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Jordanian capital market efficiency: The case of the Amman Stock Exchange

DOCTORAL DISSERTATION

Supervisor: Dr. Sandor Bozsik

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Contents

I, Bustanji Mazen Ismail Abdel-Fattah, confirm that this dissertation submitted for the degree of Ph.D. in the credit guarantee system is my individual work and is expressed in my own words.

Any uses made within it of the works of other authors in any form (e.g., ideas, equations, figures, text, tables) are properly acknowledged. A full list of the references employed has been included.

Signed: Bustanji Mazen Ismail Abdel-Fattah

Miskolc, 2022

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All praise to Allah, we praise Him, seek for His assistance and forgiveness and we seek refuge with Him from evils of our souls and our misdeed. No one can mislead whosoever Allah guides, and none can guide whosoever Allah causes to go astray. I am grateful to Allah for His continuous mercy bestowed on me for the successful completion of this dissertation.

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LIST OF ACRONYMS USED

ACPA	Arab Certified Public Accountant
ASE	Amman Stock Exchange
Arabic	Arab Bank
B O D	Board of Directors
C.A	Cairo Amman Bank
CBJ	Central Bank of Jordan
CFA	Certified Financial Accountant
CMA	Certified Managerial Accountant
CPA	Certified Public Accountant
EBRD	European Bank for Reconstruction and Development
EMH	Efficient Market Hypothesis
EBRD	European Bank for Reconstruction and Development
GDP	Gross Domestic Product
IOSCO	The international organization of securities commission
JSC	Jordan Securities Commission
JCM	Jordanian Capital Market
JOB	Jordan Islamic Bank
MoF	Ministry of Finance (Jordan)
MMOU	Multilateral Memorandum of Understanding (
P/BV	Price to Book Value
P/E	Price Earnings Ratio
RGTS	Real-time gross settlement systems
RWH	Random Walk Hypothesis
SAFWA	Jordan Dubai Islamic Bank
SSIF	Social Security Investment Fund
SCL	Securities characteristic line
SDC	Securities depository center
SEC	Securities and Exchange Commission
THBK	Housing Bank for Trade & Finance

APT	Arbitrage Pricing Theory
CAPM	Capital-Asset-Pricing Model
CML	Capital Market Line
IOS	Investment-Opportunity-Set
SML	Security Market Line
SD	Standard deviation
RWM	Random Walk Model

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Chapter 1   Introduction

1.1   The motivation of the study

I have been working in the Jordan Securities Commission as a financial inspector and licensing officer while carrying out my doctoral studies; this motivated me to choose this topic with the cooperation with my supervisor, who has extensive knowledge about this topic. The Jordanian capital market (JCM) has suffered from many financial crises on the local level and the environmental level around, like the wars and conflict in Iraq, Syria, Yemen, Palestine, and later in Lebanon, but Jordan has one of the best climates for being a safe place to attract investors not only from the Arabic countries but also from all over the world. This means that the JCM needs to develop and to attract special attention from the workers, listed companies, brokers, investors, government, and all capital market partners, so from this point I would like to provide this work to be available to those with whom we have a connection in the Stock Exchange and with whom we push the JCM to compete in the international markets, to enhance efficiency, and to increase its ability to achieve all partners' satisfaction.

A more developed and empowered market means a market that can help all partners to achieve their goals and maximize shareholders profits. This work will help the listed companies, JCM partners, brokers, Banks, Jordan Securities Commission (JSC), Amman Stock Exchange (ASE), and Security Depository Center (SDC) to follow the recent studies in this field and provide stakeholders with a database into the research and development departments.

The JCM needs such studies as this type of dissertation, which has never been done before. For example, no one has studied the semi-strong and the strong form of efficiency, or combined results with primary data to study all efficiency levels. This study alone is not enough to say that the capital market is well studied, but it will add value to those who study the JCM and help them to find new ways to analyze the market, even to judge if the market is good enough to invest in or not.

1.2   Statement of Problem and Issue

In the current time where the whole world is facing a new economic challenge every day, many countries are motivated to produce a tool to help capital market organizations, financial companies, banks, brokers, and investors to understand more about the challenges facing the capital markets and try to predict what will happen in the future, so if there is a way to prevent a crisis, the tool aims to generate quantitative data in various dimensions of capital market efficiency.

Specifically, this study aims to fill a research gap in the capital market of Jordan by studying the market closer by studying the primary and secondary data. The study addresses sampling and data collection issues for implementing the capital market efficiency theory on the capital market of Jordan and provides guidance for the use and analysis of data. In addition, the historical data will focus on the efficiency and the understanding of Fama's concept of capital markets. The other goals of the study are to provide better empirical information on the Jordanian capital market for greater benefits between researchers, policymakers, financial companies, listed companies, banks, and investors.

The capital market of Jordan is still suffering from consecutive crises. For example, the growth of the net domestic product growth was only 2.0% in the first three quarters in 2018, compared with 2.2% for the same period in 2017 (Fund, 2019). The Jordanian economy was supposed

to grow more rapidly than before because of opening the boarders with Syria and Iraq, which increases the export side from Jordan, and that was obvious from the increased exports from Jordan to Iraq, higher by 26.7% in 2018 compared with the same period in 2017, and the tourism sector gets more attention, as shown by an increase in the tourism income by 13.1 % in 2018. At the same time the market is still not liquid enough to say it is efficient or even to apply some efficiency tests (thought this is not the only problem facing the market). However, to just keep hoping that the general situation will become better while waiting for the financial crises around us to finish is not possible. This study will go proactive by analyzing the data and trying to predict how the capital market administration should behave. The most important point is that the capital market was expected to grow in 2019 and 2020 by 2.2% and 2.4% respectively, according to AMF (2020).

Lately, most investors are attracted to the new currencies like Bitcoins. The main factor behind that is the dramatic change in its value, which has made the holders achieve easy profits with it, which affects the capital markets directly by reducing the money flows to the capital markets. Instead, people invest in new currencies or even new technological inventions like 5G on the internet, as is the case with the Tokyo Stock Exchange, where this market was the main attraction for visitors all over the world in 2020 investing in the 5G internet while other markets were shutting down to prevent losses because of the coronavirus crisis, as in the case of Aman Stock Exchange. Like these points need to be taken into consideration and find clarification from the government and regulators to increase investors trust in the capital market of Jordan.

Managing the capital markets could be easily managed if we looked at the strategy and the goals in the short term. Some members of management would like to be active, which means they want to wait and see what challenges the environment could provide challenges. On the other hand, there are managers who are proactive: they will not wait for the challenges, but they will be ready for any change in the environment before anything could happen. These challenges are not easy to predict but it would be useful to connect the research in any organization to the decision makers to help modify the strategy and goals in terms of challenges. The earlier active (or reactive) management in the capital market is not enough these days, especially with the rapid changes in the technology; some old business could be risky to invest in and that is what will cause such a business to close. For example, liquidity is one of the main factors that the capital market needs these days and this problem will not be solved until the capital market gets better signs of efficiency; this will help foreign investors to enter the market because this type of market will provide an equal opportunity to get return from investments. Naturally, there will also be many other reasons which lead to a not-liquid market, which causes inefficiency at the different levels of market efficiency, according to Fama's theory (Fama et al.1969).

This proposal aims to test the efficiency of the Amman Stock Market and to understand the extent to which reality is close to the theoretical ideas of an efficient capital market. The main purpose of this research is to understand the stock markets and to provide certain guidelines to the small retail investor. In the Jordanian setting, the researcher will attempt to discover the answers to the following questions.

- Is the Jordanian capital market truly efficient in weak, semi-strong, and strong forms of efficiency? (Or in other words, how will the capital market of Jordan response to the levels-of-efficiency tests)?

- To which extent is the Jordanian capital market being efficient) (What form of efficiency describes it?)

- What could cause the efficiency gap in the capital market?

Anyone interested in capital market studies and topics related to the investors, customers, securities, companies, government affairs, and even the economy in general, wants to see what is new in the environment related to all of those subjects; moreover, no one can deny that we are all living in an unstable environment, where technology – which has made our life easier in some ways and affected others directly – has also affected the capital markets all over the world, making the flow of information more efficient and fast with lower costs.

From here the researcher wants to study the efficiency of capital markets, to understand the main type of work they do, and to look at the developed markets in the world and try to summarize the lessons behind the studies, to apply them, if possible, on the local capital market in Jordan.

The study will take into consideration the indicators according to the limitations which boarding the work:

1. The availability of the data needed to construct the considered indicators.
2. The reliability of the data collected, based on a survey from different categories of the capital market.
3. The economic meaning of the indicators, for example capital market efficiency and some special indicators in the Amman Stock Exchange.
4. The period in which the data was collected was from January to March 2020.

1.3 The significance of the study

In the previous research on efficiency, no one goes has consistently tested all three levels of efficiency. Especially if the weak form test shows that the market is not efficient, other researchers will stop at that level and claim that the market is not efficient at all on all three different levels of efficiency. This study takes advantage of my motivation to go further than any research by studying also the semi-strong and strong form of efficiency; moreover, the study will not stop at efficiency levels, because these depend on the historical data only, but in this study, I collected also primary data through a survey, which is another advantage to the research work.

This study uses many different tests to make sure the tests will achieve the same conclusion points, combining the historical data with the primary data to consolidate all study results. The sample covers a recent time period; besides, the data covered the right time for each efficiency level.

This research came to focus mainly on the efficiency gap in the capital market of Jordan, while it goes into more details of the methodology by using a combination between the theoretical and the practical parts. What makes the study unique is using primary and secondary data together to discover more details rather than just going on to the first stage of market tests (the weak form). Through studying the semi-strong and the strong form of efficiency and then studying the market again from a different point of view, the methodology added a new dimension to the work by looking at the problem from a different point of view. Most studies only investigate the weak form and then stop to discuss in detail what cause inefficiency in the weak form, as in the case of Abu Zarour (2006) where he studied all Arab markets for the weak form only and compared between the markets, and as in the case of Al-Razeen (1997), who tested the Saudi Arabia capital market and analyzed it from the weak form level of efficiency.

All the previous researchers did nice work and are worth gaining experience from, while this study looks at the problem from another dimension and investigates other details.

However, this study is unique by going further to touch the limits of the theory and discuss it in detail on every level, and in considering what is causing the efficiency gap. The primary data gained through the survey will be taken into consideration to combine the results with a conclusion from the secondary data, in order to make a solid conclusion.

1.4 Study objectives, methodology and the tasks to be solved.

The purpose of this study is to go further than any researcher has done before in the Jordanian environment and discover the microstructure efficiency gap under the theory of the capital market efficiency umbrella, which it will provide another point of view. Corporate insiders are required to disclose their trades to the Securities and Exchange Commission (SEC). JSC (2019). The JSC Act requires the insiders to report their trades to the Commission within ten days following the end of the month in which the trade occurs; the disclosure affects the trading strategies of competing insiders with imperfect information, and the implication of such trading strategies on market efficiency, market liquidity, and insiders' profit will be analyzed using many different modeling techniques.

The stock markets play a vital role in capital allocation and its transformation from savings to financing new investment initiatives, consequently creating more wealth. The efficient and effective operation of monetary markets, particularly capital markets, are the muse of the event of the modern economy, while at the same time, the financial investments on capital markets mean the flow of all streams of funds managed by banks and financial institutions, mainly the stock market and institutions investing in it, i.e., investment, pension fund, and insurance companies.

Many researchers have considered the meaning of the term capital market and demand that the definition itself remain without change, while the new internet world makes getting the information easier and more manageable. Logically, Fama et al. (1965) gave the theory a reputation that efficiency it is possible in lately by talking about the proper for all the investors access the knowledge at an equivalent time and therefore the with none trading, with no doubts that the market generally tries to manage the connection between the borrowers and lenders and aims to manage the saving percentage by offering new products or services. From another point of view, what customers need currently will become quaint in the future; those who attempt to keep the past alive will face major problems in keeping up with the times. Therefore, the demand on new computers which able to solve such a problem is one good example: businesses were competing who was to be the primary one to use computers in the 1990s. Nowadays the similar computers would not be enough for creating an equivalent job; in another words, markets also change and so the need for a new definition which borders new intending to efficiency is additionally important (the relationship between using computers and the efficiency), while we use new methods to sell and buy products and services, as well as using new methods for delivering the knowledge to the investors efficiently.

Back to efficiency, it is intended to identify the power of the capital market to act in such a fashion that security prices reflect the present and new information flows from the market in an unbiased manner, therefore the prices should be determined on the premise of demand and supply (Fama & MacBeth, 1973). In an efficient market, the safety prices (avoiding the risky stocks) are alleged to be reflected in an unbiased manner, and therefore the flow of the knowledge should be in (In case all investors reached the information at the same time without

any delay). (Ease and everyone public information is enchased by the investors and a few reflections).

So that means there is no advantage to using private information to attain excess returns (superior returns) from the investors in an efficient market, while the costs of shares absorbing the new changes in the knowledge.

There are three sorts of information efficiency of a market that will be verified. Testing weak-form efficiency provides information on reflection of the historical values of share prices. The common research on this topic proves the validity of the hypothesis that the technical analysis does not allow the achievement of abnormal rates of return. Within the case of the semi-strong form, the inquiry does not provide explicit answers; however, most research weighs in favor of the hypothesis of the semi-strong type of market informational efficiency. Consistent with the hypothesis, it is impossible to realize above-average profits within the end of the day, supported technical and fundamental analysis. The strong form efficiency represents another sort of market informational efficiency, which is most difficult to verify because it requires the utilization of non-public information.

The main objective of stock markets is to produce capital inflow for entities issuing stocks, thereby allowing them to grow and to create wealth for investors, who invest their free capital in stocks, which they perceive as attractive investments. Moreover, the capital market is a place where the current market value of a company is determined by the supply and demand of its shares. The reliability of the stock valuation process is substantially correlated with results obtained in the verification of the hypothesis of the stock market efficiency. The subject of market efficiency is very often brought into question by practitioners and theoreticians from the financial sector, who build and verify investment strategies.

One of the ways to test this level of efficiency is the event study, which is used for analyzing and evaluating the behavior of share prices, which is publicly available information. Also, it is used for typically different reasons. The first usage of it is with the semi-strong form efficiency test on the assumption that the postulates of market efficiency hypothesis hold. The second usage of the event study is as a tool for examining the impact of some event on the wealth of firms' shareholders Barnes & Ma, 2002; Kothari & Warner, 2011). The third usage is for the same purpose of this dissertation, which is for the strong form of efficiency test (Wong, 2002). Dolly (1933) who was the first researcher who employed and examined the price effects of stock splits and investigated nominal price changes at the time of stock splits, where he tested the effect of unexpected dividend on the changes of stock prices and to be a breakthrough in testing market efficiency. Over the past half-century, event studies have been employed in a great deal of research and their sophistication has been greatly improved by authors such as Fama et al. (1969).

Chapter 2   LITERATURE REVIEW

2.1   Definition (Efficient Market Hypothesis EMH)

The role of the capital market is allocation of ownership of the economy's capital stock and that is why a capital market created mainly for this reason, to drive the market to be efficient it supposed to meet the objectives of financial reporting by providing investors and creditors with useful information to help them realize what is going around and take a decision for make national investment and credit decision. (FASB, 1978).

This definition implies that there is no one who can earn extra return above average return by trading in the stock market. This means that since all the new information is already reflected in the current stock prices, no investor could be able to outperform the market.

The main idea behind the capital market is to provide compensation for the investors, and the investors expecting a range of return or expected percentage of return from their current consumption as they put their money into a stock market for getting rewards back. From this point the prices in which always fully reflect available information is called "efficient" according to Fama (1965, 1970).

The world started showing more interest in disclosure over the last thirty years, and an increasing number of studies research in this field can be noticed (Forker, 1992; Inchausti, 1997; Nichols & Street , 2007; Suwaidan et al., 2004) while the global financial crises are still affecting the sectors, especially the capital market, in a negative way (Matar and Ali Bekhet, 2013) and most of the sectors are facing a challenge to get out of the crisis and raise capital for the shareholders. from that point the study of the market efficiency as a theory talking about the effect on the disclosure (information) for making an efficient market, which will lead to a strong economy and performing higher stock market return with the same return of the economy (Kirman, 1992)

However, the history of the financial world has recorded many global financial crises, and many economists and researchers have tried to interpret this kind of economic phenomenon. This leads to a better understanding about how the economic mechanisms work and extends the public awareness of the economic world. During this time when the world is facing one of the biggest financial crises that history has recorded from the great recession because of COVID-19, researchers are still trying to understand the linkage between financial development and economic growth. Work in this began much earlier, with researchers in the field Gurley & Shaw (1955) and McKinnon (1973), up to more recent studies (e.g., Haslag & Koo, DATE; Kabir et al., 2011, Batuo et al., 2018). Moreover, while researchers are trying to develop a concept of capital market efficiency, other researchers are still interested in the main theory cases like those of Mandelbord (1966) or Fama (1969, 1970, 1991) as the best theories to reflect and interpret the capital market mechanism. Fama's theory is the most widely studied and most often referred to in the literature. This study will use Fama's theory in the capital market of Jordan to apply the efficiency theory as an umbrella and analyze the data which has been collected from the Jordanian capital market.

The time when capital markets started to attract more professional work and become a topic of researchwas during the 1960s and 1970s, when the capital markets started to see new definitions like "capital market efficiency". The first researchers who developed this definition

were Samualson (1965) and Fama (1965, 1970). The main idea was based on the assumptions that share prices adjust rapidly to new information the current price reflects all the available information, and this stimulates a process which is called the random walk.

However, Fama came up with his own definition of an efficient market: "A market in which prices always fully reflect all available information is called efficient" Fama (1970) Claesson (1987). This definition was intended to be more appropriate for empirical research. Also, this is the definition chosen for this dissertation.
Capital market efficiency from the Fame's point of view means that the market could be classified into three different levels according to efficiency hypothesis (EMH): (Fama, 1965, 1970, 1991, 1998). Based on an extensive continues review of the literature on capital market efficiency, the theory classifies existing indicators of the capital market efficiency into three broad categories:

Fama (1970) further developed the EMH and created a classification system to help with the categorization of markets: The Weak Form, The Semi-Strong Form and The Strong Form, depicted in figure 1.

All information relevant to a stock (*Strong form*)

Information set of publicly available information (*Semi-strong form*)

Information set of past prices (*Weak form*)
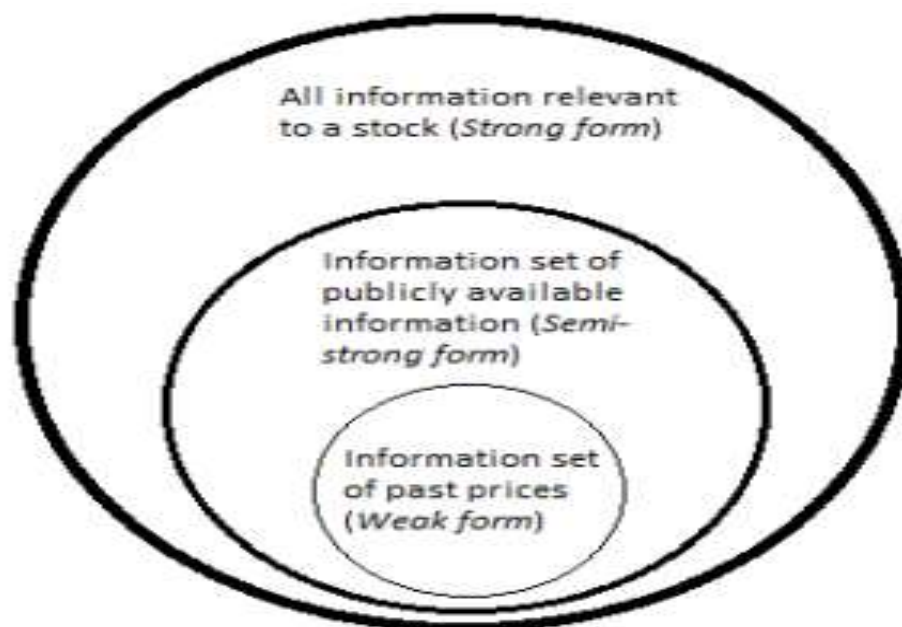
Figure 1 Relationship among three different information sets

(Ross, Westerfield, Jaffe, & Jordan, (2007, p. 375)

Consequently, *Fama (1970)* presented the classical Efficient Market Hypothesis (EMH) as a market in which firms can make production investment decisions, and investors can choose among the securities that represent ownership of firms' activities under the assumption that

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security prices at any time fully reflect all available information. Defined an informationally efficient capital market as one in which prices reflect all information and distinguished among three forms of market efficiency: weak, semi-strong, and strong.

In the case of sub-efficient markets, the share price may fail to fully reflect all relevant information and abnormal returns may be obtained by taking advantage of public information, because there is a significant time lag between announcement and full incorporation of the information. Fama (1991) calls this the level of efficiency. Rather than the weak form test, he suggests tests for return predictability, as this category now is covering a more general area of return predictability in the recent period. For the semi strong form and for the strong form he suggested a new name too, not coverage. Instead of semi-strong form tests of the adjustment of prices which are related to public announcements, he uses for this level of efficiency an event study; moreover, instead of the strong form he suggested to test for private information, as this level needs to discover whether specific investors have information not in market prices, so the title of testing private information is more descriptive rather than the strong form of efficiency. Particularly interesting in this case is the announcements of earnings, dividends, and changes in the capital structure, which can have a direct impact on the value of a company, hence, its stock price.

Closer to the definition, in the efficient capital market, the prices and the return per period are unknown and no one can predict it. In other words, the efficient market hypothesis (EMH) defines the next-day prices or value of tomorrow's price $P_t + 1$ with all given information from the previous period up to today P_t and denoted as Ω_t, should equal P_t.

This could be written mathematically by the equation, $E_t[P_{t + 1} \mid \Omega_t] = P_t + \mu$, where E_t denotes the mathematical expectation operator given the information at time t. In testing the EMH the model commonly used is $p_t = \mu + P_{t-1} + e_t$, where $e_t \sim i.i.d.(0, \Omega^2)$, or returns follow a random walk with drift $\triangle P_t = \mu + e_t$. From the beginning of this definition, these kinds of models were classified as an appropriate statistical model of stock market behavior.

The EMH, in Fama's view, is trying to focus on the main factor, which is the information and its effect on the stock prices. The intuitive notions for making a formal presentation to "fully reflect" available information could still need some work and development, because the current time is based on economic and capital markets changes. Whether or not we accept Fama's theory, much work is necessary to adopt the new changes like the intervention of technology and the new cases facing the capital market, the intuitive notions will be taken into the grounds of the Jordanian capital market.

Investor satisfaction is related to the share price behavior and that is what any listed company management tries to focus on, since this will be a good sign to judge the management. In other words, a market can be defined in which prices provide accurate signals for resource allocation, a market could help in making a reliable production-investment decision, and investors can choose from different options of securities that represent ownership of firms; these activities take place under the assumption that security prices at any time "fully reflect" all available information, which is one of the main role players in EMH.

Hence, new information cannot be used specifically by someone for earning abnormal returns, as he or she once knows information could affect the prices while others still do not know about it, here he or she can make what we call an abnormal return (Fama, 1970). A market that can reflect all available information is called "efficient", meaning "adjusted rapidly to new

information" as it was introduced to the economic literature by Fama et al. (1969) It soon became clear, however, that while rapid adjustment to new information is a crucial element of an efficient market; it is not the sole one. A more modern definition is that asset prices in an efficient market fully reflect all available information Fama (1991). This suggests that the market processes information rationally, within the sense that relevant information is not ignored, and systematic errors are not made. Consequently, prices are always at level in keeping with fundamentals.

The words during this definition are chosen carefully, but they nonetheless mask several of the subtleties inherent in defining an efficient asset market. For one thing, this is often a powerful version of the hypothesis that might only be literally true if "all available information" was costless to get. If information was instead costly, there must be a financial incentive to achieve it. But there would not be a financial incentive if the information were already "fully reflected" in asset prices (Grossman & Stiglitz, 1980). A weaker, but economically more realistic, version of the hypothesis is therefore that prices reflect information up to the main point where the marginal benefits of performing on the knowledge (the expected profits to be made) do not exceed the marginal costs of collecting it Jensen (1978).

Secondly, a model to a link from economic fundamentals to asset prices must be provided. While there are candidate models in all asset markets that provide this link, no one is confident that these models fully capture the link in any empirically convincing way. This is important since empirical tests of market efficiency – especially those that examine asset price returns over extended periods of a time –are necessarily joint tests of market efficiency and particular asset-pricing models. When the joint hypothesis is rejected, as it often is, it is logically possible that this is a consequence of deficiencies in the asset-price model rather than in the efficient market hypothesis. This is the "bad model" problem of Fama (1991). Finally, taking into consideration the word "efficient", it appears that the term was originally chosen partly as it provides a link with the broader economic concept of efficiency in resource allocation.

There have been many definitions of an efficient market. In the 1960s the economists Samuelson and Mandelbrot discovered three cornerstones for an efficient market Shefrin (2007).:

1- Investors act in a rational manner, which results in a rational valuation of shares.
2- An irrational investor will randomly act upon the market and hence these transactions will not influence the market prices.
3- The potential impact of an irrational investor will be eliminated by rational investors.

2.2 The role of Securities markets

The first capital market was established in the 17th century in Netherlands. The Dutch were the first who could establish an effectively used fully-fledged capital market as a formal stock market. Before that the Italian city-state produced a forma bond market but that market was only for bonds, which is not enough to call it a capital market. The Dutch East India company and the Dutch West India Company are the first listed companies in the market, with an average 18% of capital as a dividend for the Dutch East India Company (VOC) (Boettke & Coyne, 2015)

The main purpose for financial management is increasing the market value for the asset's owner, which is possible by increasing the share prices for the company in the market, but the shares have to reflect the share price at any time of the moment or during the shares lifetime. From the accounting view, the shares are classified in the balance sheet on the assets side if the shares can be easily sold. From this point to make the shares tradable there should be an organized market to make the process easy and fair for everyone.

The capital market is apart from the financial market, and in general factors that could affect the financial market could affect the capital market, too, but the capital market is in which long-term debt for trading and be bought and sold (Sullivan & Sheffrin, 2003). A capital market could be like a channel to save wealth and save money for more than one year (long-term) to maximize wealth. Previously, if someone wanted to sell something that had to find a buyer, the buyer had to meet some interest on the good sold and appreciate the price asked to make an agreement on the action. Once the capital market was created, it started to bring buyers and sellers into one environment so they could be closer to see how equal the assets in order to decide the price; supply and demand started to take its place and become a role player in the capital market.

The need for regulations started to be important; it became clear that an organization was required which could have authority without affecting the share prices or the process of supply and demand. In other words, an organization just to arrange the market. That is what we will talk about in the next section, and we will understand what the component of the capital market organizations are, how financial regulation could be produced by an organization like the U.S Securities and Exchange Commission (SEC), the Bank of England (BoE) and the Jordan Securities Commission (JSC) to oversee the capital markets and protect the share owners from fraud and theft from other parties.

Capital markets can be either primary or secondary. The main different between them is that it is the primary market where new securities are issued and sold, while the secondary market is where already-issued securities are traded between investors. Moreover, the primary market deals mainly with initial public offerings (IPOs) – these securities are considered as primary offering and it is a kind of market open to specific investors who are usually interested in short-term investment through securities directly from the issuing company. On the other hand, in the secondary market, where already issued securities are traded between investors themselves, well-known examples are NASDAQ and the New York Stock Exchange (NYSE).

The importance for the secondary market that it is create liquidity as the visitors do not keeping money with them but make a cycle to get the liquidity in the investor's hands, also the secondary market is providing a kind of confidence to purchase securities and increase the competition between the others.
 The common capital markets are the stocks and bonds markets, the primary and secondary are created to easy classify the stocks and it is depending on the local regulations for every market.

All markets around the world want to be different from each to empower the market and make it more attractive to investors, and this could not be easy unless there were a general method to compare of the markets around the world. That is what made researchers develop models, theories, and measurements to judge whether a market is good or not, whether it is better than other markets, and to make lists of the best markets around the world. Efficiency is one of the best-known measurements in the capital markets, as the shares should be affected by the flow of new information and as the share price should reflect the company value, which leads to the

market assessment of risk and profits during a specific period. In other words, capital markets should refer to the places where saving and investments are moved between suppliers of capital and those who need capital.

An important point when speaking about the capital markets is to differentiate between the capital markets in terms of corporate finance financial services. Financial service could refer in financial markets to equity funding, excluding debt, also, capital markets are where invisible capital for non-financial companies is available. Invisible capital refers to the external funds included in a weighted average cost of capital calculation – preferred shares and common shares, private debt, and public bonds, all of which are used to calculate the return on investment (ROI). This is already an approximate measurement for investment profitability, also it can be used to measure the profitability of a stock investment, to help in making decisions on what and where to invest in or even to evaluate the results of real estate transactions.

The capital markets are getting broader; advances in technology and new currencies have started to attract more people to invest in Bitcoin and similar currencies, which could be an easy way to make huge profits and make other people get motivated to buy to increase their profits. Now anyone living in any country could be interested in shares from all over the world and could put the money into a market which could meet their expectations to maximize the profits. This is all possible because of the high speed of internet and the possibility to easily get information through the internet.

2.3   Arab markets under examination

On the Table 1 below reported the size of most Arabic stock markets in terms of total of listed companies, market capitalization, and liquidity.

Table 1 Arabic stock markets indicators 2020

Stock market	No. of Listed Companies	Market Capitalization (million USD)	Market Capitalization to GDP (%)
Abu Dhabi market	102	129.71	32
Jordan	180	17.60	40
Bahrain	50	14.90	39
Lebanon	97	13.55	24
Morocco	76	50.79	43
Syria	27	2.71	7
Qatar	49	138.72	87
Dubai financial market	67	79.93	20
Egypt	238	30520.80	9
Iraq	102	10.83	5
Sudan	66	10.35	34
Kuwait	204	96.27	68
Oman	162	26.18	33
Palestine	48	30.58	22
Saudi Arabia	200	2207.55	41
Tunis	81	8.07	21

Total	**1749**	**33358.53**	**525%**

Table number 2 will show the change in yearly index for the stock exchange in Arabic markets.

Table 2 Change % in yearly index in Arabic markets (Million USD).

Stock market	2019	2020	change %
Abu Dhabi Market	157.27	157.27	0.0
Jordan	179.45	147.86	-17.6
Bahrain	68.23	46.19	-32.3
Lebanon	200.59	157.61	-21.4
Morocco	526.36	526.36	0.0
Syria	22.20	32.00	44.1
Qatar	242.29	204.79	-15.5
Dubai Financial Market	263.69	201.96	-23.3
Egypt	173.28	144.96	-16.3
Iraq	104.08	81.98	-21.8
Sudan	158.08	169.05	6.9
Kuwait	129.35	129.35	0.0
Oman	155.98	144.58	-7.3
Palestine	109.88	96.93	-11.8
Saudi Arabia	428.99	382.72	-10.8
Tunisia	148.13	167.02	-9.3
Total	**3104.6**	**2790**	**-137**

In 2020, Jordan performed less well compared with the previous year (-17.6%) and there are many reasons for this, but one of them was the coronavirus (Covid-19) pandemic, which affected the whole Arabic market world, as we see the total change was about -137%. Syria is a special case, as the war started to end, which is why the change is positive for example Egypt also were facing some challenges during these decades (further investigation and studies are recommended in this field) which affecting most of countries, nevertheless the additional challenges around the Arab region. That gives a motive to the other countries to make more effort to increase the yearly index positively in terms of thinking how to face the challenges. Overall, 11 Arabic countries were strongly affected by the pandemic, while 3 countries showed no effect.

With all the data collected and classified about the Arabic capital markets, still the deep research about markets is not complete for solid knowledge, for example, investigating the factors which affect the level of SD given by the market firms, noticed there is a lack of research about the topic while there were some exceptions of the studies which were in 2007 for (Nichols & Street, 2007) they try to study the relationship between competition and business segment reporting decision under IAS 14R for a sample of 160 companies in the European Union and Asia from 1999 to 2002. By multiple regression models and they were focusing on size, profitability, industry, and legal system (French, German, Scandinavian, and

china) as independent variables, while they choose the dependent variable the level of SD provided in the financial statement under IAS 14R. the results were centered on the relationship between the level of disclosure in the company's geographic activities and the firm size while there was a positive sign in between them, on the other hand, there was a negative significant relationship between SDs and returns, so they recommended that IAS 14R afforded managers the ability to aggregate industry segments to protect investors and the capital markets from any threats would face accordingly.

What could make the region important is the natural resources in the region more than any other the world, Arab oil reserves to the world reserves are about 45-55 % and this percentage is able to increase from time to time that is because of discovering new fields, while the natural gas is also can be discovered still in the region, but it is less than the oil buy 20%.

Table 3 Indicators about Arabic region.

