

The Role of Information Technology in Raising the Efficiency of Amman Stock Exchange Mediated by the Behavior of the Stock Prices

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Abstract: - The study aimed to explore the role of information technology in raising the efficiency of the Amman Stock Exchange, mediated by the behavior of the stock prices. The study chose a sample consisting of 24 companies that are listed on the Amman Stock Exchange. The study used the average of the abnormal return of the stocks gained by companies through information technology applications. The study carried out a multiple regression analysis to explore the degree to which the independent variable affected the dependent one. The study results found that the abnormal return of the stocks gained by companies through information technology applications is low. The study also found that there is a significant relationship between using IT applications and the efficiency of the Amman Stock Exchange, mediated by the behavior of the stock prices. Therefore, the study recommends expanding the scope of using IT in emerging stock markets, including the Amman Stock Exchange, with the aim of raising the operational efficiency of such markets.

Key-Words: - Information technology, Stock Exchange Efficiency, Amman Stock Exchange, behavior of the stock prices

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1 Introduction

The development of the economy is significantly aided by the financial markets. They represent the improvements and innovations in the economy that takes place in every economy. In the financial markets, there are many different exchangers, [25]. Stock exchange marketplaces must exhibit high levels of efficiency to safeguard the interests of the exchangers who use them. Raising the outward efficiency and operational efficiency of such markets is, therefore, necessary, [29]. Managers will be able to acquire a competitive advantage in terms of information if they are knowledgeable about the worth of their companies, potential prospects, and profitability. In addition, those managers may have challenges while releasing financial papers on the market if the anticipated earnings are dependent on the evaluation of such papers, [40]. Market participants can use the activities of managers as a leading indicator, [11]. Companies have a big impact on how information is reflected that investors can use to evaluate stock prices. To increase the effectiveness of the financial market and positively affect stock prices, managers in businesses and exchangers in the financial markets rely heavily on IT applications, [14].

The most crucial factor that profoundly influences how effectively stock markets operate is the availability of data and information in the requisite quality, quantity, and timing. All stock market traders must have access to such data and information, [21]. One of the most crucial factors is the speed with which sales and purchases are carried out, as well as judgments about reducing exchange costs, [18]. Having investors make judgment calls that are marked by intelligence and precision without guessing the outcome is one of them, [38]. Through a robust telecommunications network and operating infrastructure, the management of stock exchange marketplaces hopes to make it possible for exchangers to contact them, [43]. By improving the stock exchange market's operational efficiency and giving traders, investors, and businesspeople the most information possible, they hope to achieve this. They strive to make sensible selections at every turn, [45]. The establishment of financial intelligence units can help with that. These organizations support the provision of accurate data and software that streamlines the process of making judgments in stock market markets. Therefore, it is necessary to investigate the connection between the financial market's efficiency and its reliance on IT, [34], [33], [32], [20]. Therefore, the problem of the study is represented in the following question: "What is the role of IT in raising the efficiency of

the Amman Stock Exchange Market as mediated by the behaviour of the stock prices?"

The study aimed to explore the role of IT in raising the efficiency of the Amman Stock Exchange Market mediated by the behaviour of the stock prices. To meet this goal, the researchers of the study aimed to offer answers to the questions below: Q.1: What is the reality of relying on IT in raising the efficiency of the Amman Stock Exchange Market mediated by the behaviour of the stock prices?

Q.2: is there any statistically significant relationship between IT and the efficiency of the Amman Stock Exchange Market mediated by the behaviour of the stock prices?

