test of the regression results (growth opportunities)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earning plus tax, interest and depreciation expense divided by total assets, (GO_1) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (GO_2) as $sales_t$ / $sales_{t-1}$, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	D1	D2	D3
α	0.2131 (1.2252)	0.1902 (1.4233)	0.1903 (1.0568)
β_1 (SIZE)	0.0000 (-0.0014)	0.0006 (0.0716)	0.0005 (0.0451)
β_2 (CF)	-0.3385* (-1.8616)	-0.3405*** (-2.5952)	-0.3364* (-1.8610)
β_3 (GO_1)	-0.0103 (-1.4665)		
β_3 (GO_2)		-0.0008 (-1.1246)	
β_4 (P)	0.4847*** (2.6083)	0.4676*** (3.4498)	0.4628** (2.4749)
β_5 (LEV)	-0.2338*** (-7.9642)	-0.2331*** (-8.5979)	-0.2327*** (-7.9195)
β_6 (DIV)	0.6787*** (5.4955)	0.6521*** (6.0061)	0.6564*** (5.4791)
β_7 (LIQ)	-0.2705*** (-8.2467)	-0.2704*** (-11.2739)	-0.3159*** (-8.1795)
R square	54.97%	54.84%	54.83%
F statistic	13.0678***	13.0057***	13.1240***
Number of observations	960	960	960

Table 2.12

Robustness test of the regression results (profitability)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents to sales. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earning plus tax, interest and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P_1) firm's profitability which is the return on assets ROA, (P_2) earnings to sales, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	E1	E2	E3
α	1.3518 (0.8014)	-0.1053 (-0.0890)	-0.1982 (-0.1643)
β_1 (SIZE)	-0.0158 (-0.1517)	0.0670 (0.9311)	0.0691 (0.9412)
β_2 (CF)	-5.3391*** (-3.0824)	-1.5790*** (-3.9693)	-0.8657** (-2.2372)
β_3 (GO)	0.0085 (0.1142)	0.0335 (0.6744)	0.0246 (0.4849)
β_4 (P_1)	4.8776*** (3.0080)		
β_4 (P_2)		0.1957*** (5.9691)	
β_5 (LEV)	-1.2661*** (-4.2657)	-1.6448*** (-7.0396)	-1.6358*** (-6.8645)
β_6 (DIV)	2.7133* (1.6623)	2.7089*** (2.6673)	2.4985** (2.4137)
β_7 (LIQ)	-1.2776*** (-4.3474)	-1.2744*** (-5.7068)	-1.2453*** (-5.4693)
R square	24.54%	26.32%	23.36%
F statistic	4.2154***	4.5314***	4.0452***
Number of observations	960	960	960

Table 2.13

Robustness test of the regression results (leverage)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earning plus tax, interest and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV_1) leverage which is the ratio of total liabilities to total assets, (LEV_2) debt to equity ratio, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	F1	F2	F3
α	0.2131 (1.2252)	0.3527* (1.9251)	0.4550** (2.5704)
β_1 (SIZE)	0.0000 (-0.0014)	-0.0124 (-1.1481)	-0.0191* (-1.8280)
β_2 (CF)	-0.3385* (-1.8616)	-0.6780*** (-3.6457)	-0.7120*** (-3.9033)
β_3 (GO)	-0.0103 (-1.4665)	-0.0101 (-1.3235)	-0.0093 (-1.2123)
β_4 (P)	0.4847*** (2.6083)	0.8828*** (4.6602)	0.9301*** (5.0142)
β_5 (LEV_1)	-0.2338*** (-7.9642)		
β_5 (LEV_2)		-0.0081*** (-2.5968)	
β_6 (DIV)	0.6787*** (5.4955)	0.8070*** (6.2514)	0.8188*** (6.3355)
β_7 (LIQ)	-0.2705*** (-8.2467)	-0.1761*** (-6.1755)	-0.1681*** (-5.8784)
R square	54.97%	51.51%	51.13%
F statistic	13.0678***	11.5017***	11.4514***
Number of observations	960	960	960

Table 2.14

Robustness test of the regression results (dividend payout)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earning plus tax, interest and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV_1) dividend payout ratio which is total cash dividend to total assets, (DIV_2) dummy variable 1 if firm pay dividend 0 otherwise, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	G1	G2	G3
α	0.2131 (1.2252)	0.2475* (1.8103)	0.2307* (1.6858)
β_1 (SIZE)	0.0000 (-0.0014)	-0.0017 (-0.2104)	-0.0002 (-0.0251)
β_2 (CF)	-0.3385* (-1.8616)	-0.2567* (-1.9251)	-0.2135 (-1.6146)
β_3 (GO)	-0.0103 (-1.4665)	-0.0068 (-1.2546)	-0.0068 (-1.2475)
β_4 (P)	0.4847*** (2.6083)	0.4570*** (3.3019)	0.4383*** (3.1651)
β_5 (LEV)	-0.2338*** (-7.9642)	-0.2495*** (-9.0354)	-0.2589*** (-9.4650)
β_6 (DIV_1)	0.6787*** (5.4955)		
β_6 (DIV_2)		0.0173** (2.2433)	
β_7 (LIQ)	-0.2705*** (-8.2467)	-0.2804*** (-11.5154)	-0.2824*** (-11.5781)
R square	54.97%	53.21%	53.00%
F statistic	13.0678***	12.2451***	12.2629***
Number of observations	960	960	960

Table 2.15

Robustness test of the regression results (liquid assets substitutes)

$CASH_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 CF_{it} + \beta_3 GO_{it} + \beta_4 P_{it} + \beta_5 LEV_{it} + \beta_6 DIV_{it} + \beta_7 LIQ_{it} + \mu_{it}$**.** The dependent variable is cash ratio (CASH), which is the ratio of cash plus cash equivalents divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (CF) firm's cash flow which is earning plus tax, interest and depreciation expense divided by total assets, (GO) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (P) firm's profitability which is the return on assets ROA, (LEV) leverage which is the ratio of total liabilities to total assets, (DIV) dividend payout ratio which is total cash dividend to total assets, (LIQ) liquid assets substitutes will which is net working capital minus cash divided by total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

	H1	H2
α	0.2131 (1.2252)	0.2922 (1.5880)
β_1 (SIZE)	0.0000 (-0.0014)	-0.0097 (-0.8765)
β_2 (CF)	-0.3385* (-1.8616)	-0.3484* (-1.8609)
β_3 (GO)	-0.0103 (-1.4665)	-0.0097 (-1.2451)
β_4 (P)	0.4847*** (2.6083)	0.4273** (2.2680)
β_5 (LEV)	-0.2338*** (-7.9642)	-0.0824*** (-3.0502)
β_6 (DIV)	0.6787*** (5.4955)	0.7770*** (5.4459)
β_7 (LIQ)	-0.2705*** (-8.2467)	
R square	54.97%	48.36%
F statistic	13.0678***	10.3567***
Number of observations	960	960

2.5. Conclusion

In this chapter we examine the determinants of corporate cash and cash equivalents using publicly traded Jordanian firms during the period between 2000 and 2011. Financial firms have been excluded from the sample since such firms should hold a certain level of cash as part of their business. New firms have also been excluded from the sample, and any firm with missing data at the end of analysis period has also been excluded since such firms are either new firms that have not yet become engaged in business or they have financial problems, in the case of missing data at the end of the analysis period. The final number of firms remaining is 80, with 12 years' data for each firm, giving us 960 observations.

The analysis in this chapter is based upon firms' annual financial statements by checking how firm's size, firm's cash flow, growth opportunities, profitability, leverage, cash dividend, and liquid assets substitute can affect the decision on corporate cash-holding. Balanced panel data analysis has been used in this chapter; we apply three panel data models: the pooling ordinary least squares model, the fixed-effect model, and the random effect model. According to the likelihood ratio test and the Hausman test, the preferred model among the three models used in this chapter is the fixed-effect model. The results of this chapter showed that firm's size and growth opportunities have no significant effect on corporate cash-holding decisions. Firm's cash flow, leverage, and liquid assets substitute have a significant negative effect on corporate cash-holding, while firm's profitability and firm's cash dividend have a significant positive relationship with corporate cash-holding. The F statistic for the model was significant at the 1% level and R square is about 55%.

In this chapter we used two separate variables to measure cash flow and profitability. Researchers who studied cash-holding determinants used only the cash flow variable, and whenever they obtained a negative sign they explained it by stating that those firms who are able to generate more cash from operations will hold less cash. On the other hand, when they obtained a positive sign they explained it with reference to pecking order theory, which states that firms that generate more cash flow are more profitable firms and they will hold more cash as an internal source of financing. In this chapter we used separate measurements for cash flow and profitability to gain a clear and better understanding of how those two variables affect cash-holding decisions.

Several tests have been applied to check the model's robustness; those tests involve using different ways of measuring the research variables, including the dependant variable. They also involved dropping the variables from the model one by one. The results of those tests were highly consistent.

From these results we can conclude that profitable firms and firms that pay cash dividends tend to hold more cash. Firms which generate higher cash flow, have higher debt ratio, and have more liquid assets substitutes can reduce the opportunity cost of holding cash by holding smaller amounts of cash.

The results of this research show that firms in developing markets such as the Amman Stock Exchange have the same reasons to hold cash as firms in developed markets, as the results of this research match the results obtained from developed markets, as we found earlier.

The results of this chapter provide us with both theoretical and practical implications; although the financial market in Jordan is developing and is a small market with special issues related to an Islamic context, the results that have been obtained are consistent with both the theories and the literature in both developed and developing markets. It is also important to measure firm's profitability as a separate variable from the cash flow variable as previous studies found a dual effect of cash flow effect on cash holding, but when the two issues (i.e. profitability and cash flow generated internally) are studied as two separate variables the relationship becomes clearer. On the practical side, the results from this chapter will help financial managers to manage the cash they hold based on their firm characteristics and conditions in the Jordanian market, those results can also be implied on any other country with similar market conditions where Islamic regulations and rules are also applied.

Chapter 3: Cash-holding's contribution to the corporate firm value: Amman stock exchange

3.1. Introduction

The contribution made by a firm's holding of cash to its value started to become an important topic in the early 2000s. Many researchers tried to understand how the level of cash or the change in that level will contribute to the overall value of the corporate firm. They used different models of firm valuation to control for the other variables that would be expected to affect that value, in order to understand how cash and the change in cash level will affect the value of the firm.

Two theories can explain how cash can be evaluated. The first one is the pecking order theory, which suggests that, in the presence of an adverse selection problem, the cost of external financing is higher than the cost of internal financing, which will increase the marginal value of each pound held in cash.

The pecking order theory is concerned with the source of long-term financing. According to this theory, financial managers should follow a specific order to obtain long-term financing. This order suggests that financial managers should use the internal cash that is generated by the firm; next, they can use debt-financing and, as the final source, they can use equity-financing.

The adverse selection problem is a problem associated with the asymmetric information between the insiders (firms' managers) and the outsiders (investors). This problem renders the investors uncertain about the performance of the firm and its managers. The adverse selection problem is one where the outside investors have difficulty in recognising the value of the new stock being issued. Outside investors assume that the firm will only issue new stock if that stock is currently overvalued in the market. If that stock is undervalued, then outside investors assume that the managers will not issue new stock, since that would imply a transfer of wealth from the existing shareholders to the new shareholders. So, if the adverse selection problem exists when the firm needs to obtain funds from external sources, the firm is likely to face a problem in obtaining enough funds. Firstly, investors are uncertain about the firm, its

performance, and the value of the firm's assets. Secondly, even if the firm has good expected performance and has a high value of assets, the process of raising the necessary funds will take some time and might be costly, which may be a problem for the firm if it needs liquidity.

The second theory that can explain the value of the cash in the corporate firm is the free cash flow theory, which predicts that excess cash-holding associated with high information asymmetry will generate moral hazard problems. This will lead to a decrease in the marginal value of each pound held in cash.

The free cash flow theory notes that the cash that will be available for the firm after the payment of all taxes and after allocation to all positive net present value projects and investments is called free cash flow. When the firm has a large amount of free cash flow available to it, there is a likelihood that this cash might be used by the managers inefficiently, either on acquisitions or personal benefits. Investors expect the free cash flow to be used in this way because of the double incentive on the part of the managers to behave in this way. First, acquiring other firms and growing the assets of the firm will increase the remuneration that managers receive, because there is a close relation between firm size and remuneration. Second, spending the firm's resources on themselves benefits the managers, but their personal shareholding will be small and therefore they bear only a very small proportion of the cost.

The moral hazard problem is a problem related to the asymmetric information between the insiders (firms' managers) and the outsiders (investors). A moral hazard problem may occur when one party has more information than the other parties, which will make the party with better information act in way that is not appropriate from the point of view of the other parties. This problem becomes more obvious when one of the parties is not at any risk.

Several researchers have investigated and examined the determinants of cash-holding, including Kim et al. (1998), Opler et al. (1999), Ozkan and Ozkan (2004) and others. Having understood how the firms' characteristics affect and determine the cash-holding, we can now move on to another important question: What is the value of the cash that is held by firms?

In a perfect market with no transaction costs, where there are no costs of raising funds from external sources, no taxes, etc, investing in liquid assets can be considered as investing in zero net present value projects. Since firms can raise the necessary funds at any time in the future

without any delay or extra cost, they can switch between funds and investments without additional cost. In this case, the value that shareholders will place on each pound invested in cash will be one pound. In real life, markets are imperfect; there are transaction costs, taxes, inflation, etc, meaning that the argument that cash is a zero net present value project is not always true. Myers and Majluf (1984) argued that, when external financing is costly and firms can invest in positive net present value projects, and if they hold liquid assets that enable them to invest without needing recourse to external sources of funding, then each dollar invested in liquid assets may have a value of more than one dollar from the shareholders' point of view. On the other hand, Jensen (1986) argued that shareholders may prefer cash dividends if there is a chance that a firm's managers might use those liquid assets inefficiently, as the free cash flow theory suggests. This argument has been supported by Harford (1999), who found that cash-rich firms tend to make acquisitions that will decrease the value of the firm. This causes the shareholders to evaluate liquid assets at a discount to their book value. Another argument has been introduced by Jensen and Meckling (1976) in regard to equity-holders and debt-holders; since equity is a call option on the firm value, equity-holders will prefer riskier investments. Liquid assets are risk-free investments, so equity-holders will give a discounted value for each dollar invested in cash.

Agency theory explains the relationship between the firm's owners (shareholders) and the firm's controllers (managers). The agency theory suggests that controllers might work in their own interest rather than the shareholders' interest, putting the personal interest of the controllers over the interest of the shareholders creates what we call the agency problem. Although this problem undoubtedly exists, a good corporate governance system can reduce it significantly, and such a system will make the controllers work in the interest of the shareholders, which is to maximize the wealth of those shareholders. On the other hand, when the corporate governance system is weak or poor, the controllers will try to obtain maximum private benefits, even if this is at the expense of the shareholders. When the corporate governance system is weak or poor, controllers attempt to hold more cash to use for their private benefits, since liquid assets can be exchanged for private benefits at lower cost than other types of assets, as Myers and Rajan (1998) argued. So, according to the pervious arguments, if the corporate governance system is weak or poor, we expect shareholders to evaluate the cash-holding at discount value, and this will make a small or negative contribution to their wealth since this cash can be used by controllers for their private interest rather than maximizing the wealth of the shareholders. In contrast, when the corporate

governance system is strong and efficient, the controllers cannot put their private benefits over the shareholders' benefits; therefore, the value of the cash-holding will be at a premium, and it may make a positive contribution to the firm value, since that cash will be invested in ways that benefit the shareholders and maximize the value of the firm and the wealth of the shareholders. For example, Pinkowitz et al. (2006) found that, in countries with poor investor protection, each dollar of liquid assets is worth $0.33 while, in countries with good investor protection, this value is $0.91, and the difference between those two values is highly significant. This implies that shareholders value the cash or liquid assets held by firms more highly where the corporate governance system is strong because they can be confident that these assets are unlikely to be wasted.

An argument by Faulkender and Wang (2006) suggests that an additional dollar of cash can be used in accumulating internal sources of financing, distributed to shareholders either as cash dividends or stock repurchases, or used to pay firms' debts or other liabilities. For the firms that used cash as an internal source of financing, especially when those firms have low levels of internal funds or when the external funding is difficult or expensive due to the asymmetric information available to investors, shareholders will place a marginal value of more than one dollar for each dollar invested as liquid assets. On the other hand, distributing cash as dividends to the shareholders might reduce the marginal value of each dollar since shareholders have to pay taxes on their dividend incomes. In the same way, using the cash to pay the firms' debts or other liabilities will be to the benefit of the debt-holder and not to the benefit of the equity-holder.

Holding liquid assets in the form of cash or highly liquid assets such as marketable securities represents an opportunity cost to corporate firms and, although corporate firms recognize the high opportunity cost of cash-holding, they still hold liquid assets and cash. The main reasons for corporate firms to hold liquid assets are the transactions and the precautionary motives. There are several determinants of cash-holding, as we mentioned in the previous chapter. This chapter will investigate the value of the cash held by the corporate firms and how this cash and the change of cash level will affect the firm value.

The aims of this chapter are to determine the value of the cash assets held by corporate firms, how this cash is contributing to the firm value, and how the change in cash-holding will affect

the value of the firm. Then we will try to assess whether the cash held by firms can make or destroy the firm value.

In this chapter we will try to answer the following questions:
How do the cash level and the change in the cash level affect the value of the firm?
How does the change in cash level affect the value of cash?
How does the change in debt level affect the value of cash?
How does the cash dividend affect the value of the firm?

The main goal of financial managers is to maximize the shareholders' wealth. This can be done by maximizing the firm value. There are several factors that affect the value of the firm; one of these factors is cash, but how can cash affect the value of the firm? Does cash increase the value of the firm or will it decrease that value?

The rest of this chapter will continue as follows: section 3.2 will discuss the literature review, section 3.3 will describe the sample and discuss the methodology, section 3.4 will set out the results and analysis and, finally, the conclusion will be presented in section 3.5.

3.2. Literature review

Fama and French (1998) introduced a model for firm valuation; the purpose of their model was to analyse how taxation on dividends and debt will affect the value of the firm. They used different variables which measure firm characteristics in the form of the variables' current value, lagged value, and lead value. Those variables include the firm's earnings, research and development expenses, interest expenses, cash dividends, the lagged value in the firm's value, and the change in firm's total assets. Their model has been used by many researchers such as Pinkowitz and Williamson (2002), Dittmar and Mahrt-Smith (2007), Fresard and Salva (2010) and others to investigate how cash-holding affects the value of the firm. They did this by dividing the total assets variable in the Fama and French model into its cash and non-cash components, and then analysed the affect of the firm's cash-holding on the firm's value.

Pinkowitz and Williamson (2002) adapted the regression approach of Fama and French (1998). They studied the market value of cash-holding by firms. Using data from the 2000 COMPUSTAT tapes from the period from 1955 to 1999, they found that this value is $1.20

for each dollar held in cash, but they also found that this value varied cross-sectionally. When they split the sample by firm characteristics, the value of the firm's cash ranged between $0.26 and $2.38. They found that, when growth options are poor and there is poor investor protection and financial distress, firms have their cash valued at a significant discount to the book value because the aforementioned conditions will increase the possibility that controlling shareholders will use the cash for their private benefits. They also found that good growing opportunities and high uncertainty in future investment makes the value of cash greater, while financial distress values cash at a discount, and there is no evidence that access to capital market has any effect on the value of cash. Their results suggest that shareholders believe that the benefits of holding cash could offset the agency cost associated with cash-holding.

Schwetzler and Reimund (2003) analysed 5,126 firm-year observations taken from 547 publicly traded German firms. They analysed two issues. The first issue is how the cash-holding decision affects the performance of the firm. They adapted the methodology of Mikkelson and Partch (2002) and found that German firms which held excess cash in the previous three years significantly underperformed in their operations; this can be explained by the agency problem since the excess cash inside the firm will increase the free cash flow which can be used by the firm's managers inefficiently. The second issue is the effect of cash-holding on the firm's value. They adapted Berger and Ofek's (1995) valuation algorithm and found that, when the cash ratio has positive deviations from the industrial benchmark, this will lead to a value increase, while negative deviations from the industrial benchmark will be value decreasing.

Pinkowitz et al. (2006) investigate how the value of each dollar invested in liquid assets has been evaluated by investors in countries with high and poor investor protection. They found that when investor protection is high, minority investors evaluate each dollar invested in liquid assets to be worth almost one dollar, while this value is lower in countries with poor investor protection. In countries with poor investor protection the agency problem will be higher, which suggests that controller shareholders will be more able to extract their own private benefits in a way that will negatively affect the minority investors. Consistent with this, they found that for countries with above median investor protection, each dollar invested in cash is worth $0.91 while this value drops to $0.33 in countries with poor investor protection. They took the firm-level data from the Thomson Financial Worldscope database

for the period 1983-1998, but they report results only for the period from 1988 to 1998, because the number of firms in emerging countries included in the study increased sharply in the late 1980s; thus, they started from 1988 to avoid any unexpected effects in the late 1980s. The sample includes 12,339 firms, with 75,887 firm years' observations. They studied the relationship between firm value and cash-holding using the Fama and French (1998) regression valuation model and found that, in countries with low protection for the investor, this relationship is weaker than in countries with high protection for the investor. In contrast, the relationship between dividend and firm value is weaker in countries with high protection for the investor.

Faulkender and Wang (2006) also study the value of cash-holding. Based on data collected from COMPUSTAT over the period 1971-2001, they developed a model that measures the value of the shareholder by using the excess return on the firm's stock rather than the firm's value, as Fama and French had done. Using the stock's excess return rather than the firm's value has two main benefits: (1) It captures the risk factor since it compares the stock's return with the benchmark return; (2) using accounting numbers such as market-to-book value might be misleading because these numbers are backward looking and might be unable to reflect the actual replacement value of the firm's assets. This model measures the value of cash-holding, the effect of the leverage and the level of the cash on the marginal value of cash, and how distributing cash dividends or stock repurchasing affects the cash-holding value. In this model they control for the firm's characteristics such as firm's earnings, interest expenses, dividends, research and development expenses, new financing, and non-cash assets. They found that the investors evaluate cash at a discounted value since cash can be used inefficiently by the firm's managers, which will affect shareholders negatively, especially when the asymmetric information is higher, corporate governance system is weak, or there is low investor protection. The marginal value of cash declines when the amount held as cash becomes larger, because with higher levels of cash, the problem of free cash flow is more likely to occur. It also declines when the firm has a high level of leverage because, with higher leverage, more cash will benefit the debt-holders rather than the stockholders; it will also make the firm less risky, which is less preferred by stockholders, as those stockholders who consider their position as being equivalent to a call option on the firm's assets would cause them to prefer riskier firms. Also the marginal value of cash declines when the firm has access to capital markets since, when the firm is able to access the capital markets, it will be easier to obtain funds when needed; thus, holding cash inside the firm might create the free

cash flow problem, when the firm pays more dividends rather than undertakes a stock repurchase since dividend income is taxed at a higher rate compared to the capital gains income resulting from stock repurchasing. This model has been adapted by several researchers and has become a preferred alternative to the Fama and French (1998) model.

Dittmar and Mahrt-Smith (2007) used a sample of 1,952 US publicly traded firms with 13,095 firm-year observations for the period 1990-2003. They investigated how the value of the firm will be affected by corporate governance issues by studying the value of the cash held by poorly governed firms and well governed firms. By using a regression model based on the Fama and French (1998) regression valuation model and that by Faulkender and Wang (2006), they found that, in poorly governed firms, the value of each one dollar of cash is between 42 and 88 cents, rising to almost double this amount in well governed firms, because firms with poor corporate governance disperse cash quickly in a way that reduces the operating performance significantly since, with poor corporate governance, the possibility of the agency problem will be greater, as will the associated problem of free cash flow. This reduction in the firm's operating performance will be reduced when firms enhance their corporate governance.

Kalcheva and Lins (2007) investigate how cash-holding can affect the value of the firm when shareholder protection is weak. They also investigate how paying a cash dividend will affect the value of the firm when shareholder protection is weak. They used data from 31 countries with more than 5,000 firms for the financial year ending on 31 December, 1996. By using a cross-sectional regression framework they found that, when shareholder protection is weak, the value of the firm will be lower when the firm's managers hold higher levels of cash because this will create agency and free cash flow problems; however, if the firm pays a cash dividend the value will be higher even if shareholder protection is weak since the cash dividends will reduce the amount of free cash flow available to the firm's managers, and firm value is uncorrelated with the level of cash-holding when the shareholder protection is strong because this strong protection will reduce the agency problem inside the firm.

Harford et al. (2008) used a sample of 1,872 firms with 11,645 firm-year observations taken from the COMPUSTAT database for the period 1993-2004. They found that, when firms have a weak structure of corporate governance, they tend to hold a lower amount of cash reserves, and those firms with a weak corporate governance structure prefer stock repurchasing over

cash dividends because, with stock repurchasing, the firm can avoid any future commitments to cash dividends. Also, when firms have excess cash, which is associated with weak rights for their shareholders, this will lead to more acquisitions and capital expenditure, as well as low profitability and valuation.

Kisser (2009) used data collected from COMPUSTAT during the period 1950-2006 to analyse the value of internal funds from a real-options framework point of view. When firms have real options to expand their capacity they will be in the form of a trade-off between the agency costs associated with the free cash flow and the cost of external financing. He found that holding a huge amount of cash and continuing to pay a cash dividend resulted in value-maximizing since, with sufficient amounts of cash, firms are able to finance future opportunities and avoid the costs associated with external financing; also, by paying cash dividends they can reduce the possibility of free cash flow in managers' hands. The value of cash held by the firm can be valued at a premium when the firm has growth opportunities, when the firm needs external financing, and when the agency cost of free cash flow is low.

Masulis et al. (2009) based their study on the framework developed by Faulkender and Wang (2006) and used a sample of 503 U.S. dual-class companies for the period from 1995 to 2003 which includes 2,440 firm-year observations. They found a significant negative relation between excess control rights (insider voting rights) and the change in cash. Consistent with Dittmar and Mahrt-Smith (2007), they found that shareholders place a lower value on the extra dollar of cash in corporations with low institutional ownership and more anti-takeover provisions. Also, consistent with Pinkowitz et al. (2006), the cash contribution to firm value is lower in countries where investors have less protection. They found that the interaction between the level of cash and the change in the level has a significant negative coefficient with the interaction between leverage and change in cash.

Denis and Sibilkov (2010) based their work on a sample of publicly traded companies in the United States for the period from 1985 to 2006, which included 74,347 firm-year observations. They tried to answer two questions: Firstly, why is cash-holding considered more valuable in financially constrained firms?; and secondly, if cash is considered more valuable in financially constrained firms, why do some financially constrained firms still hold too little cash? Using their data they ran a regression of firm value on cash-holding and other control variables. They found that the coefficient of cash-holding for financially constrained

firms is significantly greater than for unconstrained firms. To understand why cash is more valuable for financially constrained firms, they analyzed how cash will affect investments, and then how investment will affect the value of the firm, for both constrained and unconstrained firms, by using the three-stage least squares methodology after accounting for endogeneity of the level of cash-holding. They found that, for financially constrained firms, there is a positive association between cash-holding and net investment, and this positive association becomes stronger when the firm's hedging needs are higher because hedging needs come from the low correlation between a firm's cash flow and the investment opportunities. So, for precautionary reasons firms with hedging needs attempt to hold more cash to finance their investment opportunities. Furthermore, they found that, for constrained firms, the association between firm value and investment is higher. Their results are consistent with the view that, for constrained firms, cash-holding is more valuable since more cash will allow constrained firms to invest more and, compared to unconstrained firms, marginal investments are more related to value for constrained firms. As for the second question about why some financially constrained firms still hold too little cash, their investigation supports the view that, when a firm has low internal financial resources and the cost of external financial resources is high, this will limit the financial resources available for low-cash firms. They found that, for the firms with low cash resulting from poor financial performance, the following ratios are very low compared to firms with high cash ratios: Altman's *z*-scores, interest coverage ratios, cash flow margins, and changes in cash flow margins. As a result, low-cash firms were unable to build up cash reserves and faced the problem of insufficient external financing, ending up with significant declines in the cash balance.

Drobetz et al. (2010) investigate the market value of corporate cash holdings using data from more than 8,500 companies from 45 countries during the period from 1995 to 2005. They study the effect of two opposing theories on the value of corporate cash-holding. The first theory is the pecking order theory, which suggests that the problem of adverse selection will make the cost of external financing higher than the cost of internal financing, which will increase the marginal value of each dollar held in cash. The second theory is the free cash flow theory, which predicts that excess cash-holding will be associated with high information asymmetry which will generate moral hazard problems; this will lead to a decrease in the marginal value of each dollar held in cash. Drobetz et al. start from Fama and French's (1998) valuation models and the other modified versions by Pinkowitz and Williamson (2004),

Pinkowitz et al. (2006) and Dittmar and Mahrt-Smith (2007), and further extend the framework by adding a test of the impact of the time-varying information asymmetry and firm-specific information asymmetry on the market value of corporate cash-holding since information asymmetry could be varying over time, especially when new inside or private information arrived. They used the standard deviation of the earnings per share forecasts across analysts that cover a firm, since the volatility in earnings reflects the quality of information available (Parkash et al. 1995). They obtained the following results: firstly, for the whole sample, the regression model without the information asymmetry shows that the market value of an additional dollar is $0.66; secondly, when introducing the measure of time-varying information asymmetry and firm-specific information asymmetry, the coefficient of the interaction term has a negative sign, which supports the hypothesis that the market value of the corporate cash-holding is less with a higher degree of information asymmetry.

Fresard and Salva (2010) followed the Dittmar and Mahrt-Smith (2007) way of measuring cash and used the modified version of Fama and French's (1998) valuation model on a sample of 868 non-US firms listed in US secondary markets during the period from 1989 to 2005. They found that investors consider a cross-listing in US financial markets as a way to reduce insiders' inefficient actions; the investors give a valuation premium on the excess cash for the firms that have a cross-listing in US stock markets, and this premium becomes higher if the firm comes from a country where shareholders have weak protection. They also found that when the investors have higher protection against insiders, based on the disclosure requirements and the legal enforcement of the US listing requirements, those investors will place a higher premium on the cash-holding because those disclosure requirements and the legal enforcement will reduce the inefficient actions by the firm's insiders.

Haw et al. (2011) used the valuation regression model developed by Fama and French (1998) and the modified model used by Faulkender and Wang (2006); they tested the effect of the cash-holding, cash dividend, and stock repurchasing on the firm value. Based on a sample of 59,011 firm-year observations taken from 14,495 firms during the period from 1998 to 2004, they found that the contribution of stock repurchasing to the firm's value is greater in countries with strong shareholder protection than in countries with weak shareholder protection. In countries with weak shareholder protection, cash dividends contribute more to the firm value than the stock repurchasing contributes. The marginal value of cash-holding

increases in countries with strong shareholder protection, while it will decrease in countries with weak shareholder protection as the proportion of stock repurchasing increases since, with strong shareholder protection, the agency problem will decrease as well as the free cash flow problem, which will increase the marginal value of cash-holding. Also, in countries with weak shareholder protection the marginal value of cash-holding is reduced by 12 cents when the firm used the payout on stock repurchases rather than on cash dividends. Their results are consistent with the theory of free cash flow which is associated with the agency problem in countries where shareholder protection is weak.

Tong (2011) studied how firms' diversification can affect the value of the corporate cash-holding by studying the effect of agency problems and financial constraints. Using data from 1998 to 2005 taken from 6,867 firms with 28,563 firm-year observations and employing the methodology developed by Faulkender and Wang (2006) to measure the marginal value of cash, he found that, in diversified firms, the value of cash is lower compared to single-segment firms. In both financially constrained and unconstrained firms diversification is associated with a lower value of cash-holding. Also, with a lower level of corporate governance, diversification has a negative impact on cash-holding value while, with a higher level of corporate governance; diversification has no impact on cash-holding value. The results of this study support the interpretation of agency problems that diversification reduces the value of corporate cash-holding because managers of multi-segment firms might misallocate the cash invested compared to managers of single-segment firms, i.e. there will be an incentive for managers to use the cash to cross-subsidise between divisions.