	2014	2015	2016	2017	2018	2019	2020
total area Million km2	13.3	13.3	13.3	13.3	13.2	13.2	13.2
Arab region Area for world rea%	9.60	9.60	9.60	9.60	9.60	9.60	9.60
total Arab population million	378	387	400	413	415	422	431
Total Arab population to World Population Ratio %	5.2	5.3	5.4	5.5	5.44	4.49	5.51
unemployment rate	11.3	11.4	16.5	15.4	10	12%	17.5%
Arab Oil Reserves to World Reserves	55.2	55.4	55.6	49.4	48.6	50.3	49.8
Arab Natural Gas reserve to world reserve %	27.5	27.6	27.7	27.8	27	27.2	27.1
Oil exports revenues (current prices Billion USD)	612	325.4	308.1	345.4	438.1	444.1	305.2

Source: Uniform Arabian Economic Report 2020, Arab Monetary Fund (AMF) Note: Actual preliminary figures

Relatively, in the Arabic world, we do not see such studies or compare our markets with other regions like European and American states, and so the researcher recommends further studies about this topic that would make wider knowledge available in the future to give solid recommendations to Arabic financial markets.

2.4 Jordanian capital market case

To understand the situation of Jordan in its region, a general indicator for the Arabic region and the environment of Jordan will be provided. This will help to see the percentage of Jordan capital index compared to the Arabian Area, in addition, Jordan is known with limited of natural resources, the constitutional monarchy of Jordan has generally been dependent on foreign loans and aid. One of the most problematic dilemmas for the kingdom of Jordan is the heavy debt burden, high unemployment, and the Iraqi political problems especially the Iraqi-subsidized oil, but Jordan can get a good resource from the tourism and foreign investment by working towards a more peaceful and powerful economy.

The government in Jordan promotes foreign investments, investors face numerous obstacles, restrictions, and challenges, for example, the minimum capital requirement of USD700, 000

and a maximum of 49 percent of the ownership against 51% to be taken by Jordanian investors. these kinds of restrictions prevent foreigners from creating big companies and bringing more capital into the country. On the other hand, privatization is allowed, and the governmental sector has been decreasing after privatization started to take its place in the economy. Similarly, the government is trying to foster a more competitive environment by attempting to bring about reforms, yet the bureaucratic and burdensome regulatory system is characterized by red tape and the arbitrary application of customs, tax, labor, and other laws is a strong obstacle to attracting investments.

Regarding the financial markets, the Amman Stock Exchange was founded on the first of January 1978. And from that time the market has experienced some growth in many different sectors. However, studying the Jordanian capital market could lead to notice that it is a highly concentrated market; the secondary market has the most listed shares compared to the primary market and is thinly traded.

The order-driven market-making system of the Amman Stock Exchange has no designated liquidity providers and orders are prioritized for execution in terms of price and time. By submitting a limit order, a trader provides liquidity for other market participants who demand immediacy. This means the market contains market orders and consumes liquidity, which is what investors can trade. Given the importance of the Jordanian market in the economic system, the Jordanian capital market has seen the introduction of a variety of major changes. At the fore font of those changes is the June 2000 implementation of the Electronic Trading System (ETS). This method was bought from the Paris Bourse and its cost (10.5 million French Francs) was funded by the French government. This event is often considered as a qualitative leap because it meant more transparency and safety for traders and investors, but unfortunately the Jordanian capital market still needs an online application for mobile phones, as in the case of the developed capital markets, and effective online trading for making the process of entering the market easier for investors. Since the establishment of the Jordanian capital market, investors had enjoyed a zero rate on capital gains and dividends up until 1996, when the government imposed a 10 percent charge per unit on dividends.

Table 3 gives data for the Arab region in order to demonstrate its place in the region, while Table 4 shows some indicators for Jordan. The region covers about 10% of the whole world area and its population increases by 10 million in average years, compared to a percentage of only about 5-6% for the whole world population. Moreover, the unemployment rate is not stable; as shown in Table 4 it is about 10-17%, which is quite high, and that could be for many reasons, for example wars in some Arab countries like Syria and Yemen that cause a disaster on all sides of life, especially the economy. What could make the region important is the natural resources in the region: Arab oil reserves make up about 45-55% of the world reserves (Statistics, 2020) and this percentage may even increase from time to time because of discovering new fields. Natural gas can also be discovered still in the region –it is less than the oil by 20%.

Table 4 will help read between the lines and form a base to understand more about the Jordanian capital market. If we judge on the base of the number of listed companies in the market, you can find Jordan in the 4th place. It stands at about 40% in market capitalization from GDP, which is less impressive compared to the total average, which is 58%. with the highest percentage in Kuwait and the lowest in Iraq.

Table 4 Some Economic Indicators, Jordan.

	2014	2015	2016	2017	2018	2019	2020
Population (million)	8.809	9.267	9.551	9.779	9.956	10.392	10.822
GDP (million US$)	35.83	38.04	39.2	40.71	42.23	43.74	39.00
GDP growth (%)	3.1	2.4	2.0	2.1	1.9	2.6	-2
GDP per capita (US$)	4.07	4.105	4.103	4.162	4.241	4.330	3.000
Inflation Rate (%)	1.97	-0.88	-0.78	3.32	4.46	0.3	1.68
Unemployment rate	5	6.3	14	16	19	21	23
Trade Balance	-14.55	-12.64	-11.78	-12.99	-12.56	-11.02	-16.54

Source: (Statistics, 2020), Uniform Arabian Economic Report 2019, Arab Monetary Fund (AMF)

According to the definition that Fama (1970) provided for market efficiency, lower costs should lead to more active stock trading and the information market-wide faster assimilation into stock prices, and this in turn leads to more efficiency for the capital, as the information will arrive equally to the interested persons in the capital market, and vice versa. Liu (2007) studied the Japanese capital market and concluded that there is not any effect of taxes on the efficient market at the weak level in Japan, while it negatively affects the markets which are not efficient, and the study also found that tax reform had a positive price impact on Japanese stock and provided further support to the impact on market efficiency. Table 5 shows some indicators which could play a primary role in affecting the capital market efficiency. The table shows that the percentage on income and profits from 2014-2020 and the other taxes and fees are not stable, but the taxes on goods and services and tax revenues are increasing every year. Customs duties on foreign trade are only decreasing, which reflects the desire of the Jordanian government to support this section.

Table 5 general information tax revenues in Jordan.

	2014	2015	2016	2017	2018	2019	2020
Taxes on income and profits	19.4	18.0	19.4	18.3	18.0	18.7	14.3
Taxes on good and services	69.2	67.1	67.8	67.8	70.2	71.3	64.8
Customs Duties on Foreign Trade	8.1	8.0	7.3	6.9	6.3	6.7	8.0
Other Taxes and Fees	3.3	6.9	5.5	7.0	5.5	6.2	4.5
Tax revenues (Million U.S Dollars)	5.694	5.847	6.000	6.222	6.595	6.654	5.481

Source: Uniform Arabian Economic Report 2020, Arab Monetary Fund (AMF). Note: Actual preliminary figures

Table 6 shows the position of Jordan compared with neighboring countries. Lebanon represents a similar case to Jordan in its limited natural resources, but Saudi Arabia and United Arab Emirates (UAE) can depend more on natural resources. The data show that Jordan has

higher taxes on goods and services, but at the same time it achieves the lowest tax revenues compared with the other countries, while the highest amount is from the UAE.

Table 6 general information tax revenues in Arab countries as in 2018

	Lebanon	Saudi Arabia	UAE	Jordan
Taxes on income and profits	29.1	9.8	86.7	18.0
Taxes on good and services	30.4	68.4	8.4	70.2
Customs Duties on Foreign Trade	54.0	9.6	4.8	6.3
Other Taxes and Fees	15.6	12.2	0.1	5.5
Tax revenues (Million U.S Dollars)	8.820	44.267	55.548	6.595

Source: Uniform Arabian Economic Report 2020, Arab Monetary Fund (AMF). Note: Actual preliminary figures

The question here is what is the effect of the tax system on the capital market efficiency in Jordan? And is there any connection between the tax system and the stock behavior in the Amman Stock Exchange (ASE)? These questions will be answered later in the strong form efficiency analysis and through the survey.

Most recent complete data were available for 2019 shows some important information and analyses which are important to understand the work of methodology and that give a hint about the capital market of Jordan. The traded shares number is for 189 listed companies in 2019. The prices of 75 companies marked an increase, at the same time 109 companies showed a decreased, and 5 companies remained without any changes. This year shows also a decreasing comparing with 2018 in the trading value to 1585 million JD, a 31.6% drop. On the other hand, there was a 10% increase in the number of traded shares, though the number of executed transactions decreased by 1.7% in 2019 compared with 2018. It is important to mention that the trading value includes block trades executed in 2019 by 432 JD million (ASE, 2019). Figure 2 shows the trading values for combined primary and secondary market in ASE.
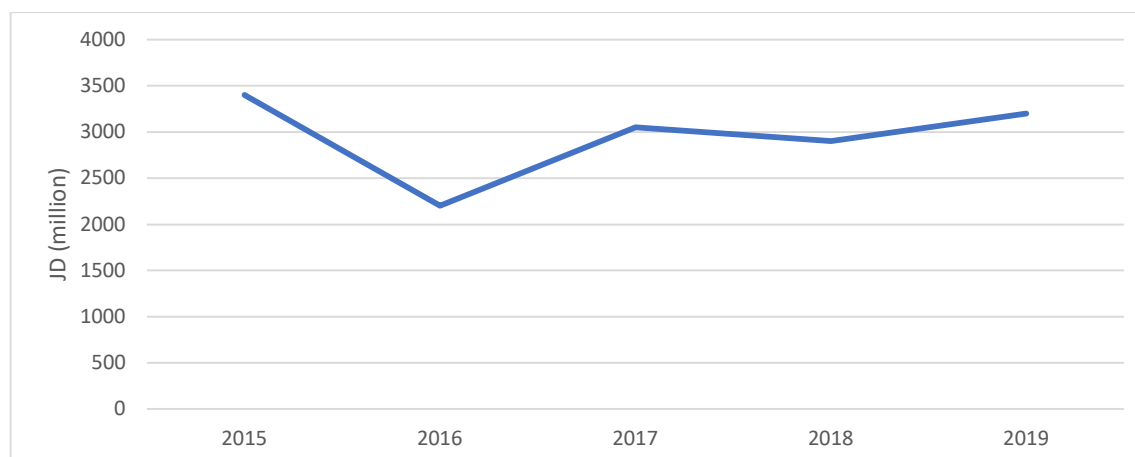
Figure 2 The trading values for the ASE

Source: Compiled by author ASE (2020)

Earlier, the capital market of Jordan consisted of three organizations: the Securities Commission, the Stock Exchange, and the Securities Depository Center. In 2020 the prime minister in Jordan combined the SDC with ASE to reduce the operational cost as a response to increasing the local debt in the country. However, I will introduce them separately. Later the chapter the general data about Jordan Economic could be found.

2.4.1 *Jordan Securities Commission (JSC)*

The Jordan Securities Commission aims to protect investors in securities and to develop legislations relevant to the capital market to enhance transparency and implement the Instructions of Disclosure. Moreover, the Commission aims to disseminate awareness of the investment culture and follow up on parties subject to its supervision, adhere to the Law and regulations to enhance the rule of law. The Commission aims to JSC (2019):

1. Issue legislations that regulate and develop the capital market and assist in providing a proper environment for investing in securities.
2. Provide the investor with all necessary information needed to support his investment decision including transparency and disclosure whether for issuing companies performance or for the trading process or parties' subject to the Commission's monitoring and supervision.
3. Develop the necessary financial services for the capital market.
4. Promote the establishment of mutual funds and regulate these funds to provide investment opportunities for small investors and efficient investment management.
5. Implement up to date international standards in the capital market and related entities for disclosure, electronic trading, electronic keeping, and price settlement of securities, as well as up-to-date International Accounting and Auditing Standards on parties' subject to the JSC monitoring and supervision.
6. Accredit the Standards of Professional Conduct for people working at the JSC, ASE, SDC, and their members.
7. Impose penalties on violators of the Law and those who commit prohibited acts.
8. Disseminate awareness among investors and the public in general in issues relevant to the national capital market and its entities, as well as other issues related to investing in securities.
9. Provide continuous training for JSC staff and for people working at the ASE and SDC to enhance their academic and professional levels, in addition to people working in licensed services companies and registered persons.
10. Receive and investigate complaints from the public and investors, to undertake proper procedures by imposing penalties on violators of the provisions of Law, instructions, and regulations issued pursuant to it.
11. Enhance the monitoring software on parties subject to the JSC surveillance and enhance daily supervision on trading at the ASE.

2.4.2 *Amman Stock Exchange*

More than twenty years ago the Amman Stock Exchange (ASE) was established in March 1999 as a non-profit independent institution authorized to function as a regulated market for trading securities in Jordan. It became a public shareholding company in 2017; the ASE has been registered as a public shareholding company completely owned by the government under the

name "The Amman Stock Exchange Company (ASE Company)". The ASE Company is the legal and factual successor to the ASE and is governed by a seven-member board of directors appointed by the Council of Ministers and a full-time chief executive officer that oversees day-to-day responsibilities ASE (2020).

Managing and developing the operations and activities of securities, commodities, and derivatives markets inside and outside Jordan is the main goal of the ASE. The ASE Company has to provide a strong and secure environment to ensure the interaction of supply-and-demand forces for trading in securities with proper and fair-trading practices and to raise the awareness and knowledge of investing in the financial markets and defining the services provided by the ASE Company. To achieve its goals, the ASE Company sets internal rules and regulations that will govern its management, also rules and regulations related to dealing in financial markets according to best international practices. The ASE Company can calculate indices for listed securities, sign agreements, and form strategic commercial, investment alliances or partnerships with other securities and derivatives markets inside and outside Jordan, data vendors, and any other party that deemed to be necessary. Furthermore, the ASE Company cooperates and exchanges information with other financial markets, regulators, government authorities, non-governmental institutions, and other parties inside and outside Jordan.
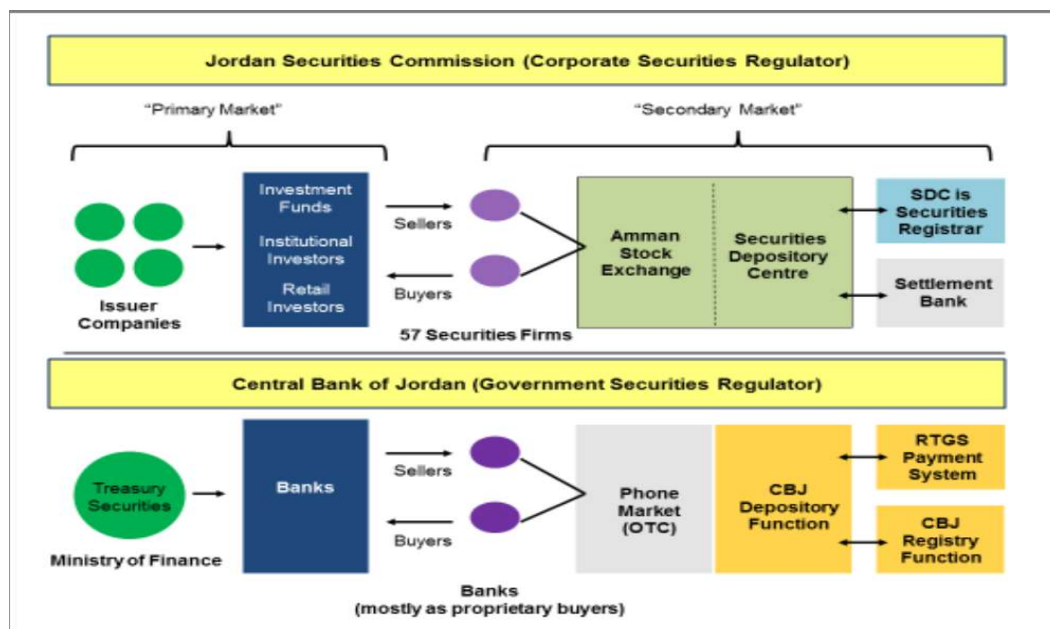
Figure 3 Components of Jordan's Capital Markets

Source: EBRD (2017)

Figure 3 shows the relationship between the capital market institutions and the central bank of Jordan: the capital market consists of the Jordan Securities Commission (the regulator), Amman Stock Exchange and the Securities Deposit Center (where the settlement takes place). These institutions are complementary for each other to manage the two types of market (primary and secondary) and how the operation happens between buyers and sellers, the issuers, and the capital market institutions. The lower section of the figure illustrates how the bond market is produced with cooperation with the Ministry of Finance, which has the main responsibility for them. The Jordan Securities Commission has fulfilled all conditions and

standards to qualify to be a signatory to the International Organization of Securities Commissions (IOSCO), signing a Multilateral Memorandum of Understanding (MMOU) on February 13, 2008.

Table 7 Amman Stock Exchange (ASE) general information

Amman Stock Exchange (ASE) general information	
Days	Sunday-Thursday
Hours	Trading Session Phases and Hours for the First & the Second Markets, Right Issues and Bonds Market are: Pre-Opening 10:00 – 10:30, Opening 10:30, Continuous Trading 10:30 – 12:30, Pre-Closing 12:30 – 12:40, Closing, 12:40, Trading at Last 12:40 – 12:50, Block Trades 12:50 – 13:00 Trading Session Phases and Hours for the Third Market are: Pre-Opening 09:45 –09:50, Opening 09:50, Continuous Trading 09:50 – 10:10, Pre-Closing 10:10 - 10:15, Closing 10:15, Block Trades 12:50 - 13:00
Market segmentation	First, second, bonds, mutual funds, off floor transactions, foreign securities allowed
System	Automated, remote access, intranet, depository links, WAN
Mechanisms	Continuous auction
Instruments	Stocks, bonds, mutual funds, right issues, Islamic Sukuk
Currency	Local and Foreign Currencies
Real time information	Best bid/ask, last price, last volume, total volume, price index, order book

Source: ASE (2019)

2.4.3 Securities Depository Center (previously)

The Securities Depository Center (SDC) of Jordan is a public utility institution established in the Kingdom by virtue of the Securities Law No (23) of 1997. The Securities Law of 1997 separated the functions of the Amman Financial Market (AFM) and created the Jordan Securities Commission (JSC), the Amman Stock Exchange (ASE) and the Securities Depository Center (SDC). The SDC subjects to the JSC's monitoring and supervision.
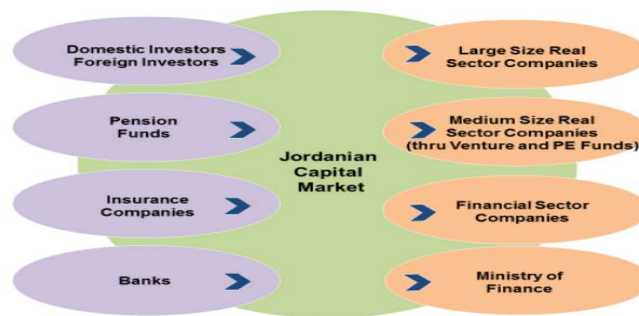
Figure 4 The relationship between Investors and Issuers
Source: EBRD (2017)

The SDC, which has a legal personality with financial and administrative autonomy, commenced operation in May 1999 and is the only entity in Jordan that is legally empowered by the virtue of Securities Law No. (18) of 2017 to oversee the following responsibilities.

● Registration of securities
● Deposit of securities
● Transfer of ownership and safekeeping of securities
● Clearance and settlement of securities transaction, mainly the merger in the depository is to cute of the costs for the capital market

2.5 Efficient Market Hypothesis (EMH) and Assets Pricing models

Fama (1991) tests the market efficiency in most cases by a joint hypothesis. The joint hypothesis problem is defining tests with some model of equilibrium, an asset pricing model. It can help in testing conditionally the efficiency of the capital markets. So, in this section I will discuss the asset pricing model, classified into two main categories: the single security test and multiple security test. There are numerous other models related to the market efficiency; I will not explain all in detail, as some of the models are far from the studying strategy of the dissertation, but I will write about the most important models that are related in details and other models it will be enough to mention them, some related models like single security model, Submartingale Model, random walk model, and Consumption-based Asset-Pricing models.

2.5.1 Single security test

This collection of tests includes Fair game models, the Martingale Model, and the Random Walk Model (RWM). We can use these tests when individual securities are examined for evidence of independence that could be used as the basis of a trading system for that security by the price or return histories.

2.5.1.1 Expected return or fair market game

The important role which is played by the "fair game" in the theory of efficient markets was recognized first and studied by Samuelson (1965) and Summers (1986). The main point in creating an efficient market is information, and information in the stock exchange means the information could affect the price of the shares. Fama wanted the prices to "fully reflect" all available information and this was the playground of the tests, this can lead to the conditions of market equilibrium could be stated in terms of expected returns. Which can be described notionally as follows:

$$E\left(\mathit{p}_{j,\ t+1}/\varPhi_t\right) = \left[1 + E\left(\check{r}_{j,t+1}/\varPhi_t\right)\right]P_{jt} \quad \text{...............}$$

where:

E: the expected value operator

P_{jt}: the price of security j at time t

$\mathit{p}_{j,\ t+1}$: price at t+1

$\check{r}_{j,t+1}$: one period percentage return $\mathit{p}_{j,\ t+1}\text{-}\mathit{p}_{jt})\,/\,\mathit{p}_{jt}$

Φ_t : is a general symbol for whatever set of information is assumed to be "fully reflect" in the price at t

$\check{p}_{j,\ t+1}$ and $\check{r}_{j,t+1}$: are random variables at t

Theoretically, this model "fair game" is in efficient markets, and some implication of the assumptions that are not obvious from the previous equation are that:

1- The market equilibrium conditions can be stated in terms of expected returns;
2- Utilizing the market forming equilibrium expected returns and thus current prices can occur by the information Φ_t as it is the set of information is assumed to be "fully reflect" in the price at t.

The value of the equilibrium expected return $E(\check{r}_{j,t+1}/\Phi_t)$ is based on and projected on the information Φ_t determined from the particularly expected return theory, while the conditional expectation notion of the previous equation is meant to imply, that the information in Φ_t is "fully reflected" in the formation of the P_{jr}.

Finding the market equilibrium in terms of expected returns and the equilibrium returns are formed basis on the information set Φ_t, has a major empirical implication. The possibility of trading system could be rule out based only on information in Φ_t that has expectations for profits and returns, mathematically, let us consider.

$$X_{j,t+1} = P_{j,t+1} - E(P_{j,t+1}/\Phi_t) \dots\dots\dots$$

This will lead to state the equilibrium as

$$E\left(\frac{x_{j,t+1}}{\Phi_t}\right) = 0 \dots\dots\dots$$

The sequence is also representing a "fair market" following the information sequence ϕ. From an economics view of point, is the excess market value of security j at the time t+1: and t+1 is the difference between the observed price and the expected value of the share price that was recorded at t based on the information, represented in same way as the return at $t+1$ above the equilibrium expected return projected at t. Consider:

$$a(\Phi_t) = [a\ (\Phi_t), a_2\ (\Phi_t), \dots, a_n\ (\Phi_t)]$$

To know the amount of $a_j\ (\Phi_t)$ of funds available at t we suppose a trading system based on Φ_t that is invested in each of the n available securities. We could rewrite the equation again as the following:

$$V_{t+1} = \sum_{j=1}^{n} aj(\Phi_t)\left[r_{j,t+1} - E(\check{r}_{j,t+1}/\Phi_t)\right]$$

After representing the trading system based on Φ_t we could write the final equation from this "fair game" as the following equation:

$$E(\tilde{v}_{t+1}/\Phi_t) = \sum_{j=1}^{n} aj(\Phi_t)E(Z_{j,t+1}/\Phi_t) = 0.$$

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2.5.1.2 The Submartingale Model

The Submartingale Model is similar to the "fair game" model but with mathematical differences. Let us assume that in the first fair game equation for all t and Φ_t $E(\beta_{j,\ t+1}/\Phi_t) \geq P_{jt,}$ this equation is the same as $E(\check{r}_{j,t+1}/\Phi_t) \geq 0$.

From the previous equation the price sequences $\{P_{jt,}\}$ for security j follow a submartingale in accordance to the information sequences $\{\Phi_t\}$, and for the equation the primary thing is the expected value of the next period's price, as the information will be projected to Φ_t, which has to be $\Phi_t \geq current\ price$. If the first equation in the "fair game" has an equal value between the expected return and price changes zero (holds equality), then the price sequence follows a martingale model. The Submartingale Model has a very important empirical implication. To understand it let us consider the set of one share and cash where these shares are owned by different investors, and which systems concentrate on individual securities, so this system can define the conditions under which an investor would hold a given security, whether the investors sell the shares or keep them for a long period of time **t**. Then the assumption from the first equation in "fair game" that expected returns conditional on Φ_t are negative is not applicable, and such an assumption would lead to specific trading rules based only on the information in Φ_t; the information has greater profits than a policy of always buying and keeping the securities during the future period in the previous equation. Using such a model or even reading about it could give a hint for what could go on in the market from the point of who could reach the information before any other shareholders.

2.5.1.3 Random walk model

When Fama (1965) started to study the capital markets he recognized that there is a common behavior that could be followed from the shares prices and returns, which led him to study the postulation that successive values of a shares are independent of each other being random; this financial phenomenon was called later the random walk hypothesis and is caused by changes in stock information. Moreover, Fama (1965) opined about the random walk theory that arises within the stochastic model when the environment is such that evolution of investor tastes and processes generating new information combine to create market equilibrium, which is that the return distributions repeat themselves during the time. This assumption could be arguing or contradict with some investors behavior when they want to sell-buy according to their attitudes. An argument from (Markewitz, 1959) provides some evidence that suggest that the efficient market hypothesis cannot be rejected which does not mean all available financial assets reflect fundamental valuations.

Mathematically we can represent this hypothesis by the following equation:

$$f(r_{j,t+1}/\Phi_t) = f(r_{j,t+1}). \ldots\ldots\ldots\ldots$$

The equation above represents the statement that the conditional or marginal probability distributions of independent random variables are identical. It is particularly important in this assumption to equal the density function of f and the time t at any time of period. This equation is expressing more than just the general expected return model which is summarized in the

"fair game"; more specifically, if the first equation in "fair game" could be restricted by assuming that the expected return on security j is consistent over time t, then we could rewrite the equation again as the following:

$$E(\check{r}_{j,t+1}/\Phi_t) = E(\check{r}_{j,t+1}).$$

The mean of the distribution of the sample taken to study the market $\check{r}_{j,t+1}$ is independent of the information at any time of the period t, and the entire distribution is independent at Φ_t. This model is almost same as the "fair game" model, and while it could be considered as an extension of fair game this model has a more detailed economic environment. The main player in the "fair game" is expected returns. Random walk focuses on the effect of the new information: how it could affect the individual's return to generate market equilibrium in return distribution, which will then repeat itself over the time.

2.5.2 Multiple security expected return models

This type of model for studying efficiency is different than the single security model, as it focuses on whether prices are "appropriately priced" vis-à-vis one another. This means there is no need for an economic theory of equilibrium expected return, as no one can judge on the differences between average returns if it's "appropriate". In this section the multi-factor assets pricing model and market model will be explained.

2.5.2.1 Capital Assets Pricing Model (CAPM)

Logically, making decisions with uncertainty levels leads to higher risk, which all investors want to avoid. The story of this model started when the organized insurance market had become well developed and when India company began trading in Amsterdam (Bernstein, 1996).

At that time the insurance company started to diversify the spread risk and rely mainly on diversification of options, until it started to build this definition in the capital market to avoid the potential risk as much as it could. The Capital Assets Pricing Model was developed to help those who have uncertainty to choose well in the capital market. The first real study in this field was studying the returns in the New York Stock Exchange (Ibbotson and Sinquefield, 1976), where they studied the average market return over the period from 1926 but they neglected the standard deviation of these returns. The interesting thing was that they found "substantially higher than safer alternatives for which data are available". This work was followed by Cootner (1963) studying the equity risk premium focusing on the long-term rates of return. The study found that the arithmetic average return on the Standard and Poor's 500 index was 10.9% per annum, and the over return on the U.S. Treasury bills was 8.8% per annum, for the period from 1926 to 1974. Then another interesting study followed, Dimson and Brealey (1978) with an estimate of 9.2% per annum over the period 1919-1977.

The formula for calculating the expected return of an asset is:

$$ER_i = R_f + \beta_I(ER_m - R_f), \quad \ldots\ldots\ldots\ldots$$

where:

ER_i : expected return of investment;

R_f : risk free rate;

β_I : beta of the investment;

$(ER_m - R_f)$: market risk premium.

From the formula it is possible to recognize that the CAPM is trying to describe the relationship between systematic risk and expected return for assets or share price. This is the main idea for CAPM, to use it throughout finance for pricing risky securities and generating expected returns for assets with the risk of assets and cost of capital. It also plays an important role in a way that the investors can decide that rather than invest their money into the capital market they can invest in another place which will bring them more benefits, so this what will motivate investors to compensate for risk. The risk-free rate in the CAPM formula takes into consideration the time value of money, besides, it is also considering the risk in a combined formula. To measure the risk on investment in a portfolio that looks like the market the formula used the beta, the mechanism of beta is that if it looks as if a stock is riskier than the market then it will have a beta >1, while the beta <1 it means the formula has calculated a reduced risk of a portfolio.

The beta in the formula can show more than the risk on the portfolio: a stock beta could be multiplied by the market risk premium, which is the return expected from the market above the risk-free rate. The risk-free rate has to be added to the product of the stocks beta and market risk premium. This will lead to the required return, or what called the discount rate, to use it to find the value of an assets.

The CAPM model aims to evaluate whether a stock is a fair value in terms of its risk and time value of money, based on the logic of paying the money to invest while the money could be used in a more efficient investment in another place, so that is why the stocks are compared to its expected return.

The CAPM is widely used for many reasons such as the ability to compare beta when there are investment alternatives (this is the same in accounting when you want to study the sunk cost or opportunity cost), while this could compare between many alternatives and help to make decisions. It is easy to use and simple, but it has some problems, such as the fact that some assumptions are already far away from reality. For example, modern financial theory is relying on two main assumptions, which are:

1. the securities market is extremely competitive and efficient, which means all the information will flow to everyone at the same time without any change and with the maximum possible accuracy, and all the shares are tradable in the same level of demand;
2. all investors are looking to maximize the satisfaction from returns on their investment. Logically it is true, but many other investors are creating a smaller investment to attract others to buy or sell a specific stock which will be in the end to their profit as they can affect other shares they hold in an indirect way.

This implies that the price movement in both directions is not equally risky, as beta in the formula assumes that the risk can be measured by a stock's price volatility. However, the t-1 and before is to determine a stock's volatility is not a standard because stocks return, and risks are not normally distributed: this, however, is one of CAPM's assumptions. Another

assumption for the CAPM is that the risk-free rate will remain constant over the discounting period. In reality the market is an imperfect comparison, while the portfolio used to determine the market risk premium is only a theoretical value and is not an asset that can be purchased or invested as an alternative to the stock.

The last critique for CAPM and the most important from an accounting point of view is that the CAPM assumes that the future cash flows can be estimated for the discounting process, so later if the investors accurately estimate the future of stock return, and then they will not need the CAPM model.

2.5.2.2 Market model

Blum (1968) was the original inventor of this model. At that time there was a need to develop a model that wasable to represent the return on an individual security (or portfolio) and the need for a liner function of an index market returns was also important. To understand this model let us consider

$$\check{r}_{j,t+1} = a_j + \beta_j \check{r}_{m,t+1} + u_{j,t+1} ,\dots\dots\dots$$

where:
$\check{r}_{j,t+1}$: is the rate of return on security j for time t;
$\check{r}_{m,t+1}$: is the corresponding return on a market index m;
a_j and β_j : are parameters that can vary from security to security; and;
$u_{j,t+1}$: is a random disturbance.

This equation in the market model is different from the other models because of the following points:
- i- The parameters (a_j and β_j) remain constant over a long term of time t as in the case of Blum (1968) when he examined the post-Second World War period;
- ii- the corresponding return on market index **m** ($\check{r}_{m,t+1}$) and the random disturbance ($u_{j,t+1}$) are close to serially independen;
- iii- the random disturbance ($u_{j,t+1}$) is independent of ($\check{r}_{m,t+1}$), also the observed properties of the market model are constant with the expected return efficient market model.

 Both Fama et al. (1969) and Ross (1976) show that the results of the market model are a statistical description of the return of generating process, and they can be consistent with other models of equilibrium expected returns.

This equation in the market model is special as than the other models because of the following points:
- iv- The parameters (a_j and β_j) remain constant over the long term of time t as in the case of the researcher (Blum, 1968) when he examined the post second world war period.
- v- the corresponding return on a market index **m** ($\check{r}_{m,t+1}$) and the random disturbance ($u_{j,t+1}$) are close to serially independent, and

vi-   the random disturbance $(u_{j,t+1})$ is independent of $(\check{r}_{m,t+1})$, also the observed properties of the market model are constant with the expected return efficient market model.

In both research work for (Fama *et al.*, 1969) and (Ross, 1976) show that the results of the market model are a statistical description of return of generating process, and they can be consistent with other models of equilibrium expected returns.