This study contributes to the IT plays in releasing information about the stocks of companies that are listed on financial exchanges that has several advantages over other samples. The IT in Jordan is explained in more detail as Jordan is rapidly spreading and is currently one of the few countries where the Efficiency of the Amman Stock Exchange is largely IT-developed. Additionally, this study adds to the knowledge of the IT usefulness of the Efficiency of the Amman Stock Exchange and the Behavior of the Stock Prices. However, the findings of this study have implications for investors' standard setters, regulators, and policymakers. Prudence (Stock Exchange and the Behavior of the Stock Prices) has just been reintroduced into the conceptual framework to Encourage and motivate new subjects. The study results found that the abnormal return of the stocks gained by companies through information technology applications is low. The study also found that there is a significant relationship between using IT applications and the efficiency of the Amman Stock Exchange, mediated by the behaviour of the stock prices

The study intends to shed light on the role that IT plays in releasing information about the stocks of companies that are listed on financial exchanges. Because it is necessary to disclose this information, given how quickly financial and non-financial information about stocks of firms is exchanged because of the development of ICT. Additionally, support those in charge of the Amman Stock Exchange in their fight against any activities that could result in the improper use of IT and harm the effectiveness of the financial markets. Additionally, make ideas and proposals that assist in resolving issues with Jordan's financial market's efficiency, particularly those that relate to IT. Subsequently, the rest of this essay is structured as follows: The paper

is organized as follows: Section 2 examines the literature; Section 3 presents research data, population, model, and techniques; Section 4 presents results, and Section 5 wraps up the paper.

2 Theoretical Literature

2.1 IT in Stock Exchange Markets

When one of the parties to the transaction has more information (or better information) than the other party or parties, the IT applications are upgraded. In other words, they are updated when the supplier (for example) knows more about a particular product than the consumer, [36]. When the borrower knows more about his creditworthiness than the lender, they are upgraded. When the executive manager is more knowledgeable about the company's earnings and future than the shareholders are, they are upgraded, [9]. When insurance company clients know more about the dangers of accidents than the insurance companies do, they are upgraded. When renters are better informed than landowners about the circumstances around the harvest and their efforts, they are upgraded, [41]. According to the principle of IT applications, at least one party to the transaction will have more pertinent information than the other party or parties. It is assumed that the latter party or parties do not have the knowledge that the other party has, [13].

The phrase "IT applications" started to catch on in the late 1970s. Its dissemination was related to the hypothesis put forth by Khudoykulov, et al, [31]. The later academics created a capital structure model based on the asymmetry of information between the management, who are knowledgeable about the company's earnings, characteristics, and investment prospects, and the shareholders, who are not, [39]. Such models are predicated on the concept that executives with inside knowledge of their organizations have a higher incentive to share that knowledge with outside investors to drive up the stock prices of those organizations, [6]. However, those managers are unable to convey positive information because shareholders would question it, [10].

It is simple to process a lot of data and information using modern technology (the internet, Extranet, and programs). As a result, IT enables a large number of exchangers to simply, promptly, and affordably access information in the stock market markets, [5]. According to various research, expenditures will be lower and information will be transmitted more quickly when dealing with electronic channels. The transactions and

communication procedures will proceed more quickly when carried out in this way, [37; 42].

A solution to the problems preventing exchangers from accessing data and conducting transactions is an information technology (IT). Even though financial services are complicated and exchange markets are far away, they can be employed to achieve this purpose. Organizational challenges are among the issues preventing exchanges in this area. Trading firms and exchangers now have unfettered access to the stock exchange marketplaces thanks to modern technologies. It raised the intensity of competition while lowering transaction costs. Because it permitted exchangers to conduct trades using online accounts, it made stock exchange market transactions simpler, [17]. The new laws and technologies produced a new class of investors. They safeguarded the investors' legal rights and gave them all the necessary information via internet live channels. They made it simpler to share information with exchanges and obtain it. They made it possible for exchangers to participate in trading activities on the stock exchange platforms. Gaining information on the exchange procedure costs. The liquidity of the secondary markets is positively and considerably affected by reducing the severity of the barriers preventing exchangers from reaching the market, [5].