To summarize, in the last 10 years several researchers have investigated the value of cash-holding by studying firms with different characteristics, such as those with strong or weak shareholder protection, or those with higher or lower agency problems. Those researchers followed either Fama and French's (1998) or Faulkender and Wang's (2006) valuation models; some researchers such as Dittmar and Mahrt-Smith (2007) used both models. Both models were used to investigate how cash-holding affects the value for the shareholders after controlling for the firm's characteristics. The main difference is that, in the Fama and French (1998) model, the value for the shareholders is measured by the firm's value while, in Faulkender and Wang's (2006) model, this value is measured by the stock's excess return. Faulkender and Wang's (2006) model has several advantages over Fama and French's (1998) model. Firstly, Faulkender and Wang's (2006) model has been developed for the purpose of

measuring the effect of cash-holding on the shareholders' value, while Fama and French's (1998) model was originally developed to test how taxes on dividends and debts will affect the firm's value; it was later modified by several researchers such as Pinkowitz and Williamson (2002), Dittmar and Mahrt-Smith (2007) and others to test the effect of cash-holding on the firm's value. Secondly, Faulkender and Wang's (2006) model takes into consideration the risk factor by using the stock's excess return over a benchmark return. Finally, using the stock's excess return rather that market-to-book value is more accurate and up to date since there is the problem of reflecting the true replacement cost using different accounting methods and numbers.

Agency theory, free cash flow theory, and pecking order theory played significant roles in explaining the relationship between cash-holding and shareholders' value. In the presence of the agency problem, managers will act inefficiently and put their own interests ahead of shareholders' benefits, spending cash inefficiently either on personal benefits or on acquisitions, and causing shareholders to place a discounted value on cash-holding. The same is true with the free cash flow problem; when this problem exists, managers will have more cash to spend on their personal benefits and acquisitions, thus causing shareholders to place a discounted value on cash-holding. On the other hand, the pecking order theory tells us that, when a firm needs funds, it will obtain them from internal sources first and then from external sources, starting from the cheapest source. In some cases, the problem of adverse selection could exist, making it difficult for the firm to obtain the required funds from external sources; even if this adverse selection problem does not exist, the process of raising funds from external sources could take a long time and result in a delayed investment. All of this makes internal sources of funding very important, especially when the firm has projects and investments to finance. In such cases, investors will place a premium value on the firm's cash-holding.

Studies by several researchers have confirmed what the previous theories suggest. Those studies conducted in countries where shareholders' protection rights are weak, and where there are high agency and free cash flow problems, found that investors place a discounted value on cash-holding; meanwhile, where there are strong shareholder protection rights and good corporate governance systems that reduce both the agency and free cash flow problems, they found that investors place a premium value on cash-holding.

3.2.1. Research Hypotheses

When the agency problem exists, a firm's managers will act in a way that affects shareholders negatively. Managers will put their personal benefits ahead of the shareholders' benefits. The greater the degree of asymmetry of information, the greater the agency problem that will arise. In this case, the free cash flow problem might occur. This will cause the shareholders to believe that the cash accumulated inside the firm will be used inefficiently by the firm's managers; therefore, they will value this cash at a discounted level to its book value. As investors in Jordan do not benefit from strong investor protection and the corporate governance system is weak, investors in Jordan are expected to value cash at a discount.
H_1: cash is valued at a discount in the Jordanian financial market.

When the firm has a higher level of cash-holding, it will become less likely to seek external sources of funding. With each additional pound of cash the marginal value associated with that additional pound will become less and less. In other words, there is a decreasing function between the additional pound of cash and the marginal value associated with that additional pound. Furthermore, with higher levels of cash, there is more likelihood of the free cash flow problem, which will affect the shareholders negatively. On the other hand, if funds are difficult to obtain from external sources, a higher level of cash might become preferable. Since debt financing is less preferred in Jordan due to the religion rules, a higher level of cash might not have a detrimental effect on firm value especially if equity financing is limited, involves a high cost, or becomes unavailable.
H_2: with a higher level of cash-holding the marginal value of cash-holding will decrease.

In the presence of leverage, firm equity can be considered as the call option on the firm value. Holding more cash will increase the value of the firm. With higher leverage, cash will benefit debt-holders more than equity-holders since this cash will increase the debt-holders' chances of being paid. Furthermore, equity-holders prefer riskier investments to obtain higher returns and maximize their profit and wealth, so having an additional pound of cash can be considered as investing in risk-free assets. Therefore, in higher-leverage firms with an additional pound of cash, the marginal value associated with that additional pound will become lower.
H_3: with higher leverage an additional pound of cash is less valuable for shareholders.

With less investor protection, shareholders will gain greater benefit if the liquid assets are paid out as cash dividends rather than being used inefficiently by the firm's managers.
H_4: the dividend has a positive effect on the firm value.

3.3. Data and Methodology

3.3.1. Research Sample

The sample of this research included non-financial publicly traded firms in the Amman stock exchange. The study used the annual financial data taken from the companies guide for the period from 2000 to 2011. As mentioned in the previous chapter, the reason for including only non-financial firms is that financial firms need to hold a certain level of cash as part of their business activities; thus the results may be affected if those firms are included in the sample. Also, firms that have missing data either at the beginning or at the end of the analysis period will be excluded from the research sample because those firms are either new to the business or are in the liquidation process, so the level of cash-holding in those firms is not a result of the firms' operations or activities; thus, including these data could affect the results of this research.

Out of 247 firms listed at the end of the financial year 2011, there are 109 financial firms and 58 firms that are new or under liquidation, which means that the final number of firms included in the research sample is 80.

3.3.2. Research Variables

3.3.2.1. Research Variables for Fama and French's (1998) Model

We used the Fama and French (1998) firm evaluation model, which has also been adapted by Pinkowitz and Williamson (2005), Pinkowitz et al. (2006), Dittmar and Mahrt-Smith (2007), Kalcheva and Lins (2007), Kisser (2009) and others. The model has been adjusted from the original form where Fama and French used the change in total assets as one of the variables that contribute to the firm value. In the model that we used, we split the total assets to cash assets and non-cash assets to be able to determine how cash contributes to the firm value (for more details, see section 3.3.5.).

The research variables are as follows: the dependent variable for this research is the firm's value (V_t), which is measured as the market value of the firm's equity plus the book value of the firm's liabilities, all divided by the book value of the firm's total assets.

The independent variables are as follows:
Firm's earnings (E_t), which are measured as the firm's earnings before extraordinary items plus interest and taxes for the current year (EBIT), all divided by the book value of the firm's total assets for the current year.

Change in the firm's earnings from the previous year (dE_t), which is measured as the firm's earnings before extraordinary items plus interest and taxes for the current year (EBIT), minus the firm's earnings before extraordinary items plus interest and taxes for the previous year (EBIT), all divided by the book value of the firm's total assets for the current year.

Change in the firm's earnings between the current year and the next year (dE_{t+1}), which is measured as the firm's earnings before extraordinary items plus interest and taxes for the next year (EBIT), minus the firm's earnings before extraordinary items plus interest and taxes for the current year (EBIT), all divided by the book value of the firm's total assets for the current year.

Change in the firm's assets from the previous year (dA_t), which is measured as the firm's assets for the current year, minus the firm's assets for the previous year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's assets between the current year and the next year (dA_{t+1}), which is measured as the firm's assets for the next year, minus the firm's assets for the current year, all divided by the book value of the firm's total assets for the current year.

Firm's research and development expenses (RD_t), which are measured as the firm's research and development expenses for the current year, divided by the book value of the firm's total assets for the current year; if there are no research and development expenses, this figure will be set at zero.

Change in the firm's research and development expenses from the previous year (dRD_t), which is measured as the firm's research and development expenses for the current year, minus the firm's research and development expenses for the previous year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}), which is measured as the firm's research and development expenses for the next year, minus the firm's research and development expenses for the current year, all divided by the book value of the firm's total assets for the current year.

Firm's interest expenses (I_t), which are measured as the firm's interest expenses for the current year, divided by the book value of the firm's total assets for the current year.

Change in the firm's interest expenses from the previous year (dI_t), which is measured as the firm's interest expenses for the current year, minus the firm's interest expenses for the previous year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's interest expenses between the current year and the next year (dI_{t+1}), which is measured as the firm's interest expenses for the next year, minus the firm's interest expenses for the current year, all divided by the book value of the firm's total assets for the current year.

Firm's cash dividend (D_t), which is measured as the firm's total cash dividend paid to the shareholders for the current year, divided by the book value of the firm's total assets for the current year.

Change in the firm's cash dividend from the previous year (dD_t), which is measured as the firm's total cash dividend paid to the shareholders for the current year, minus the firm's total cash dividend paid to the shareholders for the previous year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's cash dividend between the current year and the next year (dD_{t+1}), which is measured as the firm's total cash dividend paid to the shareholders for the next year, minus

the firm's total cash dividend paid to the shareholders for the current year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's value from the previous year (dV_t), which is measured as the firm's value for the current year, minus the firm's value for the previous year, all divided by the book value of the firm's total assets for the current year.

Firm's cash assets (CA_t), which are measured as the firm's cash assets for the current year, divided by the book value of the firm's total assets for the current year.

Change in the firm's cash assets from the previous year (dCA_t), which is measured as the firm's cash assets for the current year, minus the firm's cash assets for the previous year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's cash assets between the current year and the next year (dCA_{t+1}), which is measured as the firm's cash assets for the next year, minus the firm's cash assets for the current year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's non-cash assets from the previous year (dNA_t), which is measured as the firm's total assets minus cash assets for the current year, minus the firm's total assets minus cash assets for the previous year, all divided by the book value of the firm's total assets for the current year.

Change in the firm's non-cash assets between the current year and the next year (dNA_{t+1}), which is measured as the firm's total assets minus cash assets for the next year, minus the firm's total assets minus cash assets for the current year, all divided by the book value of the firm's total assets for the current year.

3.3.2.2. Research Variables for Faulkender and Wang's (2006) Model

Another model has been introduced by Faulkender and Wang (2006). In this model they used stock excess return rather than the firm's value as used in Fama and French's model. They argued that their model is an enhancement of Fama and French model's for the following reasons. Firstly, time-varying risk factors were included into their model estimation. Fama and French's model controlled for firm-specific characteristics that affect cash, but did not

provide any measures for risk factors or discount rates. On the other hand, the model provided by Faulkender and Wang takes this issue into account by controlling for the risk factors using the benchmark of the stock's return. Secondly, the stock return is easier to measure and interpret compared to the market-to-book value ratio since "part of the variability in market-to-book may result from the cross-sectional differences in accounting for the book value of assets relative to their true replacement cost." That could make the estimated marginal value of cash biased.

The research variables are as follows. The dependent variable for this research is the stock's excess return ($r_{i,t} - R_{i,t}$) which is measured as the firm's stock return ($r_{i,t}$) minus the benchmark return. The stock's return is equal to the stock's price in year t minus the stock's price in year t-1 all divided by the stock's price in year t-1. Meanwhile, the stock's benchmark return ($R_{i,t}$), is measured as the market return[13].

The independent variables are as follows:
The change in the firm's cash-holding ($\Delta C_{i,t}$), which is measured as the change in the cash and cash equivalents between year t and year t-1 divided by the lagged market value of equity ($M_{i,t-1}$), which is measured as the market value of the equity in year t-1. We used the lagged market value of equity to standardize the measurement of the variable and in order to be able to do the interpretation since the stock return is calculated as the value in year t minus the value in year t-1 divided by the value in year t-1. This variable will measure how the change in cash and cash equivalents contributes to the shareholders' value.

The change in the firm's earnings ($\Delta E_{i,t}$), which is measured as the change in the firm's earnings before extraordinary items plus interest and taxes (EBIT), between year t and year t-1 divided by the lagged market value of equity ($M_{i,t-1}$). This variable is used to control for the contribution of the firm's profitability to the shareholders' value.

The change in the firm's non-cash assets ($\Delta NA_{i,t}$), which is measured as the change in the firm's total assets net of cash (total assets – cash and cash equivalents) between year t and

[13] Faulkender and Wang (2006) used Fama and French's 25 portfolios formed on size and book-to-market as their benchmark portfolios. In this research we used the market portfolio since the size of the financial market in Jordan is very small compared to the market size in the US, and it will not be possible to obtain the 25 Fama and French portfolios formed.

year t-1 divided by the lagged market value of equity ($M_{i,t-1}$). This variable is used to control for the contribution of the changes in the firm's investment policy to the shareholders' value.

The change in the research and development expenses ($\Delta RD_{i,t}$), which is measured as the change in the research and development expenses between year t and year t-1 divided by the lagged market value of equity ($M_{i,t-1}$), as a control variable for the contribution of the research and development expenses.

The change in the interest expenses ($\Delta I_{i,t}$), which is measured as the change in the interest expenses between year t and year t-1 divided by the lagged market value of equity ($M_{i,t-1}$), as a control variable for the contribution of the interest expenses.

The change in the dividends paid ($\Delta D_{i,t}$), which is measured as the change in the total dividends paid to the shareholders between year t and year t-1 divided by the lagged market value of equity ($M_{i,t-1}$), as a control variable for the contribution of the dividends.

The lagged value of cash-holding ($C_{i,t-1}$), which is measured as the level of cash and cash equivalents in the year t-1 divided by the lagged market value of equity ($M_{i,t-1}$). This variable will measure how the cash and cash equivalents in the previous year contribute to the shareholders' value.

The market leverage ($L_{i,t}$), which is measured as the total debt divided by the total debt and the market value of the equity in the year t. This variable will control for how the leverage contributes to the shareholders' value.

The firm's net financing ($NF_{i,t}$), which is measured as the total equity issued minus stock repurchases plus debt issuance minus debt redemption divided by the lagged market value of equity ($M_{i,t-1}$). This variable will control for how the net financing contributes to the shareholders' value.

The product of ($C_{i,t-1}$ / $M_{i,t-1}$) and ($\Delta C_{i,t}$ / $M_{i,t-1}$); this variable is used to capture the effect of changes in the value of cash for different levels of cash holdings (Faulkender and Wang (2006)).

The product of ($L_{i,t}$) and ($\Delta C_{i,t}$ / $M_{i,t-1}$); this variable is used to capture the effect of leverage on the marginal value of cash holdings (Faulkender and Wang (2006)).

3.3.3. Research Methodology

As we mentioned earlier in chapter 1, when dealing with financial data that are cross-sectional and time-series at the same time, the best method is to use a panel data analysis, for the reasons that we mentioned in chapter 1. Also, as we explained in chapter 1, this panel data analysis can be conducted in three ways; ordinary least squares OLS, fixed-effect model, and random effect model. Using the likelihood ratio test and Hausman test we can decide which of those three forms is the most appropriate.

3.3.4. Research Models

3.3.4.1. Fama and French (1998) Research Models

These research models are based on the Fama and French (1998) firm valuation model and the adjusted models presented by Pinkowitz and Williamson (2005), Pinkowitz et al. (2006), Dittmar and Mahrt-Smith (2007), Kalcheva and Lins (2007), Kisser (2009), and others.

The model of Fama and French (1998) is:

$$V_{i,t} = \alpha_0 + \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dA_{i,t} + \beta_5 dA_{i,t+1} + \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} + \beta_{12} D_{i,t} + \beta_{13} dD_{i,t} + \beta_{14} dD_{i,t+1} + \beta_{15} dV_{i,t} + \varepsilon_{i,t} \quad (3.1)$$

Where:

V_t : Firm's value in year t, divided by the total assets in year t.

E_t : Firm's earning in year t, divided by the total assets in year t.

dE_t : Firm's earning in year t, minus firm's earning in year t-1, all divided by the total assets in year t.

dE_{t+1} : Firm's earning in year t+1, minus firm's earning in year t, all divided by the total assets in year t.

dA_t : Firm's assets in year t, minus firm's assets in year t-1, all divided by the total assets in year t.

dA_{t+1} : Firm's assets in year t+1, minus firm's assets in year t, all divided by the total assets in year t.

RD_t : Firm's research and development expenses in year t, divided by the total assets in year t.

dRD_t : Firm's research and development expenses in year t, minus firm's research and development expenses in year t-1, all divided by the total assets in year t.

dRD_{t+1} : Firm's research and development expenses in year t+1, minus firm's research and development expenses in year t, all divided by the total assets in year t.

I_t : Firm's interest expenses in year t, divided by the total assets in year t.

dI_t : Firm's interest expenses in year t, minus firm's interest expenses in year t-1, all divided by the total assets in year t.

dI_{t+1} : Firm's interest expenses in year t+1, minus firm's interest expenses in year t, all divided by the total assets in year t.

D_t : Firm's total dividend in year t, divided by the total assets in year t.

dD_t : Firm's total dividend in year t, minus firm's total dividend in year t-1, all divided by the total assets in year t.

dD_{t+1} : Firm's total dividend in year t+1, minus firm's total dividend in year t, all divided by the total assets in year t.

dV_t : Firm's value in year t, minus firm's value in year t-1, all divided by the total assets in year t.

β_i :variables' betas.

$\varepsilon_{i,t}$: unobservable characteristics.

The first model is an adjusted version of the Fama and French (1998) model, by taking the variable (A), which is the total assets and is divided into two parts; cash assets CA, and NA non-cash assets:

$$V_{i,t} = \alpha_0 + \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dNA_{i,t} + \beta_5 dNA_{i,t+1} + \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} + \beta_{12} D_{i,t} + \beta_{13} dD_{i,t} + \beta_{14} dD_{i,t+1} + \beta_{15} dV_{i,t} + \beta_{16} dCA_{i,t} + \beta_{17} dCA_{i,t+1} + \varepsilon_{i,t} \quad (3.2)$$

Where:

dCA_t : Firm's cash assets in year t, minus firm's cash assets in year t-1, all divided by the total assets in year t.

dCA_{t+1} : Firm's cash assets in year t+1, minus firm's cash assets in year t, all divided by the total assets in year t.

dNA_t : Firm's total assets minus cash assets in year t, minus firm's total assets minus cash assets in year t-1, all divided by the total assets in year t.

dNA_{t+1} : Firm's total assets minus cash assets in year t+1, minus firm's total assets minus cash assets in year t, all divided by the total assets in year t.

The second model is also an adjusted version of the Fama and French (1998) model, by taking the variable (A), which is the total assets and is divided into two parts; cash assets CA, and NA non-cash assets. However, rather than check how the change in cash will affect the value of the firm, this model will check how the cash level itself will affect the firm's value:

$$V_{i,t} = \alpha_0 + \beta_1 E_{i,t} + \beta_2 dE_{i,t} + \beta_3 dE_{i,t+1} + \beta_4 dNA_{i,t} + \beta_5 dNA_{i,t+1} + \beta_6 RD_{i,t} + \beta_7 dRD_{i,t} + \beta_8 dRD_{i,t+1} + \beta_9 I_{i,t} + \beta_{10} dI_{i,t} + \beta_{11} dI_{i,t+1} + \beta_{12} D_{i,t} + \beta_{13} dD_{i,t} + \beta_{14} dD_{i,t+1} + \beta_{15} dV_{i,t} + \beta_{16} CA_{i,t} + \varepsilon_{i,t} \quad (3.3)$$

Where:

CA_t : Firm's cash assets in year t, divided by the total assets in year t.

3.3.4.2. Faulkender and Wang (2006) Research Model

This research model has been developed by Faulkender and Wang (2006) and is also used by Dittmar and Mahrt-Smith (2007), Tong (2011), Denis and Sibikov (2010) and Haw et al. (2011).

The model of Faulkender and Wang (2006) is:

$$r_{i,t} - R_{i.t} = \beta 1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta 2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \beta 3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta 4 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \beta 5 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \beta 6 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \beta 7 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta 8 L_{i,t} + \beta 9 \frac{NF_{i,t}}{M_{i,t-1}} + \beta 10 \frac{C_{i,t-1}}{M_{i,t-1}} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta 11 L_{i,t} \frac{\Delta C_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t} \quad (3.4)$$

Where:

$r_{i,t} - R_{i,t}$: Stock excess return for stock i in the time t.

$\Delta C_{i,t}$: Change in the cash ratio for stock i between time t and time t-1.

$\Delta E_{i,t}$: Change in firm's earnings for stock i between time t and time t-1.

$\Delta NA_{i,t}$: Change in non-cash assets for stock i between time t and time t-1.

$\Delta RD_{i,t}$: Change in the research and development expenses for stock i between time t and time t-1.

$\Delta I_{i,t}$: Change in interest expenses for stock i between time t and time t-1.

$\Delta D_{i,t}$: Change in the cash dividends for stock i between time t and time t-1.

$C_{i,t-1}$: Cash ratio for stock i in the time t-1.

$L_{i,t}$: Market leverage for stock i in the time t.

$NF_{i,t}$: Net financing for stock i in the time t.

$M_{i,t-1}$: Equity market value for stock i in the time t-1.

$\varepsilon_{i,t}$: Unobservable characteristics.

3.4. Results and analysis

3.4.1. The change in cash level model

In this section we will conduct the analysis of the model that is concerned with the change in cash level and how it affects the firm's value. This model has been developed based on Fama and French's (1998) valuation model.

Table 3.1 shows the basic descriptive analysis of the variables for this research. The results in this table cover the period from 2001 to 2010, although the original data have been collected for the period from 2000 to 2011; however, since some of the research variables need to be calculated as the difference between the current year and the previous year, and other variables need to be calculated as the difference between the next year and the current year, the value of the variables between 2001 and 2010 only will be included. From table 3.1 we can make several observations. The average value of the firm's value to total assets is 154% with a high standard deviation of 83%, which explains the wide range for this variable from -3% to 620%. The firm's current earnings have a maximum value of 50% and a minimum value of -59%, with an average value of 5%. The change in the earnings from the previous year has an average value of 0.2% while the change in earnings between the next and the current year has an average value of 0.6%. Research and development expenditure represents a small amount of firms' assets with an average value of 0.1% and a maximum value of 1.4%. Interest expenses are also a small amount of the firm's assets with an average value of 1.2%.

The average cash dividend to the total assets is 2.9% while the maximum value for this ratio is 35%. The average change in the cash ratio from the previous year is 0.3%.

For a better view of the data, we can consult table 3.2 which presents a year-by-year descriptive analysis of the data from the year 2001 to the year 2010. From these tables we can see that the research variables are stable from year to year, with no big changes.

Finally, table 3.3 shows the correlation matrix for the research variables. The correlations between the research variables are low except between a few variables where one might expect to see high correlations; the most important issue is whether there is any high correlation between the cash variables and any other variables. From table 3.3 we can see that cash variables have no high correlations with any of the research variables.

Table 3.1

Descriptive analysis

The dependent variable is the firm's value (V_t), The independent variables are; Firm's earnings (E_t); Change in the firm's earning from the previous year (dE_t); Change in the firm's earning between the current year and the next year (dE_{t+1}); Firm's research and development expenses (RD_t); Change in the firm's research and development expenses from the previous year (dRD_t); Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}); Firm's interest expenses (I_t); Change in the firm's interest expenses from the previous year (dI_t); Change in the firm's interest expenses between the current year and the next year (dI_{t+1}); Firm's cash dividend (D_t); Change in the firm's cash dividend from the previous year (dD_t); Change in the firm's cash dividend between the current year and the next year (dD_{t+1}); Change in the firm's value from the previous year (dV_t); Change in the firm's cash assets from the previous year (dCA_t); Change in the firm's cash assets between the current year and the next year (dCA_{t+1}); Change in the firm's non cash assets from the previous year (dNA_t); Change in the firm's non cash assets between the current year and the next year (dNA_{t+1}). All divided by the total assets. For the period from 2001 to 2010.

	V_t	E_t	dE_t	dE_{t+1}	dNA_t	dNA_{t+1}	RD_t	dRD_t	dRD_{t+1}	I_t	dI_t	dI_{t+1}	D_t	dD_t	dD_{t+1}	dV_t	dCA_t	dCA_{t+1}
Mean%	153.9	5.0	0.2	0.6	2.3	7.6	0.1	0.0	0.0	1.2	-0.1	0.0	2.9	0.2	0.2	10.3	0.3	1.0
Median%	135.2	5.2	0.4	0.2	2.0	1.2	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	6.7	0.2	0.1
Max%	916.8	50.1	43.8	70.6	90.6	895.8	1.4	1.2	2.0	8.6	6.7	7.0	35.2	20.0	23.4	392.7	38.0	145.7
Min%	-2.6	-58.7	-70.2	-40.3	-450.0	-81.3	0.0	-1.3	-1.1	0.0	-5.3	-4.8	0.0	-53.1	-22.0	-452.3	-87.0	-35.8
SD%	82.9	9.7	9.2	9.4	23.7	49.4	0.2	0.2	0.2	1.4	0.8	0.8	4.3	3.6	3.2	56.0	8.8	10.1
Obs.	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800	800

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.2
Descriptive analysis

The dependent variable is the firm's value (V_t), The independent variables are; Firm's earnings (E_t); Change in the firm's earning from the previous year (dE_t); Change in the firm's earning between the current year and the next year (dE_{t+1}); Firm's research and development expenses (RD_t); Change in the firm's research and development expenses from the previous year (dRD_t); Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}); Firm's interest expenses (I_t); Change in the firm's interest expenses from the previous year (dI_t); Change in the firm's interest expenses between the current year and the next year (dI_{t+1}); Firm's cash dividend (D_t); Change in the firm's cash dividend from the previous year (dD_t); Change in the firm's cash dividend between the current year and the next year (dD_{t+1}); Change in the firm's value from the previous year (dV_t); Change in the firm's cash assets from the previous year (dCA_t); Change in the firm's cash assets between the current year and the next year (dCA_{t+1}); Change in the firm's non cash assets from the previous year (dNA_t); Change in the firm's non cash assets between the current year and the next year (dNA_{t+1}). All divided by the total assets. For the period from 2001 to 2010.

		V_t	E_t	dE_t	dE_{t+1}	dNA_t	dNA_{t+1}	RD_t	dRD_t	dRD_{t+1}	I_t	dI_t	dI_{t+1}	D_t	dD_t	dD_{t+1}	dV_t	dCA_t	dCA_{t+1}
2001	Mean%	111.2	5.1	1.1	0.5	1.4	0.9	0.1	0.0	0.0	1.6	-0.3	-0.3	3.0	0.8	-0.1	3.1	-0.1	1.1
	Median%	100.5	5.4	0.7	0.1	1.3	-0.7	0.1	0.0	0.0	1.0	0.0	-0.1	0.0	0.0	0.0	7.2	0.1	0.0
	Max%	307.9	23.4	40.7	37.0	69.4	78.3	0.5	0.5	0.3	7.1	1.8	1.2	18.5	18.5	7.0	93.9	26.9	39.9
	Min%	8.9	-44.3	-41.1	-24.4	-62.1	-34.9	0.0	-0.4	-0.5	0.0	-5.0	-2.9	0.0	-5.4	-18.5	-122.0	-33.0	-30.3
	SD%	55.6	9.7	8.8	7.0	16.8	15.7	0.1	0.1	0.1	1.7	1.1	0.7	4.3	2.8	2.6	33.3	7.5	9.2
2002	Mean%	119.6	5.3	0.0	0.7	-1.6	5.0	0.1	0.0	0.0	1.3	-0.3	-0.2	2.8	-0.6	0.0	7.3	-0.2	-0.8
	Median%	108.9	5.0	0.1	0.3	-0.6	1.6	0.1	0.0	0.0	0.7	-0.1	0.0	0.0	0.0	0.0	4.9	0.0	0.1
	Max%	328.3	26.0	43.8	22.5	42.6	91.0	0.7	0.3	0.6	6.6	1.2	2.5	17.8	6.0	5.1	104.0	36.3	30.9
	Min%	0.7	-16.4	-70.2	-21.2	-100.4	-34.8	0.0	-1.3	-0.4	0.0	-3.2	-4.8	0.0	-53.1	-6.7	-155.8	-87.0	-35.8
	SD%	58.6	7.7	10.7	7.1	16.9	17.7	0.2	0.2	0.1	1.6	0.7	0.8	3.8	6.1	1.6	31.9	13.6	8.8
2003	Mean%	145.3	5.2	0.2	3.6	2.8	28.1	0.2	0.0	0.1	1.2	-0.2	-0.1	2.6	0.0	1.2	28.2	-1.2	0.7
	Median%	132.9	5.5	0.3	1.5	1.5	8.2	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	21.3	0.1	0.1
	Max%	462.2	29.5	22.5	32.8	47.1	895.8	0.9	0.4	1.0	6.9	1.7	2.9	18.1	3.6	18.3	178.4	21.9	30.3
	Min%	33.5	-31.3	-30.2	-10.0	-53.2	-25.8	0.0	-0.4	-0.2	0.0	-5.3	-3.0	0.0	-6.1	-6.8	-153.0	-56.4	-28.3
	SD%	72.3	8.1	7.6	8.1	14.8	106.1	0.2	0.1	0.2	1.5	0.8	0.7	3.7	1.5	4.0	48.1	9.5	8.8

Table 3.2 Continued

		Vt	Et	dEt	dEt+1	dNAt	dNAt+1	RDt	dRDt	dRDt+1	It	dIt	dIt+1	Dt	dDt	dDt+1	dVt	dCAt	dCAt+1
2004	Mean%	166.6	7.3	2.8	2.5	10.8	14.4	0.2	0.1	0.0	0.9	-0.1	0.1	3.4	1.0	0.3	37.0	0.3	3.4
	Median%	153.5	6.6	1.3	1.7	7.7	10.3	0.2	0.0	0.0	0.7	0.0	0.0	1.6	0.0	0.0	34.0	0.1	0.7
	Max%	444.4	32.1	26.6	47.1	90.6	153.6	0.9	0.5	0.8	6.2	1.6	5.2	22.0	18.2	23.4	208.0	19.1	55.5
	Min%	21.0	-6.7	-9.1	-22.8	-31.5	-81.3	0.0	-0.2	-0.7	0.0	-3.0	-2.3	0.0	-5.8	-22.0	-41.3	-17.1	-26.0
	SD%	74.4	7.0	6.8	9.6	18.2	33.3	0.2	0.1	0.2	1.2	0.6	0.9	4.6	3.4	4.9	46.5	6.6	12.0
2005	Mean%	184.4	7.5	1.2	-2.5	2.8	4.2	0.2	0.0	0.0	0.9	0.0	0.3	3.1	0.0	0.2	31.8	2.1	0.5
	Median%	171.7	5.7	1.4	-0.6	9.5	3.8	0.1	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	24.5	0.5	0.1
	Max%	488.7	39.4	22.7	32.0	58.8	65.1	1.2	0.6	1.2	4.5	4.3	3.1	35.2	20.0	7.7	175.1	35.3	29.2
	Min%	25.4	-32.4	-30.9	-39.8	-450.0	-28.0	0.0	-0.6	-0.9	0.0	-2.2	-1.5	0.0	-31.3	-20.0	-452.3	-29.3	-17.5
	SD%	79.2	9.7	7.4	9.7	54.4	15.5	0.2	0.2	0.2	1.1	0.8	0.7	5.4	5.1	3.4	78.2	9.4	7.3
2006	Mean%	163.3	4.2	-2.9	2.6	2.1	9.2	0.1	0.0	0.0	1.1	0.2	0.2	3.2	0.1	0.3	-16.6	0.1	0.2
	Median%	143.0	5.2	-0.6	1.5	3.7	7.5	0.1	0.0	0.0	0.9	0.0	0.0	2.3	0.0	0.0	-15.8	0.1	0.2
	Max%	613.0	29.5	32.5	33.2	39.4	82.5	0.9	0.9	1.3	4.2	1.9	3.4	16.9	7.8	13.5	180.9	17.6	28.4
	Min%	65.9	-26.0	-37.4	-20.2	-38.7	-36.6	0.0	-1.0	-0.6	0.0	-2.1	-3.3	0.0	-21.7	-16.6	-162.8	-20.1	-30.6
	SD%	82.0	8.8	10.0	7.7	13.7	17.8	0.2	0.2	0.2	1.1	0.6	0.8	4.0	3.6	3.4	53.4	6.7	7.4
2007	Mean%	177.0	5.7	2.3	-1.1	6.4	20.8	0.2	0.0	0.0	1.1	0.1	0.2	3.1	0.2	-0.3	27.5	0.1	3.9
	Median%	154.0	6.3	1.4	-0.9	7.1	4.2	0.1	0.0	0.0	0.7	0.0	0.0	1.7	0.0	0.0	17.7	0.2	0.0
	Max%	619.8	34.9	33.1	70.6	42.5	699.4	1.0	0.9	2.0	5.3	2.7	7.0	19.1	13.5	14.6	392.7	15.9	145.7
	Min%	55.8	-29.6	-25.4	-40.3	-51.1	-39.9	0.0	-0.5	-0.3	0.0	-4.6	-2.9	0.0	-14.6	-7.4	-75.0	-25.3	-24.5
	SD%	92.6	9.7	7.6	13.8	14.7	96.3	0.2	0.2	0.3	1.1	0.8	1.1	4.2	3.1	3.1	64.9	6.2	19.2
2008	Mean%	164.0	3.8	-1.3	-0.3	4.8	-0.9	0.2	0.0	0.0	1.2	0.2	-0.1	2.6	-0.3	0.0	1.4	1.6	0.5
	Median%	136.0	5.0	-0.5	-1.0	4.0	-2.5	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	-5.6	0.0	0.2
	Max%	460.5	50.1	40.8	68.1	84.3	39.0	1.4	1.1	0.6	8.1	6.7	1.7	24.1	13.9	6.6	229.9	38.0	33.1
	Min%	32.4	-58.7	-61.1	-35.5	-62.0	-32.6	0.0	-0.3	-0.8	0.0	-1.7	-2.0	0.0	-7.0	-9.8	-100.6	-21.1	-35.5
	SD%	88.5	13.3	12.1	12.0	21.3	14.0	0.3	0.2	0.2	1.4	1.0	0.6	4.4	2.8	2.5	55.7	9.8	8.1

Table 3.2 Continued

		Vt	Et	dEt	dEt+1	dNAt	dNAt+1	RDt	dRDt	dRDt+1	It	dIt	dIt+1	Dt	dDt	dDt+1	dVt	dCAt	dCAt+1
2009	Mean%	156.6	2.8	-1.1	0.6	-2.6	-1.8	0.1	0.0	-0.1	1.2	-0.1	0.0	2.4	-0.1	0.4	-11.0	0.2	1.1
	Median%	133.2	3.8	-0.9	0.1	-2.4	-2.4	0.1	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	-5.7	0.2	0.5
	Max%	437.2	36.0	41.2	24.9	28.4	49.0	1.1	0.5	0.8	8.6	1.5	2.9	19.2	5.8	16.1	186.4	29.0	18.1
	Min%	15.4	-40.8	-47.3	-18.5	-48.4	-37.3	0.0	-0.8	-1.1	0.0	-2.3	-2.2	0.0	-10.5	-6.9	-171.3	-39.4	-17.5
	SD%	92.4	10.5	11.1	6.7	14.5	14.7	0.2	0.2	0.2	1.5	0.6	0.6	3.8	2.5	2.2	55.5	7.8	6.3
2010	Mean%	151.2	2.6	0.1	-0.9	-4.3	-3.5	0.1	-0.1	0.0	1.3	0.0	-0.1	2.7	0.4	-0.4	-6.0	0.6	-0.4
	Median%	126.3	3.2	0.1	-0.8	-2.4	-1.8	0.0	0.0	0.0	0.6	0.0	0.0	0.8	0.0	0.0	-3.2	0.6	-0.1
	Max%	451.3	35.5	26.3	22.4	33.0	48.5	1.1	0.8	0.1	7.1	3.0	1.6	18.3	18.3	4.5	141.3	16.3	18.7
	Min%	-2.6	-22.4	-24.0	-24.8	-81.5	-58.6	0.0	-0.9	-1.1	0.0	-2.4	-2.9	0.0	-6.5	-17.1	-154.8	-38.4	-17.1
	SD%	92.6	9.7	7.4	7.3	17.8	16.0	0.1	0.2	0.1	1.5	0.7	0.7	4.1	2.4	3.0	44.8	7.4	4.8

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.3
Correlation Matrix for the Research Variables

The dependent variable is the firm's value (V_t), The independent variables are; Firm's earnings (E_t); Change in the firm's earning from the previous year (dE_t); Change in the firm's earning between the current year and the next year (dE_{t+1}); Firm's research and development expenses (RD_t); Change in the firm's research and development expenses from the previous year (dRD_t); Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}); Firm's interest expenses (I_t); Change in the firm's interest expenses from the previous year (dI_t); Change in the firm's interest expenses between the current year and the next year (dI_{t+1}); Firm's cash dividend (D_t); Change in the firm's cash dividend from the previous year (dD_t); Change in the firm's cash dividend between the current year and the next year (dD_{t+1}); Change in the firm's value from the previous year (dV_t); Change in the firm's cash assets from the previous year (dCA_t); Change in the firm's cash assets between the current year and the next year (dCA_{t+1}); Change in the firm's non cash assets from the previous year (dNA_t); Change in the firm's non cash assets between the current year and the next year (dNA_{t+1}). All divided by the total assets. For the period from 2001 to 2010.