2.5.2.3 Markowitz model

The question of which portfolio is better is probably as old as the first capital markets in the world, because the goal is for the investors to maximize the profits from the capital market. This is the cornerstone for the CAPM model (Markewitz, 1959) when he mentions the relationship between the risk and return. Markewitz studied modern portfolio theory by defining a stock's return as a representative for a random variable, while the expected return and the standard deviation are the determinants for the distribution. Since it is possible to measure the variability of the return on an individual security by using the standard deviation, that leds us to conclude a standard deviation is an appropriate measure of the risk of an individual security. What Markowitz found interesting is that the standard deviation of a portfolio's return is smaller than the weighted sum of its individual securities' variances. Moreover, the total impact of the diversification is determined by the correlation between these securities. Markowitz wanted to find optimally diversified portfolios by adequately weighting their individual securities. In this context the term "adequately" means "by applying mathematical algorithms".
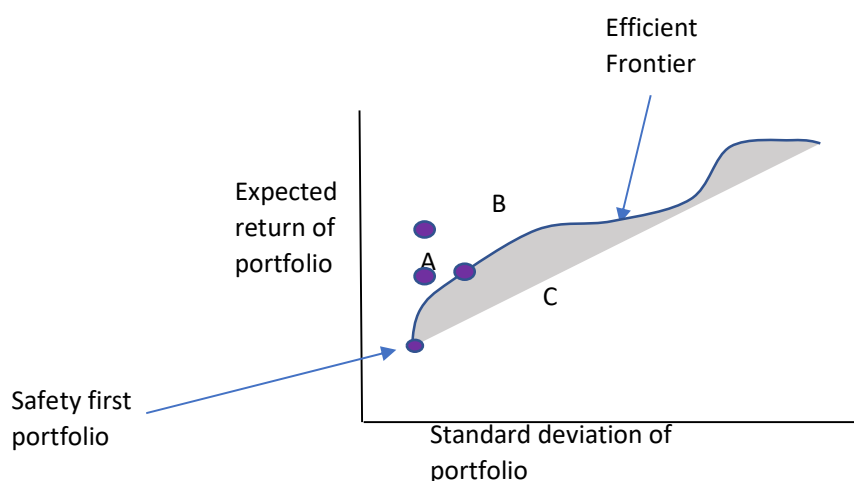
Figure 5 Markowitz optimum portfolio

The feasible set of portfolios constructed from individual securities is known as the risk-return diagram shown in Figure 5. Portfolio A and B are efficient, whereas C is dominated by A. What is important here is that this theory could help the investors to construct efficient portfolios using exchange trade funds (ETFs); in addition, it would be useful to creat diversified portfolios to reduce risk. It

also helps to reduce the volatility of shares, as adding a small investment in treasuries to a stock portfolio will have a significant impact on expected returns because of this loss-reducing effect (Markewitz, 1959).

2.5.2.4 Multifactor Models

Models usually solve a research gap from the way they look at the problem, and every model has an overview to the solution. Extracting the common factors in the shares returns and then testing whether expected returns need to be explained by the cross-sections of the loadings of the security returns on the factors was not possible until Merton (1973) suggested the Arbitrage-Pricing Theory (APT). This theory is different than others like the Sharp-Liner-Black model from the point of the analyzing the cross-section of expected returns on securities and portfolios by using the market return of securities β_s, where β is the slope in the simple regression of a security's return divided by the market return. The multifactor asset-pricing models of Ross (1976), Roll and Ross (1980) and Chen (1983) generalize the results from the Sharp-Lintner-Black model and develop the return-generating to make it able to process and involve multiple factors, and the cross-section of the expected return is sensitive in the way that it can be constrained by the cross-section of factors. But for more detailed tests and more developed, using models with up to 15 factors, Lehmann and Modest (1988) find that the multifactor model explains the size anomaly of the Shartp-Lintner-Black model, which concludes that the expected returns are too high compared to the model. Later, in the 1980s, Fama (1991) made his first test for the expected shares returns under the multifactor umbrella. Fama (1991) argues that the multifactor analysis approach is unable to confirm whether there is more than one common factor in returns and expected returns, which could be useful.

2.5.2.5 Consumption-based Asset-Pricing models

This test is an elegant version for testing the efficiency of capital market hypothesis, if we want to test the interaction between optimal consumption and portfolio decision leading to a positive linear relation between expected returns on securities and their consumption on market return of securities β_s, in the regression slope of its return on growth rate per capital consumption (a security's consumption β_s). The advantage of this model is the ability to summarize all the incentives to hedge shifts in consumption and portfolio opportunity that can appear in of Merton's multifactor model (1973), with a one-factor relation between expected returns and consumption β_s. Another advantage for this model is the productivity of a sustainable interest in an empirical test. In another words, the test use versions of the model that make time-additive utility for consumption and constant relative risk aversion (strong assumption about tests) and then leads to multivariate normality (which often joins a distribution of consumption growth and return). The last advantage of this model is the high levels of specifying descriptive results, as it is considered as a rich set of testable predictions about the time series and cross-section properties of returns. A disadvantage of this model is that the rejection is not pursued for additional descriptive information, and it obscures in one number, how the data conform to the model's many restrictions X^2 test. In other words, the restriction of this model (time-series, cross-section, or both) limit the model, because such a test of the assumption model has some time failed the test of usefulness and does not enhance the ability to describe the return behavior. Fisher and Lorie (1970) expressed their opinion that this consumption model would do no better with anomalies of the Sharp-Lintner-Black model.

The main point after clarifying some models which are related to the capital market efficiency is the importance of emphasizing that the Sharp-Lintner-Black model, the consumption model, and the multifactor model are mutually exclusive, because researchers can view the models as different ways to formalize the assets-pricing implications of the common general assumption about tastes and portfolio opportunities (risk aversion) and Multivariate normality.

2.6 Summary of modeling

In the previous subsection different models to examine the capital market efficiency were considered and discussed. Since there are different characteristics for every model and there are many advantages and disadvantages for each model, it is not possible to take one model as the best option to test all efficiency levels, because each model can solve a specific problem from its the mathematical background and the point of view from the model inventor and how they look on the problem. The inventers of the models have different backgrounds and different views to judge the efficiency levels. For example, the Fama-French three-factor model is special for the capital assets pricing model (CAPM), which focuses solely on the market risk factor, by incorporating size and value factors, on the other hand, the beta of a security is focusing on the systematic risk of a security in relation to the overall market, moreover, the multifactor models reveal which factors have the most impact on the asset price or share price.

The power of the analysis leads the investors to believe in it, that is why investors, companies, banks, researchers, and everyone having a relation with the market exchange would like to develop a model which could tell them when to buy and when to sell to maximize their profits. The Multifactor model is one of the models which has attracted inventors to construct portfolios with certain characteristics, such as risk, or to track indexes. The problem with such models is it is exceedingly difficult to decide how many and which factors to include. In addition, these kinds of models depend on the historical share prices, which might not accurately predict future values. That is why the primary data is needed and it will add value to the dissertation work.

Table 8 points out differences between the models for example, the "fair game" model depends on the efficiency of the information and its effect on the share price. This could be useful for the semi-strong and the strong level of efficiency, but it could not be applied to the weak form of efficiency in some cases, as the weak form depends on the historical data and its ability to predict the future shares price. However, the fair game model has a disadvantage in the way that it depends on the expected return and current prices based on the market being efficient, assuming that there is no insider trading, or no one has more information before the formal disclosure will be available to everyone in the market. The purpose of studying the market from such a model could be useful for specific markets – not for all – and specific shares as well.

The Submartingale model approaches the problem from a different point of view and can be a reliable model to tell investors when to sell in accurate time to make the maximum profits from the shareholding within a certain time period. This technique is very helpful for those who care about making profits within a short time without holding the shares for the long run and waiting for the share dividends; on the other hand, the Submartingale model shows weaknesses in discovering the influence of insider trading, which would not be suitable for the strong and semi-strong forms of efficiency. This could be useful and more effective for the weak form of efficiency.

 The Random Walk model can handle a huge amount of data and can deal with bigger markets to show the efficiency on the weak form level. This is an advantage over other models, but the problem could have some mean defect based on which the decision cannot be generalized to all data. It is still especially useful and widely used in many markets and previous research work, but it needs development to keep up with the recent technology changes and their effect on the capital market.

The Market model could be more effective than the Fair Market game model as the Market model is able to represent the return on an individual security because of considering random disturbance in its data sample. But if there is remarkably high pump and dump (purchasing many shares to affect the demand to increase the share prices and sell it amazingly fast afterward to increase supply to decrease the share prices extremely strongly) the model here could not be accurate. It would not show the pump and dump problem; rather, it shows the market is efficient and without any problems, while someone can affect the share prices quite easily.

The Multifactor model could be one of the best models used for the semi-strong and the strong form of efficiency, as it able to define which factor has more of an impact on the price of an asset. But the model cannot predict or decide what is the reason behind achieving return for the shares. Therefore, if a researcher or investor or even a company wants to study the future return for a share it is not possible to determine which factor could lead to a higher price share or even losses.

To obtain productivity of a sustainable interest the Consumption-Based Asset-Pricing model is the best empirical test, which can summarize all the incentives to hedge shifts in consumption and portfolio. However, to understand the return graph the user is supposed to mirror it into a graph, where it fluctuates without any logical reasons, which is the problem with the Consumption-Based Assets-Pricing models.

The last one is Capital Assets Pricing Model (CAPM) is a little model which can express the behavior of the return investment, why it reaches the max when reflected on a graph, which can help investors to predict the returns if there would be the same situation. On the other hand, this model does not take into consideration that the risk could be the same percentage as the expected returns percentage, which keeps investors more optimistic without realizing the real risk if new information affects the price shares.

Table 8 Summary of market efficiency tests used.

Model	Advantages	Disadvantages	Efficiency level usage		
			Weak	Semi strong	Strong
Expected return or fair market game	Information is the value of the equilibrium expected return.	Depending on expected returns and current prices only which assumes that the market is already efficient.	*	*	*
The Submartingale model	Able to define the condition under which investor would hold a given security.	Did not provide a way to discover insider trading.	*		
Random walk model	Can easily handle flows around complicated boundaries and the	Needs an exceptionally large number of vortices for accurate simulations and does not exactly	*		

	method conserves the total circulation?	conserve the mean position of the vorticity in free space.			
Capital Assets Pricing Model (CAPM)	able to compare beta when there are investment alternatives. it is also easy to use and simple	CAPM assumes that the future cash flows can be estimated for the discounting process. Also assumes the price movement in both directions are not equally risky.		*	*
Market model	Able to represent the return on an individual security.	It could be affected by the fake demand and supply for those who trying to increase or decrease the shares price.	*	*	*
Multifactor Models	Able to define which factor has more of an impact on the price of an asset.	Un able to confirm if there is more than one common factor in returns and expected returns.		*	*
Consumption-Based Asset-Pricing models	ability to summarize all the incentives to hedge shifts in consumption and portfolio opportunity productivity of a sustainable interest in empirical test	Assumption model has some time failed the test of usefulness not enhancing the ability to describe the return behavior.		*	*
1. **Marko witz model**	Able to define which portfolio is better to invest in	Counting on other benchmark portfolio which could miss better opportunity to invest in	*		

Source: Compiled by author

2.7 Levels of efficiency

2.7.1 Weak form of efficiency (returns predictability)

The empirical evidence on developed markets confirms the weak-form efficiency of the EMH, (e.g. Fama, 1965a) Williamson, 1972; Barnes, 1986; Granger, 1975). In addition, there is other empirical evidence supporting the weak-form efficient market hypothesis regarding both emerging and developed countries (e.g., Barnes, 1986; Fama, 1991; Lo and Mackinlay, 1990; Groenewold, 2003). Conflicting results were found when reviewing the empirical literature in emerging markets through testing the market efficiency at the weak form, and in this context some researchers support the EMH while many others oppose the EMH by employing different methodologies.

Barnes (1986) expanded the weak form of the efficient market hypothesis by adding the returns predictability. He claims that prices fully reflect the information implicit in the sequence of past prices, so that is why the prices have no memory and follow the random walk theory properties.

Several researchers have used either a run test or unit root test in teir research (e.g. Sharma and Kennedy, 1977; Mookerjee and Yu, 1999; Keith and Fawson, 1996). Others have adopted a variance ratio tests Q-test, (Dickinson and Muragu, 1994; Mookerjee and Yu, 1999; O'Sullivan et al., 2003; Urrutia, 1995), while variance ratio tests were adopted by Karemera

and Cole (1999) and others. Grieb and Reyes (1999), employ variance ratio tests and unit root to inspect weak form efficiency for twenty emerging markets, finding random walk behavior in many markets. Squalli (2005) also found random walk behavior in Brazil and Argentina stock markets from the sample tested, which also covered the Mexican stock market. Ananzeh (2016) tested the market efficiency for the financial market of the United Arab Emirates by employing the variance ratio test and run test. Results generally rejected the null hypothesis of a random walk. Based upon the previous introduction of financial literature, there is no clear-cut case regarding the efficiency of the financial markets for both developed and emerging markets, and it seems more reasonable to further investigation by conducting a new empirical study covering Jordan, which is one of the emerging markets located in the Middle East.

For getting a closer idea about previous similar work we could look to Table 9, which includes a list of research work similar in the level of weak form efficiency and the methods they use to test the random walk hypothesis. In addition, the period is listed for more specific description and different capital markets were tested within this theory, trying to include most similar markets to Jordan and comparing the results with each other. There is no sense in comparing the Amman Stock Exchange with the New York Stock Exchange or the London Stock Exchange because of the gap between the regulations between each and the size of the market and other factors which could make the comparison without efficient results related to the efficiency. Therefore, most of the studies listed as an example in the table below have negative results about the efficiency of the capital market.

The study of Khan et al. (2010) studied the Amman Stock Exchange but with a wider period and different period, from 2000 to 2013, for a total of 13 years with the same tests used to study the Amman Stock Exchange in the weak form of efficiency level and the dissertation results agree with Ananzeh's results thatthe Amman Stock Exchange is not a weak form of efficiency.

Mirza et al. (2018) studied the Indian Stock Market with different tests which were used to study the Amman Stock Exchange in the weak form of efficiency level, the study implies that the Indian Stock Exchange is not a weak form of efficiency level.

The work was carried out by Ananzeh (2016) in the Pakistan Stock Exchange, or as it is known, the Karachi Stock Exchange (KSE) using the daily returns of three shares: KSE-100 index, and KSE-30 index and KMI-30 index, for the period from 2009 to 2014. Two out of three shares did not follow the random walk theory and the results were not able to confirm the weak form efficiency for the Pakistani Capital Market.

Istanbul Stock Exchange was not in better situation than other markets, as it also shown the market is not efficient on the weak level but from theoretical tests the study examine regime-dependent integration order of Istanbul Stock Exchange 100 index (Emrah, 2018).

The Nigerian Stock Exchange (Udochukwu & Chukwu, 2020) and Malawi Stock Exchange (Garvin & Hemal , 2020) were also studied recently, showing that neither markets is efficient on the weak form level. Daily return was used to study the markets, the period of study for both was about 2014-2020 and both studies used an ADF test and other similar tests which have already been used by other researchers.

The last example for studying weak form efficiency is the Saudi Arabian Stock Exchange, which has a huge amount of cash flow compared with the Jordanian Capital Market. This market is also an important base to compare with the Jordanian case as it is a neighboring country. To test this market unit root tests, run test, and rank- and sign-based single and multiple variance ratio tests were used, and the study concludes that even such a market with

high cash flows could be considered not efficient if there is possibility to achieve excess return among other investors (Al-Ajmi, 2012).

The result from all the above studies indicates that the methods chosen to study the weak form by using different tests in this dissertation will be enough to test the random walk in the Amman Stock Exchange, and to test if the ASE is random walk and efficient at the weak level.

Table 9 Summary of results on different markets and models used for weak form of efficiency.

Authors	Market name	Source of Data	Name of the test used	Period of study	Results
(Khan, Shahid and Shahid, 2010)	Amman Stock Exchange	daily observations for the period span	serial correlation, unit root tests, and runs tests	2000-2013	The ASE is inefficient at the weak form level.
(Kendall and Hill, 1953)	Indian Stock Market	daily data for stock indices	unit root test, and Phillips-Perron test	1999-2004	The Indian stock markets are not weak form efficient signifying that there is systematic way to exploit trading opportunities and acquire excess profits.
(Musarrat , Mirza , & Khalid , 2018)	Pakistan Stock Exchange (PSX) formerly known as Karachi Stock Exchange (KSE)	Daily returns of KSE-100 index; KSE- all share index; KSE-30 index and KMI-30 index.	runs, serial correlation and unit root tests	2009-2014	Two of the shares not following the Random Walks while the 3rd follows Random walks which leads to inefficient capital market in general
(Emrah , 2018)	Istanbul Stock Exchange	examine regime-dependent integration order of Istanbul Stock Exchange 100 index	means of Markov-Switching ADF (MS-ADF) test	Theoretical Study	While weak-form efficiency is provided in the high volatile regime, the market is not weak form efficient in the low volatility regime
(Udochukwu & Chukwu , 2020)	Nigerian Stock Exchange	daily and annual all share index	ADF unit root test, Autocorrelation test, Pairwise Granger Causality test, Regression test, Normality/Random Walk test and ARCH-GARCH models	January 02, 2014, to May 20, 2019	The Nigeria Stock Exchange is not efficient in weak form, by extension is inefficient in any form.
(Garvin & Hemal , 2020)	Malawi Stock Exchange.	daily return series of three market indices of the MSE, MASI, the DSI, and the FSI	Parametric and non-parametric statistical tests including the Augmented Dickey-Fuller test, the	2016-2019	The Malawi Stock Exchange is not weak-form efficient.

			Kolmogorov-Smirnov (K-S) test, the Shapiro–Wilk test, and the runs test		
(Al-Ajmi, 2012)	Saudi Stock Market	eight industry-based indexes and a composite index	The unit root tests, With the run test, and rank- and sign-based single and multiple variance ratio tests	1994-2007	The Saudi Stock Exchange is not weak-form efficient.
(Usman & Nduka 2022)	cryptocurrency markets	Bitcoin and Ethereum were chosen as representative cryptocurrencies, since they are the top cryptocurrencies in terms of market capitalization	Long memory methods such as fractional integration to explore the stochastic characteristics of the stocks	2016 - 2020	Evidence for long memory was found which supports the EMH. Crypto market is efficient. Additionally there was degree of persistence regards the pandemic Covid-19 which reduces the degree of efficiency.

Source: Compiled by author.

2.7.1.1 Random Walk Hypothesis (RWH)

One of the common ways to test the weak form of efficiency is the random walk hypothesis, which asserts that price movement will not follow any patterns or trends and that past price movements cannot be used to predict future price movements.

It was about the beginning of the 20th century when Working (1934) started to study the random walk model, and his "fundamental principle" for the behavior of prices was that speculation should be "fair game", in the same direction, the expected profits to the speculator must be zero. The good side of the stochastic processes' theory, the process implied by this fundamental principle is a martingale. That work was followed later by Markewitz (1959) with more developed tools like computers, where he examined the behavior of weekly changes of British industrial shares prices, his sample were for 19 company and spot prices for cotton in New York at the same period and wheat prices in Chicago, he used the serial correlations and analyzed the three categories' prices for three different areas and different products. Markewitz concludes that

"The series looks like a wondering one, almost as if once a week the Demon of Chance drew a random number from a symmetrical population of fixed dispersion and added it to the current price to determine the next week's price" (Kendall 1953, p.13)

The interesting point here that Kendall's conclusion is already like that of an earlier study by (Niederhoffer and Osborne, 1966) and later another research in the same field for (Bachelier, 1900), Working concludes there was lacked from the force provided by Kendall's empirical results, and the implications for were more analyzed by Roberts in his research. After careful reading the suggestions from Working, Kendall, and Roberts and based on observations and their suggestions, it is possible to notice the series of speculative spices may be well described by random walks theory; moreover, none of the previous researchers attempted to provide

economical rational interpretation for the hypothesis, more than Kendall's comment that the economists would generally reject it.

Most researchers who have tried to test the random walk theory have used different literature, but the interpretation of the test was general expected return or "fair game" models, "which imply the "impossibility" of different types of trading systems. Profitability is also one of main tests in the random walk and some of random walk literature went to profitability as a sign to test such a system. Some other sources in the literature prefer to use tests of serial covariance of returns. The serial covariance of a "fair game" is zero, like a random walk, so these tests are relevant for the expected return models.

For better understanding, let us say the fair game is represented by X_t, and its unconditional expectation is zero and it can have serial covariance, so the serial covariance could be mathematically represented as the following equation:

$$E\left(\underline{X}_{t+r}\, X_t\right) = \int\ X_t\, X\left(\underline{X}_{t+r}/X_t\right)f(X_t)dx,$$

where f indicates a density function, but if X_t is a "fair game",

$$E\left(\underline{X}_{t+r}\, X_t\right) = 0.$$

So the second equation is the difference between the serial covariance and lagged values of a "fair game" variable is zero. That is why the observations of a "fair game" variable can be called linearly independent. On the other hand, in the "fair game" model it is not necessary to imply the serial covariances of one-period returns are zero. More specifically, the weak form of efficiency could be rewritten according to the "fair game" variables as

$$Z_{j,t} = r_{j,t} - E\left(\tilde{r}_{j,t}/r_{j,t-1}, r_{j,t-2}, \dots\right)$$

To represent the different covariance between the $r_{j,t}$ and $r_{j,t-1}$ mathematically, the equation will be:

$$E\left(\left[\tilde{r}_{j,t+1} - E\left(\tilde{r}_{j,t+1}\right)\right]\left[\tilde{r}_{jt} - E\left(\tilde{r}_{jt}\right)\right]\right) =$$

$$\int_{r_{jt}}\ \left[r_{jt} - E(\tilde{r}_{jt})\right]\left[E\left(\tilde{r}_{j,t+1}/r_{jt}\right) - E\left(\tilde{r}_{j,t+1}\right)\right]f(r_{jt})dr_{jt}\,.$$

So, from the previous formula we can conclude that $E\left(\dfrac{\tilde{r}_{j,t+1}}{r_{jt}}\right) = E\left(\tilde{r}_{j,t+1}\right)$.

According to the accumulative equations, where would the "fair game" be? The answer is the deviation of the return for $t+1$ from its conditional expectation variable, besides, the conditional expectation can depend on the return which is observed for t. A disadvantage shown in the random walk literature is that the problem of the return recognized by t is not easy to observe, since the problem assumes that the expected return and the distribution of returns is statutory through t (time). The random walk could easily estimate series covariances by taking cross products of deviations of observed returns from the overall sample mean return. There is no effect on the overall results when representing the gross approximation from the viewpoint of the general expected return efficient market model, and it does not affect   the test of the covariance test, especially for the common stocks.

The interesting case when documenting two departures from complete randomness in common stock price changes from transaction to one another as in the case with (Osborne, 1959) The sample they choose were indicating that pairs of consecutive price changes of opposite signs, this pairs of consecutive prices are changing in the same sign, that what make this pairs are unique in the way that its continuation is slightly more frequent after a proceeding continuation which will lead to a reversal in the data. Nut this study for Niederhoffer and Osborne is limited as it was for the New York Stock Exchange (NYSE) and as it was based on the market structure of the NYSE, but such a study could be helpful in the weak form test of efficiency as it provides changing price from transaction to transaction and presenting interesting signs for the process of market making on major changes.

One of the main issues for the EMH is studying the nature of distribution of price changes, which is what the random walk is working against. Because the nature of the distribution affects any interpretation test conclusion and results, studying such a model will improve the statistical tools relevant for testing the hypothesis of EMH. Continuously the random walk model is one of many ways to test the weak form but still unique to represent the weak form of efficiency as many researchers have used it and developed it, from Moore (1962), when he used a model implying normally distributed price changes and assumed price changes from transaction to transaction are independent, through Kendall (1953), Mandelbrot (1963), and Fama (1965) and they agreed all that they could notice high tails in their data distribution. Then there was the work of Sharpe (1964) when he developed the model further and suggested that the distributions for price changes over longer differencing intervals could be any member of the stable class, then followed all the work of Blum (1968) to do extensive testing and to reach the results that non-normal stable distribution is a better description of distribution for daily returns on common stocks than the normal. Also, the work of Shiller et al. (1984) and Summers (1986) considers a value added to the model while they test different data than the previous works, while Roll (1977) took the government treasury as an environment for his study.

2.7.1.2 Return predictability

The ability of the weak form to test and forecast the returns from the historical data makes this test able to investigate if the stock price is reflecting all the past information which already affected the share price. Previously the test of weak form was able to test and concentrate on the predictability of daily, weekly, and monthly returns before the test was modified to make it able to examine the predictability of returns for long horizons by Fama (1970), who expanded the coverage of the first category of EMH to expand the size of the test reliability for return predictability; for example he expands the power of forecasting of variables like share price/price ratio (E/P), dividend yield (D/P), and term structure variables.

Because of the modified version of return predictability tests a new argument arose, specifically, when the autocorrelations deviate reliably from zero, or even when they are close to zero and thus economically insignificant. The view from this point when autocorrelation is zero that implies economic insignificance – is challenged by Yalama and Çelik (2008) and Bradley (1960). They build a model able to manage a large amount of data from the stock prices slowly decaying swings away from fads, or irrational bubbles like the sheep investment strategy (investors following some fake news to buy such stocks because of their beliefs of increasing price later without technical analysis). Data show always that the short horizon returns have small autocorrelation (around zero), so in their model the market is highly inefficient, but in a way it could miss the short horizon returns tests. the autocorrelation known as a slope in a regression of the current return from historical prices return. Since the test is

drawing conclusions based on the past returns then it has a lack of power. The power we speak about is related to return predictability in case forecasting variables can be identified that are less noisy proxies for future returns comparing with the historical returns.

The dividend yield was used by Fama and French (1988) for forecasting returns on the value-weighted and equally weighted portfolios in the NYSE stocks for the period from 1 to 5 years. The purpose for using D/P is to explain small fractions for monthly and quarterly returns variances. In the same field Fama and French (1989) suggest another way to judge on limitation of return predictability for market efficiency, by diagnosing and testing the expected return variation. If it is common to different securities, then it is probably rational results based on the variation tests to help in predicting the future return. So, what they do is leave the common expected return argument in the back and focus on the systematic patterns in the variation of expected returns through time. In their study, they agreed that the variation in expected returns tracked by D/P and the default spread in the regression slope and increased from bonds to stocks, from high-grade bonds to low-grade bonds, and from large stocks to small stocks, so this could give a corresponding intuition about the risks of securities.

Finally, the variation for expecting the returns and tracking it by term spread is variation for all long-term securities like bonds and stocks will lead to high expected return on stocks and bonds when using the D/P ratio, especially when time growth rates of output have been persistently low, and that is exactly the message that Fama and French want to deliver.

2.7.2 *Semi strong form of efficiency*

The semi-strong form of efficiency is different from the way that it is including the weak form (the prices reflect all the available data) and it is also reflecting all available information for public, so we can say the market is semi-strong efficient if it is reflecting all past information and published information as well (Bustanji, 2019).

Based on the understanding of the semi-strong form, no investors or shareholders can achieve any excess return compared with other investors. This implies the general information that everyone can access data at the same time and accurately, like international news, situations of the local economy, situations of same institution belonging to share price, and the general situation for the capital market itself. In every moment, the capital market must reflect all available information on the share prices; moreover, the effect of share prices must give a hint about the future of listed companies (Fama, 1991).

The effect of the fair market on the semi-strong level of efficiency on the technical analysis to achieve any excess return is going to be zero; in other words, the investors will achieve nothing from the technical analysis because no one can achieve extra profits among others, although within a small margin let us say there could be possible variations for trying luck and chance. In this case the analysis could be only efficient for predicting where future prices will go based on the return that could be achieved and the risk could be present for the share price through analyzing international economic challenges, local economic challenges, and the listed company's situation and challenges.

There is a strong relationship between the local and international economic situation. For example, if the prices of petroleum decreases, then the profits of the countries which are already relying on oil and gas as revenue to its budget will suffer, as in the case of the Arabic Gulf countries, especially around 20 years ago, before they started to diversify their revenue sources.

Different studies have been working on the semi-strong test efficiency in different ways, for instance like dividend, bonus, split, options listing, block trading, right issue, annual earning, etc. but studying such a level of efficiency could not be possible without a special model. For example, a semi-strong form of efficiency is an aspect of the capital market hypothesis that assumes all public information would be reflected on the current stock exchange, and therefore one good way to analyze the market and make a decision if the market is efficient on the semi-strong form or not will be by using a type of regression line, the security characteristic line (SCL) (Cyrlac & Jeevanand, 2007). By plotting the performance of a particular security or portfolio against that of the market portfolio at every time of the period, the SCL is a graph where the y-axis is the excess return on a security over risk-free return and the x-axis is the excess return of the market in general. This is one of the most common ways to test the semi-strong form of efficiency in capital markets. Later more models and tests will be explained in detail.

The slope of the graph will represent the security's Beta, and Alfa will be the intercept. Since the efficiency of the capital market of Jordan has been studied by most researchers testing only the weak form of efficiency, and not going further to see to which extent the market is not efficient, the main idea behind this study is to provide better empirical information on the Jordanian capital market for greater benefits to researchers, policymakers, financial companies, listed companies, banks, and investors.

Mainly this section will focus on a review of the effect of studies by various researchers. Al-Khouri & Ajlouni (2007) studied the behavior of daily stock return volatility around the price limit hit for a sample of 159 securities listed in the Amman stock market (ASE) during 1994 and 1995. The study results indicated that stocks hit experienced its highest level of volatility on the day when stocks-hit reached its upper daily price limits of fifty (day 0) and decreased significantly sooner or later after the hit. Similar results are documented when stock hits reach their lower daily price limits of -5%, however with less magnitude.

Leuthold & Hartmann (1979) studied the semi-strong form test of the efficiency of the live-hog future market by employing an econometric forecasting model. The study concludes the market (live-hog futures exchange) has not performed efficiently and therefore, the presence of objectionable inaccuracies has been observed, thereby supporting the view that the live-hog commodities market is inefficient.

Ormos (2002) tested the empirical data of the efficiency of the Budapest Market in its semi-strong and powerful form. The study focused to look at whether the Hungarian Capital Market was efficient within the semi-strong form. The investigation was supported by capital market data over the period from 1991 to 2000, which was analyzed by employing an incident study. The study concluded that a robust style of efficiency of the capital market does not completely hold, thereby supporting the conclusion that the Budapest Market is semi-strong form efficient.

Hadi (2006), through types of the Efficient Market Hypothesis, undertook detailed research that tested the three types of market efficiency forms. It is observed that accounting-based research generally assumes that the market is efficient in a semi-strong form. The sense behind that is that the financial reports are considered public information once they have been released in the market. The paper provided empirical evidence from the Jordanian market, which suggested that the security market reacted with mixed signals on releasing profitability, liquidity, and solvency information.

(Betzer & Theissen 2009) studied the semi-strong form by investigating the Istanbul Stock

Exchange Market (ISE-100), Foreign Exchange market (FEM), and inter-bank Money Market (IMM) concerning changes in currency and circulation (CIC). The data of daily trading during the period from 1990 to 2008 was analyzed by employing the Toda Yamamoto Causality method. That study concluded that the Turkish money market is semi-strong form efficient while its capital market is not, by explaining the relationship between running from CIC to FEM and CIC to IMM; however, there is no causality relationship running from CIC to ISE-100.

(Satyajit & Chhaochharia, 2008) analyze the impact of the information relating to the announcement of stock split and bonus issue on stocks listed on the National Stock Exchange (NSE) of India by employing event studies. Both the events, stock split and bonus issue, reflect a strongly positive announcement effect. The abnormal return was about 1.8% for the bonus issue and for stock splits it was about 0.8%. Thereby the study supports the view that the Indian Stock Market is efficient in the semi-strong form.

(Pichardo & Bacon, 2009), examined the effect of Lehman Brother's Bankruptcy on the overall market by taking the stock price's risk-adjusted rate of return for 15 selected brokerage firms. Statistical tests proved that the bankruptcy had a negative impact on stock price's risk-adjusted rate of return for the 15 firms, which supports the semi-strong market efficiency theory. Even after the event, bankruptcy continued to affect the market. Some of the studies have also been made on the FII's impact on the Indian Capital Market separately, i.e., not in the context of the testing semi-strong form of EMH, only analyzing the influence of FII's on the Indian Capital Market.

Vandana (2003) tested the semi-strong efficiency of the Indian securities market over the period 1995 to 2000 by employing an occasion study. The study involved a sample of 145 bonus issues, to look at the announcement effects of bonus issues on equity share prices in India. The study concluded that the Indian stock exchange was semi-strong form efficient.

Mishra (2005) examined the reaction of the stock price to the knowledge content of bonus issues over the amount 1998 to 2004. Samples of 46 stocks listed on the NSE and BSE of India were analyzed by employing an event study employing a 180-day event window. It was found that stocks show abnormal returns before eight or nine days before the announcement, thereby supporting the evidence that the Indian stock market is efficient in its semi-strong form.