Several brokerage companies, banks, and financial organizations that subscribe to the clearinghouse can use it. Information regarding the transactions made by the subscribers is submitted to the Clearinghouse at the end of each day. It is calculated what each subscriber's net profit is. Each subscriber will receive a list with information on the financial documents that need to be supplied or filed. Each subscriber will receive information about the total amount of money that needs to be paid or acquired. The central clearing system's creation thus represents the desired outcome of doing away with the use of papers to track the behavior of stock prices. Additionally, it can be seen in the use of interconnected computers to record financial activities related to profit distribution rather than using checks, [37]. There is a need to establish businesses for the protection of investors in the financial markets due to the necessity of having complementarity between exchange operations and dealing with the problem of the delivery deficit by brokers. When brokers are unable to protect customer accounts that they manage, these businesses act as semi-public entities to do so. Through the insurance premiums, stock exchange

market brokers and participants pay the insurance fees, [42].

2.2 Financial Market Efficiency

The availability of data and information about the company whose financial papers are traded on the financial market has a significant impact on investment in financial papers. Thus, the availability of such data and information represents one of the key factors in setting the values of financial papers. To decide whether to buy or sell something, such facts and information must be analyzed, [15]. Therefore, the decision-making of investors while purchasing financial documents will be strongly impacted by the availability or lack thereof of data and information. Any flaw in these data and information will result in an inefficient financial market. Therefore, having an effective financial market means that prices react quickly and objectively to the facts and information that exchangers have access to Zhang, & Wei, [46].

The prices do not react quickly to the facts and information that are available to the exchangers when there is an inefficient financial market. It implies that certain investors have access to data and information that others do not. These facts and details concern the company or companies whose financial documents are traded on the stock market. The other investors are unaware of them. The quantity of profit earned by each investor in the financial market is negatively impacted by this gap in this regard, [30]. It compels investors who do not think the prices are reasonable to decide against trading in such a market. It results in a decrease in the volume of transactions involving the exchange of financial paperwork. It causes the number of exchangers and the market's liquidity to decline. It has a detrimental effect on the country in question's rate of economic growth. It results in stock prices that do not accurately reflect the market value of the companies in question. It helps certain investors achieve atypical earnings. The market's reputation suffers as a result. Because it is viewed as an inefficient market, it could result in the collapse of such a market, [24].

The alignment between the prices of financial papers, notably stocks, and the data and information available to exchangers is a representation of what the term "efficient financial market" means. That holds regardless of whether the data and information are recent, personal, or public. In other words, the phrase "efficient financial market" refers to the market's capacity to reflect any fresh information on certain financial documents that have been exchanged on the values of such papers. Concisely,

it refers to the market's capacity to determine the cost of financial papers based on their intrinsic value, [22]. Marketing entails allowing investors within and outside the market to receive all information of the same quality and quantity at the same time while paying minimal charges. The financial papers being traded in this relationship must have a reasonable value. The most profitable locations are where the available financial resources are used most effectively in an efficient market, [28].

The most significant issue influencing how well the financial market performs is seen to be the problem of (asymmetric Information). This is so because this issue negatively influences all the market, transactions, and overall economy. Asymmetric information refers to one of the parties to a transaction not knowing something. Investors and currency exchangers can quickly get information thanks to the efficient market. That has an immediate impact on the market's stock exchange values, [16]. There is no lag in time between gathering data and arriving at conclusions about stock value. No investor is permitted to use any data or knowledge to obtain an abnormal return in an efficient market. This is because prices in the financial market must be balanced and must fluctuate depending on the most recent information to enter the market, [22]. Such details concern the organizations responsible for the financial documents being traded. A solid financial market has a high level of liquidity and accurate data that is accessible at the appropriate moment. This level is determined by how long the financial documents are sold. In other words, it is determined by how long it takes to sell and buy such documents and convert them to cash. The cost of transferring ownership of the financial paper, the type of asset, the number of exchangers, the volume of transactions, and the type of asset all have an impact (i.e. costs of executing transactions). It is impacted by the level of competition and the ease with which money may be moved between markets (such as those for stocks, bonds, and real estate), according to Cho, and Kim, [15].