	V_t	E_t	dE_t	dE_{t+1}	RD_t	dRD_t	dRD_{t+1}	I_t	dI_t	dI_{t+1}	D_t	dD_t	dD_{t+1}	dV_t	dCA_t	dCA_{t+1}	dNA_t	dNA_{t+1}
V_t	1.00																	
E_t	0.54	1.00																
dE_t	0.11	0.50	1.00															
dE_{t+1}	-0.01	-0.34	-0.35	1.00														
RD_t	0.57	0.73	0.27	-0.11	1.00													
dRD_t	0.07	0.28	0.58	-0.12	0.50	1.00												
dRD_{t+1}	-0.02	-0.13	-0.14	0.57	-0.25	-0.22	1.00											
I_t	-0.28	-0.18	-0.02	0.02	-0.27	0.01	0.02	1.00										
dI_t	0.10	0.03	-0.01	0.00	0.00	-0.03	0.00	0.08	1.00									
dI_{t+1}	0.09	0.07	0.01	-0.04	0.03	-0.02	-0.02	-0.35	0.06	1.00								
D_t	0.54	0.62	0.12	-0.04	0.66	0.10	-0.04	-0.29	0.01	0.02	1.00							
dD_t	0.06	0.19	0.38	-0.07	0.17	0.39	-0.07	-0.01	-0.02	-0.02	0.37	1.00						
dD_{t+1}	0.05	-0.02	-0.04	0.30	-0.02	-0.01	0.31	0.00	-0.02	-0.01	-0.26	-0.21	1.00					
dV_t	0.41	0.38	0.39	-0.06	0.30	0.36	0.02	-0.10	0.07	0.13	0.14	0.16	0.11	1.00				
dCA_t	0.04	0.14	0.22	-0.08	0.14	0.25	-0.11	-0.03	-0.04	0.10	0.06	0.31	0.02	0.17	1.00			
dCA_{t+1}	0.06	0.04	-0.02	0.11	0.04	0.01	0.18	0.01	-0.04	0.02	-0.01	-0.04	0.19	0.06	-0.15	1.00		
dNA_t	0.11	0.24	0.21	-0.08	0.12	0.14	-0.02	-0.09	0.19	0.21	0.05	0.11	0.01	0.52	-0.06	0.04	1.00	
dNA_{t+1}	0.02	0.05	0.03	0.07	0.03	0.02	0.12	-0.07	-0.01	0.16	-0.01	-0.01	0.05	0.11	0.04	0.19	0.04	1.00

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

The estimated results of the research model are presented in table 3.4. We used the fixed-effect model to obtain the results from the empirical data. The benefits of using the fixed-effect model over using the pooling ordinary least squares model or the random effect model are that, under the fixed-effect model, the constant (intercept) is allowed to vary over each individual unit, time or both. This will help to eliminate the individual effect of the intercept. Then the necessary tests to check whether the fixed-effect model is the appropriate model or not will be performed to ensure that it is the right model.

So, it is very important to check whether the fixed-effect model is the most appropriate model to use. To do so, we need to run two kinds of test. The first one is the likelihood ratio test, which is a test to check whether the fixed-effect model is better than the pooling ordinary least squares model or not. If the result of this test is significant, this will mean that the fixed-effect model is preferred to the pooling ordinary least squares model; if it is not significant then we should not use the result from the fixed-effect model. Table 3.5 shows the results of the likelihood ratio test; as we see from the table, the results are significant at the 1% level which means we can use the results from the fixed-effect model.

Another important test is the Hausman test, which tests whether the fixed-effect model is better than the random effect model. Again, if the result of this test is significant, this will mean that the fixed-effect model is preferred to the random effect model. Table 3.6 shows the results of the Hausman test; from the table we can see that it is significant at the 1% level, which again means that the fixed-effect model is preferred to the random effect model. From both tests, we can accept that the most appropriate model to use is the fixed-effect model.

Table 3.4
Regression results fixed effect model

The dependent variable is the firm's value (V_t), The independent variables are; Firm's earnings (E_t); Change in the firm's earning from the previous year (dE_t); Change in the firm's earning between the current year and the next year (dE_{t+1}); Firm's research and development expenses (RD_t); Change in the firm's research and development expenses from the previous year (dRD_t); Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}); Firm's interest expenses (I_t); Change in the firm's interest expenses from the previous year (dI_t); Change in the firm's interest expenses between the current year and the next year (dI_{t+1}); Firm's cash dividend (D_t); Change in the firm's cash dividend from the previous year (dD_t); Change in the firm's cash dividend between the current year and the next year (dD_{t+1}); Change in the firm's value from the previous year (dV_t); Change in the firm's cash assets from the previous year (dCA_t); Change in the firm's cash assets between the current year and the next year (dCA_{t+1}); Change in the firm's non cash assets from the previous year (dNA_t); Change in the firm's non cash assets between the current year and the next year (dNA_{t+1}). All divided by the total assets. For the period from 2001 to 2010. ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Variable	Coefficient	t-Statistic
C	1.1958***	23.6698
E	0.5304	1.0030
dE_t	-0.0003	-0.0008
dE_{t+1}	0.1083	0.3813
dNA_t	-0.5340***	-6.2712
dNA_{t+1}	-0.0016	-0.0718
RD	162.1135***	5.9287
dRD_t	-101.8884***	-4.7938
dRD_{t+1}	16.4444	1.3373
I	4.0438	1.5746
dI_t	0.9802	0.4601
dI_{t+1}	3.3031	1.6402
D	0.0170	0.0143
dD_t	0.5524	0.7771
dD_{t+1}	-0.1619	-0.2266
dV_t	0.5453***	9.0994
dCA_t	-0.5167***	-2.4581
dCA_{t+1}	0.0774	0.5196
Adjusted R square	75.28%	
F statistic	24.1742***	
Observation	800	

Table 3.5
Likelihood ratio test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.3851	-79,694	0.0000
Cross-section Chi-square	536.1090	79	0.0000
Period F	18.7662	-9,694	0.0000
Period Chi-square	174.2578	9	0.0000
Cross-Section/Period F	9.5669	-88,694	0.0000
Cross-Section/Period Chi-square	635.5110	88	0.0000

Table 3.6
Hausman test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	76.9369	17	0.0000

Having found the most appropriate model, we can start the model analysis, and our main concern is to test how the change in cash will affect the value of the firm. The result shows that the coefficient of the change in cash variable is -0.52, significant at the 1% level, which means that changing the cash level has a negative effect on the firm's value. To be more specific, this result means a one JD increase in cash will result in a -0.52 JD in firm value, although this result supports the free cash flow theory, which suggests that, when there is high asymmetric information, the marginal value of cash-holding will decrease; however, this result showed a very strong and unusual relationship since we expected to find a positive relationship with low value in the case of high asymmetric information or low investor protection, and a higher positive coefficient when asymmetric information is low or the investors have higher protection. Another important result is that the dividend and the change in dividend have no significant effect on the firm's value, which means that using the available resources to pay a cash dividend to the shareholders will not have a significant effect on firm value; again, this is an unexpected and unusual result. The overall model has a very high adjusted R square value of 75.28% which means the dependent variables explained about 75% of the relationship; also the model is significant at the 1% level with an F statistic of 24.17. These unusual results cast serious doubt on whether the Fama and French (1998)

model is the best or correct model to investigate our data set, especially if we compare these results with those of other researchers who used the same model on different sets of data.

This model has also been used by several researchers such as Pinkowitz and Williamson (2005), Pinkowitz et al. (2006), Dittmar and Mahrt-Smith (2007), Kalcheva and Lins (2007), Kisser (2009), and others. By taking the value of the firm as the dependent variable and using the cash ratio and the change in cash ratio as independent variables plus several control variables including earnings, research and development, interest expenses, dividend, change in the firm value, and non-cash assets, Pinkowitz and Williamson (2005) found this coefficient to be 0.45. Pinkowitz et al. (2006) found that this value is 0.33 for high-corruption firms and 0.29 for poor anti-director firms. In their study, Faulkender and Wang (2006) found that this coefficient ranges between 0.75 and 1.47. Dittmar and Mahrt-Smith (2007) found that the change in cash coefficient ranged between 0.69 and 1.39. Kisser (2009) found that, for the zero leverage firms, the coefficient of the change in cash is 1.03. Tong (2011) found this coefficient to be equal to 1.39. Masulis et al. (2009) found the value of this coefficient to be between 1.05 and 1.11. Denis and Sibilkov (2010) found a coefficient range between 0.63 and 1.02. Drobetz et al. (2010) found that, for emerging markets, this coefficient is equal to 0.29, while Haw et al. (2011) found that the coefficient is 2.39.

3.4.2. The level of cash model

In this section we will use the same model used by Fama and French (1998) but now we will conduct the analysis on how the cash level itself will affect the firm value rather than the change in cash level as we did in the previous model. This model has been developed based on Fama and French's (1998) valuation model.

In addition to the basic analysis from the previous model (i.e. the one concerned with the change in the cash level), in this model, instead of using the change in cash from the previous year and the change in cash between the current and the next year, we will replace those two terms with a new variable which is the cash ratio (cash and cash equivalents to total assets). Table 3.7 shows the descriptive analysis for the new variable. The most interesting result in this table is that the cash ratio in the last three years (2008, 2009 and 2010) starts to increase and in all of those years it has been higher than the average value of 9.3%. These increases in the cash ratio might be a result of the financial crisis; cash has become more appreciated

because debt-financing since the crisis has become more difficult, so many firms have started to accumulate more cash for use as a source of financing.

Since we changed the structure of the variables, the new correlation matrix from the new data can be seen in table 3.8. From table 3.8 we can see that the new variable (i.e. cash ratio) has a low correlation with the other independent variables, except with the dividend where the coefficient is 0.50; this high coefficient can be explained by the fact that firms with more available cash can afford to pay dividends to their shareholders, and with more cash available those firms can pay more dividends.

Table 3.7
Descriptive analysis

The independent variables are; Firm's cash assets (C_t) measures as cash divided by the total assets descriptive analysis.

For the period from 2001 to 2010 and year by year from 2001 to 2010.

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001-2010
Mean%	8.9	10.2	8.9	7.8	9.2	9.1	8.5	9.4	9.7	10.8	9.3
Median%	4.1	3.4	4.2	3.9	4.9	5.8	4.6	4.9	5.3	7.1	4.9
Max%	48.5	51.8	52.0	38.9	39.9	48.5	50.7	52.0	66.4	63.7	66.4
Min%	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
SD%	12.1	13.1	11.0	9.6	10.4	9.8	10.0	11.8	11.9	11.5	11.2
Obs.	80	80	80	80	80	80	80	80	80	80	800

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.8
Correlation Matrix for the Research Variables

The dependent variable is the firm's value (V_t), The independent variables are; Firm's earnings (E_t); Change in the firm's earning from the previous year (dE_t); Change in the firm's earning between the current year and the next year (dE_{t+1}); Firm's research and development expenses (RD_t); Change in the firm's research and development expenses from the previous year (dRD_t); Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}); Firm's interest expenses (I_t); Change in the firm's interest expenses from the previous year (dI_t); Change in the firm's interest expenses between the current year and the next year (dI_{t+1}); Firm's cash dividend (D_t); Change in the firm's cash dividend from the previous year (dD_t); Change in the firm's cash dividend between the current year and the next year (dD_{t+1}); Change in the firm's value from the previous year (dV_t); Firm's cash assets (C_t); Change in the firm's non cash assets from the previous year (dNA_t); Change in the firm's non cash assets between the current year and the next year (dNA_{t+1}). All divided by the total assets. For the period from 2001 to 2010.

	V_t	E_t	dE_t	dE_{t+1}	dNA_t	dNA_{t+1}	RD_t	dRD_t	dRD_{t+1}	I_t	dI_t	dI_{t+1}	D_t	dD_t	dD_{t+1}	dV_t	C_t
V_t	1.00																
E_t	0.54	1.00															
dE_t	0.11	0.50	1.00														
dE_{t+1}	-0.01	-0.34	-0.35	1.00													
dNA_t	0.11	0.24	0.21	-0.08	1.00												
dNA_t+1	0.02	0.05	0.03	0.07	0.04	1.00											
RD_t	0.57	0.73	0.27	-0.11	0.12	0.03	1.00										
dRD_t	0.07	0.28	0.58	-0.12	0.14	0.02	0.50	1.00									
dRD_{t+1}	-0.02	-0.13	-0.14	0.57	-0.02	0.12	-0.25	-0.22	1.00								
I_t	-0.28	-0.18	-0.02	0.02	-0.09	-0.07	-0.27	0.01	0.02	1.00							
dI_t	0.10	0.03	-0.01	0.00	0.19	-0.01	0.00	-0.03	0.00	0.08	1.00						
dI_{t+1}	0.09	0.07	0.01	-0.04	0.21	0.16	0.03	-0.02	-0.02	-0.35	0.06	1.00					
D_t	0.54	0.62	0.12	-0.04	0.05	-0.01	0.66	0.10	-0.04	-0.29	0.01	0.02	1.00				
dD_t	0.06	0.19	0.38	-0.07	0.11	-0.01	0.17	0.39	-0.07	-0.01	-0.02	-0.02	0.37	1.00			
dD_{t+1}	0.05	-0.02	-0.04	0.30	0.01	0.05	-0.02	-0.01	0.31	0.00	-0.02	-0.01	-0.26	-0.21	1.00		
dV_t	0.41	0.38	0.39	-0.06	0.52	0.11	0.30	0.36	0.02	-0.10	0.07	0.13	0.14	0.16	0.11	1.00	
C_t	0.33	0.32	0.02	-0.01	-0.07	0.04	0.35	-0.01	-0.03	-0.27	0.00	0.03	0.50	0.06	0.00	0.09	1.00

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.9 shows the fixed-effect regression model results, which have been estimated from the model concerned with the level of cash itself rather than the mere change in cash level. We also checked whether the fixed-effect model is the best model to use or whether we should use either the random effect model or the pooling ordinary least squares model. By running the likelihood ratio test we obtained significant values for the results, which suggest that the fixed-effect model is better than the pooling ordinary least squares model; the results of the likelihood ratio test are shown in table 3.10. Then, by running the Hausman test, we also obtained a significant result which again suggests that the fixed-effect model is preferred to the random effect model; the results of the Hausman test are presented in table 3.11.

Again, we are looking at the effect of cash on the value of the firm and, from the table, we can see that this variable has a significant negative effect on the value of the firm, with a coefficient of -0.62 significant at the 10% level. The results also support the free cash flow theory, which suggests that cash has a decreasing value when it is associated with asymmetric information. For this model, dividend and change in dividend have no significant effect on the firm value. The model as a whole is significant at the 1% level, with an F statistic of 28.61 and a high adjusted R square of 75.73%.

This negative sign of the cash level coefficient means that cash-holding is reducing the value of the firm; again, this is an unusual result especially given that other researchers who applied the same model on different data sets found that this coefficient is low and positive for firms in countries with low investor protection or high asymmetric information, while it becomes higher when asymmetric information is reduced or when investor protection becomes higher.

From the results of this model and the previous model, we can infer that Fama and French's (1998) model was not a good model to examine the contribution of cash to the firm's value. In the next section, we will use an alternative model to examine how cash contributes to the firm value.

Table 3.9
Regression results fixed effect model

The dependent variable is the firm's value (V_t), The independent variables are; Firm's earnings (E_t); Change in the firm's earning from the previous year (dE_t); Change in the firm's earning between the current year and the next year (dE_{t+1}); Firm's research and development expenses (RD_t); Change in the firm's research and development expenses from the previous year (dRD_t); Change in the firm's research and development expenses between the current year and the next year (dRD_{t+1}); Firm's interest expenses (I_t); Change in the firm's interest expenses from the previous year (dI_t); Change in the firm's interest expenses between the current year and the next year (dI_{t+1}); Firm's cash dividend (D_t); Change in the firm's cash dividend from the previous year (dD_t); Change in the firm's cash dividend between the current year and the next year (dI_{t+1}); Change in the firm's value from the previous year (dV_t); Firm's cash assets (C_t); Change in the firm's non cash assets from the previous year (dNA_t); Change in the firm's non cash assets between the current year and the next year (dNA_{t+1}). All divided by the total assets. For the period from 2001 to 2010. ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Variable	Coefficient	t-Statistic
C	1.2318***	20.4435
E	0.5688	1.0460
dE_t	-0.0360	-0.9496
dE_{t+1}	0.1126	0.3970
dNA_t	-0.5169***	-5.6488
dNA_{t+1}	0.0084	0.4448
RD	156.6745***	5.8051
dRD_t	-102.1136***	-4.8354
dRD_{t+1}	15.2788	1.1917
I	3.5536	1.2851
dI_t	1.1185	0.5021
dI_{t+1}	2.4000	1.1886
D	1.1683	1.1125
dD_t	-0.0895	-0.1389
dD_{t+1}	0.1061	0.1495
dV_t	0.5364***	8.8781
C_t	-0.6248*	-1.9584
R square	75.37%	
F statistic	24.5157***	
Observation	800	

Table 3.10
Likelihood ratio test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	8.5739	-79,695	0.0000
Cross-section Chi-square	544.2891	79	0.0000
Period F	18.6239	-9,695	0.0000
Period Chi-square	172.8455	9	0.0000
Cross-Section/Period F	9.6914	-88,695	0.0000
Cross-Section/Period Chi-square	640.5643	88	0.0000

Table 3.11
Hausman test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	71.6102	16	0.0000

3.4.3. The stock's excess return model

In this section we will present the results of an alternative model. This model has been developed by Faulkender and Wang (2006) and uses the excess return on the stock as a measurement of the wealth of the shareholders rather than using the value of the firm as in the previous models.

Table 3.12 shows the basic descriptive analysis of the Faulkender and Wang (2006) model variables. The results in this table cover the period from the year 2001 to the year 2011. The original data cover the period from the year 2000 to the year 2011. We lose one year of data as some of the research variables need to be calculated as the change value between the current and the previous year. The value of the dependent variable ranges between -132% and 594%, with an average value of -0.59% and a high standard deviation of 55.7%. For the independent variables, the change in the cash ratio ranges between -222% and 245% with an average value of 1.16% and a standard deviation of 22%. The lag value of the cash ratio ranges between 0% and 341% with an average value of 12.3% and a standard deviation of 29%. The product of the change in the cash ratio and the lag value of the cash ratio ranges

between -748% and 491%, with an average value of -0.94% and a standard deviation of 36%. The product of the change in the cash ratio and the market leverage ranges between -132% and 169%, with an average value of 0.67% and a standard deviation of 13%. The change in the dividend ranges between -21% and 36% with an average value of 0.3% and a relatively small standard deviation compared to the other variables of only 3%.

Table 3.13 shows the same descriptive analysis for those variables year by year to provide a better understanding of those variables and whether there are any big changes in them.

Table 3.14 shows the correlation matrix between the research variables. By looking at table 3.14 we can see that the correlation coefficients between the research variables are small. Apart from the high correlations between cash and the variables resulting from the combination of cash and other variables, there are only a few high correlations; there is a high correlation between non-cash assets and new financing, as new financing is normally used to buy fixed assets (non-cash assets). Earnings and research and development also have high correlations since Jordanian firms only assign research and development expenses from the firm's earnings if the firm has positive earnings.

Table 3.12
Descriptive analysis (model 3)

The dependent variable is the stock's excess return ($r_{i,t} - R_{i,t}$), The independent variables are; Change in the cash ratio between time t and time t-1 ($\Delta C_{i,t}$); Change in firm's earnings between time t and time t-1 ($\Delta E_{i,t}$); Change in non cash assets between time t and time t-1 ($\Delta NA_{i,t}$); Change in the research and development expenses between time t and time t-1 ($\Delta RD_{i,t}$); Change in interest expenses between time t and time t-1 ($\Delta I_{i,t}$); : Change in the cash dividends between time t and time t-1 ($\Delta D_{i,t}$); Cash ratio in the time t-1 ($C_{i,t-1}$); Market leverage in the time t ($L_{i,t}$); Net financing in the time t ($NF_{i,t}$). All divided by the equity market value in the time t-1 ($M_{i,t-1}$), expect for the Market leverage ($L_{i,t}$). For the period from 2001 to 2011.

	$r_{i,t} - R_{i,t}$	$\Delta C_{i,t}$	$\Delta E_{i,t}$	$\Delta NA_{i,t}$	$\Delta RD_{i,t}$	$\Delta I_{i,t}$	$\Delta D_{i,t}$	$C_{i,t-1}$	$L_{i,t}$	$NF_{i,t}$	$C_{i,t-1} \times \Delta C_{i,t}$	$L_{i,t} \times \Delta C_{i,t}$
Mean	-0.59%	1.16%	4.01%	8.20%	0.04%	-0.44%	0.27%	12.27%	27.72%	8.78%	-0.94%	0.67%
Median	-5.54%	0.11%	0.27%	1.31%	0.00%	0.00%	0.00%	5.02%	20.66%	0.84%	0.00%	0.02%
Max	594.08%	244.87%	602.18%	2755.17%	9.16%	19.93%	35.60%	340.89%	99.18%	4798.61%	491.53%	169.24%
Min	-131.76%	-222.41%	-200.70%	-933.14%	-0.81%	-70.85%	-20.88%	0.00%	0.19%	-930.20%	-748.46%	-131.65%
SD	55.72%	21.78%	37.44%	128.55%	0.39%	4.08%	2.88%	29.37%	23.20%	184.67%	35.96%	12.68%
Obs.	880	880	880	880	880	880	880	880	880	880	880	880

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.13
Descriptive analysis (model 3)

The dependent variable is the stock's excess return ($r_{i,t} - R_{i,t}$), The independent variables are; Change in the cash ratio between time t and time t-1 ($\Delta C_{i,t}$); Change in firm's earnings between time t and time t-1 ($\Delta E_{i,t}$); Change in non cash assets between time t and time t-1 ($\Delta NA_{i,t}$); Change in the research and development expenses between time t and time t-1 ($\Delta RD_{i,t}$); Change in interest expenses between time t and time t-1 ($\Delta I_{i,t}$); : Change in the cash dividends between time t and time t-1 ($\Delta D_{i,t}$); Cash ratio in the time t-1 ($C_{i,t-1}$); Market leverage in the time t ($L_{i,t}$); Net financing in the time t ($NF_{i,t}$). All divided by the equity market value in the time t-1 ($M_{i,t-1}$), expect for the Market leverage ($L_{i,t}$). For the period from 2001 to 2009.

		$r_{i,t} - R_{i,t}$	$\Delta C_{i,t}$	$\Delta E_{i,t}$	$\Delta NA_{i,t}$	$\Delta RD_{i,t}$	$\Delta I_{i,t}$	$\Delta D_{i,t}$	$C_{i,t-1}$	$L_{i,t}$	$NF_{i,t}$	$C_{i,t-1} \times \Delta C_{i,t}$	$L_{i,t} \times \Delta C_{i,t}$
2001	Mean	-20.66%	0.74%	11.51%	4.48%	0.16%	-1.23%	1.12%	16.32%	33.47%	-1.74%	-3.72%	0.73%
	Median	-29.01%	0.07%	0.84%	1.50%	0.00%	0.00%	0.00%	5.32%	29.52%	0.40%	0.00%	0.02%
	Max	180.70%	211.14%	602.18%	385.58%	9.16%	6.45%	35.60%	175.04%	92.67%	282.87%	17.25%	148.64%
	Min	-99.97%	-99.03%	-89.80%	-243.26%	-0.45%	-22.93%	-5.37%	0.00%	1.82%	-268.20%	-123.66%	-73.40%
	SD	41.06%	29.85%	70.17%	61.64%	1.03%	4.32%	4.59%	31.76%	23.57%	59.37%	18.89%	19.76%
2002	Mean	13.22%	3.67%	5.01%	-1.37%	0.05%	-1.21%	-0.10%	16.95%	32.05%	0.77%	4.24%	0.53%
	Median	-1.81%	0.04%	0.24%	-0.67%	0.00%	-0.17%	0.00%	5.70%	23.69%	0.07%	0.00%	0.01%
	Max	159.05%	244.87%	262.26%	318.78%	0.55%	7.01%	8.06%	340.89%	92.07%	319.61%	416.04%	27.63%
	Min	-43.93%	-70.89%	-35.37%	-313.02%	-0.51%	-35.40%	-20.88%	0.00%	1.91%	-152.78%	-56.05%	-13.57%
	SD	38.63%	30.03%	32.19%	60.24%	0.14%	4.59%	2.88%	43.08%	25.10%	55.37%	46.84%	4.72%
2003	Mean	-6.77%	-3.33%	3.42%	5.10%	0.11%	-0.65%	0.03%	16.89%	26.70%	-2.79%	-10.56%	-0.38%
	Median	-27.35%	0.14%	0.57%	3.99%	0.00%	0.00%	0.00%	6.55%	18.52%	-0.19%	0.00%	0.02%
	Max	594.08%	30.90%	168.78%	261.63%	3.39%	8.86%	7.23%	336.51%	85.10%	115.96%	11.72%	15.36%
	Min	-131.76%	-222.41%	-200.70%	-353.17%	-0.56%	-24.24%	-5.37%	0.00%	1.17%	-202.07%	-748.46%	-45.38%
	SD	91.47%	27.07%	40.28%	63.52%	0.47%	3.27%	1.43%	40.70%	22.50%	34.58%	83.36%	6.74%

Table 3.13 Continued

		$r_{i,t} - R_{i,t}$	$\Delta C_{i,t}$	$\Delta E_{i,t}$	$\Delta NA_{i,t}$	$\Delta RD_{i,t}$	$\Delta I_{i,t}$	$\Delta D_{i,t}$	$C_{i,t-1}$	$L_{i,t}$	$NF_{i,t}$	$C_{i,t-1} \times \Delta C_{i,t}$	$L_{i,t} \times \Delta C_{i,t}$
2004	Mean	-19.69%	2.93%	9.15%	36.66%	0.17%	-0.42%	1.20%	8.72%	25.35%	25.64%	0.04%	2.25%
	Median	-29.93%	0.10%	1.51%	7.54%	0.01%	0.00%	0.00%	4.68%	14.09%	1.60%	0.00%	0.01%
	Max	175.92%	109.21%	177.66%	981.05%	1.86%	11.16%	17.82%	53.62%	90.21%	969.47%	12.47%	93.68%
	Min	-95.84%	-29.21%	-19.37%	-93.44%	-0.23%	-20.00%	-5.22%	0.00%	0.66%	-123.77%	-15.66%	-7.30%
	SD	53.88%	16.79%	28.26%	128.59%	0.42%	3.20%	3.77%	10.64%	23.33%	125.71%	3.13%	11.62%
2005	Mean	-20.41%	2.51%	2.83%	5.68%	0.01%	0.03%	0.13%	7.38%	19.78%	-11.13%	-0.57%	0.44%
	Median	-43.52%	1.10%	1.78%	7.00%	0.00%	0.00%	0.00%	3.55%	14.52%	1.56%	0.01%	0.09%
	Max	458.92%	89.55%	103.70%	337.88%	0.58%	19.93%	13.86%	78.42%	78.62%	131.90%	40.66%	50.50%
	Min	-106.67%	-63.65%	-21.19%	-799.42%	-0.81%	-11.49%	-16.38%	0.00%	0.54%	-843.54%	-49.91%	-27.95%
	SD	82.94%	17.38%	13.86%	102.55%	0.18%	2.94%	3.41%	12.22%	18.06%	117.61%	7.91%	7.79%
2006	Mean	14.93%	0.49%	-1.28%	3.91%	-0.02%	0.19%	0.33%	6.70%	23.22%	9.75%	-0.25%	0.37%
	Median	6.68%	0.07%	-0.30%	1.87%	0.00%	0.01%	0.00%	3.40%	17.90%	3.04%	0.00%	0.02%
	Max	269.07%	23.78%	32.99%	48.66%	0.40%	3.03%	9.03%	72.27%	88.88%	158.92%	1.00%	10.14%
	Min	-38.75%	-17.48%	-38.53%	-43.89%	-0.35%	-3.33%	-6.27%	0.02%	1.10%	-20.20%	-12.63%	-5.58%
	SD	43.25%	5.68%	8.65%	13.58%	0.10%	0.89%	2.15%	9.96%	19.73%	25.07%	1.55%	1.94%
2007	Mean	3.95%	0.51%	3.92%	6.67%	0.03%	-0.12%	0.29%	8.14%	22.68%	7.53%	-0.47%	-0.04%
	Median	-12.58%	0.13%	1.44%	5.10%	0.00%	0.01%	0.00%	5.29%	19.59%	1.88%	0.00%	0.01%
	Max	253.37%	81.54%	234.60%	295.17%	0.46%	5.52%	16.02%	75.25%	92.37%	495.73%	7.65%	32.87%
	Min	-69.35%	-51.12%	-88.34%	-362.78%	-0.31%	-32.71%	-5.35%	0.00%	0.37%	-350.50%	-38.47%	-47.22%
	SD	57.57%	12.51%	28.57%	54.96%	0.11%	3.84%	2.56%	10.32%	17.97%	69.37%	4.53%	6.67%
2008	Mean	18.24%	4.16%	-3.57%	24.60%	0.01%	0.32%	-0.32%	6.90%	28.01%	23.28%	-0.22%	2.21%
	Median	10.79%	0.02%	-0.55%	3.13%	0.00%	0.00%	0.00%	3.89%	22.41%	3.01%	0.00%	0.00%
	Max	341.61%	213.61%	38.75%	742.44%	0.62%	9.86%	10.49%	37.59%	94.20%	882.48%	5.67%	150.72%
	Min	-46.35%	-28.56%	-63.27%	-101.02%	-0.27%	-5.08%	-7.25%	0.00%	0.53%	-201.87%	-10.74%	-13.47%
	SD	51.37%	26.81%	16.26%	118.38%	0.13%	1.57%	2.43%	7.82%	22.64%	132.58%	1.79%	17.63%