(Iqbal & Mallikarjunappa, 2007) tested market reaction to the quarterly earnings announcement of 149 companies listed on the Bombay stock market for September 2001 by employing both parametric and nonparametric tests. It is observed that in the event window, runs tests do not seem to be significant at a 5% level, which signifies those abnormal returns occur randomly. On the opposite hand, the t-test rejects the existence of abnormal returns on day to day, which provides a chance to beat the market and earn abnormal returns. The study concludes that the Indian stock exchange is not efficient in an exceedingly semi-strong form.

Table 10 Summary of results on different markets and models used for strong form of capital markets

Authors	Market name	Source of Data	Name of the test used	Period of study	Results

(Al-Khouri & Ajlouni, 2007)	Amman Stock Exchange	159 securities listed	Models	1994-1995	Stocks hit experienced its highest level of volatility when stocks-hit reached its upper daily price limits of 5%, and vice versa.
(Leuthold & Hartmann, 1979)	live-hog futures market	Econometric model	econometric forecasting model semi strong form	1964	Inefficient market on the Semi strong level
Ormos (2002)	Hungarian Capital Market	daily trading	event study	1991-2000	Efficient market on the Semi strong level
Hadi (2006)	Jordanian market and Arab Capital markets	daily trading	integration techniques	2005-2006	security market reacted with mixed signals on releasing profitability, liquidity and solvency information
(Yalama & Çelik, 2008)	Istanbul Stock Exchange Market	Econometric model	semi strong form	1990-2008	no causality relationship running from CIC to ISE-100
(Satyajit & Chhaochharia, 2008)	Indian Stock Market	90 stock splits and 82 bonuses issues announced by companies listed on the BSE 500 indexes	event study	2001-2007	Efficient Market on the semi strong level
(Pichardo & Bacon, 2009)	Indian Stock Market	15 firms' stock price's risk adjusted rate of return	examining the effect of the Lehman Brothers bankruptcy on several brokerage firms	before and after September 15, 2008	the market anticipated the collapse of Lehman
Vandana (2003)	Indian Stock Market	145 bonus issues	event study	1995 - 2000	Efficient market on the Semi strong level
Mishra (2005)	Indian	46 stocks	event study	1998 -	Efficient market on the Semi strong

					level
	Stock Market	listed on the NSE and BSE of India		2004	
(Iqbal & Mallikarjunappa, 2007)	Indian Stock Market	149 companies listed	event study (T-test, Runs and sign test)	September 2001	Inefficient market on the Semi strong level

Source: Compiled by author

From the previous research some similarities and differences can be noticed, especially when the test was used at the same level of efficiency and with the same study style but at the same time found differences in the results. Example, in the last two studies about the Indian stock market after using a different sample and different tests they conclude different efficiencies. Notice also the lack of studies for the Jordanian capital market and recommendations for the managers, investors, shareholders, and government authorities in making their decisions. From those points, this study has importance in shining a spotlight on more specific details in the Jordanian capital market.

2.7.3 *Strong form of efficiency*

The full reflection of all relevant information has always been the main topic of the strong-form financial market efficiency, with all historical and public, private or insider information. Prices immediately react to new information, so the chances of finding undervalued, and overvalued securities are random. This implies that the market is "unbeatable" and that active investment strategies are in vain.

The basic task of this type of test. Also known as a private information test, is to determine whether insider-based trading yields above-average returns. Several studies (Finnerty, 1976;, Glass, 1966; and Pratt and de Vere, 1978) give an affirmative answer, for example proving that insider trading brings risk- and transaction-cost-weighted above-average return. With the help of privileged information, insiders buy stocks before the price rises and sell them before the price drops. The results of these studies provide evidence against the validity of strong-form EMH.

There is a difference in the behavior of investors. For example, insider information is forbidden in all the capital markets around the world and a person who tries to do this runs the risk of being arrested. Alternative evidence relates to the performance of mutual funds. These institutional investors invest knowledge, time, and money to collect information about company performance. The collected information is not publicly available, as it is private; unlike insider information, it is legal because it is based on analysis.

The strong form of the efficient market hypothesis assumes all available public and private information is fully reflected in a security's market price. The strong form, in terms of market participants, also assumes that no individual can have higher expected trading profits than others because of monopolistic access to information. One possible test of the strong form is to determine whether insiders earn better than average profits from their market transactions. To ascertain if the market is truly efficient will involve determining how well insiders do relative to the market in general. To date, some work has already been done in evaluating rates of return earned by insiders trading for their accounts. Some researchers have focused

on how calculated rates of return earned by insiders trading for their accounts and their work lends some support to the hypothesis that insiders do earn above-average profits, (e.g., Rogoff, 1964; Kyle, 1985; Cao and Ma, 1999; Jaffe 1974a, 1974b). A major shortcoming of these studies centers on data availability, as no precise price per share or date of insider trades were reported to the Securities and Exchange Commission (S.E.C) before 1965. Further, except for Jaffe, the studies do not incorporate an explicit adjustment for risk. An additional problem with all the studies is the skimming of the cream of the crop in their sample selection. That is the selection of samples based on "intensive" insider trading criteria, i.e., the samples are biased in favor of stocks whose performance would more than likely be superior to the average insider. This bias, while not affecting their results relative to the semi-strong-form, invalidates the findings for a test of the strong-form.

However, researchers have also written about the strong form of efficiency using different models to get results. Some of this research is summarized in Table 11. From the table it is easy to notice that this topic was used in different markets and used different models to get reliable results. Some similarities and differences can be noticed, especially from the test used at the same level of efficiency and the same study style but with differences in the results. An example is Finnerty (1976b) and Chau and Vayanos (2008) both of whom used almost the same models but did not agree about the relationship of liquidity and the results to conclude whether that market is efficient. I think that the current study looks at the research problem with more dimensions and objectivity.

Table 11. Summary of results on different markets and models used for strong form of capital markets

Authors	Topic	Market name	Source of Data	Name of the test used	Period of study	Results
(Kyle, 1985)	Insiders and Market Efficiency	NYSE firms	SEC 's Official Summary of Stock Transactions	Regression analysis and various tests for portfolio	from Jan. 1969 to Dec. 1972	Insiders can outperform the market. Insiders can and do identify profitable as well as unprofitable situations within their corporations' inefficient market on the strong form
(Cao and Ma, 1999)	Strong-Form Efficiency with Monopolistic Insiders	infinite model with a monopolistic insider	General competitive market (Theoretical data)	Kyles (1985) model	General theoretical review	First, markets can be close to strong form efficiency even in the presence of monopolistic insiders. Second, despite being close to efficiency, markets can offer significant returns to information acquisition
(Khan and Ikram, 2010)	Continuous Auctions and Insider Trading	General market	Mathematical	Dynamic Kyle model	General theoretic review	He used a model and tried to prove if its working to discover the insider trading, makes the simplified assumption that the market is organized as a series of batch auctions, which is not

						characteristic of capital markets.
(Potocki and Świst, 2012)	Trade Disclosure and Imperfect Competition among Insiders	NYSE Market when there are multiple insiders	They analyzed the effects of trade disclosure throw a disclosure of the listed companies in NYSE	Dynamic Kyle model	They focused on disclosure when there are multiple insiders for different period series	Market is more liquid, and insiders make more profit with positively correlated signals. This contrasts with the BCW model in which insiders' signals become almost perfectly negatively correlated near the end. of trade which causes the market to be very illiquid and inefficient compared to the monopolistic case
(Leković, 2019)	Testing Strong Form Market Efficiency of Indian Capital Market: Performance Appraisal of Mutual Funds	Indian Capital Market	Mutual Funds using monthly returns, based on NAV's of 8 fund schemes.	Risk and Return Analysis, Sharpe's measure, Jensen's measure, Treynor's measure and Sharpe Differential returns	from 1st April 2000 to 30th April 2010	mutual funds earn higher. return than the benchmark indicator
(Forker, 1992)	Empirical test of the strong form efficiency of the Warsaw Stock Exchange: the analysis of WIG 20 indexes shares	Poland Warsaw	The research sample consists of 3,270 recommendations	1 January 2005 and 31 March 2010 by 63 financial entities	rate of return from the WIG index	supports the dissertation of the existence of the strong form. efficiency of the Warsaw Stock Exchange
(Inchausti, 1997)	Evidence for and against the validity of efficient market hypothesis	various financial market	Mathematica l models (theoretical)	tests for private information	General theoretical review	many market anomalies have not lived long after appearing in financial literature, efficient market hypothesis cannot be tested in isolation, but only together with the corresponding equilibrium model

Source: Compiled by author.

The idea of market efficiency was formalized based on the conditional expected value relative to relevant information. This theory assumes that conditions of market stability may be expressed by the value of the expected returns achieved on an effective market.

There is a lack of studies on the Jordanian capital market and research-informed recommendations for managers, investors, shareholders, and government authorities in making their decisions for motivating the capital market cycle and attracting more investments. From those points, this study gets its importance in pointing out specific details in the Jordanian capital market. Hopefully, this study will find its way for new recommendations for the capital market of Jordan.

2.8 Survey literature review

If the market is efficient, it is expected that the information has to be accurate because the securities prices react sensitively to the new information flows from the market; in other words, there are no chances for some of the market participants to achieve abnormal return consistently (Hadi, 2006; Pandey, 2005). While others want to call the efficient market efficient in processing information, like Chadwick Research Group (2008) when they mentioned the efficiency of the capital market is all about information efficiency, essentially market prices adjust instantaneously to new information published in the market. The capital market of Jordan is one of the oldest markets in the Arabic region. It was established in 1978 and at that time people and government started to focus more on the importance of the capital market as a main player and developer of the local market, so if any investor wants to enter the market and sell or buy securities, they must do it through the agency of a stockbroker. Like in every market there are rules to make it easy and fair for everyone so in this way the investors can enter the market with trust but always there are two variables that will take a place in the rules which are price, and time. To make it easier when anyone wants to sell/buy a stock another party to buy/sell but the agreements could be done with priorities with the highest/lowest price, in addition, the one who makes the bid first has the priority to sell first and so on.

The world started to show more interest in the disclosure over the last thirty years Damodar, (1988) Damodar, ;(1988); Nichols, N B; Street, D L (2007); Suwaidan, Al-omari and Haddad (2004), while the global financial crises was still affecting the sectors, especially the capital market in negative way (Ali Bekhet & Matar, 2013) and most of the sectors were facing a challenge to get out of the crisis and raise capital for the shareholders. From that point the study of market efficiency is a theory talking about the effect on the disclosure (information) for making an efficient market, which will lead to a strong economy and performing higher stock market return with the rebounding of the economy (Kirman, 1992).

After many worlds' financial crises many economists and researchers have tried to interpret these kinds of phenomenon, and this leads to a better understanding of how the economy mechanisms operate and extends the public awareness of the world economy. During this time while the world is facing the biggest financial crisis that history has recorded since the Great Rescession. Researchers have been trying to understand the linkage between financial development and economic growth from the early researchers in the field like Gurley & Shaw (1955) and McKinnon (1973) until to current time like (Haslag & koo, 1999), (Kabir & Jung, 2011), and (Batuo & Asongu, 2018).

From the early time when capital markets started to attract more professional work and researchers from everywhere and during 1960-1970 especially, the capital markets started to see new definitions like "capital market efficiency" while the first researcher develops these definitions were Samuelson (1965) and Fama (1965, 1970), the main idea was based on the

assumption that share prices adjust rapidly to new information, in addition, the current price reflects all available information and it stimulates a process they call random walk.

Capital market efficiency from Fama's point of view means that the market can be classified into three different levels according to the efficiency hypothesis (EMH) (Fama, 1965b, 1970, 1991, 1998), a weak, semi-strong, and strong form. According to Fama's theory, the main factor is the information and its effect on the stock prices. However, the intuitive notions for "fully reflecting" available information may still need a lot of work and development to adapt them to the current time, based on the many economic and capital markets changes. To determine whether we can accept Fama's theory as is or identify a need to modify it to adopt the new changes, the researcher will take his intuitive notions into the ground of Jordanian capital market to try achieving some points listed below:

- My previous research concluded that the capital market of Jordan falls in none of the categories: it is not a weak, semi-strong, or strong form of efficiency (Bustanji, 2019; Mazen, 2019). This thesis will focus more on the reasons for this and provide some suggestions from the same Fama's theory, to lead fora more efficient market in the future taking into consideration that the market is not liquid and searching for more reasons which lead to a non-liquid market.
- This paper will provide a wider view of the capital market of Jordan to help the listed companies, the capital market organizations, financial companies, banks, and investors to more clearly understand what challenges are facing the capital market of Jordan from the capital market efficiency side.
- The new work in this paper is that the conclusion is based on data collected from a survey that represents different levels of participants in the capital market of Jordan, from investors, decision-makers, employees, and it will focus on the efficiency gap in the microstructure of Jordanian capital market efficiency.
- The researcher collected data from the Jordanian capital market and the sampling size was according to the set of the larger population (Cooper & Schindler, 2008).

Chapter 3   Research Methodology and Research Hypothesis
3.1   Introduction

This methodology will be separated into two parts:

1-   The historical data collected from websites in different countries, but mainly in Jordan. With this data, the researcher used different tests to test the efficiency of the Jordanian capital market for example (Autocorrelation, Runs, securities characteristic line, capital assets pricing model, even study, Jensen Model, and some other general statistics.

2-   The primary data are collected through a survey. The survey was collected in the Jordanian capital market (JCM) with a carefully calculated sample size and distributed only to professional people. The survey contains 20 questions with two sections: the first section is comprised of background information of the respondents, and the second section addresses the implication of determinants of efficiency to an investor. Both sections contain at least one open question to give more space for participants to comment on the market, but the remaining questions are on the Likert scale.

Figure 6 shows a methodology map to demonstrate which direction this dissertation will work on. This research is based on a theory of Fama's, so mainly to understand the map of this dissertation we needed to know about the idea behind this theory. The research methodology will be mainly connected to the research philosophy by retesting the EMH in the capital market of Jordan. It will explore if the Jordanian capital market is efficient on any level of efficiency by using primary and secondary data with complex design from both types of data to combine in one direction to increase the level of reliability and validity.

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                          ┌─────────────────────────┐
                          │  Research methodology   │
                          └─────────────────────────┘
                                      ↓
┌──────────────────┐      ┌─────────────────────────┐      ┌──────────────────┐
│  EMH Theory      │ ──►  │   Research philosophy   │      │   Exploring      │
│                  │      └─────────────────────────┘      │   purposes       │
│  Retest the EMH  │                  ↓                    ├──────────────────┤
│  with primary    │      ┌─────────────────────────┐      │   Descriptive    │
│  data            │      │    Research purposes    │ ◄──  │   purpose        │
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                                      ↓                    │   Recommending   │
┌──────────────────┐      ┌─────────────────────────┐      │   purposes       │
│ Quantitative     │      │   Research approaches   │      └──────────────────┘
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│ Qualitative      │      ┌─────────────────────────┐      ┌──────────────────┐
│ approach         │      │    Research strategy    │ ◄──  │  Historical Data │
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┌──────────────────┐                  ↓                    │     survey       │
│ Data collection  │      ┌─────────────────────────┐      ├──────────────────┤
│ (Questionnaire,  │      │     Research design     │      │   Case study     │
│ interviews,      │ ──►  └─────────────────────────┘      └──────────────────┘
│ historical data  │                  ↓
├──────────────────┤      ┌─────────────────────────┐      ┌──────────────────┐
│ Sample selection │      │ Research quality        │ ◄──  │   Reliability    │
├──────────────────┤      │ standards               │      ├──────────────────┤
│ Sample size      │      └─────────────────────────┘      │   Validity       │
└──────────────────┘                                       ├──────────────────┤
                                                           │   Sensitivity    │
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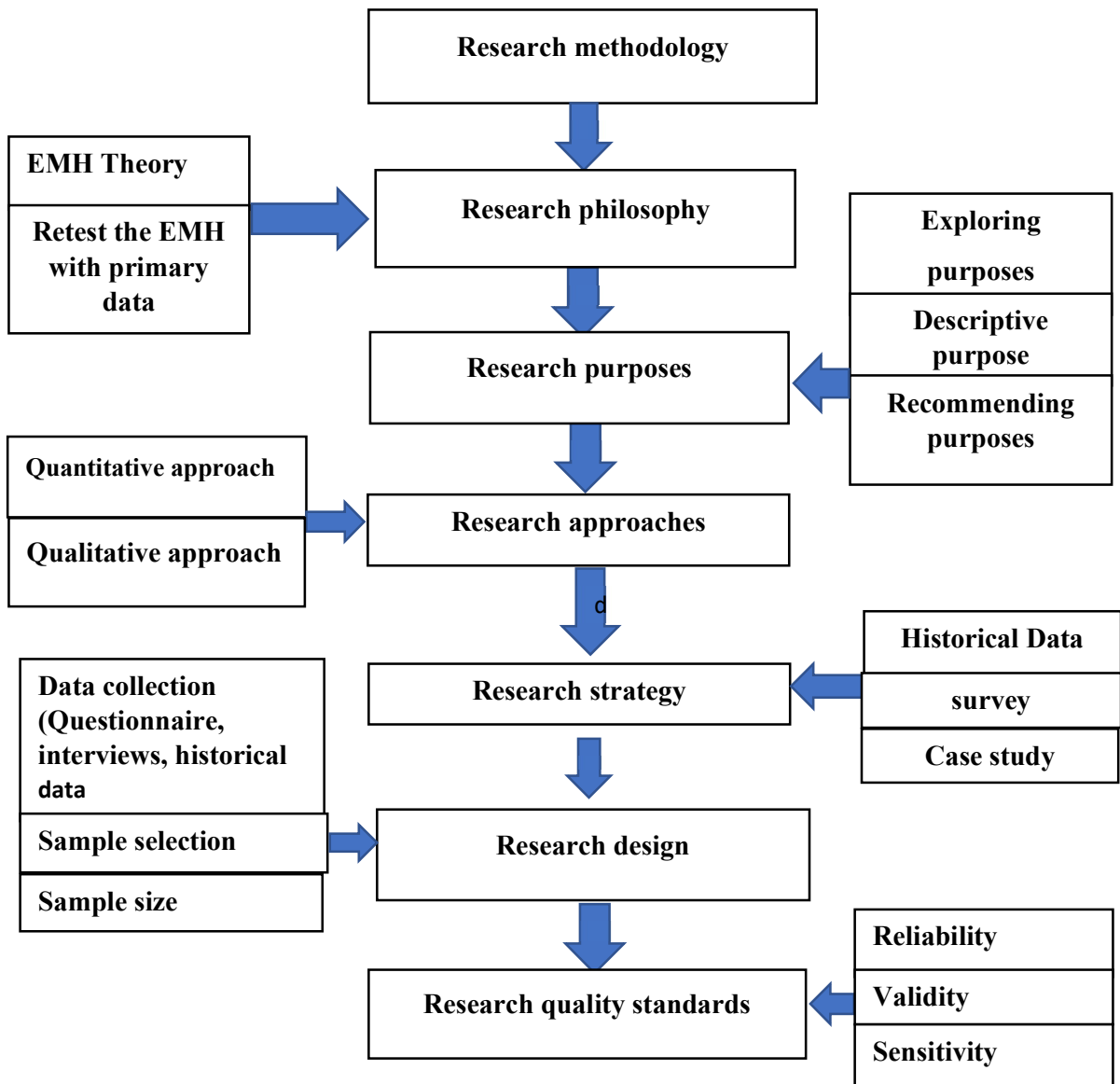
Figure 6 Methodology map

3.2 Research Hypothesis

3.2.1 *The weak form efficiency hypothesis*

Testing whether the Amman Stock market is following random-walk theory or the market is weak-form efficient by using a random walk and expected return models

- Null hypothesis (H01): The Amman Stock Exchange follows random-walk models.

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- Alternate hypothesis (Hα1): The Amman Stock market does not follow random-walk models.

- Null hypothesis (H02): The Amman Stock Exchange is weak-form efficient.

Alternate hypothesis (Hα1): The Amman Stock Exchange is not weak-form efficient

3.2.2 The semi strong form efficiency hypothesis

Testing whether the Amman Stock Exchange follows the Securities Characteristic Line (SCL) to help the investors easily to measure risk and make decisions, by using the Consumption-based Assets Pricing Model.

- Null hypothesis (H0): Amman Stock Exchange is following the SCL.
- Alternate hypothesis (Hα): Amman Stock Exchange is not following the SCL.

Testing the relation between disclosures and behavior of stocks return in the Amman Stock Exchange (ASE), to see if there is insider trading, by using an event study.

- Null hypothesis (H0): There is a relation between the movement of stock return and disclosures.
- Alternate hypothesis (Hα): There is no relation between the movement of stock return and disclosures.

Testing the efficiency of the Jordanian capital market at semi-strong form, by using the Capital Assets Pricing Model, to discover if the security prices have factored in publicly available market information and that price changes to new equilibrium levels are reflections of that information.

- Null Hypothesis (H0): The Jordanian capital market is semi-strong form efficient.
- Alternate hypothesis (Hα): Jordanian capital market is not semi-strong form efficient.

3.2.3 The strong form efficiency hypothesis

Testing whether mutual funds are earning a higher return than the benchmark, by using the Capital Assets Pricing Model, to explain if profits exceeding normal returns cannot be realized regardless of the amount of research or information investors have access to.

- Null hypothesis (H0): Mutual funds are not earning a higher return than the benchmark indicator.
- Alternate hypothesis (Hα): Mutual funds are earning a higher return than the benchmark indicator.

Testing whether the Jordanian capital market is strong-form market efficient, by using event study, to conduct if all information in a market, whether public or private, is accounted for in a stock's price.

- Null hypothesis (H0): The Jordanian capital market is not strong-form efficient.
- Alternate hypothesis (Hα): The Jordanian capital market is strong-form efficient.

Testing whether the Jordanian capital market is outperforming the Saudi Arabian capital market, to test if the Jordanian capital market is following the best way to maximize returns.

- Null hypothesis (H0): The Jordanian capital market is not outperforming the Saudi Arabian market.
- Alternative hypothesis (Hα): The Jordanian capital market is outperforming the Saudi Arabian market.

3.2.4 *Hypothesis for survey data*

Testing whether there is statistically significance of the difference between the expected frequencies of the data collected in one or more categories of a contingency table, to see the efficiency gap between the capital market organizations.

- Null Hypothesis (H0): there is no statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table.
- Alternate hypothesis (Hα): there is a statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table.

Testing if there is any evidence for the weak form of efficiency, semi-strong, and strong form of efficiency, by asking a technical question in the heart of the theory.

- Null Hypothesis (H0): There is no evidence for weak-form, semi-strong, or strong-form efficiency.
- Alternate hypothesis (Hα): There is only evidence for the weak form of efficiency while there is no evidence for the semi-strong and the strong form of efficiency.

3.3 Research Design

There are two methods for research work: qualitative and quantitative methods. Robinson (2013) states that qualitative data are associated with characteristics by their richness and fullness based on the opportunity to explore a subject in as real a manner as is possible. This indicates that the qualitative data must be collected in a particularly good, planned process, and the data cannot be collected in a standard way like the quantitative data method. The qualitative method is the primary method, and normally collects the data through the human, instead of inventories or questionnaires. The qualitative researcher must get an insight into the human's habits, working experiences, lives, etc.

Virtually all research will involve some numerical data or contain data that usefully be quantified to help answer research questions and to fulfill objectives. Quantitative data refers to all such data and can be a product of all research strategies (Saunders et al., 2009). If the quantitative research method is used, the researcher has already known what to do before starting to collect the data, unlike the qualitative method requesting the precise procedures. The

main aim is to clarify the features, and count them, then settle the statistical framework to test the observations. The data normally will be collected by using questionnaires and some instrument, such as computers, moreover, the historical financial data. Then the researcher can use the collection of data with statistical tools to test the hypothesis. As one purpose of this study is to use some historical prices to test the market efficiency anomalies, this will need a huge number of figures, furthermore, the aim is to test our hypothesis by using statistical models, so both quantitative research and qualitative research methods are suitable for this study.

This proposal will employ the descriptive research design according to Cooper & Schindler (2008), who suggest a descriptive research design while creating a profile of decision regarding what, where, how much, and by what means an inquiry, or a proposed research study will be conducted. Moreover, descriptive research design enables the researcher to reduce biases associated with qualitative data. This study sought to measure the efficiency of capital market efficiency in the case of ASE and the impact it has on investors, financial services companies, and listed companies in the market. The nature of this research prompted the use of a quantitative approach, besides composing the closing index of the Amman Stock Exchange. For every efficiency level, the researcher will use daily data for the last years through the historical data available on the websites of the Jordan Securities Commission, Amman Stock Exchange, and securities depository center. One of the main purposes of this paper is to analyze the risk of equity investments; daily data is specified in this study.

Because the EMH is about three basic levels of efficiency, I am planning to collect data and study the different levels of the EMH. Since the test of the EMH, in general, has come from the random walk literature, the researcher is interested in testing whether successive price changes were independent of each other.

3.4 Population

According to Cooper & Schindler (2008) the population is defined as the total of the elements upon which inferences can be made. A sample is concerned with the selection of a subset of individuals from a population to estimate characteristics of the whole population. The population of the study is comprised of the players in the stock market industry. These include institutional and individual investors and authorized brokerage firms in ASE.

Referring to Fares & Khamis (2011) the investors' characteristics are still not well documented. The Amman Stock Exchange, being a small exchange, does not use stock trading programs that require advanced mathematical models. Most stock trading is executed in a traditional face-to-face way. Therefore, stock trading depends on individual traders' judgements. Investors' trading behavior is influenced by several behavioral factors.

Because of that, the researcher will try to focus on the descriptive research and the historical data to achieve the maximum reliability of research and to be able to recommend advice to the organization to increase investors' trust in the capital market.

The target population of institutional and individual investors will be obtained from the Securities Depository Center (SDC) database. The target population of brokerage firms will be obtained from the Jordan Securities Commission (JSC). The companies' listed shares will be obtained from the Amman Stock Exchange (ASE). The population will be made up of 20

investors, 15 institutional investors, and 7 brokerage firms. The researcher targeted two target respondents in each institutional organization and two respondents in each brokerage firm. From Figure 7 a difference in performance in the ASE Market Capitalization per GDP can be noticed between 2005 to 2021. The decreasing period was between 2007 to 2021, let's say the ASE started to be affected by the global financial crises in last decade, like other capital markets in the world specially affected by the neighbors' countries. After 2007 the market also started to dramatically decrease in its ration in Market capitalization per GDP, mainly because of many reasons. Further research is recommended in this area, to deeply investigate the reasons of the dramatically drop in the below figure ratio.
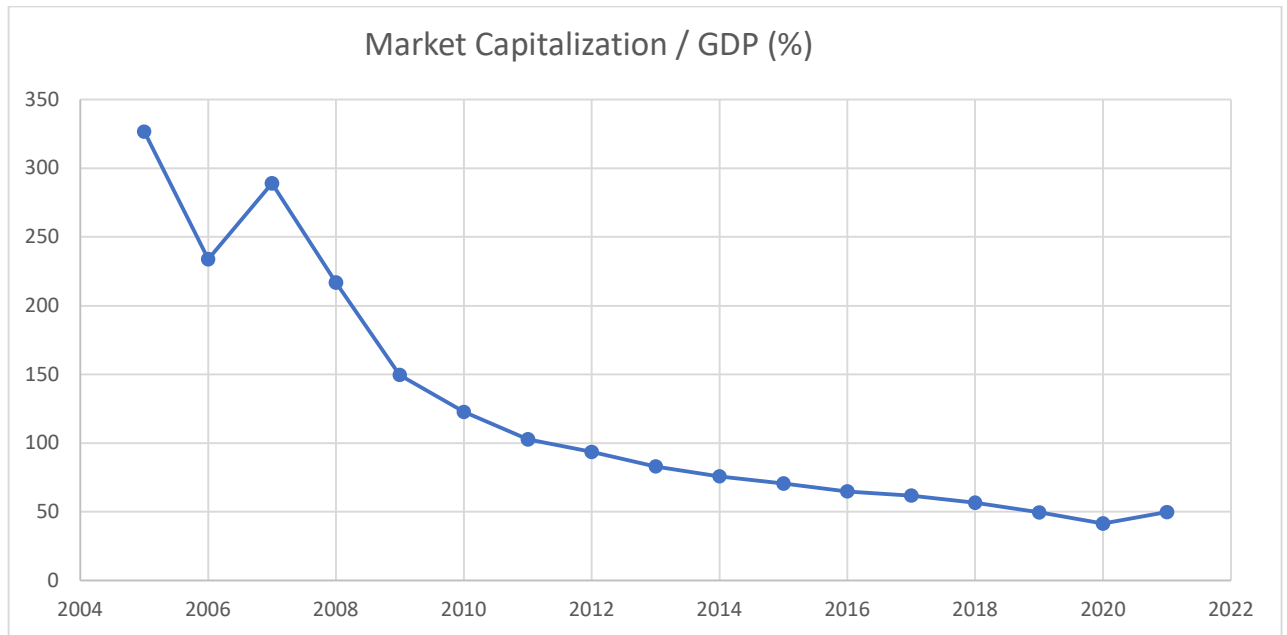
Figure 7 The market capitalization / GDP 2000 to 2020

Source: Amman Stock Exchange official site (ASE, 2021)
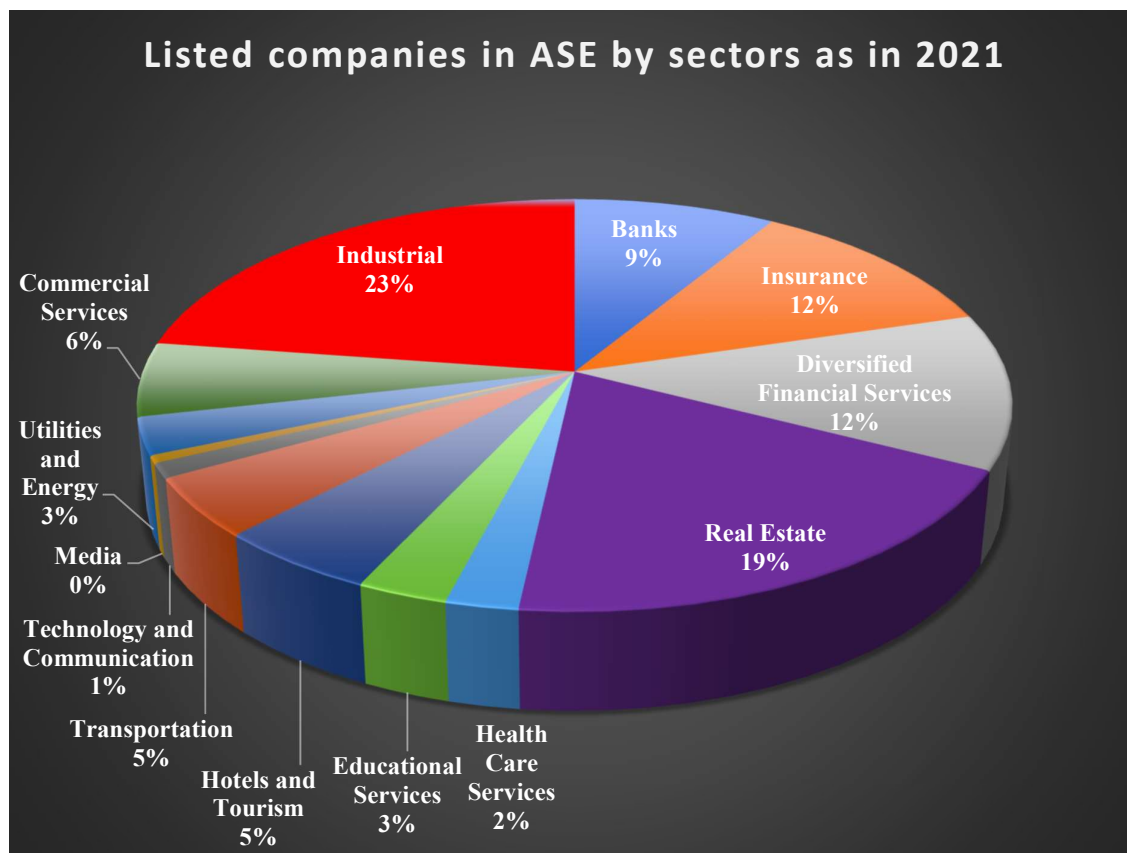
Figure 8 Listed companies in ASE by sectors as in 2021

Source: Amman Stock Exchange official site (ASE, 2021)

Real estate and diversified services represent the highest numbers of listed companies in the Amman Stock Exchange, followed by banks and insurance companies, with 15 banks and 20 insurance companies listed in the ASE. Transportation is 8 listed companies and there are companies from other services like health care and industries and the power and electric industries. The total number of companies listed in the ASE are 179 till end of 2021. (Figure 8).