2.3 Hypotheses Development

Dorodnykh, [19] developed the idea of IT applications. The latter notion provided a framework for comprehending the capture theory. It refuted the Modigliani and Miller theory's main tenet. This notion is known as the homogeneous expectations hypothesis. It suggests that both the management and the investors share the same expectations for the future of the business. A

competing idea known as the IT applications theory was refuted by (the perfect market hypothesis). The latter hypothesis assumes that all market participants are equally knowledgeable, [27].

Burhop and Lehmann-Hasemeyer, [12] present a more coherent and reasonable hypothesis. They make the implication that management is more knowledgeable than investors. Therefore, the issuance of common stock is not in the best interest of the current shareholders, [7]. As a result, those with knowledge (internal users) can acquire the skills required to use IT programs more successfully than those who are not users and produce aberrant returns, [2]. The financial market significantly depends on the type of information that is traded on the pertinent market, according to the concept's intended meaning (the effectiveness of the financial market). It is expected that any new information that exchangers receive will cause the stock values to alter swiftly.

Exchangers' perceptions of the companies issuing the stocks will change because of this information. The stock prices are anticipated to behave erratically since the bits of information are unrelated to one another and could reach the market at any time. Stock prices increase when there is positive news. They stumble when bad news arises because of unexpected circumstances. Given the predicted severe rivalry between exchangers for it, none of them can win the race to obtain or evaluate such information first. As a result, they will not have the opportunity to make unusual profits at the expense of others, [35; 25]. According to certain researchers, there is a favourable correlation between IT and stock exchange efficiency, [22; 28; 27]. Additionally, several researchers have explored the connection between stock market efficiency and stock price behaviour, [39; 41].

Zung et al., [47], observed that the adoption of an electronic trading system at the ASE increased trade volume, liquidity, and stock price volatility. Similarly, Zhao et al., [48], discovered that the deployment of IT at the ASE improved market efficiency and liquidity. Furthermore, Zeidner and Matthews, [49], reported that the application of data analytics at the ASE resulted in enhanced stock price predictions, which increased market efficiency. According to Zeidner and Matthews [49], the application of artificial intelligence (AI) at the ASE resulted in better stock price predictions and increased market efficiency. Similarly, Zhao et al., [48], revealed that the deployment of blockchain technology at the ASE increased transaction transparency and security, which boosted market efficiency. Other research has looked into the

influence of IT on stock market investor behaviour. According to Zung et al. [47], the usage of social media and online platforms at the ASE increased investor engagement and decreased information asymmetry, which boosted market efficiency. Overall, the research implies that the use of information technology at stock exchanges such as the ASE improves market efficiency, liquidity, and volatility of stock prices, as well as investor behaviour. It is crucial to highlight, however, that the impact of IT on efficiency is likely to be impacted by several factors, including market growth, legislation, and the individual IT tools and systems that are employed.

Informed by the research of previous and theoretical studies related to the subject of this research, and based on the research question and its objectives, this study is based on the following hypotheses:

H01: There is no effect of IT in raising the efficiency of the Amman Stock Exchange Market.

H02: There is no statistically significant relationship between IT and the efficiency of the Amman Stock Exchange Market mediated by the behaviour of the stock prices.

3 Methodology

To evaluate the IT application, the study used a descriptive-analytical technique. The firm value, profits, and returns obtained from its financial documents were measured to do that. The research made use of Bagehot's hypothesis, [26]. According to the latter idea, the stock price of the company will be impacted by the adverse selection brought on by having exchangers with greater financial market understanding. As a result, there will be asymmetric or random information. Consequently, the stock price will be significantly influenced, [4].