Table 3.13 Continued

		$r_{i,t} - R_{i,t}$	$\Delta C_{i,t}$	$\Delta E_{i,t}$	$\Delta NA_{i,t}$	$\Delta RD_{i,t}$	$\Delta I_{i,t}$	$\Delta D_{i,t}$	$C_{i,t-1}$	$L_{i,t}$	$NF_{i,t}$	$C_{i,t-1} \times \Delta C_{i,t}$	$L_{i,t} \times \Delta C_{i,t}$
2009	Mean	5.20%	0.22%	6.50%	2.31%	-0.02%	-0.13%	0.21%	10.79%	28.98%	3.58%	0.09%	0.20%
	Median	2.01%	0.22%	-0.86%	-2.05%	0.00%	0.00%	0.00%	5.47%	25.85%	-0.46%	0.00%	0.03%
	Max	134.96%	71.38%	229.45%	352.50%	0.46%	3.66%	7.69%	103.20%	97.45%	333.75%	73.66%	65.84%
	Min	-54.85%	-50.82%	-42.71%	-140.07%	-0.80%	-10.06%	-7.16%	0.00%	0.19%	-260.54%	-26.22%	-26.52%
	SD	35.22%	12.33%	35.90%	46.25%	0.15%	1.50%	2.34%	17.34%	23.47%	53.86%	9.18%	8.78%
2010	Mean	3.35%	0.03%	0.46%	-3.16%	-0.05%	-0.24%	0.16%	13.27%	30.54%	6.69%	-3.88%	-0.45%
	Median	-0.51%	0.34%	0.16%	-1.59%	-0.01%	0.00%	0.00%	6.51%	25.58%	0.40%	0.00%	0.03%
	Max	104.36%	58.75%	118.05%	663.23%	0.61%	5.34%	5.04%	174.99%	99.18%	711.10%	22.69%	58.27%
	Min	-64.93%	-174.33%	-39.34%	-370.16%	-0.67%	-19.10%	-5.22%	0.00%	0.84%	-173.40%	-305.07%	-131.65%
	SD	33.68%	21.80%	16.28%	90.38%	0.15%	2.45%	1.12%	27.59%	25.81%	85.68%	34.10%	16.60%
2011	Mean	2.21%	0.79%	6.12%	5.35%	-0.02%	-1.37%	-0.10%	22.94%	34.13%	35.00%	4.91%	1.46%
	Median	3.57%	-0.05%	-0.66%	-1.35%	0.00%	0.00%	0.00%	7.60%	27.92%	-0.08%	0.00%	0.00%
	Max	76.47%	188.57%	539.63%	2755.17%	0.92%	13.77%	7.86%	330.83%	96.45%	4798.61%	491.53%	169.24%
	Min	-52.24%	-45.49%	-80.84%	-933.14%	-0.68%	-70.85%	-10.26%	0.00%	0.31%	-930.20%	-117.72%	-43.87%
	SD	23.80%	23.00%	62.81%	338.15%	0.14%	9.17%	2.84%	55.54%	26.45%	550.02%	56.63%	19.84%

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.14
Correlation Matrix for the Research Variables (model 3)

The dependent variable is the stock's excess return ($r_{i,t} - R_{i,t}$), The independent variables are; Change in the cash ratio between time t and time t-1 ($\Delta C_{i,t}$); Change in firm's earnings between time t and time t-1 ($\Delta E_{i,t}$); Change in non cash assets between time t and time t-1 ($\Delta NA_{i,t}$); Change in the research and development expenses between time t and time t-1 ($\Delta RD_{i,t}$); Change in interest expenses between time t and time t-1 ($\Delta I_{i,t}$); : Change in the cash dividends between time t and time t-1 ($\Delta D_{i,t}$); Cash ratio in the time t-1 ($C_{i,t-1}$); Market leverage in the time t ($L_{i,t}$); Net financing in the time t ($NF_{i,t}$). All divided by the equity market value in the time t-1 ($M_{i,t-1}$), expect for the Market leverage ($L_{i,t}$). For the period from 2001 to 2011.

	$r_{i,t} - R_{i,t}$	$\Delta C_{i,t}$	$\Delta E_{i,t}$	$\Delta NA_{i,t}$	$\Delta RD_{i,t}$	$\Delta I_{i,t}$	$\Delta D_{i,t}$	$C_{i,t-1}$	$L_{i,t}$	$NF_{i,t}$	$C_{i,t-1} \times \Delta C_{i,t}$	$L_{i,t} \times \Delta C_{i,t}$
$r_{i,t} - R_{i,t}$	1.00											
$\Delta C_{i,t}$	0.04	1.00										
$\Delta E_{i,t}$	0.12	0.24	1.00									
$\Delta NA_{i,t}$	0.10	0.25	-0.02	1.00								
$\Delta RD_{i,t}$	0.18	0.28	0.62	0.01	1.00							
$\Delta I_{i,t}$	-0.02	-0.04	-0.54	0.35	-0.27	1.00						
$\Delta D_{i,t}$	0.08	0.02	0.13	0.00	0.15	-0.07	1.00					
$C_{i,t-1}$	0.05	-0.17	0.22	0.07	0.05	-0.28	0.05	1.00				
$L_{i,t}$	-0.09	0.07	0.12	0.10	0.07	-0.18	-0.03	0.17	1.00			
$NF_{i,t}$	0.03	0.32	-0.08	0.91	-0.06	0.28	-0.02	0.18	0.13	1.00		
$C_{i,t-1} \times \Delta C_{i,t}$	0.04	0.70	0.01	0.28	0.00	0.05	0.00	-0.19	0.01	0.41	1.00	
$L_{i,t} \times \Delta C_{i,t}$	0.01	0.85	0.33	0.44	0.33	-0.03	0.00	-0.07	0.10	0.47	0.49	1.00

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 3.15 shows the regression results of our third model using the fixed-effect model. As with the previous two models, we need to check whether the fixed-effect model is the best model to use or we whether should use either the random effect model or the pooling ordinary least squares model, using the likelihood ratio and Hausman test.

Table 3.15
Regression results of the fixed effect (model 3)

$$r_{i,t} - R_{i.t} = \beta 1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta 2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \beta 3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta 4 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \beta 5 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \beta 6 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \beta 7 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta 8 L_{i,t} + \beta 9 \frac{NF_{i,t}}{M_{i,t-1}} + \beta 10 \frac{C_{i,t-1}}{M_{i,t-1}} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta 11 L_{i,t} \frac{\Delta C_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t}$$

The dependent variable is the stock's excess return ($r_{i,t} - R_{i,t}$), The independent variables are; Change in the cash ratio between time t and time t-1 ($\Delta C_{i,t}$); Change in firm's earnings between time t and time t-1 ($\Delta E_{i,t}$); Change in non cash assets between time t and time t-1 ($\Delta NA_{i,t}$); Change in the research and development expenses between time t and time t-1 ($\Delta RD_{i,t}$); Change in interest expenses between time t and time t-1 ($\Delta I_{i,t}$); : Change in the cash dividends between time t and time t-1 ($\Delta D_{i,t}$); Cash ratio in the time t-1 ($C_{i,t-1}$); Market leverage in the time t ($L_{i,t}$); Net financing in the time t ($NF_{i,t}$). All divided by the equity market value in the time t-1 ($M_{i,t-1}$), expect for the Market leverage ($L_{i,t}$). For the period from 2001 to 2011. ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Variable	Coefficient	t-Statistic
C	0.1985***	4.8641
$\Delta C_{i,t}$	0.4131*	1.8355
$\Delta E_{i,t}$	-0.0211	-0.2780
$\Delta NA_{i,t}$	0.2855***	6.8205
$\Delta RD_{i,t}$	32.6477***	5.3507
$\Delta I_{i,t}$	-0.9227	-1.4972
$\Delta D_{i,t}$	0.7775	1.2476
$C_{i,t-1}$	0.2582***	3.1607
$L_{i,t}$	-0.9360***	-7.1084
$NF_{i,t}$	-0.1509***	-5.0230
$C_{i,t-1} \times \Delta C_{i,t}$	0.1735**	2.0490
$L_{i,t} \times \Delta C_{i,t}$	-1.1924***	-3.4001
R square	17.51%	
F statistic	2.8656***	
Observation	880	

The results of the likelihood ratio test to compare between the fixed-effect model and the pooling ordinary least squares model, as shown in table 3.16, suggest that the fixed-effect model is preferred to the pooling ordinary least squares model. Then, by using the Hausman test to compare between the fixed-effect model and the random effect model, we also obtained a significant result which suggested that the fixed-effect model is preferred to the random effect model. The results of the Hausman test are presented in table 3.17.

Table 3.16
Likelihood ratio test

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	1.0173	-79,779	0.4410
Cross-section Chi-square	86.4028	79	0.2663
Period F	10.2886	-10,779	0.0000
Period Chi-square	109.1653	10	0.0000
Cross-Section/Period F	1.9894	-89,779	0.0000
Cross-Section/Period Chi-square	180.2267	89	0.0000

Table 3.17
Hausman test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	38.6687	11	0.0001

From table 3.15, we can observe the following points. Firstly, the coefficient of the change in cash assets variable ($\Delta C_{i,t}$) is positively significant and equal to 0.41; this suggests that, for each extra Jordanian Dinar (JD) invested in cash, shareholders value this one JD at a discount value equal to 0.41 JD. This result confirms what the free cash flow theory suggests: with higher amounts of cash inside the firm, managers can spend this cash in inefficient ways or on their personal interests, which will affect the shareholders of the firm badly. The problem of free cash flow will be worse if there is a high level of information asymmetry, a poor corporate governance system, or weak investor protection. Secondly, the coefficient of the lagged value of the cash assets variable ($C_{i,t-1}$) is also positively significant and equal to 0.26, suggesting that each JD invested in cash in the previous period will contribute 0.26 JD in the

current period. Thirdly, the product of ($L_{i,t}$) and ($\Delta C_{i,t}$ / $M_{i,t-1}$) has a significant negative coefficient of –1.19; this result suggests that, with a higher level of leverage, the marginal value of each JD invested in cash will decrease. The decrease in the marginal value of cash assets occurs because, with a higher level of leverage, the additional cash assets will serve the debt-holders, as it will guarantee that the debt-holders will get their money back, and the value added to these cash assets will go to the debt-holders but not to the equity-holders. Fourthly, the product of ($C_{i,t-1}$ / $M_{i,t-1}$) and ($\Delta C_{i,t}$ / $M_{i,t-1}$) is positively significant; this variable is used to capture the effect of how the different level of cash will affect the marginal value of each JD invested in cash. We expected the coefficient to be negative since, with a higher level of cash-holding, any additional JD invested in cash will be valued less and less; also, with more cash accumulated inside the firm the likelihood of the free cash flow problem will increase. This significant positive relationship is the opposite of what we expected, as it showed that, with more cash invested in the firm, the value of the additional units of cash is increasing. This result looks unusual for a normal situation but if one considers the current situation in which all economies around the world have been hit by the financial crisis, holding extra cash might be a good thing for two reasons. First, due to the crisis, debt- and equity-financing have become more difficult, which means that firms must depend more on their internal financing sources; this makes cash more valuable for firms and every extra unit of cash will contribute positively to the firm's value rather than having the expected negative effect in a normal situation. Second, cash represents a risk-free investment to the firm compared to investing in financial assets which have lost their value in the last few years because of the financial crisis. To gain a better understanding, we will perform some further analysis to comprehend the value associated with cash and the increase in cash. The last variable we will look at is the change in cash dividend. We expected this variable to be significantly positive, as cash paid to shareholders will reduce the amount of free cash flow available to the firm's managers. This result might suggest that the cash dividend paid to the shareholders is not high enough to reduce the free cash flow problem.

To gain a better understanding of the value of cash and the value of extra cash in the firm, we ran our regression model for the subsample up to the year 2007 before the crisis affected most of the firms. The result in table 3.18 shows the outcome for our model for the period from 2001 to 2007. From table 18 we see many important points; firstly, cash is now valued at 0.94 JD and it is significant at the 1% level. The first important question is how this coefficient differs from the one in table 3.15. To answer this question we performed the test to determine

whether they are significantly different; the absolute value of the t-statistic for the difference is 1.2893 (the p-value is approximately 0.20) which means those two coefficients are not statistically different. This gap in the value (0.94 and 0.41) is due to the method of measurement as we measure the value for the shareholders as excess return; the effect of the financial crisis on share prices and return makes the coefficient look smaller. The coefficient of the product of ($C_{i,t-1}$ / $M_{i,t-1}$) and ($\Delta C_{i,t}$ / $M_{i,t-1}$) is insignificant which means that, before the crisis, the greater amount of cash that the firm retains will not contribute to the value and will only be an opportunity cost for the firm.

To summarize, cash held by the firm is valued at a discount by the Jordanian shareholders; this is because, in the Jordanian capital market, there is no clear corporate governance system, which means that shareholders have less protection than they would have in developed markets. Thus, with no corporate governance system the likelihood of the free cash flow problem will increase, which explains the discounted value of cash. Higher levels of cash are important and contribute positively to the value only when cash becomes more difficult to obtain as the financial crisis hits many countries, banks, financial institutions and firms; in the normal situation, however, higher levels of cash were statically insignificant with respect to the value of the firm. Finally, dividends did not contribute to the shareholders' value before or during the crisis; the possible reason for this insignificant effect is that those dividends are insufficient to cancel out the free cash flow problem. This implies that there is limited dividend smoothing, and that firms that pay dividends do not effectively commit to continuing to pay dividends in the future.

Finally, having obtained the results from the three different models, we need to decide which one of them should be our main research model. As we can see, the third model (i.e. Faulkender and Wang's (2006)) takes into consideration the risk factor by using the stock's excess return over a benchmark return, avoiding the problem of finding an accurate replacement value for the firm's assets when it uses the stock's excess return rather than the market-to-book ratio. Also, unlike Fama and French (1998) the model by Faulkender and Wang (2006) has been developed specifically to investigate the contribution of cash-holding to the firm's value. Also, the results obtained from Faulkender and Wang's (2006) model compared to the results from Fama and French's (1998) model are more consistent with the financial theories and literature dealing with the cash-holding value. On that basis, we believe

that the Faulkender and Wang (2006) model is the best model to use as our main research model.

Table 3.18
Regression results of the fixed effect (model 3)

$$r_{i,t} - R_{i.t} = \beta 1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta 2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \beta 3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \beta 4 \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \beta 5 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \beta 6 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \beta 7 \frac{C_{i,t-1}}{M_{i,t-1}} + \beta 8 L_{i,t} + \beta 9 \frac{NF_{i,t}}{M_{i,t-1}} + \beta 10 \frac{C_{i,t-1}}{M_{i,t-1}} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \beta 11 L_{i,t} \frac{\Delta C_{i,t}}{M_{i,t-1}} + \varepsilon_{i,t}$$

The dependent variable is the stock's excess return ($r_{i,t} - R_{i,t}$), The independent variables are; Change in the cash ratio between time t and time t-1 ($\Delta C_{i,t}$); Change in firm's earnings between time t and time t-1 ($\Delta E_{i,t}$); Change in non cash assets between time t and time t-1 ($\Delta NA_{i,t}$); Change in the research and development expenses between time t and time t-1 ($\Delta RD_{i,t}$); Change in interest expenses between time t and time t-1 ($\Delta I_{i,t}$); : Change in the cash dividends between time t and time t-1 ($\Delta D_{i,t}$); Cash ratio in the time t-1 ($C_{i,t-1}$); Market leverage in the time t ($L_{i,t}$); Net financing in the time t ($NF_{i,t}$). All divided by the equity market value in the time t-1 ($M_{i,t-1}$), expect for the Market leverage ($L_{i,t}$). For the period from 2001 to 2007. ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Variable	Coefficient	t-Statistic
C	0.2104***	3.4844
$\Delta C_{i,t}$	0.9410***	2.7508
$\Delta E_{i,t}$	-0.0467	-0.4008
$\Delta NA_{i,t}$	0.5198***	8.2044
$\Delta RD_{i,t}$	38.8470***	4.8978
$\Delta I_{i,t}$	-0.2709	-0.2996
$\Delta D_{i,t}$	0.1169	0.1515
$C_{i,t-1}$	0.1832	1.4718
$L_{i,t}$	-1.2642***	-6.0278
$NF_{i,t}$	-0.4286***	-6.9027
$C_{i,t-1} \times \Delta C_{i,t}$	0.0923	0.7067
$L_{i,t} \times \Delta C_{i,t}$	-2.8286***	-4.7049
Adjusted R square	26.85%	
F statistic	3.1371***	
Observation	560	

3.4.4. Hypotheses analysis

The first hypothesis; H_1: cash is valued at a discount in the Jordanian financial market.

The results confirm that cash-holding is valued at a discount from the investors' point of view in the Jordan capital market. This result supports what we expect to find in the Jordan capital market and is consistent with what the free cash flow theory suggests: in markets with poor investor protection, higher levels of information asymmetric, and a weak corporate governance system, firm managers use the available cash inefficiently. This problem will cause investors to evaluate cash invested in the firm at a discounted value to its face value.

The second hypothesis; H_2: with higher levels of cash-holding the marginal value of cash-holding will decrease.

We expected to see a decreasing marginal value of the cash-holding with a higher level of cash-holding, since more cash inside the firm will increase the possibility of the free cash flow problem. Also, with a higher level of cash the firm becomes less willing to seek more cash and the additional value associated with an extra amount of cash will decrease. The result from our sample is insignificant for this relationship when we studied Jordanian firms before the crisis; this result suggests that, in the Jordanian capital market, investors do not differentiate between different levels of cash-holding. On the other hand, because of the financial crisis cash has become more difficult to obtain and the result from Jordanian firms showed that a higher level of cash contributes positively to the value.

H_3: with higher leverage, an additional pound of cash is less valuable to shareholders.

With higher leverage, any increase in the cash level will make the firm less risky since it will increase the likelihood of the debt-holders being paid back; from the stock-holders' point of view, this situation will cause the additional value of the firm resulting from the higher level of cash to benefit the debt-holders. So, stock-holders will increasingly reduce their valuation of the additional JD. The result confirms this expectation and we found that, with higher leverage, the value of additional JD invested in cash is decreasing.

The fourth hypothesis; H_4: the dividend has a positive effect on the firm value.

In markets with poor investor protection, weak corporate governance systems, high information asymmetry and free cash flow problems, investors prefer to receive money from the firm as cash dividends to reduce the amount of the free cash flow inside the firm. The result from our sample shows that the cash dividends' effect on the value for the shareholders is insignificant. This result might suggest that the cash dividends paid by the firm are insufficient to offset the previous problem and create added value for the shareholders, or it might be better for the shareholders if the firm undertook stock repurchasing rather than paying cash dividends, as suggested by Faulkender and Wang (2006), Harford et al. (2008) and Haw et al. (2011).

3.5. Conclusion

This chapter examines cash-holding's contribution to the corporate value, based on a sample of publicly traded Jordanian firms, including all firms except financial firms, firms undergoing liquidation and newly listed firms. This analysis is applied to the period between 2000 and 2011 using annual firm data. Financial firms have been excluded from the sample because such firms tend to hold certain amounts of cash assets based on the nature of their business. Firms undergoing liquidation are excluded from the sample since the level of cash in the most recent years does not reflect the true level of cash; the same is true for new firms where the cash level in their early years does not reflect the true level of cash. The final number of firms involved in this research is 80. We used three models in this chapter; the first two models were based on the adjusted form of Fama and French's (1998) valuation model, while the third model was based on Faulkender and Wang's (2006) model. We applied both the likelihood ratio test and the Hausman test to make sure that the fixed-effects model is preferred to the pooling ordinary least squares model and the random effects model. Then we adapted our third model (i.e. Faulkender and Wang's (2006) model) as our research model, since this model accounted for the risk factor by using the stock's excess return and it avoids the problem of calculating the correct assets' replacement value by using the stock's excess return rather than the market-to-book ratio as a measurement of shareholders' value.

The results from our research model show that cash-holding is valued at a discount in the Jordanian capital market, with a significant coefficient of 0.41 JD for the whole period of analysis and 0.94 for the period up 2007. This result is in line with what the free cash flow

theory suggests: in firms with a free cash flow problem, shareholders place a discounted value on the cash-holding. This result also matches the results of other researchers, such as Pinkowitz and Williamson (2005), Pinkowitz et al. (2006), Faulkender and Wang (2006), Dittmar and Mahrt-Smith (2007), Denis and Sibilkov (2010) and Drobetz at el. (2010) who found this coefficient to be less than 1.00. This indicates that investors place a discounted value on each JD invested in cash when the firm has an agency problem and a free cash flow problem, or when investors have weak protection. The results also show that, with a higher level of leverage, the marginal value of each JD invested in cash is declining. With a significant negative coefficient of –1.19, the variable that measures this relationship confirms our earlier expectation: with a higher level of leverage, the increase in the cash level will benefit the debt-holders since it will increase the likelihood of them being paid back. It will also make the firm less risky and, since shareholders prefer riskier firms (the shareholders' stake is considered as a call option on the firm assets) they will place a lower value on each additional pound invested in cash. Other researchers, such as Faulkender and Wang (2006), Dittmar and Mahrt-Smith (2007), Tong (2011) and others, also found this relationship to be negative.

Finally, the results from our preferred model showed a positive significant relationship between a higher cash level and the marginal value of the extra pound invested in cash; this can be explained by the current financial crisis, as higher levels of cash have become more appreciated since the financial crisis, and has made it more difficult for firms to obtain the funding they need from external sources of financing. Finally, the results did not show any significant effect of cash dividends on the firm value. That might suggest that investors in the Jordanian capital market do not regard cash dividends as sufficient to offset the agency problem or the free cash flow problem. Another possibility is that using stock repurchasing rather that cash dividends might contribute more to the firm value compared to cash dividends, as Faulkender and Wang (2006) and Haw et al. (2011) suggest. It also implies that shareholders do not expect firms to attempt to maintain their dividend over time, and therefore do not regard the dividend payment as an ongoing commitment by firms to distribute their free cash flow to shareholders.

The results of this chapter provide us with both theoretical and practical implications; it is important to study and include a way to reflect the market condition as well as the firm's characteristics, as the market condition such as the recent financial crisis appears to have a

significant effect on the results regarding cash holding. Studying the effect of the recent financial crisis in our model showed that a higher level of cash is becoming more appreciated even with the existence of free cash flow problems, agency problems, weak investor protection, and a poor corporate governance system. It also affects the coefficient of the cash value, by reducing the value of that coefficient due to the way it has been used to measure that coefficient, since both the value and the return on firm's stocks fall as a result of the financial crisis. Practical implications on the other hand, will be as a guide for financial managers in countries and firms that have free cash problems, agency problems, weak investor protection, poor corporate governance, or more than one of the previous issues. When the firm faces any of the previous issues it should not hold a large amount of cash; this cash will be evaluated at a discount to face value by shareholders, hence reducing the overall value of firm. If the firm faces any of those issues need to keep a higher level of cash for any reason, then the firm's managers should take serious actions to reduce any free cash problem or agency problem or corporate governance issue. This can be done by enhancing the corporate governance system, giving investors more protection and rights, and providing shareholders with sufficient reward on their investments by creating a good and fair dividends policy which will help to reduce any potential free cash flow problem.

Chapter 4: How the cash-holding decisions affect the capital structure: Amman stock exchange

4.1. Introduction

In the previous two chapters we investigated two issues in regard to corporate cash-holding decisions. The first issue was about the determinants of cash-holding based on the firm's characteristics. We examined how firm's size, cash flow, growth opportunities, profitability, leverage, cash dividend, and liquid assets substitute can affect the decision on corporate cash-holding. The results showed that corporate cash-holding has a positive relationship with profitability and cash dividends, but a negative relationship with firm's cash flow, leverage, and liquid assets substitute; there is no significant relationship between corporate cash-holding and firm's size and growth opportunities.

The second issue we investigated was the value associated with cash-holding, in other words, how cash-holding contributed to the firm value. Using a model developed by Faulkender and Wang (2006) and after controlling for other firm characteristics, we found that each 1 Jordanian Dinar (JD) held in cash is valued at only 0.41 JD by Jordanian investors.

In this chapter we will investigate another issue related to cash-holding: how the level of cash-holding affects or contributes to the firm's capital structure decisions.

Capital structure determinants became an increasingly important topic of research after the seminal paper by Modigliani and Miller (1958) who suggested that, in a perfect market with no taxes, the value of the firm and its weighted average cost of capital are independent of its capital structure decisions. A few years later in 1963, in their other seminal paper, Modigliani and Miller (1963) relaxed the assumption of a perfect market and introduced the effect of taxes to examine the effect of capital structure on the firm value and its weighted average cost of capital. They found that, in a world of taxes, the value of the firm will increase as the portion of debt increases since tax expenses will reduce the taxable income; therefore, the amount of taxes paid to the government will be reduced, and the value of the firm will increase because of the tax shield. Since then, many researchers have investigated the determinants of firm capital structure to understand the reasons behind this finding.

Different researchers have used different samples in different time periods, some in developed countries, and others in developing countries. Some of those researchers included a few variables to understand the capital structure decisions, such as firm's size, growth opportunities, profitability, and assets tangibility. Others included more variables such as liquidity, availability of any non-debt tax, ownership structure, business uniqueness, business risk, firm's age, tax systems, corporate governance practices, exposure to capital markets, the level of investor protection, the borrower-lender relationship, and dividend.

Two principal theories that have been proposed to explain how the firm's characteristics affect the capital structure decisions are the Trade-off theory and the Pecking Order theory. The Trade-off theory is concerned with the trade-off between the benefits of having debt in a firm's capital structure, such as the tax-saving benefits, and the cost associated with this debt, such as bankruptcy cost. The Trade-off theory explains how different firm characteristics affect the firm's capital structure, as follows. Firm's size has a positive relationship with capital structure since larger firms are more able to diversify compared to smaller firms, which will reduce the chance of bankruptcy and allow the firm to have a higher level of debt. Another reason for this positive relationship is that larger firms can obtain cheaper debt compared to smaller firms; therefore, larger firms are able to have more debt in their capital structure.

Growth opportunities, according to the Trade-off theory, have a negative relationship with debt level, and this can be explained by the agency cost associated with the growth; as the firm grows it tends to accept riskier projects which will carry more risks for the debt-holders, but to the benefit of the shareholders. Profitability has a positive relationship with the debt ratio for three reasons; firstly, when the firm is more profitable it has to pay more taxes associated with higher taxable income, so having more debt will reduce the amount of taxable income and enable the firm to pay less tax. Secondly, more profitable firms are less likely to experience bankruptcy (or to face the possibility of bankruptcy), which allows those profitable firms to obtain higher levels of debt. Thirdly, profitable firms are more likely to have a free cash flow problem; increasing the level of debt in those profitable firms will help to significantly reduce the free cash flow problem since, with more debt in the firm's capital structure, the managers will be under more monitoring and control from the debt-holders. A related argument, but one which does not rely on the tax advantage of debt, is that firms use

debt to signal their underlying profitability to outside investors, since only those firms with good underlying profitability will be confident that they will be able to pay back the debt. This signalling argument also implies that more profitable firms will issue more debt.

The non-debt tax shield, according to the Trade-off theory, has a negative relationship with the debt ratio; this negative relationship can be explained by the notion that the non-debt tax shield such as depreciation expenses can be considered a substitute for the interest expenses to reduce the taxable income of the firm. Furthermore, this non-debt tax shield is independent of the firm's financing decisions, as some non-debt tax shields such as depreciation expenses are generated from the firm's existing assets or investment. Liquidity has a positive relationship with the debt ratio, as the Trade-off theory suggests; with more liquidity available, the firm will be able to obtain more debt as the higher amount of liquidity will help the firm to repay and service the debt when any of the financial obligations related to that debt are due. Assets tangibility is expected to have a positive relationship with debt ratio according to the Trade-off theory; if tangible assets are available inside the firm they will be considered as collateral for the debt-holders, thus reducing the financial distress costs. Assets tangibility also contributed by reducing the conflict between debt-holders and shareholders.

On the other hand, the Pecking Order theory provides different explanations of how the different firm characteristics will affect the firm's capital structure decisions. The Pecking Order theory is concerned with the order in which the firm will consider the alternative sources of finance, and this order is itself determined by the cost and availability of these sources of finance; this theory suggests that the firm will follow a specific order to finance itself, starting with the cheapest available source. The firm will depend first on its internal funds, using the retained earnings; then it will use the external sources of financing starting with debt-financing, as this source has a tax benefit, before finally using equity-financing as this is the most expensive source as it is associated with the greatest degree of asymmetric information. The relationship between the debt ratio and the firm's characteristics can be explained as follows. Firm size has a negative relationship with the debt ratio because, as the Pecking Order theory suggests, larger firms have less asymmetric information between the firm's managers and the outside investors, thus making equity-financing relatively more preferable for those investors.

Growth opportunities have a positive relationship with the debt ratio since, with growth, firms will need more funds to finance this growth, and the internal funds might not be sufficient to finance all the growth needs; furthermore, the growing firm has a higher level of asymmetric information which will make equity-financing more difficult and more expensive. Pecking Order theory suggests that profitability has a negative relationship with debt ratio since profitable firms will be able to depend on their internal funds which they have accumulated as returned earnings, and will therefore be less dependent on external finance. Liquidity, according to Pecking Order theory, has a negative relationship with the debt ratio as the available liquidity inside the firm provides a cheaper internal source to finance the firm's investment and growth needs. Tangibility has a negative relationship with debt ratio as, the more tangible assets that are available, the more they will help to reduce the asymmetric information between the outsider investors and the firm's managers, which will cause the investors to prefer equity-financing. Table 4.1 summarises the expected effect of the firms' characteristics on the debt ratio.

On the basis of the Trade-off theory, the Pecking Order theory and empirical research, we will investigate the determinants of capital structure in Jordanian corporate firms by focusing on the liquidity variable. Jordanian firms hold low levels of debt in their capital structures; the ratio of the total debt to total assets for the research sample is between 27% and 35%.[14] About one third of this total is long-term debt, which means that Jordanian firms depend on short-term debt more than long-term debt in their debt structure. Omet and Mashharawe (2002) reported this issue when they investigated the determinants of capital structure in four Arabian countries including Jordan; they found that the mean debt ratio in Jordan is 37.7% compared to the 58%, 69%, 73% and 54% debt ratios in the US, Japan, Germany and the UK respectively, as reported by Rajan and Zingales (1995). Zeitun and Tian (2008) also reported a low long-term debt ratio in Jordanian firms with an average value of 6.3% during the period from 1989 to 2003 compared to a higher long-term debt ratio in some developed countries such as 55% in Germany and 67% in the US; it is also lower than the long-term debt ratio in Thailand, Taiwan and Malaysia of about 30%, as reported by Claessens et al. (1998, cited by Zeitun and Tian, 2008). Al-Shubiri (2010) reported a total debt ratio of 31.6% for the period from 2004 to 2007 in Jordan. This confirms that the market for long-term debt is not well

[14] See Table 4.2 for more details.

established in Jordan, which means that firms have to be more reliant on shorter term bank based finance.