Following the big challenge to the market specially in the last decade, the sectors dropped – a decrease of 92.7% to JD 43.3 million, compared to JD 596.9 million for first half of 2019for the net profit after tax attributable to shareholders for the first half of 2020 for the listed companies that provided the ASE with their financial reports., At the sector level, the Services Sector decreased in profits after tax attributable to shareholders by 322.6%. Within the Services Sector, the Energy and Utilities, Transportation, and Hotels and Tourism sectors were the sectors with the sharpest drop. The Financial Sector followed with a decrease of 62.6%. The Banking Sector was the sector with the sharpest drop in the main Financial

Sector. Finally, the Industrial Sector decreased by 56.5%. The Extractive and Mining Industries Sector was the sector with the sharpest drop in the main Industrial Sector.

Table 12 Nationalities of investors percentage as in 2020

Nationality	Market Value	Stocks %	%
Jordanian	7,72,885,774.23	65.43	52.16
Saudi Arabia	889,142,374.22	5.38	6.47
United Kingdom	802,482,210.20	0.9	5.84
Bahrain	625,213,822.45	4.69	4.55
Kuwait	595,321,524.90	3.36	4.32
China	489,187,013.91	0.31	3.55
Qatar	453,676,192.63	2.54	3.3
Others	91,228,876.79	17.39	19.81
Total	13,750,796,591.67	100.00	100.00

source SDC (2020)

In the Jordanian capital market, like other capital markets in the world, over 50% of the capital in the Jordanian capital market is held by Jordanian owners (Table 12), According to data from 2020, the biggest other nationality after Jordanian is Saudi Arabian. This is because of the good reputation for safety in Jordan compared with neighboring countries and because of the strategy in the securities commission to motivate investors from abroad to invest in Jordan. Also, investors from the UK are interested in the Amman Stock Exchange as there is a good relationship between the countries, with 5.84 % of the owners from the United Kingdom. Arabic Gulf investors also have an interest in the Jordanian market with 3-5 % of ownership for Bahrain, Kuwait, and Qatar. From the others also it could be noticed that Iranian, Syrian and Palestinian investors are among the biggest investors in the Jordanian capital market, which is mainly because of the situation from wars and conflict. Moreover, Jordan is providing some facilities to foreign investors to make the entry and exit from the market organized without affecting negatively on the market, like what happened in 2008 from the pump and dump after many Iraqi investors entered the market and then withdrew their investments to move to another country which provided more facilities to them.

3.5 Sampling design

3.5.1 Sampling Frame

For primary data, the researcher follows the methodology of Cooper & Schindler (2008) as they described the sampling frame as a complete list of all the cases in the population from which the sample will be drawn. The proposal lists the criteria for selecting the sampling frame of authorized brokerage firms, which will be obtained from the Amman Stock Exchange (ASE), and the sampling frame for individual and institutional investors, which were obtained from the Securities Depository Center (SDC) database. The sampling frame was made up of 180,000 investors, 15 institutional investors, and 7 brokerage firms which were obtained in March 2018. This ensured the sampling frame was current, complete, and relevant for the attainment of the study.

3.5.2 Sampling Technique

The survey that covered the listed levels from different institutions and organizations:
1. the organizations which belong to the Jordanian capital market (JCM), including employees from the Jordan Securities Commission (JSC), Amman Stock Exchange (ASE), and Securities Depository Center (SDC).
2. The financial service companies and mainly the brokerage firms: there are 59 companies that have licenses to work as a broker in ASE, of which only 3 of them are suspended of work and 1 company is restricted SDC (2020).
3. Listed companies in ASE that are still working, and that do not have any restrictions upon their trading: their number is 192 listed companies ASE (2019).
4. The investors who trade stocks almost daily, where stock market investing means choosing among these two investment types: stock mutual funds or exchange-traded funds.

I adopted a convenience sampling technique that attempts to take subjects under study which are conveniently accessible to a researcher. This is because convenience sampling is makes it easier for the research to select the target sample, also it is the best sampling technique to gain ideas about a particular subject and finally provides greater speed for data collection. I implemented sample representatives and diversity to conduct convenience sampling (Cooper & Schindler, 2008) for organizations that belong to the Jordanian capital market organizations, authorized brokerage firms, and individual and institutional investors.

3.5.3 Sample size

The sample size is a smaller set of the larger population (Cooper & Schindler, 2008). As they argue, the sample size is important for economic reasons. An under-sized study can be a waste of resources for not having the capability to produce useful results, while an over-sized one uses more resources than are necessary. I adopted a confidence level of 90% and the margin of error is 10%.

To obtain a sample size that has an adequate size relative to the goals of the study, I adopted Yamane's formula (Yamane, 1967) as follows:

$$\mathbf{n} = N\ 1 + N\ (e)^{\wedge}2,$$

where $\mathbf{n}$ is the sample size, $\mathbf{N}$ is the population size and e are the margin of error.

$$n = \frac{180{,}000}{((1 + 180{,}000) * (0.1))^2}$$

$$n = 100$$

The researcher will use census in choosing the sample size to cover the listed levels from different institutions and organizations (professional respondents).

3.5.4 Sample Size Distribution:
The researcher chooses this category for many different reasons, which are listed on table 13:

Table 13 Table Sample Distribution Size

Category	Sample Size	Percentage of the sample size %	Percentage of the category size %
JCM organizations	25	25%	5%
Financial service companies	25	25%	42%
Listed companies in (ASE)	25	25%	13%
Investors	25	25%	40%
Total	100	100%	100%

Source: researcher own distribution calculations.

- The employees of the capital market have the experience to let them know what they need to answer and provide the right feedback like the investors, listed company's employee, and financial services companies.
- All the samples were chosen carefully after understanding the microstructure of the capital market of Jordan.
- The survey was distributed by a software application (Google survey) which made the researcher work easier and more efficient to collect data rather than waste time, money, and effort the researcher and the participants, the software was a link on the Google Survey and participants just have to press on the link to access the survey, at the moment they finish the answers will appear in the special window for the researcher.
- All the participant's recorded positive feelings for participating in such a work to support the development of the capital market of Jordan.
- There was cooperation between the researcher and the Jordan Securities Commission to distribute the survey and make the work easier.
- The researcher used a Google survey and used two languages (Arabic and English) to make it easy for the participants to answer, so that respondents could choose which language version to use.

3.6 Data Collection Method

The data were collected through a survey distributed in the capital market of Jordan between the period from October 2019 to May 2020 and before the effect of the pandemic Covid-19 took place in Jordan and the capital market. Thus, there is no relationship between this study and the 2020pandemic. More specifically, the study was distributed only to a profession who have good experience in the capital market of Jordan and an appropriate level of education.

Data was collected using questionnaires that were developed based on research objectives. Cooper & Schindler (2008) explain that questionnaires are an important data collection tool because they provide an effective and efficient way of gathering information within a noticeably short time. The questionnaire is comprised of closed and open-ended questions. Closed-ended questions were used since they are not only easy to analyze but also facilitated harmonization of information obtained from the respondents. Moreover, open-ended questions were used to explore issues in more depth since respondents use their own words and opinions

to answer the questions. The first questionnaire addressed to institutional investors, brokerage firms, and listed companies in (ASE) (professional respondents) is made up of four sections. The first section contains the background information of the respondents. The second section addressed the determinants of capital market efficiency. The third section gathered data on the implication of the determinants of efficiency to an investor and the fourth section is comprised of different measures to promote the efficiency of the stock exchange.

The second questionnaire was addressed to individual investors and to JCM employees, but in this section, there are some sections exclusive for the JCM employees only. Generally, it and consists of a series of statements and respondents use a 5-point Likert scale that express strongly agree to strongly disagree. T second questionnaire is comprised of two sections. The first section is comprised of background information of the respondents, and the second section addressed the implication of determinants of efficiency to an investor.

3.7 Weak form efficiency Methodology

Testing the random walk hypothesis plays an important role in world financial markets. The importance of this hypothesis started to take place after investigations by Working (1934), Kendall (1953), and Fama (1965). Fama made his study on the Dow Jones Industrial Average index for 30 stocks to study the prices listed and concluded that US stock prices follow either a random walk or systematic behavior in the prices. Before Fama concluded that, Kendall studied the wprices, shares indices, and cotton prices, concluding that the prices follow a random walk theory. Working has the same outcomes by concluding that several series of commodity futures prices strongly resembled an artificial series by following a random walk.

After Fama published his paper in 1965 the paper started to make a more significant impact on academic research because many researchers started to apply this theory in the capital markets everywhere. They assumed that the prices would follow the random walk hypothesis and most of them tended to agree with Fama's conclusion.

There are two classifications to the random walk involveing two separate hypotheses:

1-   Successive independence in the price returns; and

2-   A specified type of probability distribution for the return's series

Successive independence in the price returns used by several random walk test statistics have been used; the following are the most popular techniques used:

1-   Autocorrelation tests
2-   Special analysis test
3-   Runs test.

For this stage of the efficiency level, it would be enough to take the Autocorrelation tests and the Runs test to see if the conclusion will agree with different research or not. In addition, the test will be expanded for a different way of studying by analyzing the primary data as well to increase the reliability degree of the conclusion of this efficiency level. These tests are examined basically through test normality, and the normality is based on the sample skewness and sample kurtosis.

3.7.1 Tests applied for weak level efficiency: Sample and empirical Method.

The data used are from the daily market return of the Amman Stock Exchange for the period of 1st January 2013 to 31st December 2020. All the data which are collected are publicly available and published officially by the website of Amman Stock Exchange.

To make sure the empirical work will be without serious bias, the data used cover completely 5 years after the global financial crisis and the data chosen in this period will reduce the problem of non-trading bias (Muragu & Dickinson, 1994); this must empower the work of the random work test (Taylor & Basil, 1969), while using the non-parametric test and the parametric tests giving no difference in the results in the Amman Stock Exchange and no bias distribution. In addition, the data were collected for the most companies with liquidity listed in the Jordanian capital market as its important to take the test for only liquidate companies otherwise the test will be biased. The companies were chosen from different sectors like banks, airlines, telecommunications, petroleum, and manufacturing. All the sample companies are publicly held companies, tradable, non-suspense, not restricted, and listed on the Amman Stock Exchange.

For this stage of weak-form efficiency level, this methodology has considered the following issues:

1- The study focused on the descriptive statistics, run test, auto-correlation test, while there is no need to expand this stage for studying other tests such as the dynamic time series model (like auto-regression model, ARIMA model) which will lead to the same findings. Many other researchers have been tested this before, while the new work on this stage is for expanding what causing the Amman Stock Exchange to be not efficient on the weak level; moreover, what makes this research is unique is mixing this test with historical data and data collected through a survey to zoom in on the problem and understand about this stage in more detail.

2- By using the time series regression analysis such as auto-regression analysis, considering the lag of returns and current returns in Auto-regression analysis, this helps to determine if the returns are predictable from the past returns and the extent of dependency.

3- Moreover, the robustness of the results is assessed in various ways. Rather than using the historical data and analyzing it through the autocorrelation and the run tests only, the researcher will also use the primary data obtained through the survey to investigate whether both tests will lead to the same results or not. Using different testing procedures helps to reach a conclusion of consistency in the finding (Urrutia, 1995).

In this section, the hypotheses will be explained, and the work will be covered by two different tests, the serial Autocorrelation and Run tests. These tests are enough to answer if the capital market of Jordan is efficient on the weak-form level or not and if the capital market of Jordan is following the random-walk hypothesis. Later, the work will be expanded through a survey to see if the same conclusion will lead to same results or not. There will be a discussion in each subsection below for the finding of individual techniques.

3.7.1.1 Serial Autocorrelation

One of the main reasons for using the auto-correlation test is because of its ability to differentiate if the random variables in the series are independent or dependent. It is a reliable test for this purpose, and it is used for discovering the relationship between the values of random variables at today t and its values in the previous period.

This test became popular after its first use in the field by Kendall (1943) when he computed the price change at different lagged 1,2,3,4, time periods. _Later the test was used by many other researchers like Laurence (1986), Nicolaas (1997) and (Nourredine (1998).

Fama (1956) stated that in the frame of his theory of capital market efficiency, he used this test as one among possible others for studying capital market efficiency, and after him many other researchers used the same test for different situations and studies (El-Kouri, 1993). The main purpose of the test is to show the relationship between the present sample and the historical sample. If the earning for a share is not related with each other (the null hypothesis, H0: Pk = 0), this means the studied series is not stable, which means accepting the hypothesis in the weak form of efficiency that the series would follow random behavior.

(No relation between "Earning for share" = no stability in series = accept the hypothesis = random behavior).

The researcher takes into consideration the autocorrelation test properties for this situation:

a. The price change in one period is correlated with the price change in some other period.
b. Those who believe that capital markets are efficient would expect an insignificant correlation for all combinations.
c. All these studies are concerned only with short-term trends.
d. Autocorrelation is stronger for portfolios of stocks of small market size.

3.7.1.2 Run test:

The main use for the run test is to decide if the data set is from a random process (Damodar, 1988), as it is also known as a series of increasing values or a series of decreasing values, where the change for decreasing or increasing as a value is known as the length of the run. In a random data set, the probability that the (I+1) value is larger or smaller than the given amount is the basis of the run test.

One of the main reasons for using the run test is because it can test and detect statistical dependencies (randomness) which may not be detected by the autocorrelation test. The run test is preferable as it could prove the random-walk model, because the test ignores the properties of distribution. The null hypothesis is that the observed series is a random series as defined by Siegel (1956) and the test rejects the null hypothesis that says the daily returns are random, as defined by Poshakwale (1996, p. 89):

"a lower-than-expected number of runs indicates market's overreaction to information, subsequently reversed, while higher number of runs reflect a lagged response to information. Either situation would suggest an opportunity to make excess returns."

What he means is to convert the total numbers in the run test into a Z statistic. And the difference between the actual and expected numbers of runs could be for large numbers of Z statistics of the probability. The criteria are if the Z value is greater than or equal to ± 1.96, we reject the null hypothesis at a 10% level of significance (Sharma et al. 1977). If it is obvious from the table of the results from the run test the Z value is greater than ±1.96 and negative, that means that the expected number of runs with observed significance level is less than the observed number of runs. The observed numbers of runs also serve to conclude whether to reject or accept the random walk model. As in the case of (Damodar, 1988, p. 691);

"If in an application it is found that the number of runs is equal to or less than 9 or equal to or greater than 20, one can reject (At the 5% level of significance) the hypothesis that the observed sequence is random."

Back to Fama (1965), it is valid to use this test to study the efficiency in the weak form and it is also used by other researchers to test the weak form by comparing a series on return of shares both positive and negative with the tested distribution of the sample in the framework of the random movement theory.

Mainly, what is the run test all about? It is more than a statistical procedure that examines whether a string of data is occurring randomly from a specific distribution; it is also a test that analyses the occurrence of similar events that are separated by events that are different. It is also known as repeating the same value of variance, and this test is based on the null hypothesis which says that the number of expected runs should equal the actual number of runs (H0: E(runs) = E(R)) and this also means random behavior of the price shares, meaning that the market will be efficient on the weak level.

It is also can be written as (H0: E (runs) = E(r) = random price shares behavior = efficient capital market on weak form). When the sample size is large the Z test is available, which is calculated by following formula:

$Z = \frac{R - E\ (R)}{\sigma R}$ So, if the calculated Z (out of acceptance amount of the hypothesis) the programmed value of Z score (we will take 5% confidence level, while Z = ± 0.05 which means from -1.96 until to +1.96 the region of acceptance) then the researcher will reject the null hypothesis and conclude that the prices depend on each other, and it is not random walk theory; thus it is predictable, and the market is not efficient in the weak level.

The researcher will take also into consideration:

a. A run occurs when there is no difference between the sign of two changes.
b. To test a series of price changes for independence, the number of runs in that series is compared to see whether it is statistically different from the number of runs in a purely random series of the same size.
c. The results of these studies seem to strongly support the random walk model.

In the efficient market hypothesis it is not possible to find the indication for the horizon over the returns should be calculated but it is possible to make the test on many alternatives, which are holding period of a day, week, month, and a year (Cuthbertson, 1996, p. 126).To explain how the variables would be connected in the run test, Table 14 will show what the variables on the weak level of efficiency are .

Table 14 Description of variables:

Name of the variable/s	Proxy	Description
Daily market returns	(RMT)	Natural log of market returns

$$R_{mt} = Ln\left(\frac{PI_t}{PI_{t-1}}\right)$$

Where:

$$R_{mt} = market\ return, in\ period\ t;$$

$$PI_t = Price\ index\ at\ day\ t;$$

$$PI_{t-1} = the\ price\ index\ at\ period\ t-1\ and$$

LN= *natural log.*

The daily individual shares LN Natural log of individual shares return (shrit) could be written as the equation = **LN [**$(P_{t-1} + D_t)/P_{t-1}$**],** Where, LnSRjt- is the natural logarithm of returns on individual security, P_{jt} is the daily price per shares at period t, P_{jt-1}-could be the daily price per shares at period **t-1**, D_{jt} could be the dividend per shares of an individual security (**j**).

3.8 Semi-strong form of efficiency

This study seeks to measure the behavior of stock prices in the Amman Stock Exchange (ASE), which is expected to be a semi-strong form of efficiency. The aim of the study is to measure the presence of semi-strong form efficiency in the context of the securities characteristic line (SCL) and impact on the Jordanian capital market which in recent years has become a key and prominent factor for economic growth.

Since new information is publicly available in an unbiased manner it is not possible to earn an excess return based on that information. The concept of the Efficient Market Hypothesis is a vital aspect of Efficient Market Theory.

3.8.1 The objectives to study the semi strong level:

4   This section will present the securities characteristic line (SCL) model on the Jordanian capital market and study the abnormal returns through regression statistics.

5   The following equation refers to SCL:

$$R\_(j, t+1) = \alpha\_j + \beta\_j \, R\_(m, t+1) + \mu\_(j, t+1)$$

$R\_(j, t+1)$	= the rate of return on security j for the period for t to t + 1;
$R\_(m, t+1)$	= the corresponding return on a market index m;
α_j and β_j	= parameters that vary from security to security; and
$\mu\_(j, t+1)$	= error term.

Risk free rate is incorporated into α_j and β_j by the following.

$$\alpha\_j \, (\Phi\_t) = R\_(f, t+1) \, [1 - \beta\_j \, (\Phi\_t)]$$

$$\beta\_j \, (\Phi\_t) = \vdash "Cov(" R\_(j, t+1), R\_(m, t+1) \, / \, \Phi\_t) / \vdash \sigma^2 \, (R\_(m, t+1) \, / \, \Phi\_t)$$

Using the context of an efficient-market pricing model in which Φ_t is the set of relevant information available for determining security prices at time t, Equation (1) may be rewritten:

$$E(R\_(j, t+1) \, | \Phi\_t) = \alpha\_j \, (\Phi\_t) + \beta\_j \, (\Phi\_t) E(R\_(m, t+1) \, | \Phi\_t)$$

Tests of this form of efficiency will help to understand the following points:

1. Speed of adjustment of stock prices to new information.
2. Studies that consider whether investors can achieve above-average profits by trading based on any publicly available information.

The capital assets pricing model (CAPM) can be used simultaneously to test the efficiency of the capital market and the validity of the CAPM, as shown by Sharp (1964). Under the definition that semi-strong form reflects all available information, the fair-game model, which says the expected return on an asset equals its actual return, should be applied. The expected abnormal return for the security should be zero.

3.8.2 Data Collection for semi strong form

The news archives of JSC and SEC and ASE (2019, 2021) in the Jordan Securities Commission and Amman Stock Exchange, respectively, were used as news sources. According to the law on the financial securities market, listed companies are required to provide the market regulator with important news but the definition itself from the

Jordanian Securities Commission is still not obvious compared with the same level of disclosure in other countries. For example, in Lithuania "Immediately but not later than the news are announced to the mass media" (Lithuanian Securities Commission, 2018), while the ASE simply states that "The Stock Exchange shall immediately disclose information and data it receives which may have an impact on the prices of securities and trading." (ASE, 2021). It also needs to define the word 'immediately' in the Amman Stock Exchange to enhance the efficiency tools in the capital market.

3.8.3 SCOPE:

The present form of efficiency tests the market efficiency of Jordanian Capital Market in its semi-strong form of Efficient Market Hypothesis in the context of its securities characteristic line (SCL). This stage covers the period of five years, i.e., from 1st January 2013 to 31st December 2020. Also, the study focuses on most liquidate shares in the listed shares to study the most 10 important disclosures in the period. An attempt is made to carve out a clear picture of the behavior of stock prices in the Amman Stock Exchange (ASE), which is expected to follow a random walk, and study the effect of the disclosures on the price shares before the announcement of disclosures through an event study. A test of this nature was introduced by Ball and Brown (1968) and by Fama et al. (1969). This test has the most relevancy degree for the semi-strong level of efficiency because of its ability to test the market sensitivity to public information in a sufficiently rapid manner (Brown & Warner, 1980).

3.8.4 Importance to study semi-strong form efficiency

This study has the following objectives.
1. To assess the growth and development of the Jordanian capital market;
2. To test the efficiency of the Jordanian capital market on the semi-strong level;
3. To develop an understanding about the concept and role of efficiency and compare the Jordanian capital market with other markets at the same level of efficiency;
4. To study the relationship between the movement of stock prices and disclosures, in other words the efficiency of management of listed company shares and their price behavior;
5. To test the existence of the semi-strong form of the Efficient Market Hypothesis in the Jordanian capital market in the context of the securities characteristic line (SCL) model and the capital assets pricing model CAPM).

3.8.5 Design methodology for semi strong form of efficiency

The characteristic line is found by plots of the securities return at different points in time. The y-axis on the chart measures the excess return of the security. Excess return is measured against the risk-free rate of return. The x-axis on the chart measures the market's return in excess of the risk-free rate (Bollerslev et al., 1988).

Fama assumes that the state of independent investment opportunity is set, and the distribution of deflated excess rates of returns for individual securities would also be identically distributed over time. This suggests that unbiased estimates of a portfolio's expected rate of return, beta and gamma may be obtained from deflated excess rates of return over the sample period

(Fama, 1970).

The interesting thing here is how to account for the errors and the measurement in beta and gamma, risk asset portfolios were formed with a grouping procedure like the procedures used by Black *et al.* (1972) and (Fama and J. MacBeth, 1973). Using the riskless lending rate and deflated excess rates of return, beta and gamma were estimated for each stock that was continuously listed on the ASE during the 60 months from January 2013 through December 2020. The estimates of beta and gamma for the security were calculated, respectively.

Through statistical regression analysis (Durbin & Watson, 1950) they developed a static number that tests for autocorrelation in the residual form this static always between 0 and 4. The positive autocorrelation means the number will be more related to zero and the negative autocorrelation is more related to 4 while the exact 2 means there is no autocorrelation in the sample and this is the weak form of efficiency. To make sure the population is normally distributed to test the null hypothesis, if the p-value is less than the chosen alpha level, then the null hypothesis is rejected and there is evidence that the data tested are not normally distributed. On the other hand, if the p-value is greater than the chosen alpha level, then the null hypothesis that the data came from a normally distributed population cannot be rejected (Shapiro & Wilk, 1965)

3.9 The Strong Form Test Methodology

3.9.1 Problem statement

This section seeks to measure the behavior of stock prices in the Amman Stock Exchange (ASE) and compare it with that of a neighboring country, Saudi Arabia, taking into consideration the differences and trying to understand whether the capital market of Jordan is rehabilitating from the financial world crises in 2008. Strong form efficiency means that investors with access to general information, as well as those having access to non-public information, are not able to "beat the market" and achieve abnormal rates of return. I assume that the recommending institutions have access to non-public information. This article attempts to verify strong-form efficiency based on recommendations issued by 63 financial institutions in Jordan. The analysis was carried out based on the simplified assumption that financial institutions issuing recommendations could also use information not available to the average market participant (for instance non-public and confidential information). This assumption does not imply that having such information is a necessary condition for developing stock recommendations. Moreover, it is important to mention that Jordanian law prohibits exploiting non-public (inside) information in conducting transactions on the capital market.

3.9.2 SCOPE:

The present dissertation tests the strong form market efficiency of the Jordanian capital market by evaluating the performance of mutual funds and comparing it with performance in the Saudi Arabian capital market. Investment in mutual funds is the safest mode of investment by people, as it diversifies the risk. The data cover the period from 1st January 2013 to 31st December 2020. In the present dissertation, the scope is limited to some prominent schemes of only four Jordanian mutual funds, depending upon their nature and their inception period. With limited numbers of mutual funds in Jordan, the authors will test the valid and liquid mutual funds.

The measurement of performance utilized in this section of efficiency is the widely used Jensen (1968, 1969) measure, which uses the security market line to evaluate fund performance. The Jensen measure may indicate poor performance when the manager possesses and utilizes superior timing information.

3.9.3 The importance to study this level:

This dissertation aims to achieve some objectives in practice:
1. To assess the growth and development of the Jordanian capital market;
2. To test the efficiency of the Jordanian capital market;
3. To develop an understanding of the concept and role of efficiency and compare the Jordanian capital market with another market at the same level of efficiency;
4. To study the relationship between the movement of stock prices and disclosures, in other word the efficiency of management listed company shares and its price behavior;
5. To test the existence of the strong form of Efficient Market Hypothesis in the Jordanian capital market in the context of the securities characteristic line (SCL) model and the capital assets pricing model CAPM);
6. To study in detail the insider trading (if available) in order to help taking procedures for protecting the right of all investors to get information at the same time;
7. To test the existence of the strong form of the Efficient Market Hypothesis in the Jordanian capital market in the context of the Jensen test;
8. To study in detail the securities of firms, specifically whether it is possible to outperform the market and present market price or if there is a true reflection of the present situation of their securities.

3.9.4 Data Collection

The data was collected from several sources. The news archives of the Jordan Securities Commission (JSC, 2019) and Amman Stock Exchange (ASE, 2019) are the primary sources. Some information is available on the website of banks in Jordan, especially in Housing Bank, (2021) to official information for making the comparison between the Saudi Arabian and Jordanian capital market. Mubasher Trade (2021).

The data were collected from January 2013 to December 2020. A limitation of the study is the low number of the mutual funds in Jordan while it was only 4 funds in comparison to 267 Saudi Arabian mutual funds. The author understands that the number of mutual funds is not high, but it is still worth studying the available information for better recommendations to compare with the suitable country situation as a good example in the region.

According to the law in capital markets, companies listed on Financial Securities market are required to provide the market regulator with the important news, but the definition itself for "disclosing new information.

3.9.5 Technical Methodology for strong form efficiency (Jensen test)

The main point in this model test that Jensen's measure is the difference in the returns of an individual vs. the overall market, and this difference is commonly referred to as alpha. When a manager outperforms the market concurrent to risk, they have "delivered alpha" to their clients, and it is also used to measure accounts for the risk-free rate of return for the period. In any managed portfolio it must be assisted by performance during a specific period. Suppose we wish to evaluate performance with excess return.

This portfolio is chosen from N assets with excess returns $r_{jt} = 1, \dots, N$. Let r_{et} be the excess return on the portfolio that, from the point of view of the uninformed investor, is mean-variance efficient within the set of N tradable risky assets and whose orthogonal portfolio is used to compute excess returns. Next, assume that the uninformed investors' expected return on this mean-variance efficient portfolio is variances σ_e^2. Let us say also it is possible to imagine that there is expected return on assets **j** is μ_j and that the covariance. Matrix of the returns $r = (r_1, r_2 \dots, r_j \dots, r_N, \dots, r_e)$ is constant given the

information available to the uninformed investor. Given these definitions, it follows from Sharp (1977) that

$$r_{jt} = \beta_j\, r_{et} + \varepsilon_{jt}, \qquad\qquad \beta_j = \frac{cov(r_{jt,}\ r_{et})}{\sigma_e^2}$$

Let us say from the point of view of the uniformed investor, β_j it is a constant and $E_{(\varepsilon jt)= 0}$. At the same time, the portfolio manager is assumed to possess different information modifying results in time-carrying expected returns. In the result, it is clear that the portfolio weights will vary over time, as will the uniformed investor's expected value of r_{pt}, so, β_{pt} is likely to be time varying as well. We can write the returns on the managed portfolio as

$$r_{pt} = \beta_{pt} r_{et} + \varepsilon_{pt}$$

The manager of the fund potentially possesses two types of superior information. One is the information about r_{rt}. Letting Φ denote the time t information set of the manager, **if** $E(r_{et}/\phi_t) \neq$ E (r_{et}) = μ_e the manager is said to possess timing information. When E ($\varepsilon_{jt}/\phi_t\varepsilon_{jt}) = 0_{\neq E}$ the manager is said to possess selectivity information.

A popular measure of the performance of a managed fund is the Jensen test (Jensen 1968, 1969), which is the intercept, α_p, of a least squares' regression of r_{pt} on r_{et}. While the Jensen measure provides an accurate indication of the performance of a fund when the manager has selectivity information but no timing information (Jensen, 1972), Admati and Ross (1985) show that when a manager has superior timing information, the Jensen measure α_p can be negative.
Grinblatt and Titman (1989) examine a class of performance measures that includes the Jensen measure and show that certain members of the class do not suffer from the problems that arise with the Jensen measure. The class of measures, called period weighting measures, is defined for a sample of T observations by

$$\alpha = \sum_{t=1}^{T} w_t\, r_{pt}$$

$$\sum_{t=1}^{T} w_t = 1$$

$$\sum_{t=1}^{T} w_t \, r_{et}$$

where the weights, W_t, are functions of the return on the benchmark portfolio. Their main result is that if $W_t > 0$ for all t, the performance measure, denoted α* when $\mathbf{w_t > 0}$, converges in probability to zero for an uninformed investor and to a positive number for an investor with selectivity information and no timing information or selectivity information and independently distributed timing information. Grinblatt and Titman (1989) show that the Jensen performance measure is obtained by setting

$$w_t = V_e - \frac{(r_{et} - \bar{r}) \, \bar{r}_e}{T \, V_e}$$

where $\bar{r}_e$ and V_e are the sample mean and sample variance of the benchmark return. It could be concluded again that

$$\alpha_p = \sum_{t=1}^{T} w_t \, r_{pt} = \bar{r}_p - b_p \bar{r}_e$$

where $\mathbf{b_p}$ is the estimated least squares slope coefficient from a regression of r_{pt} on r_{et}. The problem that arises with the Jensen measure when the investor has timing information can be seen by examining the weights, w_t. For large values of r_{et}, $W_t < 0$. When the investor has timing ability, r_{pt} will, on average, be large when $E(r_{et} \, \Phi)$ is large and will therefore also be large, on average, when r_{et} is large. These large returns will then receive negative weights, making it possible that $\alpha_p < 0$ when the investor has timing information. Grinblatt and Titman propose restricting the class of performance measures to those with $W_t > 0$ to overcome the problem of a negative Jensen measure arising when the manager has timing information. Following their suggestion, suppose the utility function of the uninformed investor in period **t** is given by

$$U(W_t) = \frac{1}{1-\theta} * W_t 1 - \theta = W_t 1 - \theta/(1-\theta)$$

where:
W_t is wealth at the end of period t. If the uninformed investor can hold the N risky assets and a riskless asset with return R_{ft}, end-of-period wealth is given by $W_t(y) = 1 + yR_{et} + (1 - y)R_{ft}$, where beginning-of-period wealth is normalized to one. Choosing $-y$ to maximize expected utility yields, $E(W_t(Y * -\theta)r_{et}) = 0$, where $Y * \theta$ is the optimal choice of Y and r_{et} is the excess return on the benchmark portfolio. An estimate of $Y*$ can be obtained by setting $W_t(\hat{Y} * -\theta)r_{et} = 0$. Choosing the weights in **α** to be $W_t = W_t(\hat{Y} * -\theta)$ will then satisfy the last condition in (3) above. Normalizing the weights to sum to one implies that the positive period weighting measure has the same units as r_{et} does. When multiple portfolio benchmarks

are employed, the same procedures are utilized to obtain a Y for each portfolio in the benchmark.

$$\alpha^* = \sum_{t=1}^{T} W_t \left(\beta_p r_{et} + \varepsilon_{pt}\right) = \beta_p \sum_{t=1}^{T} W_t \, r_{et} + \sum_{t=1}^{T} W_t \, \varepsilon_{pt} = \sum_{t=1}^{T} W_t \, \varepsilon_{pt}$$

The choice of the benchmark to carry out the tests of performance is relatively straightforward. Grinblatt & Titman (1989) show that under reasonable conditions both the Jensen measure and the positive period weighting measure require only that we consider a portfolio that is mean-variance efficient from the point of view of the uninformed investor within the set of risky assets available to the manager. We thus do not need to measure the returns on a "market" portfolio that includes nontraded assets. The researcher does need to verify, however, that the benchmark chosen is, in fact, mean-variance efficient within the set of securities available to the fund manager. The next section describes the procedures used to test for the mean-variance efficiency of the benchmark.