Utilizing the analyst's knowledge of several undesirable characteristics is necessary to measure asymmetric information. Such details comprise unique information, such as details about (Profitability statements, dividend statements, and bankruptcy statements, bond rating statements, takeover statements, ownership structure statements, and stock split or derivative statements). They contain data about the primary attributes of the business, such as data about (relative size, growth opportunities, and the tangibility of the assets). The average number of analysts covering the firm's news and the extraordinary returns for insiders are two examples of metrics that are unrelated to the company or its attributes, [23]. The abnormal

returns are calculated based on the following equation (1), [8]:

Whereas:

- $RHDp_t - RLDp_t = \alpha P + \beta p (R_{mt} - R_{ft}) + \delta SMB_t + \sigma p HML_t + \epsilon p \dots (1)$
- RHDp_t: Return of the (HDP) portfolio during the month (t) in the companies that pay high dividend. The insiders are the final buyers (sellers) of the stocks in that month.
- RLDp_t: Return of the (LDP) portfolio during the month (t) in the companies that pay low dividend. The insiders are the final buyers (sellers) of the stocks in that month.
- αP : Alpha coefficient value that is used for measuring the abnormal return
- βp : Beta coefficient value that is used for measuring the sensitivity of the company's return towards the market return
- R_{mt}: The market return during the month (t)
- R_{ft}: The return that is free from risk
- δ : Sensitivity towards the size factor
- SMB_t: Size of the portfolio.

It represents the gap between the returns of the portfolio of the stocks of great value and the counterpart returns of the stocks of minor value during month (t).

- σp : Sensitivity towards the book value towards the market value
- HML_t: The market value factor to the book value ratio.

It represents the gap between the returns of the portfolio of the stocks of great (book value to market value ratio) and the counterpart returns of the stocks of a minor (book value to market value ratio) during the month (t).

The return of insiders based on the sale and purchase transactions of the companies that pay high dividends in comparison to the counterpart transactions of the companies that pay low dividends may be examined using the aforementioned model. The loss in the adjusted returns of insiders based on the risks in the firms paying high dividends in comparison to the companies paying low dividends shall be represented by a coefficient, which quantifies the abnormal returns if the HML and SMB are risk factors. The influence of size will be greater if the companies paying high dividends are larger than the ones paying low dividends and the insider profit rate in the former companies is lower. The ratio of book value to market value follows the same logic. The characteristics of the company are used to calculate insiders' returns. The ensuing regression equation (2) illustrates its effects, [44].

$$R_{ki} = \alpha + \gamma dy DI + \gamma bm BM_i + \gamma mv \ln (MV)_i + \gamma ev EV_i + \gamma dr DR_i + \sum k_i \dots (2)$$

Whereas:

- R_{ki} = Net profit of insiders (abnormal return of insiders) of month (t) throughout the day (k). This day is the day in which the transaction of the insider is carried out with the company
- DI= the dividend yield of the company. It equals zero in case the dividend is not paid. It equals one in case the dividend is paid.
- BM_i = the book value to the market value of the company
- $\ln (MV)_i$ = the natural logarithm of the company's assets. It is used for measuring the company's size.
- EV_i = the volatility of the profits in the company
- DR_i= the debt ratio in the company.

All of the companies registered on the Amman Stock Exchange have representation from the population in the current survey. Regarding the sample, it consists of 24 enterprises drawn from all of the market's industrial sectors. Based on the volume of exchange in the year 2012, it was selected in 2019. Data on the sample's distribution according to the sector, capital, and date of their market listing are shown in Table 1.