As firms in Jordan are more focused on short-term debt, available liquidity is a very important factor in meeting financial obligations when they are due. Not all researchers included liquidity as a variable to explain the capital structure decisions; in this chapter we will investigate the effect of liquidity on capital structure decisions in Jordanian firms. Liquidity in the capital structure literature is usually measured by the net working capital ratio (current assets minus current liabilities to total assets). In this chapter we will take the analysis a step further by decomposing the liquidity variable into its two components: liquidity from cash assets and liquidity from non-cash assets. Then we will determine whether there is any effect of cash-holding on the firm's capital structure and, if so, how this manifests itself. Ozkan (2001) suggested that the liquidity ratio has a mixed effect on the capital structure of the firm. In one explanation he suggested that, with more liquidity available in the firm's hands, the firm can borrow more funds as it will be able to support a higher ratio of debt by meeting the short-term financial obligations. In the second explanation he suggested that, with more liquidity available in the firm's hands, the firm does not need to borrow funds since it can use its internal funds to finance its needs and investments.

The aims of this chapter are as follows: First, it seeks to understand which factors affect the firm's capital structure in a developing country such as Jordan and how those factors affect the capital structure decisions; second, it will also focus on the liquidity variable and examine how it affects the capital structure; third, it will examine cash liquidity as a special type of liquidity and how it affects the firm's capital structure decision.

Table 4.1

Summary of the expected effect of the firm's characteristics on debt ratio

	Expected Sign	Reasons
Firm's size	+ Trade off theory	• Higher ability to diversify; less chance for bankruptcy. • Higher ability to access debt market at cheaper costs.
	– Pecking order theory	• Less asymmetric information; equity financing is more preferable.
Growth opportunities	– Trade off theory	• Higher agency cost.
	+ Pecking order theory	• Need for extra financing with asymmetric information; equity financing is less preferable.
Profitability	+ Trade off theory	• Help to reduce the taxable income. • Profitable firms are less likely to face bankruptcy. • Help to reduce the free cash flow problem.
	– Pecking order theory	• Depend on the internal cheaper source of financing.
Non-debt tax shield	– Trade off theory	• Help to reduce the taxable income.
	+ Trade off theory	• Can be considered as more fixed assets available to help secure the debt as collaterals.
Liquidity	+ Trade off theory	• Help to repay and serve the debt.
	– Pecking order theory	• Provide cheaper internal sources of financing.
Tangibility	+ Trade off theory	• Available collaterals for debt holders. • Reduces the conflict between debt holders and share holders.
	– Pecking order theory	• Reduce the asymmetric information; equity financing is more preferable.

Source: Financial theories and literature.

4.2. Literature reviewed

Myers (1977) argued that a firm's growth has a negative effect on corporate borrowing, mentioning that "the value of a growth option vanishes or declines if it is not exercised by the firm", for two reasons: firstly, the growth might be firm-specific and will have no value for other firms; secondly, the liquidation value of the growth options is less than the actual value, thus making growth options less preferred as secure sources for debt, especially if they are not exercised at the right time.

Titman and Wessels (1988) investigated the effects of a group of explanatory variables, including collator value of the firm's assets, non-debt tax shield, growth, uniqueness, industry classification, and firm's size, volatility and profitability, on the short-term, long-term and convertible debt. They used a sample of 469 firms for the period from 1974 to 1982. They found that the firm's business uniqueness has a negative relationship with the debt level, firm's size has a negative relationship with short-term debt, past profitability has a negative relationship with current debt level, short-term debt has a negative relationship with growth, and there is no relationship between debt level and non-debt tax shields, volatility or collateral value.

Chittenden et al. (1996) investigated the financial structure of 3,480 small firms in the UK during the period from 1989 to 1993 using an Ordinary Least Squares regression (OLS regression). They investigated the firm's size, growth rate, profitability, assets structure, age, and access to stock markets. They found that total and short-term debt has a negative relationship with firm's size, long-term debt has a positive relationship with firm's size, profitability has a negative relationship with debt ratios, short-term debt has a negative relationship with assets structure, long-term debt has a positive relationship with assets structure, debt ratios have a negative relationship with firm's age, access to capital market has a positive relationship with debt ratios, and there is no significant relationship between debt ratios and growth.

Ozkan (2001) investigated the determinants of capital structure and the empirical determinants of target capital structure of firms by using several variables including firm's size, growth opportunities, profitability, non-debt tax shields and liquidity. Based on a sample of 390 UK firms for the period from 1984 to 1996, he applied a dynamic model by using a Generalised Method of Moments (GMM model). He found that profitability, liquidity and growth opportunities have a negative effect on the capital structure. Also, there is an inverse relationship between non-debt tax shields and borrowing ratio. Finally, there is limited support for a positive effect arising from the size of firms.

Booth et al. (2001) investigated capital structure in 10 developing countries: India, Pakistan, Thailand, Malaysia, Turkey, Zimbabwe, Mexico, Brazil, Jordan, and Korea. The data were collected from the International Finance Corporation (IFC) for the period from 1980 to 1990, with 772 firms (India 99, Pakistan 96, Thailand 64, Malaysia 96, Turkey 45, Zimbabwe 48,

Mexico 99, Brazil 99, Jordan 38, and Korea 93). By using pooling and fixed-effect models, they found that the variables that explain the capital structure in developed countries such as the European countries and the US are also relevant to explain the capital structure in developing countries, with some small differences related to different aspects in different countries, such as; different institutional factors, the tax rate and business risk. They also found that, regardless of how the debt ratio is measured, the relationship between the debt ratio and profitability is negative, consistent with Pecking Order theory.

Omet and Mashharawe (2002) investigated the capital structure determinants in four Arabian countries: Jordan, Kuwait, Oman and Saudi Arabia. This investigation covers the period from 1996 to 2001 and included 51 Jordanian companies, 30 Kuwaiti companies, 38 Omani companies and 29 Saudi Arabian companies. Capital structure has been measured in two different ways: as total debt to total assets and as long-term debt to total assets; they used an Ordinary Least Squares regression, fixed-effect model, and random effect model. Their results showed that, firstly, for Jordanian companies the total debt ratio has a significant positive relationship with firm's size and growth opportunities and it has a significant negative relationship with firm's profitability and liquidity. For the long-term debt ratio there is a significant positive relationship with firm's size and tangibility, and a significant negative relationship with firm's growth opportunities, profitability and liquidity. Secondly, for Kuwaiti companies the total debt ratio has a significant positive relationship with firm's size and growth opportunities, and a significant negative relationship with firm's profitability and liquidity. For the long-term debt ratio there is a significant positive relationship with tangibility and growth opportunities and a significant negative relationship with firm's profitability and liquidity. Thirdly, for Omani companies the total debt ratio has a significant positive relationship with firm's size and growth opportunities and a significant negative relationship with firm's profitability and liquidity. For the long-term debt ratio there is a significant positive relationship with growth opportunities and tangibility, and a significant negative relationship with firm's liquidity. Fourthly, for Saudi companies the total debt ratio has a significant positive relationship with firm's size and a significant negative relationship with firm's tangibility, profitability and liquidity. For the long-term debt ratio there is a significant positive relationship with firm's size, and a significant negative relationship with firm's growth tangibility, profitability and liquidity. They also found that, for these countries, the capital structure decisions did not reflect the tax benefit advantage of the long-term debt financing, as they found that Jordanian companies that are subject to the highest tax rate of

35%, compared to the 10% tax rate in Oman and zero taxes in both Kuwait and Saudi Arabia, do not hold significantly higher debts than other countries in their sample.

Bevan and Danbolt (2002) investigated the determinants of capital structure in the UK by studying 822 firms in 1991 using a cross-sectional analysis. They found that growth is positively related to total and short-term debt but not significantly related to long-term debt, size is positively related to total and long-term debt but not significantly related to short-term debt, profitability is negatively related to debt ratios, and tangibility is negatively related to total and short-term debt but positively related to long-term debt.

Frank and Goyal (2003) used data from non-financial U.S. firms for the period from 1950 to 2000 to examine the relative importance of 39 variables for leverage decisions using stepwise regressions[15]; they found that the Trade-off theory and the stakeholder co-investment theory provide better descriptions of the data compared to the Pecking Order and market timing theories. They also found that some variables have a more reliable effect on the leverage decisions than others; for example, median industry leverage, firm's size, intangibles, and collateral have a positive effect on leverage decisions, while bankruptcy risk, dividend payments, and market-to-book ratio have a negative effect on leverage decisions. The others have a less reliable effect, and they found that change in total corporate assets, corporate income tax rate, and Treasury bill rate have a positive effect, while variance of the firm's stock returns, net operating loss carry-forwards, financial constraints, and profitability have a negative effect on leverage decisions.

Chen (2004) investigated the determinants of capital structure using a sample of 88 Chinese firms for the period from 1995 to 2000. She examined how several firm characteristics including firm's size, growth opportunities, profitability, tax shields effects, cost of financial distress, and assets structure affect the firm's capital structure using both overall leverage and long-term leverage by using a pooled ordinary least squares regression, fixed-effect model, and random effect model. She found that firm's size and profitability have negative

[15] Stepwise regressions: this is a process of creating or building a model by adding or removing variables to the model based on their t-statistics; this process can be done either forwards or backwards. The backward process is done by starting with all possible explanatory variables, and then removing one variable at the time; it will then report the square value of t-statistic for each variable still in the model and call it (F-to-remove) and the square value of t-statistic for each variable not in the model and call it (F-to-enter). After that, the model should include all the variables with the highest (F-to-enter) or remove all the variables with the lowest (F-to-remove). The forward process has the same methodology but rather than starting with all the possible explanatory variables, we will start with no variables and add one at a time.

relationships with the firm's capital structure, while assets tangibility and growth opportunities have positive relationships with the firm's capital structure.

Hall et al. (2004) investigated the determinants of the capital structures of European small and medium-sized firms using a sample from Belgium, Germany, Spain, Ireland, Italy, Netherlands, Portugal, and the UK for the year 1995. They examined how some firm characteristics including firm's size, growth opportunities, profitability, age, and assets structure affect the firm's short- and long-term debt ratio by applying a cross-sectional regression. For the short-term debt ratio they found that only firm's size and assets structure have a positive effect on debt ratio. On the other hand, for the long-term debt ratio they found that profitability, age, firm's size and assets structure have a negative effect on debt ratio, while the opportunities have a positive effect on the firm's debt ratio.

Bevan and Danbolt (2004) investigated the determinants of capital structure of 1,054 firms for the period from 1991 to 1997 using different forms of debt ratio, including total liabilities, total long-term debt, long-term bank borrowing, long-term securitised debt, total current liabilities, total trade credit and equivalent, short-term bank borrowing, and short-term securitised debt. They included the firm's size, growth opportunities, profitability, and assets tangibility in their analysis and used a pooled ordinary least squares regression and fixed-effect model. They found that firm's size has a positive relationship with debt level, and profitability has a negative relationship with all forms of debt except for short-term bank debt, where the relationship becomes positive. Tangibility has a positive relationship with long-term debt and short-term bank borrowing, but it is insignificant for other forms of debt. They found that growth opportunities are negatively related to short-term bank borrowing.

Low and Chen (2004) investigated the effect of diversifications as product and international diversifications on the firm's capital structure. Using a sample from 30 countries, including 232 firms, and ordinary least squares regression, they found that there is a significant negative relationship between international diversification and capital structure, but when they applied a further analysis they found that this significant negative relationship is only related to US firms and it becomes insignificant for non-US firms. For the product diversification, their results showed that there is a significant positive relationship between product diversification and capital structure since, with product diversification, the firm's risk will be reduced, thus allowing the firm to obtain a higher level of debt. As other variables in their model they

include measurements for liquidity, growth opportunities, financial performance, firm's size, industrial effects, and country effects. The results showed that there is a significant negative relationship between capital structure from one side and liquidity and financial performance (except US firms) from the other side; there is also a significant positive relationship between capital structure and firm's size and with growth opportunities for non-US firms only.

Gaud et al. (2005), employing data from 104 Swiss firms for the period from 1991 to 2000 and using Generalised Method of Moments (GMM model), investigated the determinants of capital structure. By examining variables including firm's size, growth opportunities, profitability, tangibles, and financial distress costs, they found that leverage has a positive relationship with the firm's size and assets tangibility, and a negative relationship with growth and profitability. Those results support both Pecking Order theory and Trade-off theory.

Abdullah (2005) investigated the determinants of capital structure using a sample of listed firms in Saudi Arabia. His sample included 56 listed firms for the period from 1995 to 2000. He examined how the firm's size, growth opportunities, profitability, liquidity, age, and assets structure will affect the capital structure of the firm, including the effect on total debt, long-term debt, and short-term debt, using an ordinary least squares regression. He found that, for total debt, there is a significant and positive relationship between growth opportunity and total debt, and a significant and negative relationship between total debt and both liquidity and assets structure. He found that long-term debt is significantly and positively related to firm's size and growth opportunities, and it is significantly and negatively related to assets structure. Finally, he found that short-term debt is significantly and negatively related to firm's size and growth opportunities only.

Song (2005) investigated the determinants of capital structure for about 6,000 Swedish firms from 1992 to 2000. He investigated the effect of firm's size, growth, profitability, tangibility, non-debt tax shield, uniqueness, and income variability on debt ratios including total debt, long-term debt and short-term debt ratios by using a fixed-effect model. He found that firm's size has a positive relationship with total and short-term debt ratios but a negative relationship with long-term debt ratio, growth and uniqueness; income variability has no relationship with capital structure, profitability is negatively related to debt ratios, tangibility has a positive relationship with total and long-term debt ratios and a negative relationship with short-term

debt ratio, and non-debt tax shields are positively related to short-term debt and negatively related to long-term debt.

Sayilgan et al. (2006) tested the impact of a firm's characteristics on its capital structure decisions. They used a sample of 123 Turkish manufacturing firms that had been listed on the Istanbul Stock Exchange for ten years from 1993 to 2002. They analyzed the effect of firm's size, profitability, growth opportunities in plant, property and equipment, growth opportunities in the firm's total assets, non-debt tax shields and tangibility using a fixed-effect model. They found that capital structure is positively related to firm's size and growth opportunities (in the firm's total assets), while it is negatively related to profitability and growth opportunities (in the firm's plant, property and equipment), non-debt tax shields and tangibility.

Qian et al. (2007) used data from 650 publicly listed Chinese companies for the period from 1999 to 2004 to examine the capital structure determinants. By examining the firm characteristics including firm's size, profitability, tangibility, non-debt tax shield, growth opportunities, volatility, and non-circulating share ratio using an ordinary least squares regression, fixed-effect model and random effect model, they found that firm's capital structure is positively related to firm's size, tangibility and ownership structure, while it is negatively related to profitability, non-debt tax shields, growth and volatility. Then they used a generalized method of moments model (GMM model) to study the adjustment process of the determinants of capital structure; they found this process to be very slow and the lagged profitability has a negligibly small and positive effect on the firm's capital structure.

Antoniou et al. (2008) investigated the determinants of firms' leverage in two different types of economies: market-oriented economies and bank-oriented economies. Using a sample from the UK and the US as a market-oriented economy and a sample from France, Germany, and Japan as a bank-oriented economy for the period from 1987 to 2000, and employing a generalized method of moments model (GMM model) they found that, in both economies, there is a positive relationship between leverage and the firm's size and tangibility, but there is a negative relationship between leverage and growth opportunities, profitability, and share price performance. They also found that firm's leverage is affected by the type of economic environment, tax systems, corporate governance practices, exposure to capital markets, the level of investor protection, and the borrower-lender relationship.

Cheng and Green (2008) analyzed how the tax policy affects the firm's leverage ratio; they used a balanced panel analysis on 129 medium-sized European firms during the period from 1993 to 2005 using a generalized method of moments model (GMM model). As control variables they used assets tangibility, assets intangibility, growth opportunities, firm's size, firm's risk, profitability, liquidity, dividend dummy, industrial classification, and term spread. For their dependent variables they used total debt, long-term debt, and short-term debt. The result for the tax effect shows that the impact of tax is significant but small. On the other hand, the results for the control variables are as follows. Assets tangibility shows a significant negative coefficient with debt ratio. Assets intangibility shows an unexpected positive relationship except with short-term debt; the authors explained this unexpected positive sign by stating that those intangible assets might be seen as growth opportunities. Growth opportunities have a significant and positive effect on debt ratio except for the short-term debt, while profitability has a significant negative effect on all forms of debt ratio. Liquidity has a significant negative effect on total and short-term debt while it has a significant positive effect on long-term debt. Firm's size has a positive and significant effect on all forms of debt. Firm's risk (volatility) has a negative effect on debt ratio, while the dividend dummy shows a significant positive effect on all forms of debt ratio. The industrial dummy shows a significant effect on debt ratio, being positive on short-term debt and negative on long-term debt. Term spread has a negative sign for both short- and long-term debt but the magnitudes were different. Finally, their results suggested that there is a difference between the determinants of short- and long-term debt.

Daskalakis and Psillaki (2008) investigated the determinants of firms' capital structure by using a sample of European small and medium-sized enterprises (SMEs) in France and Greece for the period from 1998 to 2002 employing a fixed-effect model. They attempted to examine whether the capital structure in those countries was driven by the same factors as in other countries, whether any differences are related to firm-specific or country-specific factors, and whether the structure and the size of the financial market played any role in explaining any cross-country difference in the capital structure. By applying a panel data analysis using asset structure, firm's size, profitability and growth rate, they found that there is a similarity in the capital structure in both countries, there is a significant positive relationship between leverage and firm's size in both countries, the relationship between leverage and both assets structure and profitability is significantly negative, and the growth

rate is only significant in France, with a positive relationship with leverage. They explained that the similarity in the results is due to the similarity in the institutional characteristics, specifically to the commonality of the civil law systems in both countries. They also found some differences in the intensity of the capital structure which are due to firm-specific rather than country-specific factors.

Serrasqueiro and Macas Nunes (2008) used data from 39 Portuguese firms for the period from 1998 to 2004 to find the determinants of the capital structure in Portuguese firms. They included firm's size, growth opportunities, assets tangibility, profitability, non-debt tax shield, and the level of risk employing an ordinary least squares regression, fixed-effect model, and random effect model; then they used a generalized method of moments model (GMM model) for their dynamic model. They found that capital structure has a positive relationship with firm's size and non-debt tax shield, and a negative relationship with profitability; they found that capital structure has no significant relationship with assets tangibility, growth opportunities and level of risk.

Westgaard et al. (2008) investigated the determinants of the capital structure for real-estate companies in the UK. Using a generalized method of moments model (GMM model) and a sample of 308 firms during the time period from 1998 to 2006, they investigated the effect of profitability, tangibility, non-debt tax shield, assets turnover, size, earning variability and expected growth. They found that profitability, tangibility and firm's size have a positive relationship with leverage, while asset turnover and earnings variability have a negative relationship with leverage.

Zeitun and Tian (2008) investigated the determinants of capital structure using a sample of 167 Jordanian firms during the period from 1989 to 2003 and employing an ordinary least squares regression, fixed-effect model, and random effect model. They used a group of variables to determine what drives the decision on capital structure including tangibility, profitability, firm's size, growth opportunities, non-debt tax shield, liquidity, earnings volatility, share price or market performance, stock market development, regional crises and uniqueness. They found that Jordanian firms depend mostly on short-term debt. They also found that firm's size, tangibility, and earnings volatility are positively related to capital structure, while capital structure is negatively correlated to profitability, the level of growth opportunities, liquidity and stock market activities. Short-term debt is negatively related to

tangibility. The 1990-1991 Gulf crisis had a significantly positive effect on corporate leverage in Jordan. Capital structure decisions associated with inadequate long-term debt are strongly driven by factors such as stock market activity.

Balboa et al. (2009) investigated the determinants of capital structure on venture capital firms in Spain. They included 166 venture capital firms and 166 non-venture capital firms as a control group during the period between 1994 and 2003. They focused on the following variables in order to understand the capital structure determinants of venture capital firms: firm's size, growth opportunities, profitability, assets tangibility, volatility and tax reduction. Using a fixed-effect model, they showed that firm's size, growth opportunities and assets tangibility are positively related to capital structure, while profitability is negatively related to capital structure. Their results support the view of the Pecking Order theory.

Psillaki and Daskalakis (2009) investigated the determinants of firms' capital structure using a fixed effect model on a sample of 320 Italian, 52 Portuguese, 1,252 Greek, and 2006 French SMEs for the period from 1998 to 2002. By comparing the capital structure of the firms in their sample based on the firm's characteristics, including asset structure, size, profitability, risk and growth, they found that the commonality of these countries' civil law systems and the similarities in these countries' financial and institutional characteristics cause them to determine their capital structures in the same way. On the other hand, firm-specific effects are the reason for capital structure differences. They found that leverage is positively related to the firm's size, while it is negatively related to asset structure, profitability and risk; their result showed that growth is not a significant determinant of the firm's capital structure.

Ramlall (2009) analyzed the determinants of capital structure for the period from 2005 to 2006 for about 450 non-listed non-financial firms in Mauritius by examining the effect of growth, firm's size, tangibility of assets, profitability, liquidity, non-debt tax shield, age of the company and investment on capital structure in the form of liabilities, debt and leases including both short- and long-term forms. Using an ordinary least squares model he found that liquidity and firm's size have a negative effect on firm's capital structure, assets' tangibility has a positive effect on firm's capital structure, and profitability, non-debt tax shield and growth have no significant effect on a firm's capital structure. Investment has mixed effects: it has a positive effect on leases but is negatively related to loans.

Al-Shubiri (2010) used an ordinary least squares model to examine the determinants of capital structure by using the following variables: firm's size, growth rate, asset tangibility, liquidity, firm's age, business risk, earnings rate (ROA), and non-tax shield. Based on a sample of 59 Jordanian firms for the period from 2004 to 2007, he found that capital structure is significantly positively related to size, asset tangibility, growth rate and non-tax shield; it is significantly related to earnings rate (ROA), but there is no significant relationship between capital structure and liquidity and firm's age.

Arifin (2010) investigated the effect of ownership structure on a firm's capital structure by using a sample of 333 publicly listed non-financial firms on the Jakarta Stock Exchange for the period from 2001 to 2003. Using an ordinary least squares model, he examined the effect of institutional ownership, managerial ownership, assets structure and assets growth, finding that managerial ownership and assets structure have a positive effect on capital structure, while institutional ownership and assets growth have a negative effect on capital structure.

Belin et al. (2010) used a generalized method of moments model (GMM model) to investigate the effect of research and development on capital structure besides the other variables that affect the capital structure of the firm, such as profitability with a negative relationship and collaterals with a positive relationship. Based on a sample of 15,941 observations of French firms for the period from 1994 to 2004, they found that the relationship between the research and development-to-sales ratio and bank debt is negative. They explain that this negative relationship is due to the use of research and development in basic research activities and in internal research and development. They also found that the bank debt ratio is positively related to the past realization.

Daskalakis and Thanou (2010) used data on 1,018 Greek SMEs (120 micro firms with less than 9 employees, 642 small firms with a total staff of between 10 and 49, and 256 medium-sized firms with total numbers of employees ranging from 50 to 249). They investigated whether the determinants of capital structure will be different for firms in different groups according to their firm size. Using a panel data analysis on their sample and applying a pooled Generalized Least Squares model, they found that the factors that affect a firm's capital structure, which are profitability, growth and assets structure, are not affected by the differing sizes of the groups. All groups have the same relationship with the factors affecting the capital structure. Profitability and assets structure have a significant negative relationship with the

debt ratio in all groups - micro, small, medium, and full sample - while growth has a significant positive relationship with the debt ratio in all groups.

Al-Najjar (2011) investigated the determinants of a firm's leverage using several variables including dividends, institutional ownership, profitability, business risk, asset structure, asset liquidity, growth opportunities and firm's size. Using an ordinary least squares regression, fixed-effect model, and random effect model on a sample of 110 firms for the period from 1999 to 2003, he found that there is a significant negative relationship between leverage and profitability, business risk and institutional ownership, and there is a positive relationship between leverage and firm's size, market-to-book ratio, asset tangibility and liquidity, while there is no significant relationship between leverage and dividends.

Aybar-Arias et al. (2011) examined the determinants of capital structure using a sample of Spanish SMEs included in the SABI (Sistema de Ana´lisis de Balances Ibe´ricos) database during the period from 1995 to 2005. They investigated the effect of firm's size, growth opportunities, profitability, non-debt tax shields, business uniqueness, assets tangibility and default risk using a fixed-effect model, and then used a generalized method of moments model (GMM model) as a dynamic model. They found that there is a significant positive relationship between capital structure and firm's size and growth opportunity, and there is a negative relationship between capital structure and profitability, non-debt tax shields, assets tangibility, business uniqueness and default risk.

Balla and Mundaca (2011) investigated the determinants of capital structure using 4,178 observations of Hungarian manufacturing firms; they employed a generalized method of moments model (GMM model) for the period from 1992 to 2006 to examine the effect of the following variables: firm's size, growth opportunities, cash-holding, profitability, assets tangibility, foreign ownership, state ownership, and participation in export markets. They found that Hungarian firms have a higher ratio of short-term liabilities compared to long-term liabilities; this situation results in Hungarian firms facing difficulties in planning for long-term investments. To be able to access external funding it is important that the firm is large both in terms of size and as an exporter; if a smaller firm is a large exporter, it will still have difficulty in accessing external funding. It is necessary to have collateral assets to be able to obtain long-term debt. They found no evidence to show that when the firm becomes large it will be able to access long-term funding easily. They also found that the small firms used the

free cash-holding to reduce their long-term liabilities in order to obtain a good reputation, while the large firms used their free cash-holding to reduce their short-term liabilities in order to reduce the costs associated with those short-term liabilities. Firms with foreign ownership keep their liabilities unchanged even with they have free cash-holding.

Although other researchers investigated the capital determinants on a sample of Jordanian firms, such as Booth et al. (2001) Omet and Mashharawe (2002) and Al-Shubiri, (2010). The new contributions of this chapter are; it has included a much larger sample size, covered a long period of time, included a deeper analysis of the liquidity variable by studying the cash and the non-cash liquidity as well as the total liquidity, and most importantly it has investigated the speed of adjustment of the debt ratios by considering a GMM dynamic model.

4.2.1. Research Hypotheses

As the Trade-off theory suggested, larger firms are more able to diversify their investments which will reduce the firm's total risk as well as the bankruptcy risk; this enables larger firms to have more debt in their capital structure. Also, larger firms are more able to access debt markets at a cheaper cost of debt compared to smaller firms. Another issue is that larger firms will inspire more confidence in the lenders that their money is more likely to be repaid because of the collateral assets available inside the firm. Larger Jordanian firms are more likely to be able to obtain more debt financing from external sources as those firms have more collateral to satisfy the lenders.

H_1: Firm's size has a positive effect on the firm's capital structure.

As the Pecking Order theory suggested, larger firms have less asymmetric information between the firms' insiders (managers) and outsiders (investors); this means that equity-financing will be easier and preferable. As debt financing in Jordan is less preferable due to the Islamic rules that will make equity financing a more preferable option for Jordanian firms.

H_2: Firm's size has a negative effect on the firm's capital structure.

Growing firms have higher agency costs as these firms tend to accept riskier projects and investments which will carry more risk for the debt-holder for the benefit of the shareholders; the Trade-off theory expected that the relationship between growth opportunities and capital

structure will be negative. As equity financing is more preferable as a long term financing source in Jordan due to the religion issue, growing firms in Jordan will depend where possible on equity financing.

H_3: Growth opportunities have a negative effect on the firm's capital structure.

Pecking Order theory suggested that when firms are growing they need more funds to finance their growth; once they have used the internal funds available inside the firm they will borrow more funds as debt-financing will be the cheapest external source of funds. As firms in Jordan used all available sources of internal funds it will move to external sources although debt financing is less preferable in Jordan, firms might face a situation where it needs to use that source especially when it can raise more funds from equity financing.

H_4: Growth opportunities have a positive effect on the firm's capital structure.

The Trade-off theory expected the relationship between profitability and debt ratio to be positive for several reasons; more profitable firms are less likely to go bankrupt, which allows these more profitable firms to have higher levels of debt. With more profits, the firm has to pay more taxes as its taxable income will increase; having more debt in the firm's capital structure will help it to reduce the taxable income and it will thus pay fewer taxes. With more profits, the likelihood of the free cash flow problem will increase; increasing the debt level in the firm's capital structure will help to reduce the free cash flow problem since the firm's managers will be under more monitoring. Although debt financing is less preferable in Jordan, more profitable firms might use debt financing to get the advantage of tax saving associated with debt.

H_5: Profitability has a positive effect on the firm's capital structure.

Pecking Order theory suggested that more profitable firms will accumulate their profits as retained earnings for later use as the cheapest internal source of financing compared to other external sources of financing, including debt-financing. Since debt financing is less preferred in Jordan, more profitable firms will be more motivated to accumulate retained earnings to avoid the need for using debt.

H_6: Profitability has a negative effect on the firm's capital structure.

Trade-off theory provided two explanations for the effect of non-debt tax shields; non-debt tax shields such as depreciation expenses can be used as a substitute for interest expenses in

order to reduce the taxable income, which means that the relationship between debt ratio and the non-debt tax shields is expected to be negative, have more non-debt tax shields will help Jordan firms to reduce the amount of debt to keep align with Islamic rules on interest. On the other hand, a higher level of non-debt tax shields can be a sign of a higher level of fixed assets, which means more collateral for the lender; in other words, there is a positive relationship between debt ratio and non-debt tax shields.

H_7: Non-debt tax shields have a negative effect on the firm's capital structure.

H_8: Non-debt tax shields have a positive effect on the firm's capital structure.

According to the Trade-off theory, liquidity has a positive relationship with the debt ratio as this liquidity can be used to service the debt and its interest when it becomes due. Jordanian firms which decide to use debt financing will find that available liquidity is very useful to support the debt and meet the financial obligations when it becomes due.

H_9: Liquidity has a positive effect on the firm's capital structure.

Pecking Order theory, on the other hand, has a different explanation for the relationship between debt ratio and liquidity; Pecking order theory suggests that when the firm has more liquidity it can use this liquidity as an internal cheaper source of financing, which means that liquidity has a negative relationship with debt ratio according to Pecking Order theory. Jordanian firms which avoid using debt financing that carry interest expenses will find more liquidity more appreciated as this liquidity will provide a good source for financing which will reduce their dependency on debt financing.

H_{10}: Liquidity has a negative effect on the firm's capital structure.

Assets tangibility has a positive relationship with debt ratio, as the Trade-off theory suggested; by providing collateral for the debt, firms with more tangible assets can afford to have a higher level of debt, while tangible assets can also contribute by reducing the conflict between debt-holders and shareholders.

H_{11}: Assets tangibility has a positive effect on firm's capital structure.

Pecking Order theory, on the other hand, suggested that, with more tangible assets inside the firm, the asymmetric information between the investors and the managers will be reduced, which makes equity financing preferable. As tangible assets reduce the asymmetric

information, Jordanian firms will be more able to obtain more external funds from equity financing rather than debt financing.

H_{12}: Assets tangibility has a negative effect on firm's capital structure.

Long-term and short-term debts have different time maturities, which might result in different effects of the firm's characteristics on long- and short-term debt.

H_{13}: The effects of the firm's characteristics on the long-term debt ratio are different from the effects on the short-term debt.

4.3. Data and Methodology

4.3.1. Research Sample

The sample will include all firms listed in the Amman stock exchange for the period from 2000 to 2011 based on annual data for the firms; all financial firms will be excluded from the sample along with new firms and any firm that does not have a full set of observations for the study period. Out of 247 firms listed at the end of the financial year 2011, there are 109 financial firms and 58 new firms or firms undergoing liquidation, which means that the final number of firms included in the research sample is 80.

4.3.2. Research Variables

The literature on capital structure determinants provides us with many variables that determine the firm's capital structure. Some of those variables are common to all research such as firm's size, growth opportunities, tangibility, non-debt tax shield and profitability. While some researchers use other variables to determine the firm's capital structure, such as business uniqueness, we did not include this variable in our analysis since the sample for this research contains many sub-industries, and many of these sub-industries contain only 2 or 3 firms. In this chapter we will use a model that includes the variables used most frequently to determine the firm's capital structure and we will include liquidity as an explanatory variable beside the most frequently-used variables.