For testing the hypothesis, the calculation has been done for the Jensen Model. We use the following equation:

Jensen Model $= R_f + \beta * (R_m - R_f)$

where:

$\mathbf{R_m}$ = Return on market

$\mathbf{R_f}$ = Risk Free Rate

$\boldsymbol{\beta}$ = beta coefficient of portfolio = Cov_{xy} / Var_x

$\mathbf{X}$ = Market return

$\mathbf{Y}$ = Stock Return

3.10 Methodology for Primary data

3.10.1 Statement of Problem and Issue

The main goal of this section is to produce a tool to help the capital market organizations, financial companies, banks, and investors to understand more about the challenges are facing the capital market of Jordan, the tool aims to generate quantitative data in various dimensions of capital market efficiency, specifically, Cramér's V Test, correlation coefficient, and other statistics applied to this paper. This level of efficiency addresses sampling and data collection issue for implementing the capital market efficiency theory on the capital market of Jordan and provides guidance for the use and analysis of data. Other goals of this section are to provide better empirical information on Jordanian capital market to greater benefits between researchers, policymakers, financial companies, listed companies, banks, and investors.

The capital market of Jordan is still suffering from consecutive crisis, at the same time the market is still not liquid enough to say it is efficient or even to apply some efficiency tests, but the efficiency tests are very important to understand the complete reasons about the capital market inefficiency, while this is not the only problem facing the market. Naturally, there are many other reasons which lead to a not-liquid market which causes inefficiency on the three

different levels of market efficiency based on Fama's theory. This section will fill the gap of the efficiency to answer many questions such as:

1. One of the most important points –why is the market not liquid enough?
2. If the capital market were covered well by the previous research in the capital market of Jordan?
3. Is there is a clear understanding of the nature of the Jordanian capital market? If yes, what is it? If not, how to create one?

After answering these questions, determining the level of efficiency would be able to provide recommendations theoretically and statistically.

This section will take into consideration the indicators according to limits of the listed points:

I. The availability of the data needed to construct the considered indicators;
II. The reliability of the data collected which these indicators are based on a survey from different categories of the capital market;
III. The economic meaning of the indicators, for example the capital market efficiency and some special indicators in the Amman Stock Exchange;
IV. The period during which the data was collected, from January 2013 to March 2020.

Chapter 4   Fundamental and Technical Analysis

4.1   Weak level of efficiency

4.1.1   Scientific analysis for weak form efficiency (descriptive statistics)

The descriptive data show there is not normal distribution of returns for the daily shares in the Amman Stock Exchange during the study period. The mean for the returns shares is 5.13. It can also be seen from Table 15 that the frequency distribution of the return series is not normal, while the skewness coefficient is in excess of unity, generally taken to be fairly extreme (Chou & Chou, 1969). Note that the evidence for positive skewness (3.279) is similar in the finding of Poshakwale (1996) in the Indian capital market, although in that case the skewness coefficient is much less (0.98). Comparing with the Gaussian distribution, a kurtosis coefficient of 2.902.7 kurtosis was expected; generally, either much higher or lower indicates extreme leptokurtic or extreme platykurtic (Parkinson, 1987) while the observation in the ASE case of 13.163 falls under extreme leptokutic distribution. Based on the values of skewness, if it is in between zero and 3 normally it will indicate that the observed distribution is perfectly normally distributed. Thus, the skewness and leptolurtic frequency of the ASE indicates that the distribution is not normal. This means the non-normal frequency distribution of the stock return series deviates from the prior condition of the random walk model, which means rejecting the null hypothesis which says that the distribution is following normal distribution with a significance level of 10%.

According to the descriptive data, the frequency distribution of the ASE daily series is not normal as the positive amount of the mean for return series of the sample, moreover, the positive amount of kurtosis also shows that the frequency distribution is not normal. The frequency distribution of the return series is leptokurtic, indicating higher peaks than expected in comparison with normal distributions. From all the above it can be concluded that the ASE is not following the RWM.

Table 15 Descriptive statistics for daily index return of ASE

Date: 28/01/2021	Time: 23:45
Sample: 11073	**RT**
Mean	5.13
Median	0.00935
Max	0.06258
Min	-0.04256
Std. Dev	6.1
Skewness	-0.32794
Kurtosis	13.16304
Prob	0.0
Obs	3850

Source: Compiled by author.

4.1.2 Autocorrelation results:

There is a relation between "earning for share" = stability in series = reject the hypothesis = regular behavior.

In other words, the earning for share was not related with each other (the null hypothesis, H0: Pk = 0), which means the studied series are not stable and leads us to reject the hypothesis in the weak form of efficiency: the series does not follow random behavior.

Table 16 shows main information to explain why these shares mainly are chosen as a sample to study this level of efficiency. Typically, these shares are from the most liquid shares in the ASE. To test the efficiency on any level the sample has to be tradable, and liquid enough, and naturally not suspended from trading, and there is demand for the shares with daily trading. The table also shows the market capitalization. Note that the Amman Stock Exchange calculates a price index weighted by the market capitalization of free-float shares. The market capitalization of each company included in the index is calculated by multiplying its total number of listed shares with the last close price and then by a number called "factor". The final column of the table gives the autocorrelation figures.

Table 16 Descriptive statistics for daily index return of ASE

Company Symbol	Original name	Main operation	Market Capitalization (JD)	Closing Price (JD) till end of 2019	Weight %
JTEL	Orange Jordan	integrated communications services in the Kingdom	270,000,000	1.44	1.24
RJA	Royal Jordanian	airline of Jordan company	71,398,722	0.25	
AJIB	The Jordanian investment bank	Bank sector and financial services	196,500,000	1.31	2.20
JOPH	Jordan Phosphate Mines	Mining and processing phosphate	228,525,000	2.77	1.68
ARBK	Arab Jordan Investment Bank	Bank sector and financial services	3,684,600,000	5.75	9.50
APOT	The Arab Potash	It is the eighth largest potash producer worldwide by volume of production and the sole producer.	1,703,853,100	20.45	3.80
CABK	Cairo Amman Bank	Bank sector and financial services	195,700,000	1.03	3.76
UBSI	Bank El Etihad	Bank sector and financial services	257,600,000	1.61	3.36
JOIB	Jordan Islamic Bank	Bank sector and financial services	560,000,000	2.80	8.24
THBK	The Housing Bank for Trade and Finance	Bank sector and financial services	1,726,200,000	5.48	4.27

Source: ASE (2021)

The following columns showing the results of autocorrelation taking into consideration 10 times series, based on that the author rejecting H1 hypothesis, linear independence of which less than 0.3 (which shows autocorrelation for return series are jointly significant at the level of 0.3). This gives some evidence (not enough) that the ASE is efficient at the level of weak form. In the data appearing all of the listed shares are less than the required amount, however, I accept H0: this means the studied series is stable, which means rejecting the hypothesis in the weak form of efficiency, supporting that the series follow regular behavior
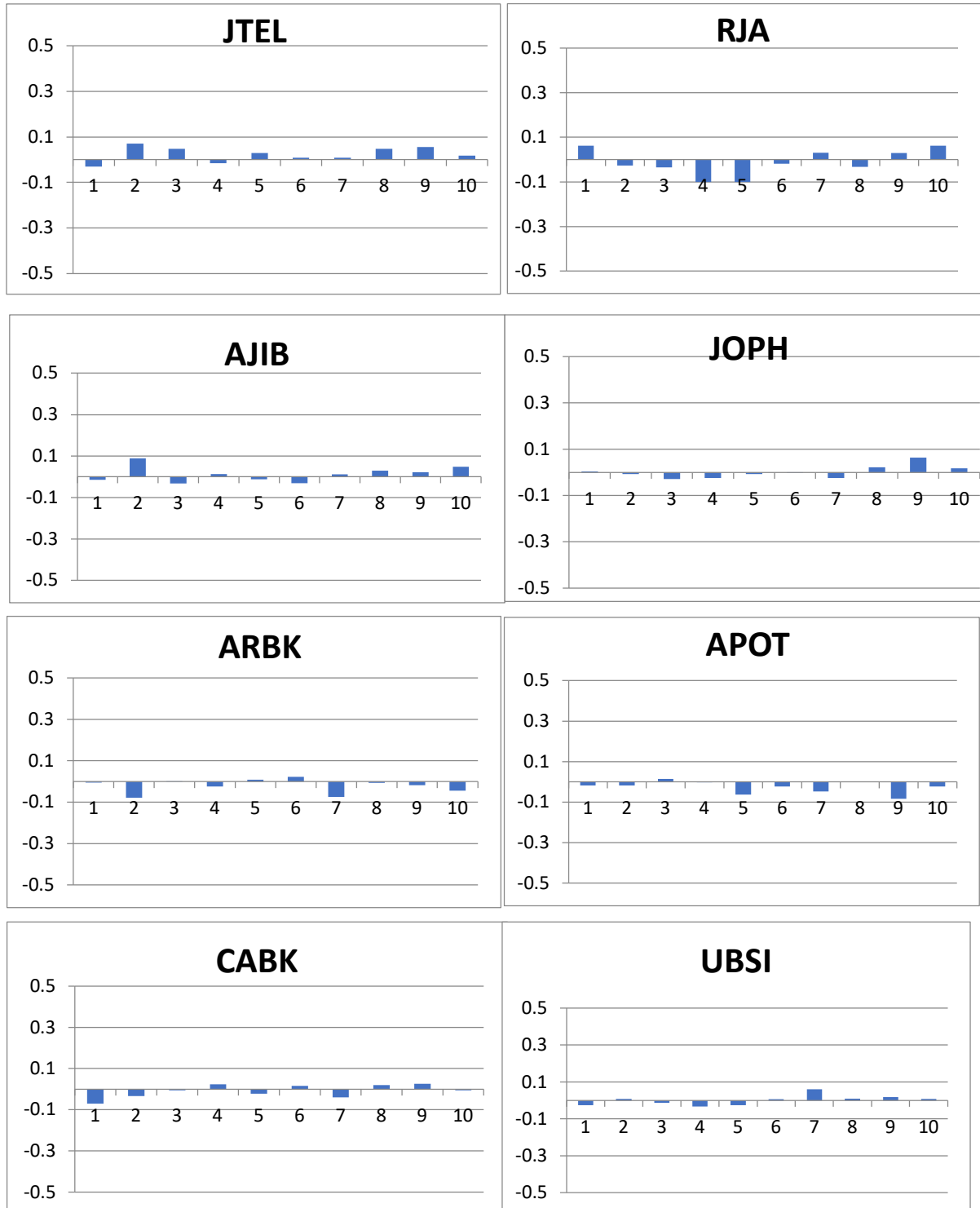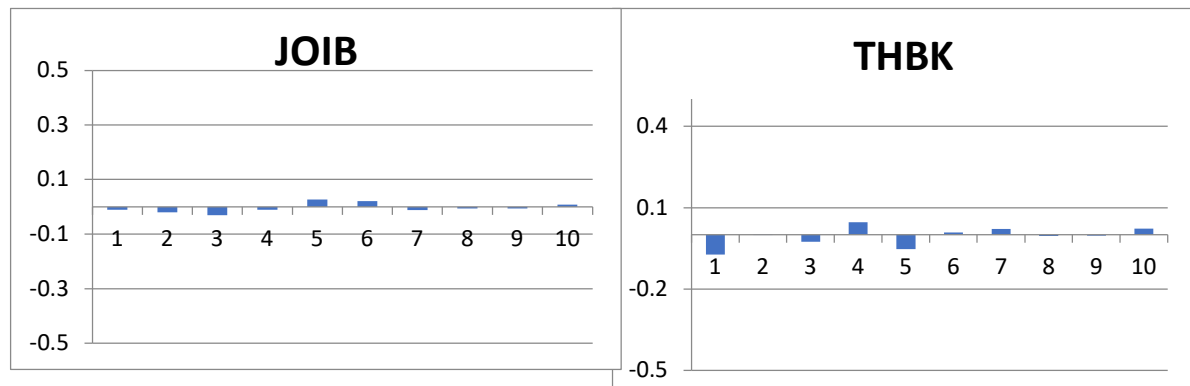
Figure 9-18 The auto correlation test for different listed companies

Source: Compiled by author, data from Jordanian securities commission

The autocorrelation coefficients are very low, which indicates the price movements are independent day to day, consequently, the ASE is in weak form efficient – random walk, from the period of 1st January 2013 to 31st December 2020. This result does not mean the ASE is completely efficient but this could provide some evidence for weak form efficiency.

4.1.3   Results for Runs test

After analyzing the Z value, it was found that it is out of the acceptable region, and in addition the p-value is less than 0.05, which means rejecting the null hypothesis of no randomness and concluding that the series does not alternate enough. This means that it is possible to predict its randomness, which leads us to conclude that the capital market is not efficient in the weak form. In other words, the Run test is a non-parametric test applied to examine the dependence or randomness in the ASE return series. Table 17 shows the results.

Table 17 Run test and Statistics for daily index returns of ASE

| Sample: 11073	Values
Number above cut-off	8036
Number below cut-off	3037
Number of runs	1340
E(R)	4409.079
Stdev(R)	41.8
Z-value	105.092
p-value (2-tailed)	0.9025

Source: Compiled by author.

This test serves to verify that ASE share returns series are not random. Therefore, the shares return are tend to be predictable and not random walk behavior.

4.2 Semi strong form efficiency analysis

4.2.1 Capital Assets Pricing Model (CAPM) analysis

According to the diagrams and from the sample studied and applied on the data of banks, it was found that none of the banks could be the best example to explain the market. The Arabic Bank shows the best performance among the banks but still, only 11% of its shares could be represented by the variation of the X-axis (the market). Also, the slopes in the figure are tending to the horizontal axes, which are explaining less risky but at the same timeless expected return of the shares or portfolio. This assumption would be noticed in the Modern Portfolio Theory Markowitz (1999), which suggests that there is a relationship between the risk-free rate and expected return of the portfolio: if the risk-free rate increases then the expected return will increase as well. The point here is that any portfolio which fits the Capital Market Line (CML) will represent the market better than the others which are not on the CML. Theoretically, it could be possible but in real life, it is not easy to build a portfolio that fits on the CML: investors usually tend to take more risky shares, which in the end will have the same amount of expected return as the stable stocks with less return. In the CAPM model we can say that as beta increases the expected return also increases, which will be with the relation with the Modern Portfolio Theory. This type of sample was chosem here because because the banks are most liquid and always tradable and the daily return graph shows redundancy from day to day; moreover, it was selected to make sure the data will not show any contradiction, like in the case with the weak form efficiency.

Arabic

$y = 1.0243x + 0.007$
$R^2 = 0.1183$
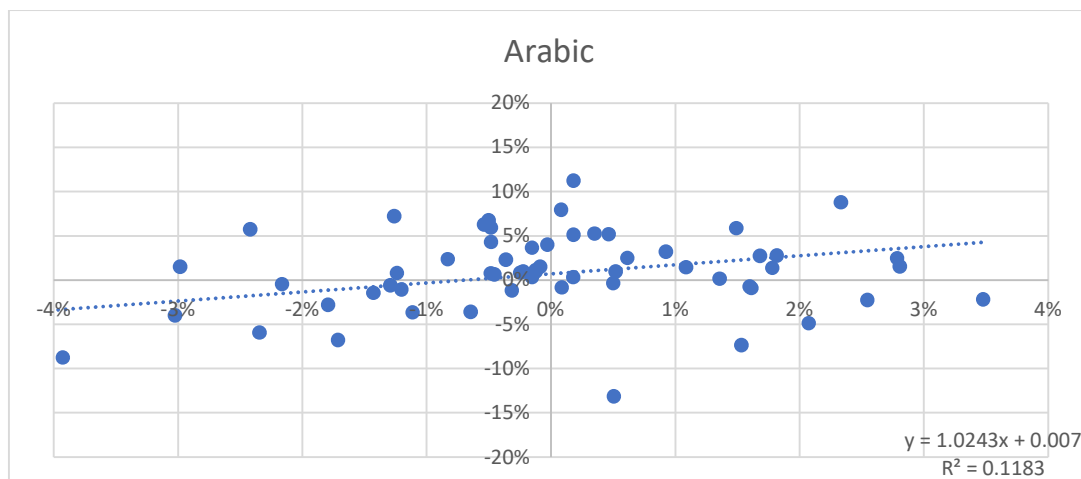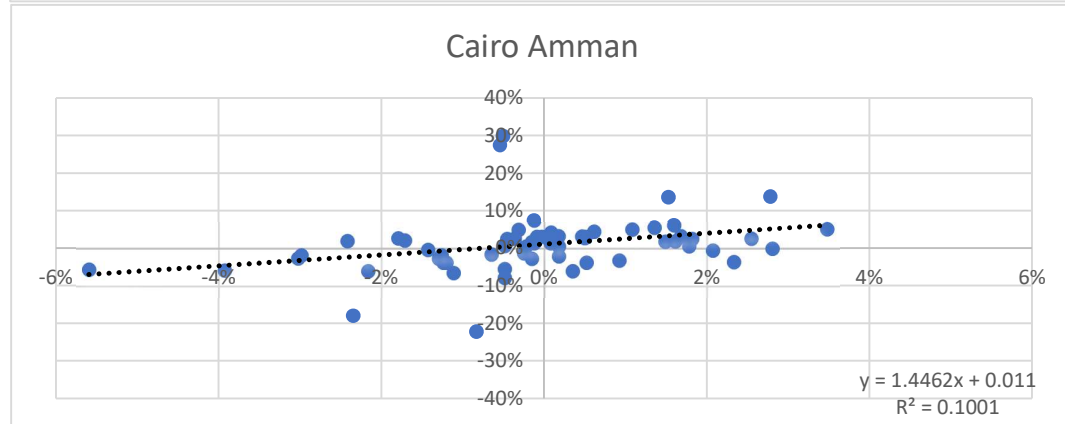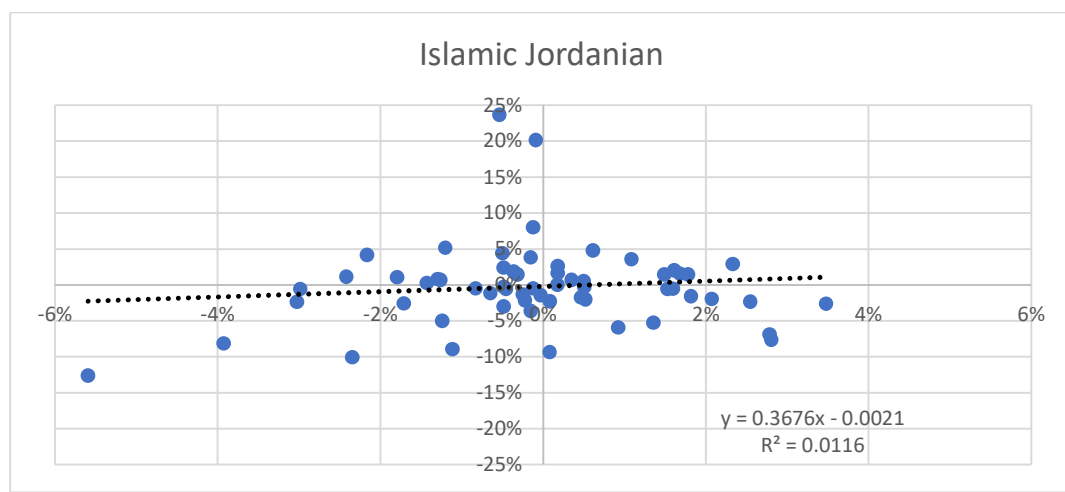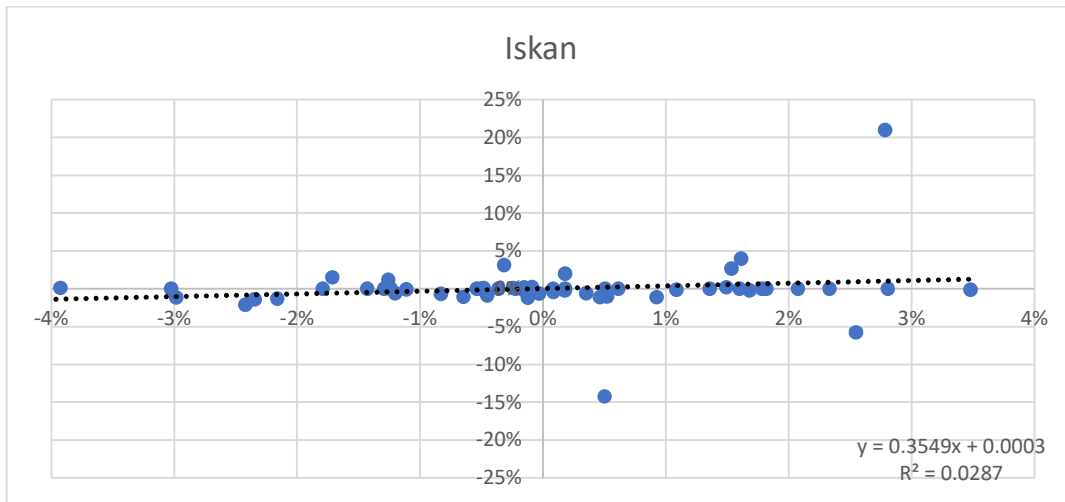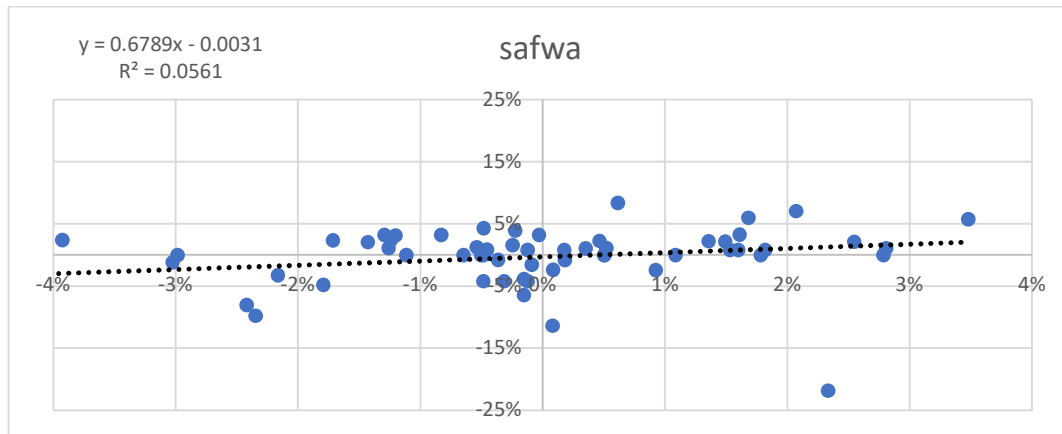
Figures 19-23

The CAPM figures for ASE banks sample

To keep in mind how the best performing bank in the Amman Stock Exchange is not performing well and there are no leading shares in the market, we could reflect the Securities Market Line with the core meaning of CAPM, that there is a connection between a stock's beta and its expected risk, and we agree that higher beta is a higher risk. In addition, a higher beta could exist somewhere on the capital market line where it is preferable to trade around that line, at least from the point of view of the theoretical part.

After examining the data to apply it on the scatter diagram, it relates to expected return and systematic risk (beta) to show how the market must prise individual securities about their security risk class. It was possible to apply the CAPM model to only two banks out of the five, the Arab Bank and Cairo Amman Bank, in order to calculate the reward-to-risk ratio for any security concerning that of the overall market. Therefore, when the expected rate of return for any security is deflated by its beta coefficient, the reward-to-risk ratio for any individual security in the market is equal to the market reward-to-risk ratio, thus:

$$R\_(j, t + 1) = \alpha\_j + \beta\_j R\_(m, t + 1) + \mu\_(j, t + 1) \qquad \ldots\ldots\ldots (1)$$

For Arabic Bank = 0.7% + 1.0243. It's $R^2 = 0.1183$, that mean 11% proportion of the variation in the y-axis (Arabic share) being explained by the variation of the x-axis (the market). For Cairo Amman Bank = 1.1% + 1.4462 and its $R^2 = 0.1001$, meaning that a 10% proportion of the variation in the y-axis (Arabic share) is explained by the variation of the x-axis (the market), and so on. In general, this is supports rejection of the Null Hypothesis (H0): Amman Stock Exchange is following the SCL, it is not easy for the investors to measure risk and make decisions, because only the SCL could be reliably applied to only two banks out of the five.

The investment risk in a portfolio that looks like a market is measured by the beta of a potential investment. If a stock is riskier than the market, it will have a beta greater than one. If a stock has a beta of less than one, the formula assumes it will reduce the risk of a portfolio. What was found here is that the investment risk is not significant except in the case of the Cairo Amman bank. The main point here is the evaluation of the sample stocks is not fair value when its risk and the time value of money are compared to its expected return.

Table 18 General statistics on different banks in Jordan.

	Mean	Standard Deviation	Standard Error	α_j(intercept)	β_j(Slope)	R²
Arabic	6.795667	98.8%	12.76%	1.0243	0.70%	11.8%
Iskan	9.053333333	56.7%	7.32%	0.3549	0.03%	2.9%
Islamic Jordanian	3.560833	35.4%	4.57%	0.3676	0.21%	1.2%
Cairo Amman	2.440833	61.6%	7.96%	1.4462	1.10%	10%
Safwa	1.055833	17%	2.20%	0.6789	0.31%	5.6%

Source: Author own calculation (ASE, 2018)

4.2.2 Event Study analysis

The event study is all about studying the impact of a significant catalyst occurrence (the event or other news that launches the price of security dramatically up or down) or contingent event to the value of shares listed in the market. The event study can explain the effect of a specific event on a company by looking at the associated impact on the company's shares.

By merging the market model and the event study, both can monitor the abnormal returns on a specific day or during an event which makes a difference to the company's share price.

The following data will explain the disclosures effect on the accumulated return for the sample, at least 10 days before and 10 days after of the disclosures, while the Bold and red marker reflects the day of disclosures. The most effective examples were taken to explain the accumulated return behavior. The theory expects that the prices should change based on the disclosures, and for the semi-strong level we should to watch the prices after the announcement, while to test the strong form level of efficiency, the series before the announcement day is the main evidence to judge on the efficiency level.
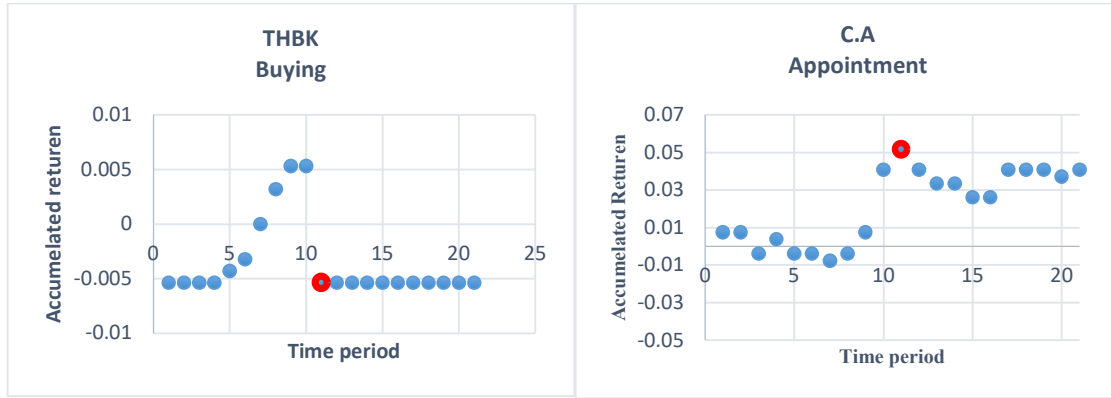
Figures 24- 25.

Disclosures effect on the accumulated return, signs of insider trading – strong inefficiency, semi-strong efficiency examples

Figure 24 and 25 shows that there was an increase in returns before the disclosure for both events, and this could be because some investors can access information before others, which is a good example of the inefficiency of the strong form. There was different disclosures studied in this area for example raise capital announcement, publishing public report and appointment for new as a director of the committee member. Usually in the efficient capital markets the shape has to be stable before the announcement take place and after has to start increasing, decreasing, or stay stable after it. Such examples could be found in more detail, as well in which day the event gets announced, in Table 19.
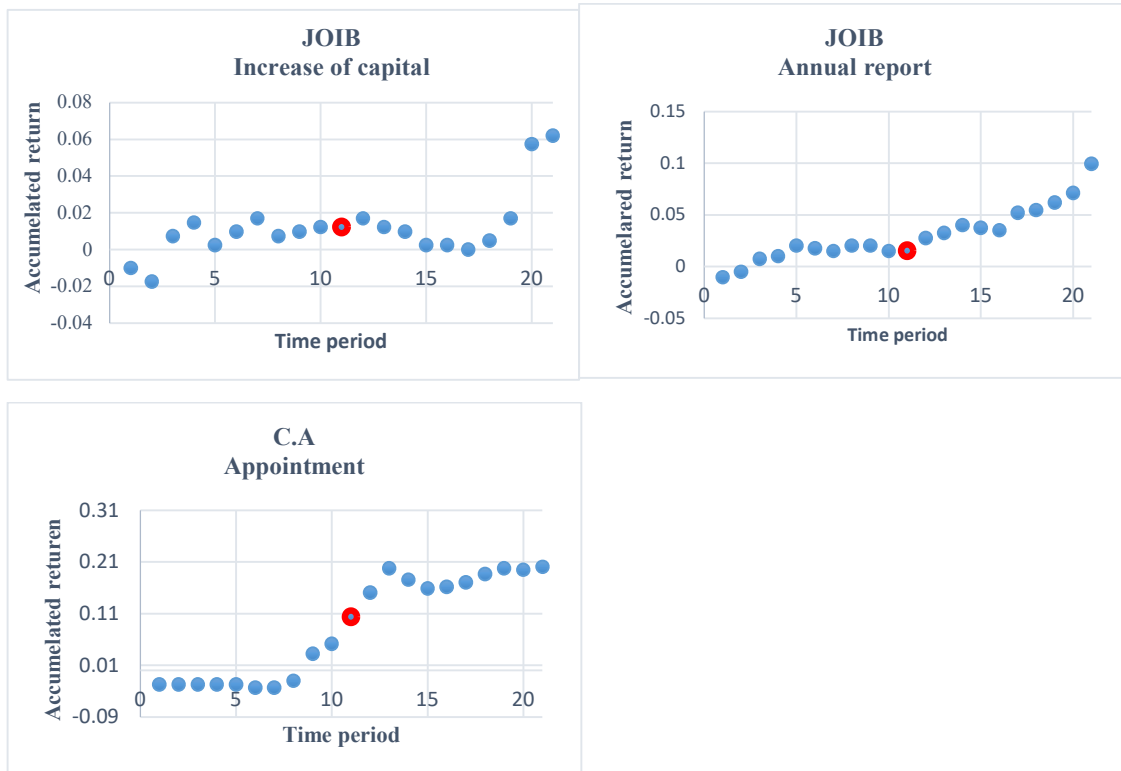
Figures 26- 28

Disclosures effect on the accumulated return, neither semi-strong nor strong inefficiency examples

The release of data in an annual report and increase of capital taking its normal place before and after announcing to stay steady within a limit, but for the decision of increasing capital, it did not affect the market much on this share. This could be a good example of no effect on the shares or more efficient for the adjusting of the shares price according to the new information, this could be a typical form of an event study example for efficiency. In the third graph the disclosure started already after the prices take off to reach the top as it supposed to be affected to the news, this which support the results.

Figures 29- 31.

Disclosures effect on the accumulated return – strong and semi-strong inefficient examples

For the last group of the sample examples shown in Figure 29 – the decisions of the board of directors, appointment of a new member to the board of directors, the release of the annual report – it will be easy to identify an effect of the disclosures on the return after the disclosure takes place on the 11th day. Before it the different accumulated return remains fairly constant and after the announcement it could increase or decrease. This case is proper behavior of both semi-strong efficiency and the strong form, because of the fast price adjustments on the disclosure day and taking several days until it returns to its normal shape.

Notes on the figures of the event study:

(1) The red points represent the day of disclosing in the ASE market.

(2) I ran the bootstrap sampling more than 3,000 times to calculate the confidence intervals.

(3) R version from the whole sample of the bank was used to calculate R^2.

Table 19 shows the number of disclosures, the disclosure types, and the results for the disclosure according to the event study depending on if the behavior of the share is semi-strong or strong efficient. The table also shows the total observations and the specific date of the disclosure (dd-mm-yyyy), taking into consideration that the disclosures are not affected by any other disclosure within 10 days before or after, which will help to study the real effect without any interventions from other disclosures. This section covered the data from 2013 to 2020 with a total sample size of 44, and it covered all disclosures topics which affect the share prices.