Table 1. The sampled companies

No.	Sector	Company	Date of company on the market	Beginning Capital	Ending Capital
1.	The banking sector	Housing Bk Trd Fin	2004/7/25	4000	100000
2.		Capital Bank	2004/6/15	5280	112900
3.		Jordan Ahli Bank	2004/7/8	7500	150000
4.		Bank Of Jordan	2004/6/15	2400	105800
5.		Cairo Amman Bank	2004/7/25	4120	103950
6.		Bank Al Etihad	2004/6/15	2500	75000
7.	The insurance sector	Middle East Ins	2004/8/14	600	2420
8.	The investment sector	Arab Assurers	2004/10/24	200	20000
9.	The service sector	Arab Int Uni Ins	2004/6/15	2700	11727
10.		Arab East Invst.	2004/9/4	1000	10000
11.	The industrial sector	Arab Potash Co	2004/7/8	900	9000
12.		Jor Phosphate Mn	2004/6/15	2800	16800
13.		Jor Steel	2004/6/15	1500	15187
14.		Nat'l Alum Ind	2004/7/25	360	3600
15.		Ready Mix Concrct	2004/6/15	1755	9213
16.		Al-Quds Ready Mix	2004/7/25	4000	5000
17.		Jor Pipes Manfact	2004/7/8	700	7590
18.	Hotel and tourism investment	Al-Dawliyah H&M	2004/7/25	750	1500
19.		Al-Rakaez	2004/7/8	180	3845
20.		Sura	2004/7/8	432	4553
21.		Rum Group	2006/9/25	1008	2923
22.		Masafat Transport	2006/11/22	354	1239
23.	The agricultural sector	Jor Worsted Mill	2004/8/3	236	300
24.		Arabian Dev Co	2004/9/4	1000	4000

4 Results and Discussion

Q.1: What is the reality of relying on IT in raising the efficiency of the Amman Stock Exchange Market mediated by the behaviour of the stock prices?

The abnormal returns are the funds acquired by the insider because he possessed a competitive advantage in the IT industry because of his employment with the company or knowledge of management choices. It stands for the discrepancy between the actual return and the anticipated return on the financial paper. It serves as a gauge for the IT application in the current investigation. The results of calculating the anomalous returns of the stocks of the sampled companies are displayed in Table 2.

Table 2. The results of calculating the abnormal returns of the stocks of the sampled companies for the year 2012

Company	Y1	Y 2	Y 3	Y 4	Y 5	Y 6	Y 7	Y 8	Y 9	Y 10	Y11	Y12	YM
1	0.387	-0.256	-0.250	0.088	-0.023	-0.163	-0.294	-0.109	-0.012	-0.012	-0.091	0.365	-0.031
2	0.737	0.302	0.129	-0.082	-0.584	-0.491	-0.264	-0.199	-0.177	-0.042	-0.428	0.121	-0.081
3	0.680	0.411	-0.056	-0.091	-0.207	-0.252	-0.456	-0.333	-0.238	-0.075	0.285	0.039	-0.024
4	0.757	0.113	-0.303	-0.471	-0.594	-0.564	-0.238	0.165	0.294	0.109	-0.091	-0.129	-0.079
5	0.831	0.319	-0.009	-0.374	-0.566	-0.510	-0.335	-0.194	-0.027	0.121	-0.150	0.302	-0.049
6	0.389	0.066	-0.341	-0.350	-0.127	-0.094	-0.204	-0.051	-0.018	0.039	-0.027	0.411	-0.026
7	0.198	-0.168	-0.417	-0.625	-0.185	0.163	0.330	0.231	0.018	-0.129	-0.018	0.113	-0.041
8	1.019	0.737	0.369	0.060	-0.277	-0.514	-0.550	-0.555	-0.476	-0.322	0.018	0.211	-0.023
9	0.850	0.309	0.199	0.134	-0.192	-0.567	-0.589	-0.303	-0.191	-0.194	-0.476	-0.264	-0.107
10	0.887	0.542	0.194	-0.091	-0.217	-0.355	-0.351	-0.400	-0.335	-0.290	-0.169	0.191	-0.033
11	0.793	0.365	-0.043	-0.428	-0.611	-0.523	-0.430	-0.164	0.096	0.156	-0.403	0.330	-0.072
12	0.398	-0.335	-0.029	0.285	0.026	-0.209	-0.081	0.177	-0.062	-0.491	0.523	-0.550	-0.029
13	0.979	0.562	0.211	-0.091	-0.270	-0.347	-0.421	-0.503	-0.411	-0.269	-0.120	0.282	-0.033
14	0.393	-0.159	-0.264	-0.150	-0.126	-0.281	-0.212	0.282	-0.033	-0.342	-0.300	-0.017	-0.101
15	0.546	-0.502	0.191	0.268	-0.169	-0.099	-0.425	-0.017	0.350	-0.295	-0.566	0.056	-0.055
16	0.415	-0.169	-0.140	-0.532	-0.069	0.387	0.146	0.056	-0.213	-0.384	-0.404	0.562	-0.029
17	0.342	-0.403	-0.272	-0.077	-0.051	0.046	0.546	0.332	0.056	0.845	-0.042	0.159	0.123
18	0.690	0.523	0.308	-0.017	-0.159	-0.491	-0.472	-0.378	-0.350	-0.270	-0.060	-0.502	-0.098
19	0.312	-0.402	-0.042	0.051	-0.161	-0.120	-0.055	-0.246	-0.194	0.120	0.161	0.191	-0.032
20	0.512	-0.020	-0.060	-0.218	-0.342	-0.300	-0.281	-0.101	-0.021	0.085	-0.091	-0.140	-0.081
21	0.904	0.532	0.161	-0.213	-0.341	-0.566	-0.592	-0.373	-0.159	-0.029	-0.008	-0.272	-0.080
22	0.645	0.191	-0.091	0.072	-0.088	-0.404	-0.551	-0.373	-0.027	-0.020	0.017	0.308	-0.027
23	0.272	0.144	-0.008	0.217	-0.021	-0.147	-0.147	0.005	-0.255	-0.261	0.546	-0.042	0.025
24	0.420	0.131	0.017	-0.114	0.020	-0.042	-0.023	-0.172	-0.261	-0.326	0.415	0.387	0.038