The dependent variable for this research will be the debt ratio (DEBT), and we will use different forms of debt ratio: (1) total debt ratio, calculated as total debt to total assets; (2)

long-term debt, calculated as long-term debt to total assets; (3) short-term debt, calculated as short-term debt to total assets.

The independent variables for this research will be as follows:

Firm's size (SIZE) will be calculated as the natural logarithm of the total assets at the book value of each firm. It is expected that firm's size will have a positive relationship with debt ratio; larger firms are more able to access external sources of funds as debt sources, and are more able to diversify their investments and assets, meaning they are less likely to go bankrupt. Furthermore, more assets can be used as collateral for debt, which allows the firm to have more debt when it becomes larger.

Growth opportunities (GROW) will be calculated as the book value of total assets, minus the book value of equity, plus the market value of equity all divided by the book value of assets (market-to-book value). It is expected that there will be a positive relationship between the debt ratio and growth opportunities; with more growth, firms will need more funds to finance that growth, which explains the positive relationship. Another explanation for the positive relationship is that, with growth, the value of the firm will increase, thus enabling it to take on more debt.

Profitability (PROFIT) will be calculated as the return on assets ROA (earnings before interest and taxes to total assets). There is expected to be a negative relationship between debt ratio and profitability; more profitable firms tend to depend on internal sources of financing and will depend on those internal sources before searching for any external sources of financing, including debt-financing.

Non-debt tax shields (NDTS) will be calculated as annual depreciation expense to total assets. There is expected to be a negative relationship between debt ratio and non-debt tax shields; with non-debt tax shields, the benefits of having debt in the capital structure become relatively less important.

Liquidity (LIQ) we will include this variable which is measured as net working capital to total assets. Then we will break this variable down into two variables; cash liquidity (CLIQ) will be calculated as cash and cash equivalent assets to total assets, and non-cash liquidity

(NCLIQ) will be calculated as current assets minus cash and cash equivalent assets to total assets. The relationship between liquidity and debt ratio could be positive or negative. With more liquidity, firms will be able to service and repay their debt, which might explain the positive relationship. On the other hand, with the availability of internal funds firms will depend less on external sources of financing, including debt-financing, which might explain the negative relationship.

Assets tangibility (TANG) will be calculated as fixed assets to total assets. There is expected to be a positive relationship between assets tangibility and capital structure; with more tangible assets, firms will be better able to obtain secured debt since those assets can be used as collateral.

4.3.3. Research Methodology

As we mentioned earlier in the introduction chapter and in our previous two empirical chapters, since we are dealing with data that have both cross-sectional and time-series dimensions, the appropriate way to analyse those data is to use panel data analysis because of the advantages that have been listed in chapter one. On the other hand, panel data analysis will be become biased when we use the dynamic model, as we explained in chapter one; thus, for that dynamic model we will use the Generalized Method of Moments model (GMM model).

4.3.4. Research Models

Harris and Raviv (1991, cited in Westgaard et al., 2008) stated that "the number of factors and circumstances that can affect a company's capital structure is uncountable". For our models we will include the most used variables that can explain the capital structure decisions; these are the variables that have been used in the capital structure literature.

Proposed models

In this chapter we will investigate the determinants of debt ratio, firstly by using static models as listed below, and then by using a dynamic model to investigate the speed of adjustment of the debt ratio.

Firstly, the static models will be based on panel data models including pooled OLS, fixed-effect model and random effect model; then, we will decide which one of those models is the most appropriate by using the likelihood ratio test and the Hausman test.

$$TDEBT_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 LIQ_{it} + \beta_6 TANG_{it} + u_{i,t} \quad (4.1.)$$

$$LDEBT_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 LIQ_{it} + \beta_6 TANG_{it} + u_{i,t} \quad (4.2.)$$

$$SDEBT_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 LIQ_{it} + \beta_6 TANG_{it} + u_{i,t} \quad (4.3.)$$

$$TDEBT_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 CLIQ_{it} + \beta_6 NCLIQ_{it} + \beta_7 TANG_{it} + u_{i,t} \quad (4.4.)$$

$$LDEBT_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 CLIQ_{it} + \beta_6 NCLIQ_{it} + \beta_7 TANG_{it} + u_{i,t} \quad (4.5.)$$

$$SDEBT_{it} = \alpha_0 + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 CLIQ_{it} + \beta_6 NCLIQ_{it} + \beta_7 TANG_{it} + u_{i,t} \quad (4.6.)$$

Where:

DEBT : Debt ratio.
TDEBT : Total debt ratio.
LDEBT : Long debt ratio.
SDEBT : Short debt ratio.
SIZE : Firm's size.
GROW : Firm's growth opportunities.
PROFIT : Firm's profitability.
LIQ : Liquid assets.
CLIQ : Firm's cash liquid assets.

NCLIQ : Firm's non-cash liquid assets.

NDTS : Firm's non-debt tax shields.

TANG : Firm's fixed assets.

u : error term.

All of the explanatory variables are measured as ratios which will correct for heteroscedasticity in the results.

Secondly, we will use the dynamic models to measure the adjustment speed toward the optimal debt ratio. Like many other researchers such as Gaud et al. (2005), Gonzales and Gonzales (2008) and La Rocca et al. (2009), we will consider the change in the debt ratio between the current year and the previous year ($DEBT_{it} - DEBT_{it-1}$) to reflect the difference between the target level of the debt ratio ($DEBT^*_{it}$) and the lagged level of the debt ratio ($DEBT_{it-1}$);

$$DEBT_{it} - DEBT_{it-1} = \alpha\,(DEBT^*_{it} - DEBT_{it-1})$$

$$DEBT_{it} = \alpha\, DEBT^*_{it} + (1 - \alpha)\, DEBT_{it-1}$$

Where;

$$DEBT^*_{it} = \alpha_0 + \beta_1\, SIZE_{it} + \beta_2\, GROW_{it} + \beta_3\, PROFIT_{it} + \beta_4\, NDTS_{it} + \beta_5\, LIQ_{it} + \beta_6\, TANG_{it} + u_{i,t}$$

$$DEBT^*_{it} = \alpha_0 + \beta_1\, SIZE_{it} + \beta_2\, GROW_{it} + \beta_3\, PROFIT_{it} + \beta_4\, NDTS_{it} + \beta_5\, CLIQ_{it} + \beta_6\, NCLIQ_{it} + \beta_7\, TANG_{it} + u_{i,t}$$

$$DEBT_{it} = \alpha\alpha_0 + (1 - \alpha)\, DEBT_{it-1} + \alpha\beta_1\, SIZE_{it} + \alpha\beta_2\, GROW_{it} + \alpha\beta_3\, PROFIT_{it} + \alpha\beta_4\, NDTS_{it} + \alpha\beta_5\, LIQ_{it} + \alpha\beta_6\, TANG_{it} + \alpha u_{i,t}$$

$$DEBT_{it} = \gamma_0 + \delta\, DEBT_{it-1} + \gamma_1\, SIZE_{it} + \gamma_2\, GROW_{it} + \gamma_3\, PROFIT_{it} + \gamma_4\, NDTS_{it} + \gamma_5\, LIQ_{it} + \gamma_6\, TANG_{it} + \varepsilon_{i,t} \qquad (4.7.)$$

$$DEBT_{it} = \alpha\alpha_0 + (1 - \alpha)\, DEBT_{it-1} + \alpha\beta_1\, SIZE_{it} + \alpha\beta_2\, GROW_{it} + \alpha\beta_3\, PROFIT_{it} + \alpha\beta_4\, NDTS_{it} + \alpha\beta_5\, CLIQ_{it} + \alpha\beta_6\, NCLIQ_{it} + \alpha\beta_7\, TANG_{it} + \alpha u_{i,t}$$

$$DEBT_{it} = \gamma_0 + \delta\, DEBT_{it-1} + \gamma_1\, SIZE_{it} + \gamma_2\, GROW_{it} + \gamma_3\, PROFIT_{it} + \gamma_4\, NDTS_{it} + \gamma_5\, CLIQ_{it} + \gamma_6\, NCLIQ_{it} + \gamma_7\, TANG_{it} + \varepsilon_{i,t} \qquad (4.8.)$$

Where:

TDEBT : Total debt ratio.
LDEBT : Long debt ratio.
SDEBT : Short debt ratio.
SIZE : Firm's size.
GROW : Firm's growth opportunities.
PROFIT : Firm's profitability.
LIQ : Liquid assets.
CLIQ : Firm's cash liquid assets.
NCLIQ : Firm's non-cash liquid assets.
NDTS : Firm's non-debt tax shields.
TANG : Firm's fixed assets.
ε : error term.

4.4. Results and analysis

4.4.1. Descriptive analysis

In this first model we will investigate how the factors that affect capital structure affect Jordanian firms' capital structure. In this model we will include the main factors mentioned in the literature by many researchers, including firm's size, growth opportunities, profitability, liquidity, the availability of any non-debt tax shields, and assets tangibility. As these factors are most frequently mentioned in the literature, we will start our analysis by examining their effect on the firm's total debt ratio, long-term debt ratio and short-term debt ratio.

Tables 4.2 and 4.3 show the descriptive analysis of the variables for this basic model. In Table 4.2 we included the descriptive analysis for the whole sample which covers the period from 2000 to 2011. Then in Table 4.3 we included the same descriptive analysis for same set of data year by year to obtain a deeper view of the data.

Table 4.2 reveals some interesting observations about this sample; firstly, we can see that the average total debt ratio in our sample is about 32%, which is relatively low, especially when we know that the capacity of debt-borrowing is an internal decision for the firm's board of

directors. The firm's board of directors are allowed to borrow up to 2 to 3 times the firm's equity capital, which means that we expect to see a total debt-to-assets ratio of 60% to 75%. This relatively low debt ratio can be explained by Jordan's religious background; as Islam is the dominant religion in Jordan which is followed by more than 90% of the total population, the rules of the Islamic religion might affect the capital structure decision. According to the Islamic rules, one is not allowed to deal with interest as it is prohibited in Islam. However, although dealing with interest is not allowed, because of the necessity of debt capital some Islamic scholars permit firms to use debt-borrowing which involves interest, but it should be kept to a minimum.

Table 4.2

Descriptive analysis

The dependent variable is debt ratio (DEBT) which has three forms; total debt ratio (TDEBT) which is the ratio of total liabilities divided by the total assets, long term debt ratio (LDEBT) which is the ratio of long term liabilities divided by the total assets, and short term debt ratio (SDEBT) which is the ratio of current liabilities divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (GROW) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (PROFIT) firm's profitability which is the return on assets ROA, (LIQ) liquid assets which is net working capital divided by total assets, (NDTS) non-debt tax shield which is the depreciation expenses divided by the total assets, and (TANG) assets tangibility which is the ratio of fixed assets divided by the total assets. For the period from 2000 to 2011.

2000-2009	TDEBT	LDEBT	SDEBT	SIZE	GROW	PROFIT	NDTS	LIQ	CLIQ	NCLIQ	TANG
Mean	32.47%	8.60%	23.87%	16.64	149.10%	2.71%	3.61%	21.10%	9.38%	11.73%	42.83%
Median	28.93%	2.10%	20.42%	16.46	133.05%	3.25%	3.16%	19.43%	4.88%	10.51%	40.97%
Max	94.47%	90.00%	87.66%	20.92	619.79%	43.30%	21.73%	98.74%	81.19%	78.02%	99.60%
Min	0.44%	0.00%	0.05%	13.22	-67.21%	-60.01%	0.00%	-71.66%	0.00%	-71.66%	0.39%
SD	21.03%	13.37%	16.15%	1.41	82.24%	9.70%	2.67%	24.50%	11.62%	20.85%	23.64%
Obs.	960	960	960	960	960	960	960	960	960	960	960

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Secondly, the average long-term debt ratio is much lower than the average short-term debt ratio. The average long-term debt ratio is only one third of the average short-term debt ratio, at 8.60% compared to 23.87% respectively. As we mentioned before, due to religious considerations Jordanian firms try to avoid exposure to debt that involves interest. Since the short-term debt as measured by the current liabilities, it does not involve any interest expenses. This explains why Jordanian firms tend to depend more on short-term debt than on long-term debt: short-term debt does not involve interest costs.

Thirdly, the minimum value of the long-term debt ratio is 0.00%. With further investigation we found that there are 372 observations with no long-term debt; this represents more than one third of the total of 960 observations. In addition to the previous explanation, some firms depend only on short-term debt because it is much cheaper than long-term debt.

Fourthly, the average total liquidity ratio is about 21%, which means that firms in Jordan can cover two thirds of their total debt using their net working capital. Cash liquidity measures as cash ratio are more than 9%, which means that, on average, firms in Jordan can cover all of their long-term debt just by using the cash available at hand, or they can use this cash to cover almost half of the short-term debt; if we consider the total debt, the cash liquidity can cover one third of the total debt.

Fifthly, firms in Jordan have fixed assets which are worth more than their total debts; this means that all debt can be repaid in cases of bankruptcy, and it also means that firms in Jordan will still have the ability to borrow more money, as this money can be secured by the firms' tangible assets.

Table 4.3 shows the descriptive analysis for the research variables year by year, starting from the year 2000 and finishing at the year 2011. Table 4.3 shows that the research variables are stable over time with no abnormal changes. Some small changes occurred for the total debt ratio as it increases from around 31% in the first few years to about 35% in the last few years. These changes arise from the increases in the short-term debt ratio as it increases from around 21% in the first few years to around 26% in the last few years, while the long-term debt ratio showed a slight decline in the last few years.

These changes can be explained by the debt crisis: as debt-financing becomes more difficult to obtain, firms start to depend more on short-term debt and less on long-term debt. Cash ratio on the other hand showed a slight increase as cash became more important after the debt crisis when debt-financing became more difficult to obtain. Non-cash liquidity has declined in the last few years; as we mentioned earlier, increases in short-term debt cause this non-cash liquidity to decline as it is measured as net working capital minus cash. Firms' profitability started to decrease from 2008 to become a negative number in 2011; this decline can be explained as the effect of the debt crisis on the firm's profits as a result of the losses on

financial investments. Tangibility has increased in the last few years as firms focus on fixed-assets investments more than financial assets investments since the financial markets have performed badly in recent years as a result of the debt crisis.

Table 4.3

Descriptive analysis

The dependent variable is debt ratio (DEBT) which has three forms; total debt ratio (TDEBT) which is the ratio of total liabilities divided by the total assets, long term debt ratio (LDEBT) which is the ratio of long term liabilities divided by the total assets, and short term debt ratio (SDEBT) which is the ratio of current liabilities divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (GROW) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (PROFIT) firm's profitability which is the return on assets ROA, (LIQ) liquid assets which is net working capital divided by total assets, (NDTS) non-debt tax shield which is the depreciation expenses divided by the total assets, and (TANG) assets tangibility which is the ratio of fixed assets divided by the total assets. Year by year for the period from 2000 to 2009.

		TDEBT	LDEBT	SDEBT	SIZE	GROW	PROFIT	NDTS	LIQ	CLIQ	NCLIQ	TANG
2000	Mean	31.64%	9.01%	22.63%	16.34	111.04%	1.95%	4.40%	21.03%	9.70%	11.32%	45.77%
	Median	29.11%	3.20%	19.74%	16.11	100.00%	2.30%	3.66%	16.55%	2.86%	8.65%	45.57%
	Max	91.58%	50.47%	57.41%	20.08	350.94%	27.43%	12.49%	98.74%	81.19%	67.20%	92.73%
	Min	0.60%	0.00%	0.05%	14.31	15.73%	-20.67%	0.00%	-38.17%	0.00%	-39.83%	0.73%
	SD	20.11%	12.51%	14.05%	1.30	59.46%	9.23%	2.89%	25.90%	14.93%	19.86%	24.72%
2001	Mean	31.23%	9.08%	22.14%	16.37	111.23%	2.83%	4.50%	21.05%	8.94%	12.11%	46.03%
	Median	29.49%	1.95%	18.86%	16.18	100.51%	3.56%	3.70%	19.45%	4.13%	8.03%	45.49%
	Max	91.86%	63.22%	65.61%	20.18	307.86%	22.76%	16.58%	77.89%	48.50%	64.26%	93.35%
	Min	1.82%	0.00%	1.82%	14.06	8.88%	-46.16%	0.00%	-38.44%	0.00%	-39.02%	0.63%
	SD	19.53%	13.44%	13.94%	1.31	55.55%	9.58%	3.09%	23.79%	12.13%	20.57%	24.23%
2002	Mean	31.33%	10.42%	20.91%	16.37	119.60%	3.43%	4.36%	23.22%	10.21%	13.01%	45.21%
	Median	28.10%	2.60%	16.87%	16.20	108.87%	2.98%	4.11%	22.88%	3.35%	9.50%	41.82%
	Max	91.99%	66.41%	54.79%	20.14	328.33%	22.21%	13.33%	78.29%	51.78%	68.20%	93.37%
	Min	2.31%	0.00%	2.15%	13.97	0.66%	-18.91%	0.10%	-26.67%	0.00%	-28.69%	0.61%
	SD	21.24%	14.59%	13.61%	1.32	58.61%	7.36%	2.48%	23.92%	13.14%	20.27%	23.54%
2003	Mean	31.43%	10.39%	21.04%	16.40	145.27%	3.42%	4.17%	22.88%	8.89%	13.99%	44.53%
	Median	26.95%	2.56%	20.58%	16.27	132.90%	3.34%	3.64%	21.33%	4.22%	10.79%	41.48%
	Max	92.14%	67.03%	73.59%	20.15	462.16%	25.15%	14.13%	78.64%	52.03%	67.73%	90.74%
	Min	1.69%	0.00%	1.69%	14.03	33.54%	-37.94%	0.00%	-46.53%	0.00%	-46.90%	0.75%
	SD	20.69%	14.87%	14.25%	1.32	72.28%	8.27%	2.81%	24.11%	11.03%	21.28%	23.47%
2004	Mean	33.53%	11.02%	22.52%	16.56	166.58%	5.66%	4.06%	22.26%	7.79%	14.47%	41.87%
	Median	25.24%	2.48%	16.70%	16.39	153.54%	5.27%	3.33%	20.18%	3.92%	15.30%	39.08%
	Max	93.77%	90.00%	87.38%	20.00	444.44%	28.00%	21.73%	77.75%	38.91%	67.88%	90.12%
	Min	0.89%	0.00%	0.89%	14.25	20.98%	-11.22%	0.07%	-64.77%	0.00%	-65.03%	0.55%
	SD	24.00%	16.72%	17.95%	1.31	74.42%	6.82%	3.46%	25.52%	9.61%	23.24%	23.82%
2005	Mean	28.75%	7.33%	21.43%	16.67	184.69%	5.87%	3.40%	24.37%	9.19%	15.17%	40.33%
	Median	26.73%	0.49%	18.92%	16.53	171.66%	5.07%	2.84%	24.02%	4.87%	12.28%	38.90%
	Max	91.97%	68.20%	74.01%	20.12	488.74%	34.12%	12.64%	81.33%	39.92%	61.64%	91.23%
	Min	0.79%	0.00%	0.79%	14.06	25.43%	-32.52%	0.00%	-51.79%	0.00%	-52.37%	0.39%
	SD	19.15%	12.48%	14.53%	1.35	79.52%	9.47%	2.59%	24.30%	10.44%	20.60%	24.63%

Table 4.3 Continued

		TDEBT	LDEBT	SDEBT	SIZE	GROW	PROFIT	NDTS	LIQ	CLIQ	NCLIQ	TANG
2006	Mean	30.15%	7.06%	23.10%	16.71	163.76%	2.51%	3.38%	21.76%	9.11%	12.66%	39.56%
	Median	27.50%	0.77%	21.09%	16.62	142.98%	3.40%	3.08%	20.80%	5.83%	11.96%	37.11%
	Max	91.85%	70.17%	67.25%	20.21	612.98%	29.47%	11.88%	81.26%	48.51%	68.77%	88.47%
	Min	1.71%	0.00%	1.71%	14.05	65.93%	-26.01%	0.00%	-28.25%	0.00%	-31.53%	0.75%
	SD	18.77%	12.02%	14.44%	1.37	82.00%	8.34%	2.29%	22.90%	9.80%	19.22%	22.07%
2007	Mean	31.91%	6.02%	25.90%	16.79	177.58%	3.90%	3.16%	20.76%	8.46%	12.29%	38.19%
	Median	30.32%	0.40%	23.04%	16.71	154.84%	4.88%	3.04%	16.14%	4.59%	9.45%	35.72%
	Max	91.69%	69.25%	85.77%	20.31	619.79%	29.38%	11.14%	78.72%	50.70%	76.04%	89.94%
	Min	0.77%	0.00%	0.77%	14.01	55.84%	-30.85%	0.00%	-30.35%	0.00%	-30.79%	0.44%
	SD	18.86%	11.37%	16.18%	1.40	92.49%	9.18%	2.12%	21.87%	10.01%	19.51%	22.30%
2008	Mean	34.85%	7.47%	27.37%	16.89	164.77%	1.80%	2.96%	19.88%	9.42%	10.45%	37.11%
	Median	32.28%	1.62%	24.87%	16.74	136.27%	3.34%	2.56%	17.45%	4.90%	9.26%	33.90%
	Max	90.20%	64.55%	84.50%	20.59	460.54%	43.30%	11.23%	80.29%	51.99%	63.98%	89.90%
	Min	1.35%	0.00%	0.93%	13.83	35.92%	-60.01%	0.00%	-28.44%	0.00%	-32.06%	0.74%
	SD	21.62%	12.04%	18.74%	1.46	88.22%	12.74%	2.18%	23.16%	11.82%	19.38%	21.70%
2009	Mean	33.91%	8.35%	25.57%	16.88	157.24%	1.05%	2.55%	20.18%	9.69%	10.49%	37.81%
	Median	32.42%	3.13%	23.32%	16.79	133.21%	2.32%	2.36%	16.24%	5.27%	10.42%	35.40%
	Max	93.76%	67.62%	82.51%	20.60	437.16%	36.02%	11.79%	80.53%	66.35%	78.02%	92.95%
	Min	0.44%	0.00%	0.44%	13.76	15.36%	-40.84%	0.00%	-36.55%	0.00%	-36.78%	0.84%
	SD	21.67%	12.91%	17.15%	1.49	92.19%	10.26%	2.26%	24.04%	11.87%	20.03%	21.69%
2010	Mean	34.61%	8.68%	25.93%	16.86	151.51%	0.76%	3.16%	19.57%	10.76%	8.82%	47.88%
	Median	32.71%	2.93%	23.01%	16.69	127.74%	2.02%	3.00%	19.70%	7.11%	9.42%	46.28%
	Max	94.47%	73.05%	87.66%	20.73	451.28%	35.51%	10.59%	79.22%	63.73%	75.91%	99.37%
	Min	1.25%	0.00%	1.25%	13.35	-2.59%	-26.85%	0.00%	-49.38%	0.00%	-49.38%	1.22%
	SD	22.38%	13.20%	17.24%	1.54	92.55%	9.93%	2.22%	25.67%	11.54%	21.18%	23.50%
2011	Mean	36.28%	8.35%	27.93%	16.80	135.95%	-0.72%	3.24%	16.28%	10.33%	5.96%	49.67%
	Median	32.47%	3.29%	23.57%	16.70	123.50%	0.96%	2.56%	15.62%	7.04%	7.75%	48.70%
	Max	91.53%	61.18%	73.41%	20.92	463.15%	31.47%	12.28%	74.88%	64.63%	72.92%	99.60%
	Min	0.47%	0.00%	0.47%	13.22	-67.21%	-32.99%	0.00%	-71.66%	0.00%	-71.66%	0.86%
	SD	22.39%	12.46%	18.28%	1.54	83.85%	11.53%	2.45%	27.31%	11.72%	22.82%	23.57%

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

Table 4.4 shows the correlation matrix between the research variables. Most of the correlation coefficients are low, while a few are slightly high such as the correlation coefficient between growth opportunities and profitability; this high coefficient is not a major surprise since growing firms are likely to be more profitable than mature firms. Liquidity also has high correlation coefficients with most of the research variables, as we can see from Table 4.4. Liquidity has high negative correlation coefficients with the debt ratios, which might be a sign of support for the Pecking Order theory. Liquidity also has a high positive correlation coefficient with profitability; this can be explained by the fact that more profitable firms tend to accumulate their profits inside the firm.

Table 4.4

Correlation Matrix

The dependent variable is debt ratio (DEBT) which has three forms; total debt ratio (TDEBT) which is the ratio of total liabilities divided by the total assets, long term debt ratio (LDEBT) which is the ratio of long term liabilities divided by the total assets, and short term debt ratio (SDEBT) which is the ratio of current liabilities divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (GROW) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (PROFIT) firm's profitability which is the return on assets ROA, (LIQ) liquid assets which is net working capital divided by total assets, (NDTS) non-debt tax shield which is the depreciation expenses divided by the total assets, and (TANG) assets tangibility which is the ratio of fixed assets divided by the total assets. For the period from 2000 to 2011.

	TDEBT	LDEBT	SDEBT	SIZE	GROW	PROFIT	NDTS	LIQ	CLIQ	NCLIQ	TANG
TDEBT	1.0000										
LDEBT	0.6405	1.0000									
SDEBT	0.7717	0.0058	1.0000								
SIZE	0.3550	0.3629	0.1618	1.0000							
GROW	-0.2373	-0.1559	-0.1799	0.2226	1.0000						
PROFIT	-0.2926	-0.1449	-0.2609	0.2789	0.5253	1.0000					
NDTS	-0.0447	0.0486	-0.0985	0.0320	-0.0319	0.0457	1.0000				
LIQ	-0.5400	-0.3287	-0.4309	-0.2160	0.2505	0.3334	-0.1509	1.0000			
CLIQ	-0.2804	-0.1989	-0.2004	0.0531	0.3282	0.3357	-0.0224	0.5280	1.0000		
NCLIQ	-0.4783	-0.2754	-0.3947	-0.2834	0.1114	0.2047	-0.1648	0.8808	0.0630	1.0000	
TANG	0.0813	0.2387	-0.0919	-0.0050	-0.1356	-0.1796	0.4413	-0.5302	-0.3141	-0.4479	1.0000

Source: Calculated by the researcher based on companies' guides available in Amman stock exchange website for several years.

4.4.2. Model analysis

Our first model is the basic model which includes the dependent variable of the firm's debt ratio DEBT. The firm's debt will be analysed in three forms: as the total debt TDEBT (total liabilities to total assets), long-term debt LDEBT (long-term liabilities to total assets), and short-term debt SDEBT (current liabilities to total assets). For the independent variables, we will start with the main variables that have been used in the literature to determine the debt ratio, including firm's size SIZE (the natural logarithm of the total assets), growth opportunities GROW (the market-to-book ratio), profitability PROFIT (return on assets ROA), non-debt tax shield NDTS (depreciation expenses to total assets), liquidity LIQ (current assets minus current liabilities to total assets), and assets tangibility TANG (fixed assets to total assets).

Table 4.5 shows the results of our three models. The first column shows the results of the model where the dependent variable is the total debt ratio, the second column shows the results where the dependent variable is the long-term debt, and the third column shows the results where the dependent variable is the short-term debt. The three models have been run as fixed-effect models for both cross-section and period. Further tests to determine whether the ordinary least squares, fixed-effect, or random effects model is the most appropriate model for our set of data have been conducted, including the likelihood ratio tests which determine wither the fixed-effect model is preferred to the ordinary least squares model or not; if the results of the likelihood ratio test show a statistical significance, the fixed-effect model is preferred to the ordinary least squares model, but if the results are insignificant then the ordinary least squares model is preferred to the fixed-effect model. Table 4.6 shows the results of the likelihood ratio tests where panel A is for total debt model, panel B is for long-term debt model, and panel C is for short-term debt model.

Table 4.5

Regression results

$DEBT_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 LIQ_{it} + \beta_6 TANG_{it} + u_{it}$. The dependent variable is debt ratio (DEBT) which has three forms; total debt ratio (TDEBT) which is the ratio of total liabilities divided by the total assets, long term debt ratio (LDEBT) which is the ratio of long term liabilities divided by the total assets, and short term debt ratio (SDEBT) which is the ratio of current liabilities divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (GROW) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (PROFIT) firm's profitability which is the return on assets ROA, (LIQ) liquid assets which is net working capital divided by total assets, (NDTS) non-debt tax shield which is the depreciation expenses divided by the total assets, and (TANG) assets tangibility which is the ratio of fixed assets divided by the total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Dependent Variable	TDEBT Fixed effects	LDEBT Fixed effects	SDEBT Fixed effects
α_0	-0.3624 (-1.2081)	-1.0158*** (-7.3795)	0.6534*** (3.3265)
β_1 (SIZE)	0.0535*** (3.1927)	0.0644*** (8.0289)	-0.0110 (-0.9497)
β_2 (GROW)	-0.0100* (-1.6712)	-0.0113** (-2.0892)	0.0014 (0.2768)
β_3 (PROFIT)	-0.2689*** (-4.1694)	-0.2648*** (-6.4608)	-0.0041 (0.0956)
β_4 (NDTS)	0.3492 (1.2195)	0.4474*** (2.7362)	-0.0982 (-0.6959)
β_5 (LIQ)	-0.5721*** (-8.4842)	0.0390* (1.8446)	-0.6111*** (-19.7621)
β_6 (TANG)	-0.1633*** (-3.3359)	0.0706*** (3.0181)	-0.2339*** (-6.7296)
Adj. R square	81.41%	66.89%	83.10%
F statistic	44.74***	21.1854***	50.1132***
Number of observations	960	960	960

Table 4.6 shows that, for all models (i.e. total debt, long-term debt, and short-term debt models) the fixed-effect models are preferred to the ordinary least squares models, since the likelihood test showed significant results for cross-Section/period for our three models.

Table 4.6
Likelihood ratio test

Panel A

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	22.9634	-79863	0.0000
Cross-section Chi-square	1086.7951	79	0.0000
Period F	1.9792	-11863	0.0275
Period Chi-square	23.9183	11	0.0131
Cross-Section/Period F	20.4995	-90.863	0.0000
Cross-Section/Period Chi-square	1097.7936	90	0.0000

Panel B

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	15.2621	-79863	0.0000
Cross-section Chi-square	839.2917	79	0.0000
Period F	4.7207	-11863	0.0000
Period Chi-square	56.0931	11	0.0000
Cross-Section/Period F	14.1834	-90863	0.0000
Cross-Section/Period Chi-square	871.6000	90	0.0000

Panel C

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	32.1773	-79863	0.0000
Cross-section Chi-square	1317.6846	79	0.0000
Period F	4.2294	-11863	0.0000
Period Chi-square	50.4052	11	0.0000
Cross-Section/Period F	28.9272	-90863	0.0000
Cross-Section/Period Chi-square	1334.8523	90	0.0000

Another test conducted to determine whether the random effects model is preferred to the fixed-effect model is the Hausman test; if the results of the Hausman test show a statistical significance, the random effects model is not preferred over the fixed-effect model, but if the results are insignificant then the random effects model is preferred to the fixed-effect model. Table 7 shows the results of the Hausman tests where panel A is for total debt model, panel B is for long-term debt model, and panel C is for short-term debt model. The random effects tests have been run as random for both cross-section and period but because the results of Hausman tests always show that the period test variance is invalid, and the Hausman statistic is set to zero, we rerun all the models with random effect only for the cross-section. The results in Table 7 panels A, B, and C suggest that, for the total debt ratio model, and the long- and short-term debt ratio models, the fixed-effect model is preferred to the random effects model, since the results show a significant value for the Chi-Square statistic.

Table 4.7

Hausman test

Panel A

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	13.6974	6	0.0332

Panel B

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	17.6824	6	0.0071

Panel C

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	32.8768	6	0.0000

Having found the preferred model from our three candidates, we can start our analysis. Firstly, in the total debt ratio model we regress the total debt ratio to a group of explanatory variables that include firm's size, growth opportunities, profitability, non-debt tax shield, liquidity, and assets tangibility. As we mentioned before, having run some statistical tests we found that the preferred model is the fixed-effect model. The results for total debt ratio model suggest the following. Firm's size has a positive and significant relationship with total debt ratio which means that larger firms tend have a higher total debt ratio compared to smaller firms; this result supports the transaction theory as it suggests that larger firms are more able to access debt markets to obtain external sources of funding, and are also more able to diversify their investments, thus reducing the likelihood of bankruptcy.