Table 19. The sample disclosure from different categories from 2013-2020

Number of Disclosures / Disclosure type	Total Observations	Semi strong Efficiency		Strong efficiency	
		Efficient	inefficient	Efficient	inefficient
Disclosure of ownership	10	3	7	4	6
		04-01-2015	18-03-2013	18-03-2013	01-06-2014
		29-04-2019	01-06-2014	04-01-2015	19-06-2014
		01-05-2019	19-06-2014	23-11-2017	15-10-2014
			15-10-2014	29-04-2019	15-02-2015
			15-02-2015		26-07-2018
			23-11-2017		01-05-2019
			26-07-2018		
Buying shares	10	3	7	2	8
		04-06-2016	04-05-2014	20-11-2016	04-05-2014
		20-11-2016	19-10-2015	18-07-2017	19-10-2015
		11-09-2017	20-11-2016		04-06-2016
			18-07-2017		20-11-2016
			17-07-2018		11-09-2017
			18-06-2019		17-07-2018
			29-09-2020		18-06-2019

					29-09-2020
Increase of capital	10	3 15-05-2014 08-02-2015 21-04-2015	7 02-04-2014 08-02-2015 08-05-2016 27-02-2017 16-05-2018 11-07-2019 06-07-2020	2 08-02-2015 21-04-2015	8 02-04-2014 15-05-2014 08-02-2015 08-05-2016 27-02-2017 16-05-2018 11-07-2019 06-07-2020
Board of directors decision	13	4 22-01-2013 29-01-2013 16-07-2014 31-03-2016	9 18-02-2013 05-08-2013 26-01-2014 12-02-2014 23-07-2014 12-03-2015 06-05-2015 04-09-2016 28-11-2016	5 22-01-2013 29-01-2013 18-02-2013 26-01-2014 16-07-2014	8 05-08-2013 12-02-2014 23-07-2014 12-03-2015 06-05-2015 31-03-2016 04-09-2016 28-11-2016
Semi-annual financial reports	10	3 31-07-2013 03-05-2018 27-11-2019	7 06-10-2013 27-07-2015 30-07-2015 26-08-2015 31-07-2016 07-11-2016 31-07-2017	3 30-07-2015 31-07-2017 03-05-2018	7 31-07-2013 06-10-2013 27-07-2015 26-08-2015 31-07-2016 07-11-2016 27-11-2019
Annual financial reports	10	2 30-03-2015 12-01-2020	8 11-04-2013 30-03-2014	4 30-03-2014 30-03-2015	6 11-04-2013 01-02-2015

		01-02-2015 30-03-2015 05-05-2017 23-10-2018 25-12-2019 15-02-2020	12-01-2020 15-02-2020	30-03-2015 05-05-2017 23-10-2018 25-12-2019	
Appointment of a new person(CEO, member of boarding director)	10	2 18-04-2013 27-06-2013	6 25-11-2013 27-03-2013 28-03-2013 11-02-2014 28-05-2015 01-07-2015 07-09-2019 03-01-2020	2 18-04-2013 01-07-2015	6 27-03-2013 28-03-2013 27-06-2013 25-11-2013 11-02-2014 28-05-2015 07-09-2019 03-01-2020
Resignation	7	3 17-02-2016 20-10-2020 03-02-2019	4 05-10-2016 16-02-2016 21-05-2017 25-11-2018	2 25-11-2018 20-10-2020	5 05-10-2016 17-02-2016 16-02-2016 21-05-2017 03-02-2019

Source: Compiled by author.

The total percentage of the semi-strong efficient form is = 28%=23/80. This will lead to the conclusion that the Amman Stock Exchange is not an efficient market from the efficiency of-disclosures point (1-0.28) is not <0.5. Twenty-eight observations showed shares returns did not move before but were affected after the price shares effected directly after disclosures take place.

The total percentage of the strong efficient form is = 30%=24/80 This also includes that the capital market is not efficient in the strong form, since the point of disclosures (1-0.30) is not <0.5. Thirty observations showed shares returns were not moving before but were affected at the time of disclosure, the price were stable and affected directly at the time of disclosures.

After examining the behavior of the data comparing every share return with the period before and after the information announcements for ten days before and ten days after, the following observations were made.

There are three types of behavior for the sample shares, classified in Table 20.

Table 20. Groups of the disclosure behavior in ASE

Group number	Description	Results
1	The price shares were stable before disclosing and were affected directly after the time of disclosures, whether dramatically increasing or decreasing.	Efficient on the both semi-strong and strong form of efficiency.
2	the price shares were affected before and still affected at the time of disclosure, and become stable again after a short time of announcing the disclosure to the public	Strong form of efficiency only
3	the price shares is not effected at all by the information provided, either before and after disclosure	Semi-strong form efficiency only

Source: Compiled by author.

If the Price shares are not affected before the disclosure, which this means it is semi-strong efficient and there is no insider trading; at the same time if data are affected after the disclosures directly, this means investors react to information to make decisions and this is the strong form of efficiency.

Testing the relationship between disclosures and behavior of stock return in the Amman Stock Exchange (ASE) leads to rejecting the Null Hypothesis (H0), that there is a relation between the movement of stock return and disclosures, and accepting the Alternate hypothesis that there is no relation between the movement of stocks returns and disclosures. since only 18% of the cases (9 out of 15) have the characteristics of semi-strong efficiency.

4.3 Strong form efficiency analysis

4.3.1 *Performance Appraisal of Funds: Risk and Return Analysis for capital markets*

Table 21 introduces some general statistics on the Jordan and Saudi Arabia markets. In this table, 96 months were taken into consideration (8 years) as the same base. The table shows the risk-specific period free rate, and the average annual risk-free rate is higher for Jordan, while Saudi Arabia collected the higher average market return and average monthly market return.

Table 21. General statistics on the Jordanian and Saudi Arabian markets 2019

Jensen index		
	Jordan	**Saudi Arabia**
Number of trading months	96	96
Average monthly market return	-0.13%	0.32%
Average annual risk-free rate	95.73%	5.68%
Average market return	-3.25%	24%
Specific period risk free rate	12.80%	1.60%

Source: Calculated from various monthly report of securities commissions of Jordan and Saudi Arabia.

4.3.2   Performance Appraisal of Funds: statistics analysis for mutual funds

Table 22 includes only two mutual funds for Jordan as there are only three mutual funds in total, one of which is no longer tradable. The total number in the sample of mutual funds in Saudi Arabia is 26; the sample selected from the total mutual funds from Saudi Arabia is included in Table 21. In Saudi Arabia in 2015, public mutual fund assets accounted only for 4.25% of GDP, i.e., USD 464 billion. Further, the value of assets of the Saudi Arabia mutual funds industry reached SR 102.9 billion in 2015, which is equal to 27.44 billion USD. However, the data also shows many other parameters, for example, the maximum amount in return percentage for Jordanian mutual funds is about 36% while for Saudi Arabia it is about 604%.

Table 22. General statistics for Jordanian and Saudi Arabian mutual funds

Name of mutual fund		Mean	Standard deviation	Standard error	Minimum	Maximum
Jordan	**ALOfuq MF**	0.15%	0.44%	5.25%	-0.009	0.83%
	Stock exchange HB MF	0.10%	10.42%	7.43%	-75.00%	36.00%
Saudi Arabia	**Ryadh MF for ryal trading**	-0.04%	0.47%	622.45%	-2.45%	0.23%
	Ryadh MF for dollar trading	-0.02%	0.18%	355.25%	-0.82%	0.11%
	Assundouq aldawli	-0.18%	4.64%	423.27%	-25.31%	8.13%
	Sanduq aleyadh alaqari aldawli	-0.26%	5.17%	6.25%	-14.83%	11.50%
	Sandouq Aletisalat	-0.38%	5.52%	5.31%	-23.08%	7.97%

Sandouq alousahim alkhaligi	-0.14%	7.81%	6.54%	-37.86%	12.56%
Ryadh for SMEs	0.30%	9.93%	182.49%	-37.74%	31.88%
the British stock funds	0.41%	5.39%	84.61%	-27.41%	7.73%
M F for future stocks	7.65%	72.29%	261.30%	-86.76%	604.77%

Source: Calculated from monthly reports of the securities commissions of Jordan (JSC, 2019a) and Saudi Arabia (Mubasher, 2021).

4.3.3 Performance Appraisal of Funds: Jensen Modeling technique results

The following table is talking about the mutual funds in Jordan and Saudi Arabia by using the Jensen test for the sample chosen to represent the environment. The Jensen test looks for the difference between a specific mutual fund or portfolio returns vs. the overall market. In the Jordanian case, it was 12.73% which is bigger than the 9.13% of the sample which represents the Saudi Arabian market, but in this case, we cannot say the ASE case is better than Saudi Arabian market because there are only two mutual funds and this is not enough to judge on the ASE market, but it could give a motive for establishing future mutual funds to diversify the ASE market.

Table 23 Jensen Test for the Jordanian and Saudi Arabia Mutual Funds

Mutual fund (M F) name		β	Jensen Expected return	α	Average sample Jensen Expected return
Jordan	ALOfuq M F	-1.03%	12.61%	-13.64%	12.73%
	Stock exchange HB MF	-2.18%	12.84%	-15.10%	
	Riyadh MF for royal Trading	0.73%	1.024%	-0.29%	
	Riyadh MF for Dollar Trading	0.45%	0.96%	-0.50%	9.13%
KSA	Assundouq Aldawli	33.88%	9.25%	24.63%	

Sanduq Aleyadh Alaqari Aldawli	18.25%	5.37%	12.88%
Sandouq Aletisalat	17.69%	5.23%	12.46
Sandouq Alousahim Alkhaligi	94.81%	24.37%	70.44%
Riyadh for SMEs	94.81%	24.37%	70.44%
the British stock funds	8.22%	-1.20%	-7.02%
M F for future stocks	48.09%	12.77%	35.31%

Source: Calculated from monthly reports of the securities commissions of Jordan
(JSC, 2019b) and Saudi Arabia (Mubasher, 2020)

Given a beta of 24.63%, for example, the mutual fund is expected to be riskier than the index, and thus earn more. A positive alpha in this analysis shows that the mutual fund manager earned more than enough return to be compensated for the risk they took over the course of the year. If the mutual fund only returned 25.83%, the calculated alpha would be -1.2%. With a negative alpha, the mutual fund manager would not have earned enough return given the amount of risk they were taking. This implies that the insiders observe privately the expected growth rate of asset dividends at all time of the trading, in addition, this would give advantage for the insiders to trade with competitive market makers in the presence of noise traders. This is also being noticed with the semi-strong form efficiency, where when the market approaches continuous trading, the prices were affected even before the disclosures takes place; as the profits of the insiders do not coverage to zero, this means that the information would be reflected only after a long time series of dividend observations.

The Jensen test focuses on the alpha as a measure of the performance of the mutual fund manager concurrent to risk. The responsibility of the mutual fund managers is to deliver alpha to their clients. The Jordanian mutual fund's managers appear to be less efficient than the Saudi Arabian mutual fund managers from the minus value of the alpha in the 2 samples of ASE. The Jensen test takes into consideration the risk free-rate of return for a specific time period: the study covers enough time to make a conclusion about the two cases of Jordan and Saudi Arabia with no need to extend the study, for example, to reach 2020, as it would lead to the same results especially with the low numbers of mutual funds in Jordan.

4.4 Analysis of the survey data

4.4.1 General statistics signs for the survey results:

Table 24 General statistics signs

ITEM	N	Mean	SD	Mode	Kurtosis	Skewness
1- Broker effect on prices	109	3.45	1.15	3.00	-0.54	-0.31
2- broker effect on commission	109	3.16	1.14	3.00	-0.40	-0.40
3- JCM progress 2008-2020	109	2.51	1.10	3.00	-0.57	0.30
4- Information availability	109	2.67	1.26	2.00	-0.86	0.35
5- formal system info provider	109	3.29	1.16	3.00	-0.77	-0.14
6- System accessibility	109	3.48	1.12	4.00	-0.50	-0.40
7- updating online trading system	109	3.34	1.03	3.00	-0.50	-0.16
8- Time of disclosure	109	3.20	1.00	3.00	-0.54	-0.08
9- cost of additional commission	109	3.31	1.01	3.00	-0.28	-0.28
10- Transparency	109	2.96	1.07	3.00	-0.56	-0.30
11- Trust	109	2.81	1.19	3.00	-0.97	-0.01
12- Rumors	109	2.70	1.16	3.00	-0.80	0.17
13- Disclosure commitment	109	3.26	0.99	4.00	-0.49	-0.25
14- Disclosures in JCM follow the IFRS	109	3.31	1.02	3.00	0.08	-0.28
15- Disclosures price representatively	109	2.81	1.17	3.00	-0.76	0.12
16- Brokers responsibility	109	3.27	1.12	4.00	-0.72	-0.30
17- One formal source for information	109	2.73	1.16	2.00	-0.87	0.21
18- Tax and commission fairness	109	2.42	1.22	3.00	-0.59	0.48
19- Price Productivity	109	3.05	1.02	3.00	-0.47	-0.31

5-point scale: strongly agree	4-points scale: Agree	3-point scale: Neutral	2-point scale: Disagree	1-point scale: Strongly Disagree

Source: field survey data in (JCM)

4.4.2 Cramér's V Test

The Cramer test is a statistical test for finding the relationship between two or more nominal variables while the limits are from 0 to 1 maximum. It is also related to Pearson chi-squared statistic because already chi-square value is needed to continue the calculation later, in addition, to find the association of two variables. This test draws a general indicator about how strongly two categorical variables are associated (Cramér, 1946; Sheskin, 1997).

Cramér's V test could be calculated based on the following equation (Liebetrau, 1983):

$$\mathbf{V} = \sqrt{\frac{X^2}{n(K-1)}} \quad \text{.............. (1)}$$

where:

V = is the significance of P-value, which also could be calculated by Pearson's chi-squared test,

X^2 = is the obtained value of the chi-square statistics,

n = is the sample size,

K = is the number of rows or the number of the columns, whichever is smaller.

By applying the formula, the researcher noticed that the chi-square value is very small (3.32365E-18) which determines that there is no statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table. The statistics supporting the Null Hypothesis (H0): there is no statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table.

- For the participants who responded to this survey, higher price reflects the ability of changes satisfaction scores were correlated with medium Jordanian capital market progress between 2008-2020 overall satisfaction scores, r = 0.24 which can have considered a medium effect.
- Effect size: If r = +/-0.5 it is large, +/- 0.3 its medium, and +/-0.1 it is small, while using this test in correlation the researcher wqs able to infer the same correlation to the rest of the population from which our sample was drawn.

Form the small chi-square value there is no need to continue to apply the Cramér's V Test because this test depends mainly on the chi-square value. The final Cramér's V Test is equal (2.01228E-11) which means there is no association between variables, and the variables are not determined by others, and based on the statistics there is no statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table of answers in the survey.

4.4.3   Graphic Analysis and Interpretation survey data

The survey participants were chosen very carefully, and the survey was distributed online. To make sure everyone will answer all questions the survey did not allow the participants to move to the next question if they did not complete the one before, but they had the right to withdraw from the survey at any time they wanted. The survey was distributed in cooperation with the JSC by giving the companies the right to participate in this survey as an optional decision. When any participants open the survey, they will see this information and a statement that their answers will be used for only research purposes without any responsibility on them.

Figure 32 shows what positions the participants were holding at the time they answered the survey. Most of them were full-time employee (47%) and only 9% were part-time employees. About 20% were CEOs, 14% managers in the companies, and about 10% are heads of sections or departments. Thus, this sample represents all parts who participate in the capital market.
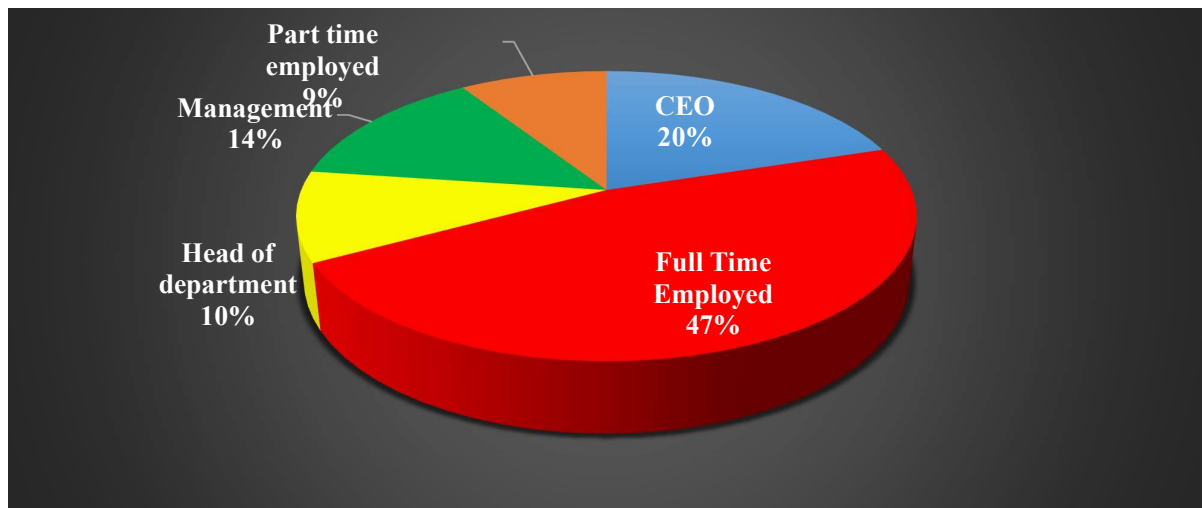
SOURCE: *Compiled by author.*
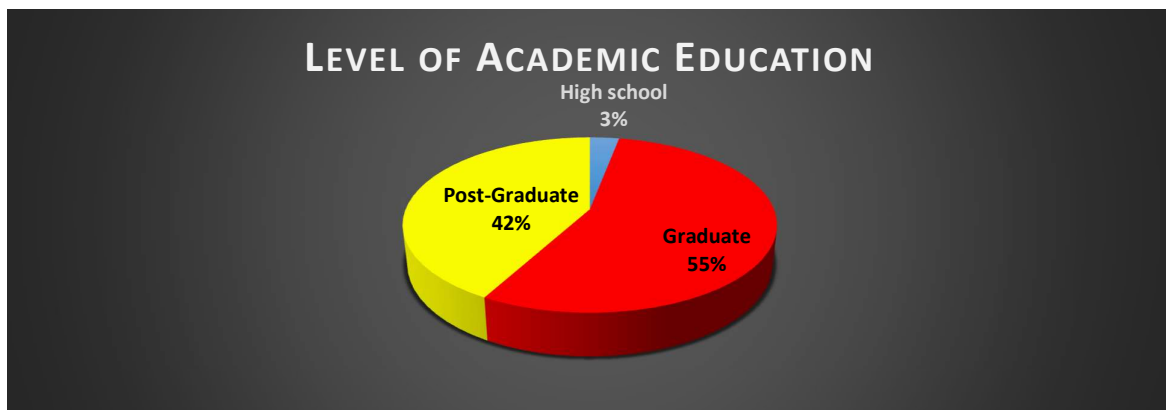
Figure 32
Participants' positions

The data in Figure 33 shows that the percentage of the participants will cover the category of experience from 2 years or less until to more than 10 years. Above half of the respondents have more than 6 years of experience, which ensures that the data are reliable, and the participants are well informed about the market.
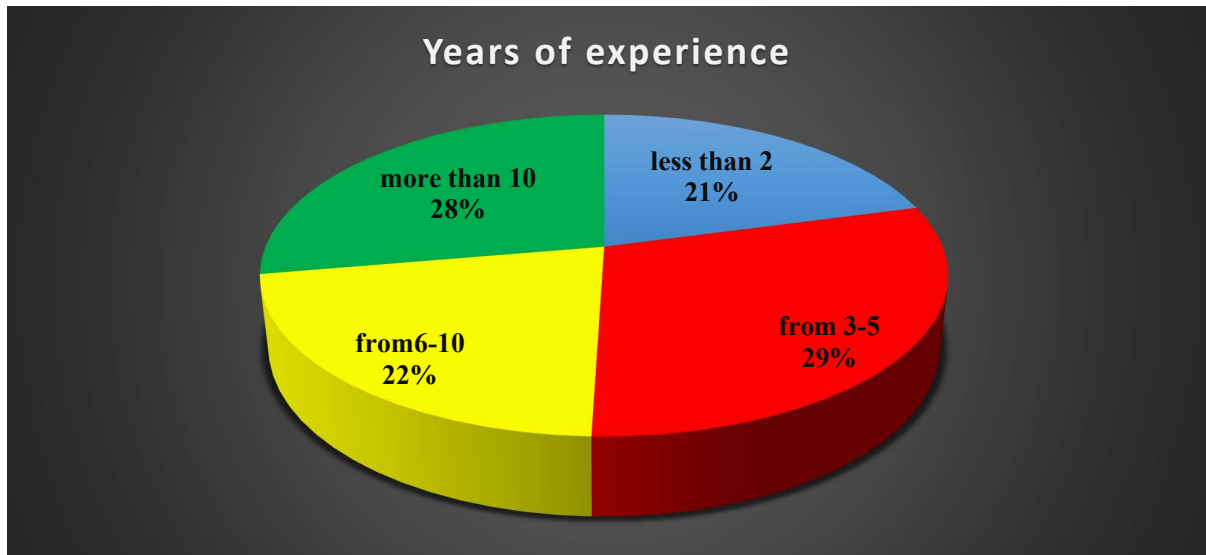
Source: study survey data in (JCM)

Figure 33
Years of experience of the survey participants

About 21% of the participants had only 2 or fewer years of experience, which is because manly they are new graduates- However, those with a high level of experience is about 28%, which is more than enough to give a good answer about the ASE and other matters in the capital market. The participants who have 6-10 years were about 22% and finally the participants who have 3-5 years are about 29%.
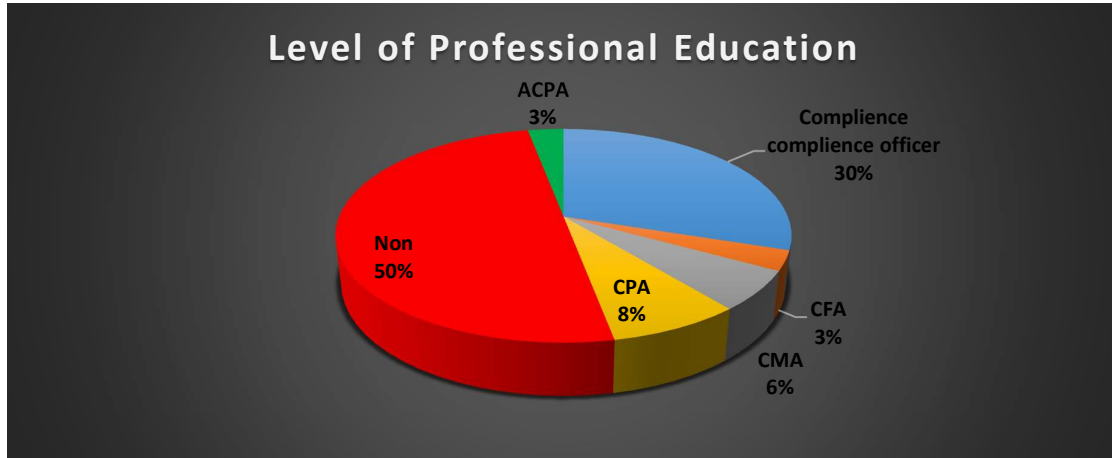

Source: study survey data in (JCM)

Figure 34
Level of Academic Education

The data shows that most of the participants are highly educated and most of them are university graduates or even hold postgraduate degrees. This will help the data reliability and prove that the researcher has chosen the sample well.

Figure 35 shows the professional education for the participants. Most of them do not have a professional education in economics, finance, or accounting, they have at least a university degree, while qualified compliance officers are about 30% and CMAs about 6%, CPAs are about 8%, CFAs is about 3% and ACPAs also 3%. That could be because most of the certified persons are getting better chances to work in the capital market with other international companies or in the Arab Gulf, as well, as they pay much higher salaries.

Source: study survey data in (JCM)

Figure 35
Level of professional education for the survey participants

INVESTOR TARGET GROUP

The researcher planned to focus from the beginning about the participant's type in Figure 36. The data show about 37% of the participants are not investors but they are not allowed to invest in the capital market for some reasons as they can access some information more than others, for example, the employees of the capital market (Professional Respondents). Individual investors are about 36% and investors inside the institution are about 24%; finally, the foreign investors are 3% in the sample.
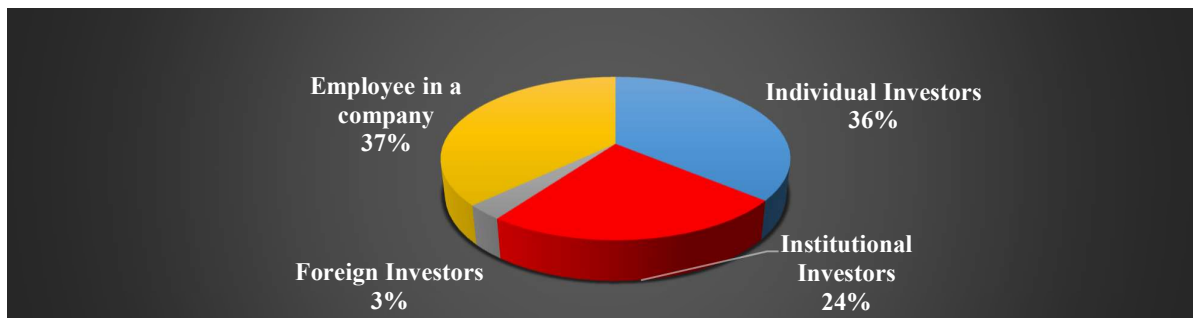
Source: study survey data in JCM

Figure 36
Investor target groups for the survey participants

Chapter 5   Results and discussion

5.1   Summary for weak form efficiency

Weak form efficiency states that it is not possible to predict the future prices from past prices (historical values and trends). Moreover, share prices do not reflect all current information, and this could imply a problem with the disclosing system of the capital market organization, for example problems in the way that the listed companies must disclose the information. There may be a delay in the process of delivering the information or perhaps the information channel between the companies and the Securities Commission is not efficient in terms of time and speed. Finally, the past price movements, volume, and earnings affect the shares' price, so it could be used to predict the future direction. The market is not following the random walk, future share prices are not random and influenced by past events, which could be proven by the Run tests and the general statistics. On the other hand the Autocorrelation test shows that the ASE is a weak form efficient market because the autocorrelation coefficients are very low, which indicates the price movements are independent day to day, consequently, the ASE is weak form efficient, during the period of 1st January 2013 to 31st December 2020.

Based on the descriptive statistics for the daily index return of the ASE, I conclude that the frequency distribution of the ASE daily series is not normal, due to the positive amount of the mean for return series of the sample. Moreover, the positive amount of kurtosis also means that the frequency distribution is not norma. .The frequency distribution of the return series is leptokurtic, indicating higher peaks than expected in comparison with normal distributions. From all of the above it can be concluded that the ASE does not follow the RWM.

The random walk hypothesis and the efficiency theory on the weak form level were tested in the Amman Stock Exchange by using the daily data for the sample companies and the general index of the Amman Stock Exchange and different types of tests were applied to test the efficiency of the Amman Stock Exchange by applying autocorrelation and runs on 10 of the most liquid shares of the market from 1/1/2013 until 31/12/2020. Findings agree with other studies like those of Bustanji (2019), Jaradat (2011), Matar (2016) and Ananzeh (2016), which also conclude that the Amman Stock Exchange is not efficient in the weak form, but dissagree with them in that this study foundsome evedance for weak form efficiency through the autocorrelation test implying that the price movements are independent day to day, and consequently, the ASE is in weak form efficient – random walk, from the period of January 1st, 2013 to December 31st, 2020. This result does not mean the ASE is completely efficient but does provide some evidence for weak form efficiency. While the stocks are not following the random walk theory, and moreover, the behavior of the share is also not random behavior, there is a significant relationship between the historical prices and future data. In other words, the past prices in the ASE (historical values and tends) can predict future prices.

The autocorrelation test shows that the studied series is stable, which means rejecting the hypothesis of the weak form of efficiency, as the series follows regular behavior. (There is a relation between "Earning for share" = stability in series = reject the hypothesis = regular behavior). The series tend to be stable and supports rejecting the hypothesis in the weak form of efficiency and the series would not follow random behavior. This could be for many different reasons, for example the period examined is not the most representative period, especially with

the market facing so many challengies, like coronavirus and the decreasing number and size of investements in the ASE.

From the results, it is obvious that there is a bubble effect for the high market volatility or inflation prices on the stock market return level, moreover, investment would be safer for the long-run term and riskier for the short term (Giannetti, 2005), and that there is an opportunity to achieve unusual returns through mathematical calculations for shares prices and to decide which shares to buy and when to sell because ASE isn not a weak-form efficient market form.

All the cases state that the series return does not follow the assumption of independent relationship of the random walk model. According to this it is obvious to reject the null hypothesis, which includes the return series of ASE following the random walk theory, in addition, the results of the run test led to the significance of two-tailed with negative Z values greater than 1.96 suggest non-randomness as the too few observed numbers of runs than expected.

There are many possible reasons for the Amman Stock Exchange not following the random-walk hypothesis and not being weak-form efficient, such as:

4- The disclosure system is not as effective and efficient as in other stock exchanges and there are no direct research connections to develop the disclosure process that could be from the weakness of connections from both departments in the capital market organizations.

5- There is a restriction on the movements of the daily prices, which is ±5% from the opening price.

6- On the hot zone, the market could be affected by large capitalized firms, followed by smaller and smaller, which reduces the speed of the information flowing to the public at the end and affectsthe prices, achieving some advantage for some investors over others, as in the case of Lo & MacKinlay (1988).

7- The market is following a sheep strategy or influenced strongly by noise traders, as in the case of Poterba & Summers (1988).

5.1.2 Recommendations for the weak form

1. The Stock Exchange has the responsibility to create the legal framework for the issuance of new financial instruments; encouraging, attracting, and protecting investors; establishing a transparent and fair market – these were all main factors for issuing the Securities Law in the process of reforming the capital market, and this implies that it must find new channels to disclose the information at an efficient time and speed to deliver the information to everyone at the same time.

2. The distribution of the frequency distribution of the ASE daily series has to be normal, which could help the market to be weak-form efficient, and follow the random walk theory: the key here is to control the restrictions on the movements of the daily prices, which is now set at ±5%, and make it more flexible according to the general economic situation, taking into consideration all economic factors which could affect the shares prices in Jordan, like inflation rate, global oil prices, and taxes on profits which came from dealing with shares and liquidity ratios in the market.

3. From the auto correlation test, the data shows the series is stable in terms of the investors being able to guess the same profitability with the same amount of risk, which is because of reasons like there being no motive to support the new entrance to the market, the strategy of buying and selling being based on rumors or fake news which, or the "sheep strategy" for buying and selling, which implies that if the big investors selling or buying other investors will follow without analyzing data. This should lead the Securities Commission to think about new strategies and recommend studies which could be done by the departments of research and development and whose results could be shared with the public to increase public awareness.

5.2   Summary for semi strong level of efficiency

In this dissertation I examine Fama's (1970) semi-strong form EMH in the ASE market in Jordan by using the Capital Assets Pricing Model (CAPM) and an event study and I conclude that the Amman Stock Exchange does not follow the SCL. Moreover, it is not easy for investors to measure risk and make decisions, because none of the banks act as a strong example to explain the market. The Arabic Bank appears to have the best performance among the banks but still, only 11% of its shares could be represented by the variation of the x-axis (the market), which is not nearly enough.

Particularly the focus is on the relationship between disclosures and the behavior of stock returns in the Amman Stock Exchange (ASE) to explore whether the ASE has the semi-strong form of stock market efficiency evolving over time from 2013 to 2020. It has been noted that government policy plays a primary role in interventions that change the semi-strong stock market efficiency through the distortion of the price of securities, like the shares which the government buy, foreign exchange, and bonds that the government issues. To understand this relationship between government intervention and the semi-strong level efficiency I give special attention mainly to the disclosures related to the government effect. Through an event study and the impulse responses based on Ito et al. (2014, 2017) with a conventional approach such as the event study analysis, which is used with studies in the semi-strong efficiency level, I could summarize the results as follows:

1- The Amman Stock Exchange does not follow the security characteristic line (SCL).

That means the investors cannot measure the risk and make decisions according to the SCL because the sample which is supposed to be the most liquid in the market is not represented by the variation of the market.

2- There is no relation between the movement of stock return and disclosures.

This means that there is a gap between the disclosure and the effect on the share prices, which could lead to another problem that the information is not coming from one official site, which implies there could be a possibility for insider trading, where some investors could access information before others, which is against the EMH.

3- The Jordanian capital market is not semi-strong form efficient.

This means that the ASE securities price movements are not a real reflection of publicly-available material information. In this case, there are no profits behind fundamental and

technical analysis and it is useless in predicting future price movement. Nonpublic material (insider trading) has the primary role in the share price effect and for considering the use of trading. The efficiency of capital markets is connected directly to the speed change of share prices listed in the market, especially information available to the public that will help investors re-evaluate the financial stock to decide to take any action. , At the same time, whether the efficiency level is different from market to market depends on the degree of information available. In this dissertation I conclude that the Amman Stock Exchange is not an efficient market at the semi-strong form, which agrees with a previous study (Bustanji, 2019). On the basis of the data analyzed, there is no significant relationship between the movement of shares returns and disclosure time in the Jordanian capital market and the Amman Stock Exchange, hence there is an insignificant relationship between the movement of price returns and disclosures. The capital market in relation to the SCL Model is not semi-strong form efficient. While a different methodology and data beginning after the financial crisis period were used to make sure the effect of global crises would be neutralized, the capital market was still affected by the financial crisis, as we mentioned before, and continues to be affected by other factors from the global economic challenges.