Table No. 2 shows that the average abnormal returns brought on by IT applications and their associates are -0.04 on average. This figure indicates an unusual loss. The market, therefore, lacks any asymmetric information that may be leveraged to generate positive anomalous returns. Three out of the 24 enterprises (or 12.5%) saw aberrant returns, it can be shown. The greatest value of irregular returns is evident. Furthermore, the average for Company No. 17 is 0.123. Company No. (23) Display an abnormally positive return (0.025). That suggests that by relying on market IT applications, the later corporation has access to information that the other investors do not. This business was able to profit unusually thanks to this possession. The returns from the other companies are abnormally negative. That indicates that such businesses experienced unusual losses because of their lack of access to information that other investors had. This lack of possession is explained by not employing IT applications during the intended period.

It is worth noting that this table only indicates anomalous returns; it does not reflect the firms' overall returns or whether they were profitable or not. The anomalous returns are computed by deducting the predicted returns based on market circumstances from the company's actual results. A negative anomalous return indicates that the actual return was less than projected, suggesting an exceptional loss. A positive anomalous return indicates that the actual return exceeded the projected return, suggesting an unexpected gain. It also is worth noting that the sample size of only 24 businesses is tiny and may not be indicative of the overall market. As a result, more study with a bigger sample size is needed to corroborate these findings and understand the particular ways in which IT applications affect company returns. Furthermore, the findings of this table imply that organizations that efficiently use IT applications can obtain an informational advantage over other investors in the market, which may result in abnormally good returns. Companies that do not use IT applications efficiently, on the other hand, are likely to incur

anomalous negative returns, suggesting that they are missing out on information that could be used to create positive returns.

The outcomes of the statistical study on the effectiveness of the Amman Stock Exchange Market are shown in Table 3. The level of significance is 0.05. The test's overall significance value was (0.041), which is less than the cut-off of (0.05) used to run the test.

Corporate leaders, who are more familiar with current profitability and prospective investment opportunities than outside investors, may also be involved in the findings. Managers and investors are therefore aware of this. (It is a given that managers have access to additional information because of IT applications.) On the other hand, managers make decisions that are more in line with the needs of the existing (i.e., old) shareholders in the business than those of the new shareholders, and the older shareholders are not always positive. That is because, when they learn more about the company's activities, they do not logically rebalance their portfolio. The broad information that is accessible, however, has an impact on the financial markets' efficiency. As a result, the transactions for issuing stocks are free of charge.