Growth opportunities have a negative and significant relationship with total debt ratio. Myers (1977) and Titman and Wessels (1988) suggested that the relationship between growth opportunities and debt ratio is negative. In a state of nature, the firm will lose some of the valuable investment opportunities with more risky debt finance; also, growing firms have a higher agency cost, and even if they have invested in capital assets, some of those assets are not collateralized and can be seen as intangible or unable to generate income for the firm. Many capital assets are useful and valuable as long as the firm remains in business, but if the firm goes bankrupt those capital assets' value will fall dramatically; this result is consistent with the Trade-off theory view. Another reason is that Jordanian firms depend on equity-financing more than debt-financing; Table A1 in appendix A shows the secondary public offering (SEO) for the Jordanian firms during the period from 2000 to 2011.

A firm's profitability has a significant negative relationship with total debt ratio, which means that more profitable firms tend to have lower debt ratios. This result supports the Pecking Order theory view which suggests that firms follow a specific order when they require new financing started with the cheapest source and then moving to the next cheapest source and so on until they fulfil their needs. According to the Pecking Order theory, the firm will start with their internal funds as these are cheapest source of financing available; it will then move on to other sources such as debt- and equity-financing. So, we expect to find this negative relationship between profitability and debt ratio as those more profitable firms tend to depend more on their own funds rather than obtaining funds from external and more expensive sources.

Non-debt tax shield has no statistically significant effect on total debt ratio for Jordanian firms, which means that, for Jordanian firms, the existence of the other tax shields will not affect the total debt ratio. The relationship between debt ratio and the non-debt tax shield is expected to be negative since, with other tax shields, the benefits of having debt in the firm's capital structure will become relatively less important as a way to reduce the taxable income; more debt in the firm's capital will only increase the probability of bankruptcy and no extra benefits of tax reduction are associated with this increased debt. The most likely reason for the insignificant relationship between total debt ratio and the non-debt tax shield in Jordanian firms is that Jordanian firms depend more on short-term debt compared to long-term debt as we mentioned earlier in the descriptive analysis section; this means that most of the firm's debt has no tax expenses or carries very low interest expenses with less than one year's maturity, which explains why there is no significant relationship between total debt ratio and non-debt tax shield for Jordanian firms.

Liquidity has mixed effects on the debt ratio, as the theories and the literature suggested; the initial view suggests that liquidity has a negative effect on the debt ratio because the firm can use this increased liquidity to finance its investments rather than depend on external sources of financing such as debt-financing, which is a more expensive source as the Pecking Order theory suggests. Also, according to Prowse's (1990) argument about liquidity and the relationship between shareholders and debt-holders, liquidity can be used as a sign to show how shareholders are able to manipulate the available liquidity at the expense of debt-holders. The second view suggests that liquidity has a positive effect on the debt ratio because, with more liquidity, the firm is able to service a higher level of debt in its capital structure if any financial obligations are due. The results from the sample of Jordanian firms show that the relationship between a firm's liquidity and its total debt ratio is significantly negative. This result supports the Pecking Order theory view, as the firm with more liquidity will use that available liquidity to finance its investments rather than depend on debt-financing which carries a higher cost. Also, in Jordanian firms' case, as we showed earlier, most of the firms' debts are short-term debts; so, firms will borrow less if they have liquidity rather than depend on short-term debt, since their liquidity will be sufficient to cover the short-term needs, which account for the larger portion of total debt in the Jordanian market at about 75% of the total debt.

Assets tangibility is one of the variables that affect the debt structure of the firm; with more tangible assets, debt can be more secured as these tangible (fixed) assets can be used as collateral in case of bankruptcy. The results from our sample show that assets tangibility has a significant negative relationship with the firm's total debt ratio. Again, as we mentioned before, the structure of the debt in Jordanian firms can provide a better explanation of why there is a negative relationship rather than a positive one as we expected. Since short-term debt in Jordanian firms represents about 75% of the total debt, having more tangible assets will not be seen as a good sign. This is because, for short-term debt which will mature in less than one year, the firm needs to have short-term assets to match this maturity since the tangible assets are long-term assets; this means that, if the short-term debt matures, the firm may not be able to meet that short-term financial obligation using the tangible assets. So, in Jordanian firms' case, we found that assets tangibility has a negative effect on firms' debt. Chittenden et al. (1996), Bevan and Danbolt (2002) and Song (2005) found that that the assets tangibility and the long-term debt have a positive relationship while there is a negative relationship between assets tangibility and the short-term debt.

The overall model has an adjusted R square value of 81.41% which means that the previous set of explanatory variables can explain 81.41% of the total debt ratio; it is also has an F statistic of 89.19 which is significant at the 1% level, which means that the overall model is significant at 1%.

Having investigated how the total debt ratio in Jordanian firms is affected by a group of explanatory variables, we will now investigate how the same explanatory variables will affect the long- and short-term debt ratios for the same sample of Jordanian firms, starting with the long-term debt ratio and then moving on to the short-term debt ratio.

Secondly, we come to the long-term debt ratio model; in this model we regressed the long-term debt ratio measured as long-term liabilities to total assets to the same group of explanatory variables that we used in the first model which has the total debt ratio as dependent variable. Firm's size has a significant positive relationship with long-term debt, as we mentioned earlier. This result supports the transaction theory which states that larger firms are more able to access debt markets at relatively lower cost compared to smaller firms and are thus better able to diversify their investments which will reduce the chance of bankruptcy and allow those firms to obtain more debt.

Growth opportunities show a significant negative relationship with long-term debt. Again, as suggested by (Myers 1977) and Titman and Wessels (1988), this relationship is negative since growing firms invest in valuable assets that can generate income and add value as long as the firm remains in business. This negative relationship also results from the higher agency costs associated with growing firms. Another reason for this negative relationship is that firms in the Jordanian capital market depend more on equity-financing to support their growth; Table A1 in appendix A shows the new equity-financing for firms in the Jordanian capital markets during the analysis period.

Firm's profitability has a negative and significant relationship with long-term debt ratio. Pecking Order theory can be used to explain this result as this theory suggests that firms will use the cheapest source of financing to provide their required funds before considering other sources, starting with the cheapest to the more expensive until they cover all the funds they need. So, profitable firms will use their internal funds which are the cheapest source of financing to provide the needed funds, which explains the negative relationship between a firm's profitability and its long-term debt ratio.

The relationship between non-debt tax shield and long-term debt is significantly positive. This relationship is expected to be negative since, with the availability of other tax shields from non-debt sources, the benefits of having debt in the firm's capital structure compared to the costs associated with debt-holding will decline, and this is expected to lead to a lower debt ratio in the firm's capital structure. On the other hand, the non-debt tax shield such as the one we used in this study is calculated as the depreciation expenses to the total assets, which means that it can also be seen as a proxy for the level of the fixed assets inside the firm. In other words, the positive relationship between the non-debt tax shield and the long-term debt can be explained as follows: as Jordanian firms hold more fixed assets, these fixed assets give the lenders more security for their loans to the firms and explain why firms with higher non-debt tax shields still have higher long-term debt ratios compared to the firms with lower non-debt tax shields.

Liquidity has a dual effect, as we mentioned earlier. It could have a negative effect, as Pecking Order theory suggests, when the firm depends on its own liquidity rather than using external debt or equity-financing. Or it could have a positive effect as this liquidity will

support a higher level of debt by allowing the firm to meet more financial obligations. Earlier, we found that total debt ratio and liquidity are negatively related, but with long-term debt ratio the relationship is positive, but only at the 10% significance level. With long-term debt, firms should be able to meet more financial obligations in the long and the short term including the interest expenses (short term) and the principle amount of the debt (long term); the availability of liquidity will support this higher level of debt, which explains the positive relationship between liquidity and long-term debt.

Assets tangibility will provide security for the firm's debt, as these fixed assets can be used as collateral in case of bankruptcy. The more tangible (fixed) assets that the firm has, the more long-term debt it can take on. The results showed that, for Jordanian firms, the relationship between assets tangibility and long-term debt is positive; as we explained, with more fixed assets firms in Jordan can take on more long-term debt as these long-term debts can be secured with more fixed assets available to those firms.

The overall model has an adjusted R square value of 66.89% which means that the previous set of explanatory variables can explain about 67% of the long-term debt ratio; it is also has an F statistic of 22.49 which is significant at the 1% level, which means that the overall model is significant at the 1% level.

Thirdly, we come to the short-term debt ratio model; in this model we regressed the short-term debt ratio, measured as current liabilities to total assets, to the same group of explanatory variables that we used in the first two models. Of the six explanatory variables, only two variables are significantly related to short-term debt.

Liquidity has a significant positive relationship with short-term debt. As we explained in previous models, according to the Pecking Order theory firms will depend on their own source of financing, which is cheaper than the other sources available. So, as suggested by the Pecking Order theory, we found that short-term debt is positively related to firm's liquidity.

Assets tangibility has a significant negative relationship with short-term debt. Tangible assets can be used as collateral for firms' long-term debt; however, tangible assets have different maturities compared to the short-term debt so the effect of these tangible assets on the short-term debt is negative since the firm cannot liquidize those assets to meet any financial

obligations associated with the short-term debt. This explains the significant negative relationship that we found in our sample. This relationship has been discussed by Chittenden et al. (1996), Bevan and Danbolt (2002) and Song (2005) who found that assets tangibility is positively related to the long-term debt ratio but is negatively related to the short-term debt ratio.

Firm's size, growth opportunity, profitability, and non-debt tax shield have no significant relationship with the short-term debt ratio. The most likely reason for these results is that the short-term debt ratio matures in less than one year, which makes the effect of those variables relatively low on this type of debt compared to the long-term debt ratio, which may explain why there is no significant relationship between them and the short-term debt ratio.

The overall model has an adjusted R square value of 83.10% which means that the previous set of explanatory variables can explain about 83% of the short-term debt ratio; it also has an F statistic of 41.52 which is significant at the 1% level.

4.4.3. Further analysis of the liquidity variable

As the main aim of this chapter is to discover how the cash-holding decisions affect the capital structure, we will now take our analysis a step further by breaking down the liquidity variable into two components: the cash liquidity (CLIQ) which is measured as cash and cash equivalents to the total assets; and the non-cash liquidity (NCLIQ) which is measured as net working capital minus cash and cash equivalents to the total assets.

Table 4.8 shows the results of our three new models. As with our basic models, the first column shows the results of the model where the dependent variable is the total debt ratio, the second column shows the results where the dependent variable is the long-term debt, and the third column shows the results where the dependent variable is the short-term debt. These three models are constructed by using the fixed-effect model for both cross-section and period. Further tests have been conducted to determine whether the ordinary least squares, fixed-effect, or random effects model is the most appropriate model for our set of data. These include the likelihood ratio tests which determine whether the fixed-effect model is preferred to the ordinary least squares model; if the results of the likelihood ratio test show a statistical significance, the fixed-effect model is preferred over the ordinary least squares model, but if

the results are insignificant then the ordinary least squares model is preferred over the fixed-effect model. Table 4.9 shows the results of the likelihood ratio tests where panel A is for total debt model, panel B is for long-term debt model, and panel C is for short-term debt model.

Similar to our analysis of the basic models, the results from the likelihood ratio test show significant values for the three models under investigation, which means that the fixed-effect model is preferred to the ordinary least squares model.

For the Hausman test, the results were similar to our analysis of the basic models. For our three models, the Chi-Square statistic was significant, which means that the fixed-effect model is preferred over the random effects model. See table 4.10.

Table 4.8

Regression results

$DEBT_{it} = \alpha_{it} + \beta_1 SIZE_{it} + \beta_2 GROW_{it} + \beta_3 PROFIT_{it} + \beta_4 NDTS_{it} + \beta_5 CLIQ_{it} + \beta_6 NCLIQ_{it} + \beta_6 TANG_{it} + u_{it}$. The dependent variable is debt ratio (DEBT) which has three forms; total debt ratio (TDEBT) which is the ratio of total liabilities divided by the total assets, long term debt ratio (LDEBT) which is the ratio of long term liabilities divided by the total assets, and short term debt ratio (SDEBT) which is the ratio of current liabilities divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (GROW) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (PROFIT) firm's profitability which is the return on assets ROA, (CLIQ) cash liquid assets which is cash and cash equivalents divided by total assets, (NCLIQ) non-cash liquid assets which is net working capital minus cash and cash equivalents divided by total assets, (NDTS) non-debt tax shield which is the depreciation expenses divided by the total assets, and (TANG) assets tangibility which is the ratio of fixed assets divided by the total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Dependent Variable	TDEBT Fixed effects	LDEBT Fixed effects	SDEBT Fixed effects
α_0	-0.4058 (-1.3972)	-0.9837*** (-7.1036)	0.5779*** (3.0308)
β_1 (SIZE)	0.0554*** (3.3875)	0.0630*** (7.8296)	-0.0076 (-0.6777)
β_2 (GROW)	-0.0095 (-1.5967)	-0.0116** (-2.1499)	0.0021 (0.4341)
β_3 (PROFIT)	-0.2719*** (-4.2585)	-0.2625*** (-6.4138)	-0.0093 (-0.2229)
β_4 (NDTS)	0.3641 (1.2709)	0.4364*** (2.6712)	-0.0723 (-0.5278)
β_5 (CLIQ)	-0.5007*** (-9.0035)	-0.0139 (-0.3985)	-0.4867*** (-13.4197)
B_6 (NCLIQ)	-0.5904*** (-8.0778)	0.0526** (2.3588)	-0.6430*** (-19.8272)
B_7 (TANG)	-0.1500*** (-3.1883)	0.0607** (2.5375)	-0.2107*** (-6.2156)
Adj. R square	81.48%	66.99%	83.58%
F statistic	44.5015***	21.0679***	51.3354***
Number of observations	960	960	960

Table 4.9
Likelihood ratio test

Panel A

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	23.0693	-79862	0.0000
Cross-section Chi-square	1090.5457	79	0.0000
Period F	1.8968	-11862	0.0364
Period Chi-square	22.9602	11	0.0179
Cross-Section/Period F	20.5913	-90862	0.0000
Cross-Section/Period Chi-square	1101.4771	90	0.0000

Panel B

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	15.3467	-79862	0.0000
Cross-section Chi-square	843.0404	79	0.0000
Period F	4.4685	-11862	0.0000
Period Chi-square	53.2373	11	0.0000
Cross-Section/Period F	14.2456	-90862	0.0000
Cross-Section/Period Chi-square	874.7748	90	0.0000

Panel C

Redundant Fixed Effects Tests
Equation: Untitled
Test cross-section and period fixed effects

Effects Test	Statistic	d.f.	Prob.
Cross-section F	33.3174	-79862	0.0000
Cross-section Chi-square	1343.5853	79	0.0000
Period F	3.2446	-11862	0.0002
Period Chi-square	38.9477	11	0.0001
Cross-Section/Period F	29.8818	-90862	0.0000
Cross-Section/Period Chi-square	1359.1982	90	0.0000

Table 4.10

Hausman test

Panel A

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	15.3787	7	0.0314

Panel B

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	23.6073	7	0.0013

Panel C

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	36.8575	7	0.0000

The new models' results are very similar to the basic models' results in regard to the firm's size, growth opportunities, profitability, non-debt tax shield, and assets tangibility[16]. So, in this section we will not discuss these variables as they have been analysed in the model analysis section; we will only analyse the new two variables (cash and non-cash liquidity) that we derived for the liquidity variable.

For the total debt model, cash and non-cash liquidity have a negative and significant relationship with total debt ratio. As we explained before, this negative relationship supports the Pecking Order theory view which suggests that firms will depend on the cheapest available source of financing; this means that the firm's dependency on debt-financing is lower when it has sufficient available liquidity to finance its operations and investments.

[16] Except for the growth opportunities in the total debt model; in the second model the growth opportunities become insignificant to the total debt ratio while in the first model it was significant at 10% level. A comparison of the t-Statistic and p-value for the two models shows that they are very close to each other (t-Statistic -1.6712, p-value 0.0951 for the first model, t-Statistic -1.5967, p-value 0.1107 for the second model).

For the long-term debt model, the cash liquidity did not show any significant relationship with the long-term debt ratio. A possible reason for this insignificant relationship is that, because of the long-term nature of this type of debt, the cash itself will not have a direct effect on the long-term debt ratio compared to non-cash assets or fixed assets which act as secure collateral for long-term debt; cash liquidity may play a more significant role in explaining the short-term debt as the time horizon for this type of debt will be more affected by the available liquidity in its most liquid form (i.e. the cash form). On the other hand, the non-cash liquidity has a significant positive relationship with the long-term debt ratio; as explained earlier, with more liquidity in the form of non-cash assets, firms can support more long-term debt where this non-cash liquidity can be liquidized and used to support higher levels of long-term debt.

Finally, for the short-term debt model we found further support for the Pecking Order theory, since both cash and non-cash liquidity show significant negative relationships with the short-term debt. This means that firms in Jordan will depend on their own liquidity as cash and non-cash liquidity to finance their short-term needs before using short-term debt-financing.

4.4.4. The Dynamic model

In these models we investigated the speed of adjustment of the total debt ratio, long-term debt ratio, and short-term debt ratio. Table 4.11 shows the results of these three models. Firstly, the results of the total debt ratio model showed that firms in Jordan adjusted their total debt ratio toward the target ratio quickly, as δ is equal to 0.3130, which means that α the speed of adjustment given by $(1 - \delta)$ is relatively high and equal to 0.6870; the speed of adjustment takes a value between 0 and 1, where 0 indicates that firms do not adjust toward the target debt ratio and the debt ratio in the current year is equal to the debt ratio in the previous year, while a value of 1 means that firms obtained their optimal debt ratio and the debt ratio in the current year is equal to the optimal debt ratio. In other words, the higher value of α (the speed of adjustment) means that the firm is close to its optimal debt ratio (Ozkan, 2001; Gaud et al., 2005; Serrasqueiro and Macas Nunes, 2008). For the rest of the explanatory variables, the GMM produced some different results compared to those shown by the static fixed-effect model. Ozkan (2001) also noted some changes when he used the GMM model as some explanatory variables change their sign, significance level, or both.

Table 4.11

Dynamic models results

$DEBT_{it} = \gamma_0 + \delta\ DEBT_{it-1} + \gamma_1\ SIZE_{it} + \gamma_2\ GROW_{it} + \gamma_3\ PROFIT_{it} + \gamma_4\ NDTS_{it} + \gamma_5\ CLIQ_{it} + \gamma_6\ NCLIQ_{it} + \gamma_7\ TANG_{it} + \varepsilon_{i,t}$**.** The dependent variable is debt ratio (DEBT) which has three forms; total debt ratio (TDEBT) which is the ratio of total liabilities divided by the total assets, long term debt ratio (LDEBT) which is the ratio of long term liabilities divided by the total assets, and short term debt ratio (SDEBT) which is the ratio of current liabilities divided by the total assets. The independent variables; (SIZE) firm's size which is the natural logarithm of the total assets, (GROW) growth opportunities which is the ratio of book value of total assets, minus the book value of equity, plus the market value of equity divided by book value of assets, (PROFIT) firm's profitability which is the return on assets ROA, (CLIQ) cash liquid assets which is cash and cash equivalents divided by total assets, (NCLIQ) non-cash liquid assets which is net working capital minus cash and cash equivalents divided by total assets, (NDTS) non-debt tax shield which is the depreciation expenses divided by the total assets, and (TANG) assets tangibility which is the ratio of fixed assets divided by the total assets. The numbers in brackets are t-values, ***, **, * indicate coefficients are significant at the 1%, 5%, and 10% levels respectively. t-statistics are corrected for heteroskedasticity using White's (1980) correction.

Dependent Variable	TDEBT GMM	LDEBT GMM	SDEBT GMM
δ ($DEBT_{it-1}$)	0.3130*** (8.1746)	0.4064*** (12.6889)	-0.0141 (-0.4846)
γ_1 (SIZE)	0.0268 (1.5779)	0.0485*** (3.4493)	0.0191 (1.1871)
γ_2 (GROW)	-0.0397*** (-3.0705)	-0.1316*** (-24.7814)	-0.0104 (-1.0663)
γ_3 (PROFIT)	0.0964* (1.6697)	-0.1612*** (-3.2139)	0.1749*** (3.4247)
γ_4 (NDTS)	1.1630*** (3.6651)	0.1663 (1.4881)	-1.2884*** (-4.0595)
γ_5 (CLIQ)	-0.1200 (-1.2334)	-0.1823*** (-3.1008)	-0.5281*** (-6.2892)
γ_6 (NCLIQ)	-0.4987*** (-9.1771)	0.1975*** (7.8545)	-0.7383*** (-28.6382)
γ_7 (TANG)	-0.0513 (-1.5159)	-0.0639** (-2.5744)	-0.0534* (-1.7154)
Wald test	485.2374***	7,496.0500***	911.1256***
Sargan test	50.5234***	46.3178***	45.1419***
Number of observations	800	800	800

Firm's size under the GMM model showed a positive relationship with total debt ratio but it becomes insignificant; Ozkan (2001) found the same situation when the firm's size variable become insignificant under the GMM model and it also became negatively related to debt ratio. Growth opportunities are still negatively related to total debt ratio and now become significant, thus supporting the Trade-off theory view. Profitability in the GMM, where the explanatory variables are now treated as endogenous, becomes positively related to the total debt ratio; this positive relationship, although weak (only at 10% level), can be explained by the fact that, with more profit, firms can afford more debt as they can pay back the debt and service it. Another reason is that a higher level of debt will help to reduce the taxable income and the free cash flow generated by the extra profit; also, more profit will reduce the likelihood of bankruptcy, thus allowing the firm to take on a higher level of debt. Non-debt tax shield under the GMM model is still positively related to total debt ratio and now becomes significant; this positive relationship can be explained by the notion that this variable can be seen as a proxy for the fixed assets as well, which means that firms with higher non-debt tax shields have more fixed assets which can be used to secure higher levels of debt. Liquidity in the form of cash and non-cash has a negative relationship with the total debt; as we explained before, this result supports the Pecking Order theory where liquidity can be used as a cheaper source of financing before the firm has to obtain more expensive financing such as debt. Assets tangibility, although insignificant, is still negatively related to total debt ratio.

Secondly, under the long-term debt ratio model the speed of adjustment is also quick with α equal to 0.5936, and we can see that Jordanian firms adjusted their long-term debt quickly toward the optimal level. As for the rest of the explanatory variables, firm's size, growth opportunities, profitability, and non-cash liquidity have the same results as the fixed-effect model, so we will not explain those results again. Non-debt tax shield, although retaining the same sign, now becomes insignificant; cash liquidity, on the other hand, becomes significant and still has the same sign. Assets tangibility becomes negatively related to the long-term debt ratio; this might be explained by the notion that tangible assets help to reduce the asymmetric information, which makes equity-financing preferable.

Thirdly, for the short-term debt ratio the speed of adjustment is insignificant, which means that Jordanian firms do not have a target or optimal short-term debt ratio as short-term debt is more of an operational decision than a financing decision. As for the rest of the explanatory variables, firm's size, growth opportunities, cash liquidity, non-cash liquidity, and tangibility

have the same results as the fixed-effect model, so we will not explain those results again. Non-debt tax shield is now significant again as this variable can be a proxy for the level of fixed assets and, since the short-term debt is measured as short-term liabilities, the difference in the time horizon for these two variables can explain this negative relationship. Profitability has a significant positive relationship with short-term debt; this can be explained by the notion that, with more profit, firms are able to repay their debts since the likelihood of bankruptcy is lower, meaning that these more profitable firms are able to afford more debt.

4.4.5. Hypotheses analysis

The first and second hypotheses; H_2: Firm's size has a positive effect on the firm's capital structure. H_3: Firm's size has a negative effect on the firm's capital structure.

For the total and the long-term debt ratio in both models, firm's size shows a positive relationship with the debt ratio. As we explained, this relationship is due to the Trade-off theory which suggests that larger firms are more able to access external sources of financing at cheaper cost since they are more likely to be diversified and have more collateral to secure the higher level of debt. Meanwhile, the results for the short-term debt ratio models showed a negative relationship with the firm's size; as we explained, this negative relationship is due to lower asymmetric information, which makes equity-financing preferable. It may also be due to a higher transaction cost for the smaller firms, as Titman and Wessels (1988) argued.

The third and the fourth hypotheses; H_4: Growth opportunities have a negative effect on the firm's capital structure. H_5: Growth opportunities have a positive effect on the firm's capital structure.

The results of the total and the long-term debt models showed that this relationship is negative. These results support the Trade-off theory as growing firms have higher agency costs. For the short-term debt models, the relationship was insignificant. Also, as we explained before, Jordanian firms depend more on equity-financing to support their growth opportunities, for religious reasons. Also, as we mentioned, Myers (1977) and Titman and Wessels (1988) suggested that some of the assets acquired during the growth period are valuable as long as the firm remains in business; however, should the firm go bankrupt, the value of these assets would fall dramatically. The short-term debt is not directly related to

growth opportunities as the maturity of these two variables does not match; short-term debt matures in less than a year while growth usually accrues in the long run - more than a year.

The fifth and sixth hypotheses; H_6: Profitability has a positive effect on the firm's capital structure. H_7: Profitability has a negative effect on the firm's capital structure.

As the Pecking Order theory suggested and the results on total and long-term debt showed, profitability has a negative effect on debt ratio as the firm will depend on it as a cheaper source of financing rather than using more expensive sources such as debt-financing.

The seventh and eighth hypotheses; H_8: Non-debt tax shields have a negative effect on the firm's capital structure. H_9: Non-debt tax shields have a positive effect on the firm's capital structure.

Non-debt tax shield only showed a significant relationship with the long-term debt. This was a positive relationship which can be explained by the fact that non-debt tax shield can be a proxy for the size of fixed assets held by the firm, and not just as a tax shield; this means that the positive relationship is due to the fact that, with more fixed assets, long-term debt can be secured since the firm has more fixed assets for use as collateral in case of bankruptcy.

The ninth and tenth hypotheses; H_{10}: Liquidity has a positive effect on the firm's capital structure. H_{11}: Liquidity has a negative effect on the firm's capital structure.

The results for the long-term debt models only showed a positive relationship with liquidity in the forms of total liquidity, cash, and non-cash liquidity. These results suggested that a higher level of liquidity allows the firm to obtain more long-term debt as liquidity can help the firm meet the financial obligations associated with long-term debt, as the Trade-off theory suggested. On the other hand, the results for the total and short-term debt models showed that the relationship with liquidity is negative. These results support the view of the Pecking Order theory which suggested that firms started with the cheapest source available to finance their operations and investment. Liquidity will provide the firm with a cheaper source of financing which means that it will depend less on debt-financing, especially for short-term financing.

The eleventh and twelfth hypotheses; H_{12}: Assets tangibility has a positive effect on firm's capital structure. H_{13}: Assets tangibility has a negative effect on firm's capital structure.

The more tangible and fixed assets the firm has the more secured its debt will be. These assets will be used as collateral for the firm debt in the case of bankruptcy, as the Trade-off theory suggested. This explanation of the positive relationship works for the long-term debt, but when it comes to the total debt and the short-term debt, the results showed a negative relationship. The Pecking Order theory suggested that the negative relationship can be explained by the fact that, with more tangible assets, the asymmetric information will be reduced, which makes equity-financing preferable. Also, tangible and fixed assets with long-run maturity compared to the short-run maturity of the short-term debt could make the effect become negative as these tangible and fixed assets cannot be liquidised in a short period of time or without major losses. This may explain why short-term debt has a negative relationship with assets tangibility, as the results from our sample showed and as Chittenden et al. (1996), Bevan and Danbolt (2002) and Song (2005) found.

The thirteenth hypothesis; H_{14}: The effects of the firm's characteristics on the long-term debt ratio are different from the effects on the short-term debt.

The results from our sample showed that the long-term debt ratio and the short-term debt ratio models generated totally different results for the explanatory variables, as Tables 4.5 and 4.8 showed; these different results are due to the different time maturity for these two forms of debt ratio.

4.5. Conclusion

In this chapter we investigated how the capital structure of Jordanian firms is affected by a group of explanatory variables; among these variables, we were interested in the liquidity variable. We started with basic models to gain a better understanding of how liquidity affects the debt ratio. These basic models measured debt ratio in three ways: total debt ratio, long-term debt ratio, and short-term debt ratio. The effect of liquidity on debt ratio can be positive or negative; Pecking Order theory suggests that the effect should be negative since the firm will depend on its own liquidity before starting to use external sources which are more expensive. In another view, the effect of liquidity on debt ratio can be positive when this

liquidity is seen as a source for the firm to meet the financial obligations associated with the debt, thus allowing the firm to have a higher level of debt. Then we took the analysis a step further by breaking down the liquidity variable into two other variables: the cash liquidity variable and the non-cash liquidity variable. The new adjusted models provided us with results that were consistent with the results from the basic models.

The sample of this research included 80 non-financial publicly traded firms listed in the Amman stock exchange. With 12 years' data from the year 2000 to 2011, the final number of observations was 960. We used a balanced panel data analysis on our data; both the likelihood ratio test and the Hausman test were applied to determine the best model to use among the ordinary least squares, fixed-effect, or random effects models. Then we used a GMM model to understand how firms in Jordan adjusted their debt ratio toward optimal or target debt ratio.

The results showed support for both the Trade-off theory and the Pecking Order theory; many other researchers, such as those we mentioned in the literature review section, had similar findings. The results showed that the variables that affect debt ratio are similar to those in developed financial markets. They also showed that the effect of the explanatory variables is different on different types of debt. Firm's size has a positive effect on the firm's total and long-term debt but has a negative effect on short-term debt. Growth opportunities have a negative effect on both total and long-term debt but have no significant effect on short-term debt. Profitability has a negative effect on total and long-term debt but no significant effect on short-term debt. Non-debt tax shield is only significant for long-term debt with a positive relationship. Assets tangibility has a significant negative effect on total and short-term debt and has a positive effect on long-term debt.

For our main explanatory variable, liquidity in the forms of total liquidity, cash liquidity and non-cash liquidity, results showed that they have a negative effect on total and short-term debt but a positive effect on long-term debt.

Finally, we found that Jordanian firms quickly adjusted their debt ratio toward the target or optimal ratio for the total debt ratio and for the long-term debt ratio, but have no target debt ratio for the short-term debt.

The results of this chapter provide us with both theoretical and practical implications; this chapter introduced a further analysis of the effect of cash and non cash liquidity on the capital structure decision. Also in this chapter we study the speed of debt ratio adjustment on a sample of Jordanian firms where no research has been done on this issue before. This chapter used a larger sample size and covered a longer period of time compared to any other research conducted on Jordanian firms or that included Jordanian firms as part of the sample. This chapter provides a better understanding on how the capital structure decision is affected by the firm's characteristics in a developing country such as Jordan where there is a special issue related to Islamic religion; as Islam forbids the dealing with interest, this Islamic rules has a significant influence on the debt ratio, and this ratio is low compared to other countries either in developed or developing countries. Furthermore, most of the debt financing in Jordanian firms is short term debt, as the short term debt represents about two-thirds of the total debt ratio, and about one-third of the firms in our sample do not have long term debt financing. These results will help firms' management to design their firms' capital structure based on their firms' characteristics and the religion rules, to avoid any shortage in financing as the debt financing is less preferable. It will also provide a guide for managers in other developing countries with similar circumstances to Jordan.

Chapter 5: General Conclusion

In this dissertation we investigated the decisions on cash-holding by examining three main issues: the determinants of cash-holding; the value associated with cash-holding; and how cash-holding affected the firm's capital structure decisions. These issues have been investigated based on empirical data taken from the Amman stock exchange. The Amman stock exchange is the only financial market in Jordan; it was established and formed in 1978 after many years of unorganised securities trading in Jordan between 1930 and 1978. The financial market in Jordan was established to organise the securities exchange, protect the investors, and make the process of securities exchange fast, easy and safe; it is also intended to establish an appropriate investment environment, support the national economy of Jordan, and provide investors with the financial and statistical information that will help them in their financial decisions.

Since it was established, the financial market in Jordan has been improved in many ways; the laws that control this market have been improved and amended in a way that will protect the investors and make the trading in securities safer, easier, faster and smoother. The structure of the Amman financial market has also been improved by replacing the Amman financial market with three new institutions: the Amman Stock Exchange (ASE), Jordan Securities Commission (JSC), and Securities Depository Centre (SDC). The security trading process has also been improved by introducing a computerised system in 2000 to replace the previous manual process. The financial and statistical information provided by ASE has been improved since 2000 to include more detailed financial data. The ASE index has been improved several times to give a better reflection of the market movements.