The analysis of the data based on correlation and regression techniques leads to the conclusion that the Null Hypotheses are rejected in all three cases:

1-   The Amman Stock Exchange is not following the SCL.
This means it is not easy for the investors to measure risk and make decisions because the SCL could be reliably applied to only two shares out of four.

2-   There is no relation between the movement of stocks return and disclosures.
Stock prices do not respond to the disclosure information and published financial reports for companies but are affected by other factors.

3-   Testing the efficiency of Jordanian capital market at semi-strong form.
Reject the Null Hypothesis (H0) that the Jordanian capital market is semi-strong form and conclude that the Amman Stock Exchange is not an efficient market at semi-strong form.

5.2.1   Recommendations for the semi-strong form of efficiency:

These recommendations suggest ways to reduce the efficiency gap in the ASE from the point of view of the statistical analysis:

- Provide information at the right time with more speed, because any delay will negatively affect the market and motivate investors to get information in an illegal way. For this, the techniques should be enhanced and developed in: (a) the disclosure department – in this point, this adds to the recommendations made for with the weak form level– and (b) the Capital Market Institutions Monitoring Department. These kinds of departments are in charge of monitoring and inspecting the operation and performance of the ASE and the SDC; if these departments are empowered then they will be more efficient to connect the relation between the movement of price return and disclosures.
- Follow up new ways to analyze the stocks listed in the market, for example CAPM, and Securities characteristic line.

- Introduce more rules to gain investors' trust by controlling the disclosures to make them more efficient and effective in both time and accuracy.
- For investors, they can make more money by analyzing the shares after disclosures and reacting in a short time to the changes in the price of shares.

5.3   Summary for strong form of efficiency

In this level of efficiency, the small number of mutual funds in the Jordanian capital market it was taken into consideration, as it would affect drawing a conclusion about if the market is strong-form efficient or not. That is why the Jensen test was used and the Saudi Arabian market was studied as a better example, from which ASE could learn, as Jordan shares borders with Saudi Arabia and what could affect Jordan also affects Saudi Arabia in terms of economics, and as both are in the same environment of the Middle East. The Jensen test in general statistics observes the risk-specific period free rate, and the average annual risk-free rate is higher for Jordan, while Saudi Arabia collected the higher average market return and average monthly market return.

There is no doubt that the strategies taken by mutual fund managers are a conservative investment way of investment. The primary investment style followed is traced mainly by the market portfolio, in which the managers do not take risk for achieving higher return, as is the general rule in the finance world (more risk, more reward), to attract risk-aversion investors. Otherwise, they mostly try to adopt other stock characteristics to diversify the fund's portfolio and realize an abnormal return; however, they are more attracted to the small, growth, and past winner stocks. This is because such stocks are less informationally efficient and are not dramatically followed by the investors; on the other side of the equation, this means that the stocks are less efficiently priced in the market, and this is a good opportunity for the managers to achieve an abnormal return in both environments of the study. This kind of stock is preferable to other stocks due to its growth, low liquidity, and long-term stability.

Without a doubt, the results from the study show that there is no evidence of a strong form of efficiency in either the Amman Stock Exchange or the Saudi Arabian capital market. Therefore, investors in the Amman Stock Exchange and the Saudi Arabian capital market cannot predict stock prices or returns in the short term. Concerning the firms, it suggests that the securities of firms cannot outperform the market and the present market price is to a certain extent a true reflection of the present situation of their securities, although there is an extremely limited availability of mutual funds in Jordan.

Finally, the results from the strong form of efficiency could be summarized as the following:

- Statistical tests reject the first null hypothesis, where if the value of the test is positive, then the portfolio is earning excess returns. In other words, a positive value for Jensen's alpha means a fund manager has "beat the market" with their stock for achieving excess return, while in the Jordan case with only two mutual funds (because of the limited mutual funds in Jordan). Based on Jensen test results, there is a possibility to achieve excess return with results around 12% positive. Saudi Arabia shows more variance in its results, with a maximum amount of 24% and a minimum of about -1% for only one negative result out of nine mutual funds.

- After analyzing the data, I reject the null hypothesis (H0: Mutual funds are not earning a higher return than the benchmark indicator) and accepts the alternative hypothesis that mutual funds earn a higher return than the benchmark indicator.
- These results lead to another question. Is the capital market of Jordan a strong form of efficiency? I reject the Alternate hypothesis (Hα): The Jordanian capital market is strong form efficient and accept the null hypothesis (H0): The Jordanian capital market is not strong form efficiency, because there is a possibility to achieve an excess return.
- While the previous two hypotheses show that neither the Jordanian nor the Saudi Arabian capital market is a strong form of efficiency, it is also possible to compare both capital markets by testing whether the Jordanian capital market is outperforming the Saudi Arabian market or not. In this case, the null hypothesis is accepted: the Jordanian capital market is not outperforming the Saudi Arabian market, and the alternative is rejected (Hα: Jordanian Capital Market is outperforming the Saudi Arabian market).

5.3.1 The recommendation for strong form efficiency

- The study recommends that the Jordanian capital market need to establish a more suitable environment to attract more mutual funds in addition to adopting a new strategy rather than trying to fix the current one and recommends following the good practice of the neighboring country, at least in increasing the number of mutual funds.
- The ASE should also open the international trading gate to these kinds of investments if we still talking about the available liquidity in the capital market as the only problem, but this is not a problem to motivate and support more mutual funds in ASE by making more easy regulations.
- The ASE recommended creating a coherent and comprehensive database for the mutual fund industry in both capital markets.
- Fund managers are also recommended to reassess their investment styles and maintain comfortable liquidity to adopt the rewarding investment styles at the right time to diversify the fund's portfolio and improve its returns.

5.4 Conclusion for Survey

In this section of the dissertation, the Cramér's V Test was used to find the relationship between two or more nominal variables while the limits are from 0 to 1 maximum. This is also related to the Pearson chi-squared statistic, because the chi-square value is needed to continue the calculation. The chi-square test's value is very small (3.32365E-18), which determines that there is no statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency in Table 23, According to the statistical analysis, results support the Null Hypothesis (H0): there is no statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table.

Some points related to Table 24 are listed below:

- The number of participants was 109, which is more than planned, with 9 only for making sure of reaching the target of 100.
- All participants answered the whole survey, valid responses to the questionnaire were received.
- The mean of the data set was the highest recorded (3.48) for question number 6 (System accessibility) and most of the participants agreed that they can access the site, while the least amount of mean was in question number 18 (Tax and commission fairness), where most of the participants did not agree that the tax and commission amounts are fair. were for question number 10 (Transparency satisfaction) and from the point of view of the capital market efficiency it means that the chosen sample sees the transparency as fair enough in the capital market by understanding its dimensions according to the capital market efficiency theory.
- The variation between the maximum observations were in question number 4 (information availability) with a standard deviation of 1.26, which indicates that the information could be accessed by some parties before others. This is one of the main points in the capital market efficiency identifying that there is no efficiency on the semi-strong form level of efficiency. This also agreed with my previous work (Bustanji, 2019). The minimum observation was in question number 13 (Disclosure commitment) with 0.99 standard deviation, and it means it the best work in the capital market and especially for the department of disclosures in both Amman Stock Exchange and Jordan securities commission (this conclusion also related to the open questions in the survey.
- The most frequent answers were neutral, which supports the researcher's assumption that most of the participants in the capital market do not know much about the efficiency of the capital market and there is not enough public awareness in the capital market of Jordan. It will require more research to investigate that later.
- Based on the other statistics, it was found that the variation between the maximum observations in Table 24, question number 4 (information availability) with 1.26 standard deviation, which means the information could be accessed by some parties before others and this is one of the main points in the capital market efficiency; thus, the market is not a semi-strong and strong level of efficiency, as concluded also in Bustanji (2019), although here a different methodology and different data are used. , This leads to accepting the Alternate hypothesis (Hα): There is only evidence for a weak form of efficiency while there is no evidence for the semi-strong and the strong form of efficiency, as found in Table 24, Questions 4, 5, and 15.

Based on the general statistics signs, after analysis it was found that there is no association between variables, and the variables are not determined by each other, and thus the study accepts the Null Hypothesis (H0): there is no statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table.

The following is the summary of conclusions that were reached from the survey:

a. There is a lack of information about how to enter and exit the market; while many people wanted to enter or even try, it was found that the information is not easily found, and the individual investors do not know ways to access the market. In addition, the high transaction cost affects the efficiency negatively, as in the case of Omet & Khasawneh (2001). This was noted in the variation between the maximum observations, found in question number 4 (information availability) with a 1.26

standard deviation, which means the information could be accessed by some parties before others.

b. There is some evidence of a weak form of efficiency from this study, while there is no evidence of a semi-strong and strong form of efficiency. Question number 13, with the least variation, supports this assumption. That is because operation in the market is not fully transparent, there are instances of insider trading, delays in the disclosing process, shocking fees from the broker's side, and poor information to support investing in the market. In question number 17 about the source of information, most participants responded that there is more than one source of the information, disagreeing with Maghyereh & Omet (2011) in the first part of this point while agreeing with them in the second part of the same point in conclusion.

c. Providing different online sites and different rules from the capital market organizations makes the process of finding information more challengeable (negative points). Only those who had 5 years or more of experience were able to answer about the specific rules they must know, and in question number 7 on updating the online trading system answers suggested the need for an efficient online system.

d. One of the main factors which prevents the public from investing is not the liquidity only – as most of the research agrees – but it is the fear of the capital market's reputation, from hearing different stories and lack of marketing in the public media. Questions number 11 and 12, on Trust and Rumors, respectively, show that most respondents feel there is less trust in the capital market and there are a lot of rumors.

e. The capital market of Jordan is shown to be not semi-strong efficient for the second time, testing with a different methodology; the capital market needs to improve the disclosing process with new technology rather than using the same techniques for disclosing information, with stricter rules on breaking rules of insider information or any other illegal information path rather than the formal procedure through the securities commission or stock exchange organization.

f. Questions like why the liquidity of the capital market is still low because of many things; most importantly there is no diversity in the tools of investments like mutual funds. In the market in Jordan there are only two active mutual funds and another that is not tradable anymore. In addition, it was been found that the cost of the trading in ASE is high for some of the listed stocks, and results for the broker effect on prices and on commission shows they have a hand in that market where it is not supposed to be, which reflects the undesirability of investors to invest in the local market and go to another market as in the case of (Omet & Khasawneh, 2001).

5.4.1   Survey recommendations:

1- One of the main problems in the capital market of Jordan is that the market is not liquid enough, mainly because lack of knowledge about the securities commission and weaknesses of the marketing technique of the financial services company to attract more investors and increase the investments of the market. In addition, lack of trust of the market is noticed from the survey (Question 11). On the other hand, the environment of Jordanian economy is stable as there are no wars as in neighboring countries and it is possible to develop the regulations to save every investor's right, which should be used well to increase the level of investor trust in the ASE.

2- Based on the Chi-Square value, it was determined that there is no statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency table of answers in the survey. I collected data from professionals in the capital market of Jordan, most of whom are well educated

and well informed about the capital market rules and regulations (most have a master's degree or the equivalent or have more than 5 years of experience). while the analysis showed that there is not a clear enough understanding of the nature of the Jordanian capital market (Table X). What we recommend is that there has to be more cooperation between the organizations of the Jordanian capital market to organize more public awareness to make other people know and trust it and motivate them to enter the market.

3-   A new technology technique is required to deliver the information from only one official site and use social media to explain the role of the capital market as a safe investment place.

4-   New trading applications must be developed, and other investors must be trained to use them. There is a need to empower the research and development department and connect it with the public for those who need to access information.

Further research should be conducted to extend the survey from the capital market with only professional responses to an expanded range of topics which contain more deep market efficiency problems, with other financial factors like earnings variability, liquidity of the shares (trading volume). The next step needed is to investigate behavioral finance in the Jordanian Capital Market.

5.5   Summary conclusion for all efficiency levels

I summarize all conclusions into Table 25, as the table shows the test which used to test the hypothesis, which hypothesis is accepted, the results, and finally, the recommendations from every level and section in this dissertation. The statistical evidence in this study did not support the efficient market hypothesis in all the efficiency levels for the case in Amman Stock Exchange. The statistical results presented in Chapter 4 implied that the daily price does not follow the random walk. The change of the price was found to be highly and positively serially correlated. More statistics are used to give more evidence for the statistical dependence of price changes in the Amman Stock Exchange at the low frequencies.

In the next stage, I tried to test whether the investors can measure the real risk and make decisions to buy or sell the securities by using the Securities Characteristic Line, finding that the ASE is not following SCL. Moreover, I tried to test the relation between the movement of stock return and disclosures and found that there is a gap between the disclosures and the effect on the share prices, which could lead to another problem that could be a possibility for insider trading, and some investors could access information before others. To provide more evidence we also studied the return shares movement in terms of disclosures and the data show there is evidence for insider trading. All of the above lead to the conclusion that the ASE is not semi-strong efficient.

The strong form of efficiency showed that the mutual funds are earning a higher return than the benchmark through a Jensen test, which leads to a market that is not efficient on the strong level of efficiency. Even with far fewer mutual funds available in Jordan compared with Saudi Arabia, we can say that the Jordanian capital market does not outperform the Saudi Arabian Market in the strong form of efficiency; moreover, neither the Jordanian nor the Saudi Arabian capital market is the strong form of efficiency.

The last section was about studying the market through the primary data collected from carefully selected professional respondents. The results showed that there appears to be a lack of information about how to enter and exit the market and found there is no statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table. Moreover, there is some evidence of a weak form of efficiency from this study, while there is no evidence of a semi-strong and strong form of efficiency, with the least variation support this assumption. That is because operation in the market is not fully transparent, there is evidence of insider trading, delays in the disclosing process, extremely high fees from the brokers' side, and poor information to support investing in the market, and about the source of information most of the answers indicated that there is more than one source of the information.

The primary data support the statistical data, which all together found that the ASE is not a weak, semi strong, or strong form of efficiency, meaning that the Jordanian capital market needs to make a package of actions in the short term and the long term to avoid the risk from the challenges which the market already faces and will face in the future. Table 25 shows these actions as a recommendation.

Table 25. Summary table for the dissertation results

Level of Efficiency	Test used	Hypothesis	Results	Recommendations
weak form efficiency	Random walk and expected models (general statistics, autocorrelation, run test)	Testing whether the ASE is follows random-walk theory	Alternate hypothesis ($H\alpha 1$): Amman Stock market does not follow the random-walk models.	1- Find new channels to disclose the information at an efficient time and speed to deliver the information to everyone at the same time. 2- Control the restrictions for the movements of the daily prices to make it more flexible according to the general economic situation. 3- Empower the research and development departments in the JCM organizations.
		Testing whether the ASE is weak form efficient	Alternate hypothesis ($H\alpha 1$): Amman Stock Exchange is not weak form efficient.	
semi-strong form efficiency	Consumption based Assets Pricing Model	Testing if Amman Stock Exchange follows the Securities Characteristic Line (SCL)	Alternate hypothesis ($H\alpha$): Amman Stock Exchange does not follow the SCL.	1- Enhance and develop techniques in (a) the disclosure department and, in this point, it is aggregating with the recommendation with the weak form level and (b) the Capital Market Institutions Monitoring Department; these kinds of departments oversee monitoring and inspecting the operation and performance of the ASE and the SDC, if these departments are empowered then they
	event study	Testing the relation between disclosures and	Alternate hypothesis ($H\alpha$): There is	

		behavior of stocks return in the Amman Stock Exchange (ASE)	no relation between the movement of stock return and disclosures.	will be more efficient in connecting the relation between the movement of price return and disclosures. 2- Follow up new ways to analyze the stocks listed in the market, for example CAPM, SCL. 3- Introduce more rules to gain the investor's trust by controlling the disclosures to be more efficient and effective in time and accuracy. 4- For investors, they can make more money by analyzing the shares after disclosures and react within a short time to the changes in price shares.
	Capital Assets Pricing Model	Testing the efficiency of Jordanian Capital Market at semi-strong form	Alternate hypothesis (Hα): Jordanian Capital Market is not Semi-Strong Form Efficient.	
Strong Level of Efficiency	Jensen test	Testing whether mutual funds are earning a higher return than the benchmark		The Jordanian capital market needs to: 1. establish a more suitable environment to attract more mutual funds. 2. adopt a new strategy (for the long term) rather than trying to fix the current one. 3. follow the good practices of the neighboring countries, at least in increasing the number of mutual funds. 4. open international trading by providing convenient facilities to foreign investors. 5. create a coherent and comprehensive database for the mutual fund industry, in both capital markets. 6. Encourage fund managers to reassess their investment styles and maintain comfortable liquidity to adopt the rewarding investment styles at the right time to diversify the fund's portfolio and improve its returns.
	event study	Testing whether the Jordanian capital market is strong form market efficient	Null hypothesis (H0): The Jordanian capital market is not strong form efficient.	
	Capital Assets Pricing Model	Testing weather, the Jordanian Capital Market is outperforming the Saudi Arabian capital market	Null hypothesis (H0): The Jordanian capital market is not outperforming the Saudi Arabian market.	
All Levels through primary data	Comparing between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table	Testing whether there is a statistically significance of the difference between the expected frequencies of the data collected in one or more categories of a contingency table	Null Hypothesis (H0): there is no o statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a	1- The market is not liquid enough, so the level of trust needs to be raised for opening a door for new investors. 2- More cooperation is needed between the organizations of the Jordanian capital market to organize more public awareness to make people know, trust, and be motivated to enter the market. 3- A new technology technique is required to deliver the information from only one official site and use social media to explain the role of the capital market as a safe investment place. 4- There is a need to empower the research and development department and connect it with the public for those

		contingency table.	who need to access information.
			5- New trading applications must be developed, and investors must be trained to use them.
		Testing if there is any evidence for the weak form of efficiency, semi-strong, and strong form of efficiency.	Null Hypothesis (H0): There is no evidence for weak form, semi-strong, or strong- form of efficiency.	

Source: Compiled by author.

5.6 Thesis section summary

From Table 25 the author will summarize the thesis work as below:

Thesis one: Testing the weak form efficiency for the ASE between the periods from January 1, 2013, to December 31, 2020, the conclusion is accepting the alternative hypothesis that ASE is not following random walk model and it is not weak form efficient, but there is some evidence for weak form efficiency through an autocorrelation test. This can be summarized with three points.

A. General statistics: The descriptive data indicate that the frequency distribution of the ASE daily series is not normal, as the positive amount of the mean for return series of the sample and the positive amount of kurtosis make the frequency distribution not normal; it could be noticed that the frequency distribution of return series is leptokurtic, indicating higher peaks than expected in comparison with normal distributions. From this I conclude the ASE is not following the RWM and accept the alternate hypothesis: ASE not following the RWM.

B. Autocorrelation Test: The autocorrelations coefficients are very low, which indicates the price movements are independent day to day, consequently, the ASE is weak form efficient – random walk, from the period of 1st January 2013 to 31st December 2020 (from the point of autocorrelation test). This result does not mean the ASE is completely efficient but this could suggest that there is some evidence for weak form efficiency. I accept the null hypothesis: Amman Stock Exchange follows the random-walk models.

C. Run test: the test shows that p-value is less than 0.05, which means I reject the null hypothesis of no randomness and conclude that the series does not alternate enough, so it is possible to predict the randomness, which leads me to conclude the ASE is not efficient on the weak form. The ASE does not follow the RWM. The Run test is a non-parametric test applied in the dissertation to examine the dependence or randomness in the ASE return series,

Thesis two: Testing the semi-strong efficiency for ASE from January 1, 2013, to December 31, 2020. This can be summarized with two points.

A. CAPM Model test: with only two banks out of five was it possible to apply the CAPM model (Arab Bank and Cairo Amman Bank) and calculate the reward-to-risk ratio for any security concerning that of the overall market. When the

expected rate of return for any security is deflated by its beta coefficient, the reward-to-risk ratio for any individual security in the market is equal to the market reward-to-risk ratio. In general, results support rejecting the Null Hypothesis (H0): Amman Stock Exchange is following the SCL, it is not easy for the investors to measure risk and make decisions, based on the inability to analyze real risk and the sample not following the SCL.

B. Event study: 80 cases were studied to analyze the disclosure effect on the return logarithm, revealing that only 23 out of 80 showed an efficient reaction on the semi-strong level of efficiency, which is about only 28% from the sample. This result supports rejecting the null hypothesis and accepting the alternative hypothesis, which says there is no significant relationship between the movement of stock return and disclosures.

Thesis three: Testing the strong form of efficiency for ASE from the period of January 1, 2013, to December 31, 2020, the conclusion is to accept the null hypothesis for all section tests, which can be summarized in three points:

A. Jensen test: the average sample Jensen expected return for the Jordanian case is higher than the case in Saudi Arabia but the Beta (risk) of the Jordanian case is also higher by default (higher return, higher risk); moreover, the alpha amount shows in this analysis that the mutual fund manager did not earn enough return to be compensated for the risk they took over the course of the year, this goes to accept the null hypothesis: mutual funds are not earning a higher return than the benchmark indicator.

B. Event study: 80 cases were studied to analyzing the disclosure effect on the return logarithm, showing that only 24 out of 80 showed an efficient reaction on the strong level of efficiency, which is about only 28% from the sample, supporting the null hypothesis which says the Jordanian capital market is not strong form efficient.

C. CAPM: the standard error for the strong form of efficiency in the case of ASE is higher than in the case with the Saudi Arabian Market, which is affected by the difference in sample size (there was only three mutual funds in ASE, one of which is suspended from working), but there was much more for the Saudi Arabian market). Moreover, the standard error was the statistical term to measure the accuracy with which sample distribution represent the population, and the sample mean deviates more in the Jordanian case compared with the Saudi Arabian case, which supports accepting the null hypothesis: the ASE is not outperforming the Saudi Arabian market.

Thesis four: Testing whether there is statistically significance of the difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table and looking for any evidence of weak, semi-strong, or strong form of efficiency. Based on results of the survey distributed and collected in June 2021, the conclusion is accepting the null hypothesis that there is no statistically significant difference between the expected frequencies and there is only some weak evidence for weak form efficiency in ASE. These emerged in two stages:

A. Cramér's V Test: this was used to find the relationship between two or more nominal variables while the limits are from 0 to 1 maximum, it's also related to the Pearson chi-squared statistic because the chi-square value is needed to continue the calculation. The chi-square test value is very small (3.32365E-18), which determine that there is no statistically significant difference between the expected frequencies and the observed frequencies in one or more categories of a contingency in Table 24; thus, the statistical results support the Null Hypothesis (H0): there is no statistically significant difference between the expected frequencies and the observed frequencies of the data collected in one or more categories of a contingency table.

B. General statistics: through asking different technical questions to professional participants with extensive knowledge of the ASE, it was found that most of the indicators support weak form efficiency level in terms of there being no possibility to predict future prices based on past prices, and stock prices could reflect most of the current information, which is strong evidence for the weak form efficiency. The conclusion is there was no evidence for semi-strong or strong form efficiency, but there is some evidence for weak form efficiency.

Table 26. Summary table for the dissertation results as per thesis

Thesis #	Test used	Comments	Results Accepted
Thesis one	General statistics	the descriptive data noticed that the frequency distribution of the ASE daily series is not normal as the positive amount of the mean for return series of the sample and the keratoses also shows the frequency distribution not normal	Ha1
	Autocorrelation	The autocorrelations coefficient are very low which indicates the price movements are independent day to day	Ha1
	Run test	p-value is less than 0.05	H0
Thesis two	CAPM Model	when the expected rate of return for any security is deflated by its beta coefficient, the reward-to-risk ratio for any individual security in the market is equal to the market reward-to-risk ratio	H0
	Event study	80 cases were studied to analyze the disclosure effect on the return logarithm; only 23 out of 80 showed efficient	H0

Thesis three	Jensen test	the average sample Jensen Expected return for ASE case is already higher than the case in SA but the Beta (risk) for the ASE is also higher by default. Alpha amount shows in this analysis that the mutual fund manager did not earn enough return to be compensated for the risk they took over the course of the year	H0
	Event study	80 cases were studied for analyzing the disclosure effect on the return logarithm	H0
	CAPM	standard error was the statistical term to measure the accuracy with which sample distribution represent a population	H0
Thesis four	Cramér's V Test	used to find the relationship between two or more nominal variables while the limits are from 0 to 1 maximum	H0
	General statistics	asking different technical questions to professional participants who have extensive knowledge of the ASE	H0

Table 27 Summary table for the dissertation results

Level of Efficiency	Test used	Hypothesis	Result	Recommendation
weak form efficiency	Random walk and expected models (General statistics, autocorrelation, run test)	Testing weather, the ASE is follows random-walk theory	Alternate hypothesis (Hα1): Amman Stock market not following the random-walk models.	4- Find new tunnels to disclose the information throw an efficient time and speed to deliver the information for everyone at the same time.
		Testing weather, the ASE is weak form efficient	Alternate hypothesis (Hα1): Amman Stock Exchange is not a week form efficient.	5- control the restrictions for the movements of the daily prices to make it more flexible according to the general economic situation. 6- Empower the research and development departments in the JCM organizations.

semi strong form efficiency	Consumption based Assets Pricing Model	Testing if Amman Stock Exchange following the Securities Characteristic Line (SCL)	Alternate hypothesis (Hα): Amman Stock Exchange is not following the (SCL).	5- enhance and develop the techniques A. the disclosure department and, in this point, it is aggreging with the recommendation with the weak form level B. the Capital Market Institutions Monitoring Department, these kinds of departments oversee monitoring and inspecting the operation and performance of the ASE and the SDC, if these departments empowered then they will be more efficient to connect the relation between the movement of price return and disclosures. 6- Follow up new ways to analyze the stocks listed in the market for example CAPM, SCL, and Securities characteristic line. 7- Introduce more rules to gain the investor's trust by controlling the disclosures to be more efficient and effective by time and accuracy. 8- For investors, they can make more money by analyzing the shares after disclosures and react after a short time to the changes in price shares.
	event study	Testing the relation between disclosures and behavior of stocks return in the Amman Stock Exchange (ASE)	Alternate hypothesis (Hα): There is no relation between the movement of stock return and disclosures.	
	Capital Assets Pricing Model	Testing the efficiency of Jordanian Capital Market at semi-strong form	Alternate hypothesis (Hα): Jordanian Capital Market is not Semi-Strong Form Efficient.	
Strong Level of Efficiency	Jensen test	Testing whether mutual funds are earning a higher return than the benchmark		7. the Jordanian capital market needs to establish a more suitable environment to attract more mutual funds 8. adopt a new strategy (for the long term) rather than trying to fix the current one 9. follow the good practice of the neighboring countries, at least in increasing the number of mutual funds. 10. open international trading by providing easy facilities to foreign investors. 11. The ASE recommended creating a coherent and comprehensive database for the mutual fund industry in both capital markets. 12. Fund managers are also recommended to reassess their investment styles and maintain comfortable liquidity to adopt the rewarding investment styles at the right time to diversify the fund's portfolio and improve its returns.
	event study	Testing whether the Jordanian capital market is strong form market efficient	Null hypothesis (H0): The Jordanian capital market is not strong form efficient.	
	Capital Assets Pricing Model	Testing weather, the Jordanian Capital Market is outperforming the Saudi Arabian capital market	Null hypothesis (H0): The Jordanian capital market is not outperforming the Saudi Arabian market.	
All Levels throw primary data	Comparing between the expected frequencies and the observe frequencies of the data	Testing weather there is statistically significance of the difference between the expected	Null Hypothesis (H0): there is **No** statistically significant difference between the	6- The market not liquid enough, so the level of trust for opening a door for new investors is needed. 7- more cooperation between the organizations of the Jordanian capital market to organize more public awareness to make other

| collected in one or more categories of a contingency table. | frequencies of the data collected in one or more categories of a contingency table | expected frequencies and the observe frequencies of the data collected in one or more categories of a contingency table. | people know, trust, and motivate to enter the market. 8- A new technology technique is required to deliver the information from only one official site and using social media to explain the role of the capital market as a safe investment place. 9- There is a need to empower the research and development department and connect it with the public for those who need to access information. 10- New trading applications must be developed and train other investors to use them. |
| | Testing if there is any evidence for the weak form of efficiency, semi-strong, and strong form of efficiency. | Null Hypothesis (H0): There is no evidence for weak form, semi-strong, and strong-form of efficiency. | |

Source: Compiled by author.

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APPENDIX 1:
SECTION A:
QUESTIONNAIRE FOR INSTITUTIONAL INVESTORS, BROKERAGE FIRMS AND LISTED COMPANIES IN (ASE) (PROFFESIONAL RESPONDENTS)

SECTION A: BACKGROUND INFORMATION

1. What position do you hold in the firm………………………………?

2. For how long have you participated in the Amman Stock Exchange?

Less than 2 years
3-5 years
6-10 years
Over 10 years

3.Level of Academic Education
    Primary school
    Secondary
    Graduate
    Post-Graduate
    Others…………………

3   Level of Profession Education
    CPA
    ACCA
    CFA
    Others ……………….

4   Investors target group

    Individual Investors
    Institutional Investors
    Foreign Investors
    Others ……………….

SECTION B: DETERMINANT S OF CAPITAL MARKET EFFICIENCY

Indicate the extent to which you agree with the following statements by using a scale of 1 to 5 where 1= strongly disagree and 5 = strongly agree.

Liquidity	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) Investors diversify their stocks without extra payment.	1	2	3	4	5
2) The capital market is increasingly stable (in your opinion)	1	2	3	4	5
3) The capital market is reheeling from the financial crises (in your opinion)	1	2	3	4	5
4) Brokers could determine commission which will cover the cost of their business	1	2	3	4	5
5) Disclosure information is readily available to all investors at the same time.	1	2	3	4	5
Technology					
6) Electronic trading system is efficient enough to adapt new changes.	1	2	3	4	5
7) The Amman Stock Exchange looking to include new technology for trading system	1	2	3	4	5
8) Clearing and settlement days are enough for investors to move for next trading step	1	2	3	4	5
9) Trading system helps to reduce operating cost in the stock market?	1	2	3	4	5
10) The stock price is affected in the published information	1	2	3	4	5
Regulation					
11) Regulations in ASE increase investors' confidence	1	2	3	4	5
12) Regulation in ASE effectively enhances allocation of capital raised.	1	2	3	4	5
13) Listed companies meet annual disclosure legal requirement. "For Capital market Employees only	1	2	3	4	5

14) The publications or announcements of the companies comply with accounting reporting standards.	1	2	3	4	5
15) The laws and regulation for disclosure department are enough to promotes transparency in stock market activities	1	2	3	4	5
Technical Transparency					
16) Brokers have enough knowledge about their responsibility they have	1	2	3	4	5
17)There is only one disclosing source in the market authorized to publish essential information.	1	2	3	4	5
18) The stock exchange brokerage fee is fair enough	1	2	3	4	5
19) It is possible to predict the future prices by analyzing the historical data	1	2	3	4	5
20) Media discloses the true events information of the related stocks in the market.	1	2	3	4	5
Transaction Costs					
21) Increase in market turnover leads to low transaction costs	1	2	3	4	5
22) Information asymmetry between the buyer and seller increases transaction costs	1	2	3	4	5
23) Low transaction leads to price volatile due to increase of investors in the market.	1	2	3	4	5
24) The stock exchange brokerage fee is fair.	1	2	3	4	5

25) In your opinion what are other variable which can be used to determine the efficiency of Amman stock market……………………………………………………………….

SECTION B:
DETERMINANT S OF CAPITAL MARKET EFFICIENCY

Indicate the extent to which you agree with the following statements by using a scale of 1 to 5 where 1= strongly disagree and 5 = strongly agree.

Investors challenges	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1) Investors can enter or exit the market easy at any time	1	2	3	4	5
2) There is no problem always to warming about the insider trading activities in the market.	1	2	3	4	5
3) All public information is published to the market at the same time	1	2	3	4	5
4) The capital market is increasingly stable with foreign investment.	1	2	3	4	5
5) At any given time, prices fully reflect all information about a particular stock.	1	2	3	4	5
Implication of Transparency					
6) Investors can easily access information on stocks at the same time	1	2	3	4	5
7) Investors fully utilize all available information on related stock.	1	2	3	4	5
8) Transaction turnaround time has reduced.	1	2	3	4	5
9) Investors get access to diverse investments in Amman Stock Exchange.	1	2	3	4	5

10) Investors and brokers have confidence on capital market	1	2	3	4	5
Implication of Transaction Costs					
11) Investors make informed decision with available market information.	1	2	3	4	5

12) How do you assess the situation of Capital market…………………………………