Although the financial market in Jordan has been improved in many ways in the last few years, it is still a small, young and developing market; which means that it still needs to improve and grow. Since this market is still a young and developing market, the availability, of data might represent a challenge, especially if one wishes to investigate issues in detail or undertake further or deeper analysis. The sample size might also be a challenge as this is still a small market. Another important issue influencing the financial market in Jordan is Islamic regulations. Jordan is an Islamic country, and the Islamic regulations will play an important role in the market such as influencing the debt market and capital structure; since interest is

forbidden in Islam, we can see why the debt market is a very small market in Jordan, as the transaction size in the debt market is less than 0.06% compared to the equity market for the period from 2000 to 2011. Also, the total debt ratio for Jordanian firms is around 32%, but it is much higher in other countries such as the US (58%) and Germany (73%).

For our empirical investigation we used a sample of listed non-financial firms. We excluded the financial firms from the research sample as those financial firms need to hold a certain level of cash as part of their business; had we included those firms, they would have affected the results of our models as those financial firms usually hold higher levels of cash. We also excluded new firms from our sample as the level of cash for those firms might not reflect the firms' decisions on holding cash. Firms that have left the business, on the other hand, have been excluded from the sample as those firms have started the liquidation process, which means that the cash level that they hold is not based on management decisions; that cash, if any, comes from asset liquidation. Furthermore, those firms might not have any cash as all available cash has been used to meet their financial obligations. Another reason for excluding those firms is that they have a number of missing observations, which makes it impossible to measure some of the research variables.

The sample covered the period from 2000 to 2011. Before the year 2000 the database of ASE only included certain items of financial data; that database included the major items of the balance sheet and the income statement, but some items that we needed to measure as research variables were not available on the database before 2000, such as cash. The data for 2011 are the most recent data as the financial year 2012 has not yet ended.

The first issue we investigated in our first empirical chapter (chapter 2) was the determinants of cash-holding. Investigating the determinants of cash-holding goes back to 1936 when Keynes defined the motives for cash-holding as transaction demand, precautionary demand, and speculative demand. Managing cash-holding become an interesting topic again in the 1950s and 1960s, when many researchers investigated the motives for cash-holding. Since the late 1990s, researchers started to analyse the determinants of cash-holding by studying the effect of the firm's characteristics on their decisions on holding cash. Those researchers who studied the determinants of cash-holding applied their models on different samples during different time periods; they used ordinary least squares OLS models, panel data models and cross-sectional models.

We used fixed-effect panel data models to investigate how firms' characteristics including firm's size, firm's cash flow, growth opportunities, profitability, leverage, dividends and liquid assets substitutes affect the firm's cash-holding. We also used the likelihood ratio test and the Hausman test to ensure that the fixed-effect model is most appropriate panel model compared to pooled ordinary least squares OLS model and random effect model; the results of these two tests showed that the fixed-effect model is the most appropriate model to use.

The results from the fixed-effect model on the determinants of cash-holding showed that both profitability and dividends have significant positive relationships with corporate cash-holding, while firm's cash flow, leverage, and liquid assets substitute have a significant negative effect on corporate cash-holding; on the other hand, firm's size and growth opportunities showed insignificant relationships with corporate cash-holding. A robustness test has been carried out by using different ways of measuring the explanatory variables as well as dropping one variable at a time. The results from all models were highly consistent with our main model, as the signs associated with the research variables stayed the same and those variables that were significant remained significant. The results that we obtained from our empirical sample match the results obtained by several researchers and are also consistent with what the theories suggested, even for firms in a small, developing market such as Jordan.

The second issue we investigated in our second empirical chapter (chapter 3) was the value associated with cash-holding. Since the early 2000s, many researchers have studied the cash-holding value based on two models. The first model used is Fama and French's (1998) valuation model, which was developed to study how taxes on dividend and debt affect the firm value. This model has been adjusted by several researchers who broke down the change in total assets variable into two components, cash and non-cash assets, to investigate how cash-holding contributes to the firm value. The second model used is Faulkender and Wang's (2006) model, which has two advantages over Fama and French's (1998) model: firstly, it controls for the risk factor by using the excess stock return; secondly, using the excess stock return rather than the market-to-book value is better since excess stock return is easier to measure and interpret.

Although we applied both models, we used Faulkender and Wang's (2006) model as the research model since it has some advantages over Fama and French's (1998) model. The

results showed that cash is valued at a discount from its face value. Each 1 JD invested in cash is valued at 0.41 JD and this coefficient is 0.94 when we include a subsample using the period from 2000 until the year 2007; those two coefficients are not different statistically, which means that the lower value of the coefficient when we included the whole sample is due to the effect of the financial crisis, which significantly affected the measurement of stock returns during the latter period. The results also showed that, with higher levels of cash-holding, each extra JD invested in cash has a positive effect on the firm value as, since the financial crisis, cash has become more appreciated as it is more difficult to obtain cash from external sources. The results also showed that, with higher levels of debt, each extra JD invested in cash has a declining value. Dividends did not have any significant effect on the firm value.

The result is consistent with what the theories predicted; in developing markets with weak investor protection, weak corporate governance systems, higher information asymmetry, higher free cash flow problems and higher agency problems, cash-holding is valued at a discount. This result is also consistent with the findings of other researchers who studied developing markets or countries with weak investor protection, weak corporate governance systems, higher information asymmetry and higher free cash flow problems. However, the value of cash is at the low end in comparison to the existing studies, implying that these issues may be more significant in Jordan than in most other countries. This is clearly an aspect of the Jordan financial market that needs to be addressed by regulators and others in the future.

The third issue we investigated in our third empirical chapter (chapter 4) was the determinants of the debt ratio and how cash affects the debt ratio. We investigated how firms' characteristics affected the firm's total debt ratio, long-term debt ratio and short-term debt ratio. We examined how firm's size, growth opportunities, profitability, non-debt tax shield, liquidity, and assets tangibility affect debt ratio; then we examined how cash liquidity affects the debt ratio by breaking the liquidity variable into two variables: cash and non-cash liquidity.

The results showed that the total debt ratio is positively related to the firm's size, total debt ratio is negatively related to growth opportunities, profitability, total liquidity and liquidity in the forms of cash and non-cash liquidity, and assets tangibility, but non-debt tax shield is insignificantly related to the total debt ratio. Long-term debt ratio is positively related to the

firm's size, non-debt tax shield, liquidity as total liquidity and with non-cash liquidity only, and assets tangibility, but is negatively related to growth opportunities and profitability. As for the short-term debt, it is only significantly related to liquidity (total and in the form of cash and non-cash liquidity) and assets tangibility, and it has a negative relationship with both these variables.

Finally, we investigated a dynamic model to understand the speed of debt ratio adjustment. We used a Generalized Method of Moments model (GMM model) to investigate the speed of adjustment of the debt ratio; the results showed that Jordanian firms are quick to adjust their total and long-term debt ratio toward their target ratio. This implies that the relatively un-developed debt market in Jordan does not present a barrier to firms being able to access the debt market, and raise the amount of debt that they require.

To summarise, this research investigated some new issues; as in the determinants of cash holding we included a separated variable to measure profitability and operational cash flow. When we studied the value of cash holding we included the effect of the financial crisis on the cash value. Finally, when we studied the capital structure determinants we took the analysis a further step by breaking down the liquidity variable into two types of liquidity; cash and non-cash liquidity, also, we studied the debt ratio speed of adjustment on Jordanian firms where this issue have never been studied before.

The results from this research will help managers in Jordan and other developing countries which have similar circumstances as Jordan to determine their needs for cash to be held inside the firm, understand how that cash is evaluated by the shareholders, and how it affects firm value. It will also help those managers to design the firm's capital structure taking into account the firm's characteristics and other circumstances.

5.1. Research limitations

The main limitation of this research is related to the ASE itself, as this market is a developing market. This market was organized at the beginning of 1978, with only 66 firms listed at that time. The computerized system of securities trading started in the early 2000s, while the database of the firms' financial data before the year 2000 was very limited and included only the main figures which are current, fixed and total assets, current and total liabilities,

authorized capital, total equity, net revenues/sales, earnings before tax, and net income/loss. Even after 2000, when the database started to include a more complete set of financial data for each of the firms, those data were only quantitative data and did not allow a very deep analysis. (The researcher was very keen to include some variables to measure the effect of corporate governance on the cash-holding decisions; unfortunately, due to the data's unavailability, we could not measure the effect of corporate governance on the cash-holding decision; corporate governance usually measured as index, where this index is created based on several variables[17]. The main variables on this index are related to firm's insider, such as the number of those insider, whether they own any stocks, the percentage of their shares to the total shares, etc. Unfortunately, the database in ASE does not include any of those variables, also other database such as Bloomburg does not have corporate governance index for Jordanian firms). Also, as only a small number of firms were listed in the ASE we were limited in our sample size, especially as most of the firms listed in ASE are financial firms, accounting for about 45% of the total number of listed firms.

5.2. Further Research

As a suggestion for further research; including a variable or several variables to reflect market conditions as well as firm characteristics. The existing models include only firm characteristics. The presence of the financial crisis affects firms in many ways, especially the ability to obtain funds from external sources, which will have a significant effect on firms' capital structure and also will affect firms' cash holding decisions as this cash will be more important to replace the shortage of external funds.

In this research we studied how cash holding affects firm's value, and how it affects the capital structure decisions. One other potential issue to study is the effect of cash holding on firm investments. As the cash available inside the firm will provide it with a cheaper source of finance to invest and grow.

[17] Bloomburg database include a corporate governance index for countries and firms. This index is not available for the Jordanian firms. This index include 22 variables which are; 1) Size of the Board, 2) Classified Board System, 3) Number of Independent Directors, 4) Percentage of Independent Directors, 5) Percentage of Women on Board, 6) CEO Duality, 7) Independent Lead Director, 8) Presiding Director, 9) Board Average Age, 10) Board Duration, 11) Number of Board Meetings for the Year, 12) Audit Committee Meetings, 13) Board Meeting Attendance Percentage, 14) Outside Compensation Advisors Appointed, 15) Blank Check Preferred Authorized, 16) Say On Pay Provision, 17) Auditor Ratification, 18) Years Auditor Employed, 19) Executive Compensation Linked to ESG, 20) ESG Linked Compensation for Board, 21) GRI Criteria Compliance, 22) Global Reporting Initiatives Checked. (Appendix B provide more details)

One additional issue for further research, is to expand the models by adding more variables to study more detailed issues; such as adding a variable to measure the effect of the availability of the line of credit for the firm (if any) to understand how it might affect the determinants of cash holding; add a variable to study the stock repurchase on the firm's value not only dividends, or adding any other variable which might have an effect on either cash holding determinants or debt ratio determinants.

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Appendixes

Appendix A: SEO for the Jordanian firms during the period from 2000 to 2012

Table A1*

Firm's Code	Capital**	2001	2002	2003	2004	2005	2006
JOIB	38,500,000		1,500,000				25,000,000
JOKB	20,000,000	5,000,000			6,250,000	8,750,000	35,000,000
JCBK	40,000,000				0	10,000,000	7,500,000
THBK	100,000,000						150,000,000
AJIB	20,000,000				10,000,000		14,000,000
JDIB	24,000,000						
UBSI	20,000,000				5,000,000	15,000,000	15,000,000
ABCO	23,000,000				4,600,000	6,900,000	10,350,000
INVB	27,226,764					5,773,236	11,000,000
EXFB	34,500,000				7,000,000	30,500,000	44,000,000
SGBJ	15,945,091				6,508,653	4,516,809	
CABJ	20,000,000				10,000,000	15,000,000	22,500,000
BOJX	21,000,000	5,250,000	8,400,000	1,850,000	8,290,000	21,210,000	20,000,000
AHLI	49,411,259				10,588,741	12,050,000	37,950,000
ARBK	88,000,000				88,000,000		180,000,000
MEIN	3,520,000				3,480,000	3,000,000	5,000,000
AAIN	2,000,000					500,000	2,500,000
JOIN	10,000,000					10,000,000	10,000,000
GARI	2,000,000						2,000,000
DICL	2,000,000	250,000	250,000	300,000	560,000		1,640,000
JERY	3,000,000					1,200,000	1,260,000
UNIN	2,000,000				1,000,000	2,964,218	1,035,782
JOFR	3,850,000				150,000	2,000,000	500,000

Table A1 continued

Firm's Code	Capital*	2001	2002	2003	2004	2005	2006
HOLI	2,000,000					1,000,000	575,000
YINS	2,000,000					1,000,000	2,000,000
GERA	2,000,000						800,000
ARSI	2,000,000						19,000,000
AOIC	2,000,000				500,000	1,250,000	6,250,000
JEIC	2,500,000					2,500,000	
ARIN	3,564,000				436,000	1,000,000	3,000,000
PHIN	2,000,000					500,000	494,539
AIUI	2,000,000					2,000,000	
NAAI	2,000,000						
JIJC	4,600,000				736,000	6,664,000	4,500,000
AMMI	2,000,000					2,000,000	
AGICC	5,000,000					800,000	4,600,680
TIIC	3,000,000					600,000	4,400,000
ARAS	2,000,000					2,100,000	1,800,000
ARGR	5,000,000					1,500,000	2,275,000
ARAI	3,000,000					2,929,847	14,950
BAMB	6,000,000				3,600,000	5,400,000	5,000,000
ABMS	10,000,000				2,000,000	3,000,000	
JOEP	40,000,000				5,000,000	5,000,000	10,000,000
AIHO	15,500,626		499,374		4,000,000		5,000,000
IREL	4,000,000						
SHIP	1,200,000				300,000	6,550,000	4,025,000
PRES	4,500,000					1,500,000	1,500,000
JDPC	7,500,000						
MHFZ	2,500,000				500,000	6,951,216	5,048,784
TAJM	1,200,000				-700,000	13,500,000	26,000,000
JDFS	5,000,000						
JEIH	8,379,895					2,932,963	3,687,142

Table A1 continued

Firm's Code	Capital*	2001	2002	2003	2004	2005	2006
JOMA	600,000				10,400,000		
JOPP	2,500,000				800,000		700,000
SITT	3,437,564				1,562,436	2,000,000	6,200,000
JOIT	15,354,498					1,630,496	12,528,895
ZEIC	8,475,000						
AIEI	20,250,000						20,250,000
TRTR	3,455,200						
JOTF	4,199,965				800,035	2,500,000	7,500,000
ABLA	3,878,514						
UNIF	5,000,000					1,000,000	511,057
UINV	11,000,000				5,500,000	33,500,000	
AFIN	4,000,000			-1,500,000			
ULDC	5,000,000				1,964,285	8,035,715	30,000,000
SPIC	9,161,465				2,838,535	5,800,000	2,700,000
AIPC	11,750,000						4,250,000
UAIC	16,500,000				3,500,000	20,000,000	80,000,000
SPTI	2,050,000						930,236
AEIV	4,527,218					4,471,984	9,109,670
SIJC	4,000,000						
REDV	4,000,000				3,000,000	43,000,000	
EJAD	1,375,000						
AAFI	7,450,075						1,490,015
UCFI	4,910,000						
ARED	3,667,067						16,332,933
ITSC	12,134,646				-1,516,831		
JOCE	4,000,000					489,863	10,137
PETT	6,000,000					6,000,000	3,000,000
CICO	6,905,200					14,032,562	1,062,238
NAQL	900,000					7,100,000	

Table A1 continued

Firm's Code	Capital*	2001	2002	2003	2004	2005	2006
JPTD	14,500,000						2,500,000
RJAL	56,000,000				10,000,000		
RJAA	1,600,000						
IEAI	13,000,000					2,000,000	14,953,604
REAL	2,500,000						7,496,082
BIND	1,000,000					1,000,000	4,500,000
DKHS	6,000,000						1,500,000
IBFM	5,000,000					14,901,979	1,393,138
INMA	5,500,000					1,500,000	
INVH	6,000,000						
AMWL	20,000,000					16,877,500	5,622,500
OFTC	7,400,000						
JRCD	15,000,000						15,000,000
SECO	7,500,000						
AMAL	7,500,000						
CEBC	5,000,000						
AMAD	6,000,000						
WIVA	1,500,000						
EMAR	4,199,779						7,543,643
TAMR	211,923,247						6,576
MEET	5,000,000						
COHO	3,615,000						
MSFT	12,000,000						
AWTD	1,000,000						
BLAD	10,000,000						
JOMC	500,000						
JMIL	715,094						149,906
DERA	25,000,000						
ABUS	10,000,000						

Table A1 continued

Firm's Code	Capital*	2001	2002	2003	2004	2005	2006
FUTR	15,500,000						
MANR	3,400,000						
RAMM	6,000,000						
CARD	10,000,000						
LEAS	5,000,000						
THDI	2,000,000						
AMLK	55,000,000						
SHRA	6,000,000						
AMWJ	14,000,000						
MANE	5,000,000						
ENTK	3,423,060						
UGLT	4,200,000						
APCT	4,500,000					-3,000,000	3,500,000
ACDT	665,004					665,004	
WOOL	1,400,000				-400,000	200,000	
ATTA	2,800,000					2,849,989	300,453
EICO	15,000,000					1,500,000	3,500,000
LIPO	3,300,000						-2,800,000
IDMC	1,125,612				9,874,388	3,000,000	
INTI	3,000,000						
JPPC	9,000,000				-3,000,000	4,000,000	6,000,000
JODA	2,625,000						
GENM	1,000,000				500,000		
ICAG	9,000,000					2,696,942	2,700,000
NAST	4,000,000						
DADI	20,000,000						
IPET	4,000,000				0	0	1,000,000
JOWM	4,000,000					4,000,000	2,000,000
JOCF	5,000,000				2,500,000		

Table A1 continued

Firm's Code	Capital*	2001	2002	2003	2004	2005	2006
JOPI	3,250,000					325,000	
JOTN	1,000,000					500,000	
AJFM	2,000,000					-748,242	125,176
JOIC	1,363,351				272,671		163,602
WOOD	1,875,000						625,000
WIRE	7,500,000					2,500,000	2,500,000
JOSL	4,502,576					-1,534,966	
UCVO	2,500,000				1,000,000	1,000,000	
NATC	7,200,000				1,800,000		
JOIR	8,000,000				2,000,000	3,250,000	
JNCC	8,000,000				1,760,000		3,740,000
ELZA	7,500,000					2,500,000	1,500,000
NMCO	30,000,000						
RMCC	3,000,000				1,000,000	6,961,106	1,138,894
JOST	15,000,000						8,075,000
MPHA	9,500,000					369,263	320
UTOB	7,500,000				2,500,000	5,000,000	
IENG	5,000,000					2,175,097	
ICER	4,000,000					2,000,000	
INOH	1,350,000					2,900,000	
AIFF	6,000,000						4,500,000
NDAR	6,500,000					1,750,000	1,750,000
MECE	31,764,458				8,235,542		53,927,552
ASPMM	6,000,000					1,500,000	1,500,000
AMAN	4,000,000					3,000,000	
UADI	2,436,646				563,354		
JVOI	3,000,000						
SLCA	2,000,000				366,815		
JIIC	2,000,000				-974,257		974,257

Table A1 continued

Firm's Code	Capital*	2001	2002	2003	2004	2005	2006
TRAV	4,000,000					600,000	
JPHM	16,000,000						4,000,000
FNVO	3,000,000					1,500,000	
AQRM	5,000,000					2,000,000	7,000,000
MBED	6,000,000						3,000,000
GLCI	8,500,000						
CJCC	3,000,000						
IPCH	5,000,000						
PHIL	1,600,000						
NCCO	50,000,000						
Total	1,889,612,874	10,500,000	10,649,374	650,000	244,646,367	459,341,581	1,074,167,761

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
JOIB		16,250,000					81,250,000
JOKB		25,000,000					100,000,000
JCBK	5,750,000	6,325,000	3,478,750	7,305,375	2,410,773		82,769,898
THBK		2,000,000					252,000,000
AJIB	56,000,000						100,000,000
JDIB			26,000,000	25,000,000	14,000,000		89,000,000
UBSI	40,000,000		5,000,000				100,000,000
ABCO	11,212,500	8,409,375	6,447,188	9,080,937	19,057,137	942,863	100,000,000
INVB	11,000,000	6,325,000	8,675,000	7,500,000	7,750,000	14,750,000	100,000,000
EXFB	7,000,000	9,280,000	17,720,000				150,000,000
SGBJ		13,485,277			9,544,170		50,000,000
CABJ	7,500,000	5,000,000	8,000,000	12,000,000			100,000,000
BOJX	14,000,000				55,100,000		155,100,000
AHLI					16,500,000	23,500,000	150,000,000
ARBK		178,000,000					534,000,000
MEIN	3,000,000			2,000,000	1,000,000		21,000,000
AAIN	5,000,000						10,000,000
JOIN							30,000,000
GARI	4,000,000						8,000,000
DICL		3,000,000					8,000,000
JERY		2,540,000					8,000,000
UNIN		1,000,000					8,000,000
JOFR	2,600,000						9,100,000
HOLI	425,000						4,000,000
YINS	3,000,000						8,000,000
GERA		1,200,000					4,000,000
ARSI							21,000,000
AOIC		1,000,000	1,850,000	2,150,000	2,500,000		17,500,000
JEIC		20,000,000	-20,000,000				5,000,000

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
ARIN							8,000,000
PHIN	755,461		250,000				4,000,000
AIUI		2,000,000			2,000,000		8,000,000
NAAI	1,500,000	4,500,000					8,000,000
JIJC				1,650,000			18,150,000
AMMI	2,000,000	2,000,000					8,000,000
AGICC							10,400,680
TIIC		2,000,000	2,000,000				12,000,000
ARAS	2,100,000				-4,000,000	2,500,000	6,500,000
ARGR		1,225,000				-2,000,000	8,000,000
ARAI			-1,500,000	2,555,203			7,000,000
BAMB							20,000,000
ABMS		1,500,000	1,000,000				17,500,000
JOEP	6,000,000	4,000,000		5,600,000			75,600,000
AIHO			7,000,000				32,000,000
IREL						2,000,000	6,000,000
SHIP							12,075,000
PRES					2,500,000		10,000,000
JDPC		62,500,000					70,000,000
MHFZ					-5,000,000		10,000,000
TAJM			15,170,859	15,829,141	29,000,000		100,000,000
JDFS					2,500,000		7,500,000
JEIH		11,125,000					26,125,000
JOMA							11,000,000
JOPP		500,000					4,500,000
SITT				1,800,000			15,000,000
JOIT							29,513,889
ZEIC			3,525,000		3,000,000		15,000,000
AIEI							40,500,000

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
TRTR	-20,450						3,434,750
JOTF		1,500,000					16,500,000
ABLA	2,121,486	34,000,000				-2,221,727	37,778,273
UNIF			20,000				6,531,057
UINV							50,000,000
AFIN	7,500,000	5,000,000					15,000,000
ULDC							45,000,000
SPIC	2,500,000	2,760,000					25,760,000
AIPC							16,000,000
UAIC	27,500,000			7,000,000			154,500,000
SPTI	94,764						3,075,000
AEIV	16,891,128	12,000,000					47,000,000
SIJC	500,000						4,500,000
REDV		41,500,000					91,500,000
EJAD		2,750,000				1,500,000	5,625,000
AAFI		1,059,910					10,000,000
UCFI				3,090,000			8,000,000
ARED	5,000,000	15,000,000					40,000,000
ITSC	4,382,185						15,000,000
JOCE					-2,177,193		2,322,807
PETT							15,000,000
CICO							22,000,000
NAQL	3,000,000	1,100,000					12,100,000
JPTD		4,500,000					21,500,000
RJAL	18,373,350						84,373,350
RJAA			968,575	7,431,425			10,000,000
IEAI	46,396						30,000,000
REAL							9,996,082
BIND	6,500,000	7,000,000					20,000,000

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
DKHS		4,700,000	2,800,000				15,000,000
IBFM	7,453,290						28,748,407
INMA							7,000,000
INVH	6,000,000				-9000000		3,000,000
AMWL				2,500,000			45,000,000
OFTC	34,600,000						42,000,000
JRCD			4,500,000				34,500,000
SECO	42,500,000						50,000,000
AMAL		7,500,000					15,000,000
CEBC	20,000,000		9,000,000			-28,055,910	5,944,090
AMAD		600,000				1,400,000	8,000,000
WIVA		3,500,000	5,000,000				10,000,000
EMAR	226,578	1,810,000	3,005,670	3,214,330			20,000,000
TAMR	52,250	500					211,982,573
MEET	2,500,000	7,500,000					15,000,000
COHO	2,385,000						6,000,000
MSFT		5,000,000		850,000			17,850,000
AWTD				9,000,000			10,000,000
BLAD			1,500,000	500,000			12,000,000
JOMC	1,000,000			-100,000	140,000		1,540,000
JMIL	135,000	23,000	477,000	240,000			1,740,000
DERA	3,800,000	11,200,000					40,000,000
ABUS	10,000,000			10,000,000			30,000,000
FUTR			21,000,000				36,500,000
MANR	76,600,000						80,000,000
RAMM		1,000,000		7,000,000			14,000,000
CARD		4,223,184	500,000	736,159			15,459,343
LEAS			2,000,000				7,000,000
THDI					300,000		2,300,000

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
AMLK		5,000,000	-59,000,000			-500,000	500,000
SHRA					3,300,000		9,300,000
AMWJ			9,401,408	6,598,592			30,000,000
MANE			105,000,000				110,000,000
ENTK				1,503,370			4,926,430
UGLT			3,800,000			-1,400,000	6,600,000
APCT		15,000,000				-10,000,000	10,000,000
ACDT							1,330,008
WOOL							1,200,000
ATTA	6,049,558						12,000,000
EICO							20,000,000
LIPO	2,835,942						3,335,942
IDMC	7,000,000						21,000,000
INTI		4,000,000	4,000,000			3,500,000	14,500,000
JPPC	-2,211,126	-7,388,874	-3,840,000	12,440,000			15,000,000
JODA	1,375,000						4,000,000
GENM							1,500,000
ICAG		-9,396,942	5,000,000				10,000,000
NAST			-2,000,000	2,000,000			4,000,000
DADI					3,000,000		23,000,000
IPET							5,000,000
JOWM	2,500,000	2,500,000					15,000,000
JOCF							7,500,000
JOPI							3,575,000
JOTN			376,973	123,027			2,000,000
AJFM	137,693	485,373		-113,847			1,886,153
JOIC							1,799,624
WOOD	1,000,000	1,000,000			500,000		5,000,000
WIRE		7,500,000				-700,253	19,299,747

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
JOSL	1,032,390	1,000,000				-43,611	4,956,389
UCVO							4,500,000
NATC							9,000,000
JOIR			3,400,000				16,650,000
JNCC		13,500,000	13,000,000			-1,110,790	38,889,210
ELZA		991,948	2,508,052				15,000,000
NMCO	-29,044,100	44,100					1,000,000
RMCC		12,900,000					25,000,000
JOST		11,925,000					35,000,000
MPHA							9,869,583
UTOB							15,000,000
IENG							7,175,097
ICER							6,000,000
INOH							4,250,000
AIFF							10,500,000
NDAR							10,000,000
MECE	6,072,448			40,000,000	10,000,000		150,000,000
ASPMM							9,000,000
AMAN							7,000,000
UADI							3,000,000
JVOI		1,000,000					4,000,000
SLCA							2,366,815
JIIC							2,000,000
TRAV							4,600,000
JPHM							20,000,000
FNVO							4,500,000
AQRM							14,000,000
MBED		1,000,000		600,000			10,600,000
GLCI			1,512,464				10,012,464

Table A1 continued

Firm's Code	2007	2008	2009	2010	2011	2012	Final capital
CJCC				300,000	700,000		4,000,000
IPCH		2,000,000					7,000,000
PHIL			400,000	1,000,000			3,000,000
NCCO					5,000,000		55,000,000
Total	481,231,743	628,451,851	218,946,939	208,383,712	169,624,887	4,060,572	5,400,267,661

* The numbers in this table represent the total capital increases (in case the firm increases their capital more than one time in the same year) or the net capital increases (in case the firm increases and decreases their capital in the same year), capital increases include public offering, private offering, stock dividends, and returned earnings capitalization.

** represent the firm's capital as at the end of 2000 if the firm has been established before the year 2000, or the firm original capital if the firm established after the year 2000.

Source: Securities Depository Centre.

Appendix B: Bloomburg Corporate Governance Index

The following are the components of Bloomburg Corporate Governance Index where each variable is weighted in terms of importance, with board of directors' variables carrying greater weight than other variables. This index take the value between 0.1 and 100.

1) Size of the Board

Number of Directors on the company's board, as reported by the company. Full time Directors only. Deputy members of the Board will not be counted. Europe: Where the company has a Supervisory Board and a Management Board, this is the number of Directors on the Supervisory Board. Field is part of the Environmental, Social and Governance (ESG) group of fields.

2) Classified Board System

Indicates the company has a two or three tier classified/staggered board system. This field is part of the Environmental, Social and Governance (ESG) group of fields.

3) Number of Independent Directors

Number of Independent Directors on the company's board, as reported by the company. Independence is defined according to the company's own criteria. Europe: Where the company has a Supervisory Board and a Management Board, this is the number of Independent Directors on the Supervisory Board. Field is part of the Environmental, Social and Governance (ESG) group of fields.

4) % Independent Directors

Independent directors as a percentage of total board membership. Field part of Environmental, Social or Governance (ESG) group of fields.

5) % Women on Board

Percentage of Women on the Board of Directors, as reported by the company. Europe: Where the company has a Supervisory Board and a Management Board, this is the Percentage of Women on the Supervisory Board. Field is part of the Environmental, Social and Governance (ESG) group of fields.

6) CEO Duality

Indicates whether the company's Chief Executive Officer is also Chairman of the Board, as reported by the company. "N" indicates the two roles are separate. Field is part of the Environmental, Social and Governance (ESG) group of fields.

7) Independent Lead Director

Indicates whether the company has an independent lead director within the board of directors. For companies with Presiding directors, please refer to ES169 (PRESIDING_DIRECTOR) This field is part of the Environmental, Social and Governance (ESG) group of fields.

8) Presiding Director

Indicates whether the company has a presiding director in its board of directors. For companies with independent lead directors, please refer to ES168 (INDEPENDENT_LEAD_DIRECTOR). This field is part of the Environmental, Social and Governance (ESG) group of fields.

9) Board Average Age

Average age of the members of the board. Field part of Environmental, Social or Governance (ESG) group of fields.

10) Board Duration (Years)

Length of a board member's term, in years. For boards which allow renewal of terms, it is the length of a single term prior to renewals. Field part of Environmental, Social or Governance (ESG) group of fields.

11) Number of Board Meetings for the Year

Total number of corporate board meetings held in the past year. Field part of Environmental, Social or Governance (ESG) group of fields.

12) Audit Committee Meetings

Number of meetings of the Board's Audit Committee during the reporting period. Field part of Environmental, Social or Governance (ESG) group of fields.

13) Board Meeting Attendance %

Percentage of members in attendance at board meetings during the period. Field part of Environmental, Social or Governance (ESG) group of fields.

14) Outside Compensation Advisors Appointed

Indicates whether the company appoints outside executive compensation advisors. This field is part of the Environmental, Social and Governance (ESG) group of fields.

15) Blank Check Preferred Authorized

Indicates whether the company is authorized to issue blank check preferred stock without shareholders' approval. This field is part of the Environmental, Social and Governance (ESG) group of fields.

16) Say On Pay Provision

Indicates whether the company has a say on pay provision. This is marked Y when the provision has been voted FOR by shareholders at the most recent Annual General Meeting (AGM). It is marked N when the provision has been voted AGAINST by the shareholders at the most recent AGM. This field is part of the Environmental, Social and Governance (ESG) group of fields.

17) Auditor Ratification

Indicates whether the auditor has been ratified in the recent shareholder meeting. This field is part of the Environmental, Social and Governance (ESG) group of fields.

18) Years Auditor Employed

Indicates the number of years the auditor has been employed. This field is part of the Environmental, Social and Governance (ESG) group of fields.

19) Executive Compensation Linked to ESG

Indicates whether executive compensation is linked to Environmental, Social and Governance (ESG) goals. This field is part of the Environmental, Social and Governance (ESG) group of fields.

20) ESG Linked Compensation for Board

Indicates whether board compensation is linked to Environmental, Social and Governance (ESG) goals. The field is part of the Environmental, Social and Governance (ESG) group of fields.

21) GRI Criteria Compliance

Indicates whether the company is in compliance with Global Reporting Initiative (GRI) criteria. Field part of Environmental, Social or Governance (ESG) group of fields.

22) Global Reporting Initiatives Checked

Indicates whether the company's application level was checked by the Global Reporting Initiative (GRI). This field is part of the Environmental, Social and Governance (ESG) group of fields.