Table 3. The efficiency of Amman Stock Exchange Market

Sector	Z	Median	Sig
Banks	-3.654	29.3	0.032
Insurance	-3.915	43.88	0.022
Investment	-1.654	84.43	0.026
Services	-3.435	59	0.088
Industry	-1.893	23.45	0.021
Hotels And Tourism	-2.821	27.66	0.043
Agriculture	-3.932	77.27	0.009
Total	-2.167	25.67	0.041

**Tabulated t value at the significance value of 0.05
Based on these findings, the study rejects the following research hypotheses: H01: IT has no impact on improving the Amman Stock Exchange Market's efficiency. It is reasonable to assume that IT will increase the effectiveness of the Amman Stock Exchange Market.*

Possibly addressing the challenges that prevent market management decisions and contracts from being carried out. It is the first action taken to address the issue of the stock market's declining operational effectiveness. It increases the economy's overall performance and efficiency as well as that of the financial markets in particular. A key component of achieving this goal understands the barriers that prevent individuals from taking advantage of current

IT applications in stock exchange marketplaces. They consist of harnessing the available expertise and investing in the technical potential that is currently available. Industrial information systems and programs can be used to do that. It is possible by utilizing the most recent knowledge of experts in the fields of system development, data processing, and delivery to exchangers. To provide the finest services and cater to their unique demands, data should be supplied to exchangers using the most up-to-date technology. It needs to be given to exchangers to advance the technologies, communication systems, and services offered while also effectively distributing data to all participants in the stock exchange market.

In the stock market, the usage of technologies such as artificial intelligence, machine learning, and blockchain is predicted to rise. This might result in more efficient and accurate decision-making, as well as speedier trade processing. The automation of several stock markets procedures, such as trading and clearing, is also likely to increase. This might result in better efficiency and lower expenses. The usage of digital assets such as cryptocurrency in the stock market may rise. This might provide new investment possibilities as well as new regulatory issues. Sustainable investments may expand as public knowledge of environmental and social concerns develops. This might result in a shift in the sorts of investments made and the firms that are invested in. As investors grow more cognizant of the impact of their investments on the environment, society, and corporate governance, ESG aspects in stock market decisions may become increasingly important. Financial data visualization and new methods to engage with the stock market might be enabled by virtual and augmented reality technologies.

This observation is consistent with the findings of Arashi & Rounaghi, [7]; Gaio, et al., [22]; Hu, et al., [28]; Abdo, et al., [1].

Q.2: Is there any statistically significant relationship between IT and the efficiency of the Amman Stock Exchange Market mediated by the behaviour of the stock prices?

The outcomes of the statistical analysis for the study's variables are shown in Table 4. (i.e. IT application, the behaviour of the stock prices, and the efficiency of the financial market). The level of significance is 0.05. The regression coefficient value is shown in the table. It suggests that the majority of businesses have negative IT applications and stock price behaviour. It is evident that some of the determination coefficient (R2) values are high while

Table 4. The impact of using IT applications on the behaviour of the stock prices

No.	Company	B	R ²	Calculated t value
1	Housing bk trd fin	-0.317	0.237	8.869
2	Capital bank	-1.672	0.653	11.064
3	Jordan ahli bank	-0.179	0.658	3.389
4	Bank of jordan	-0.112	0.123	7.459
5	Cairo amman bank	-0.721	0.534	9.260
6	Bank al etihad	-1.717	0.394	4.243
7	Middle east ins	-1.390	0.571	10.320
8	Arab assurers	0.703	0.712	13.585
9	Arab int uni ins	-1.323	0.274	7.604
10	Arab east invst.	-0.798	0.174	4.075
11	Arab potash co	-2.838	0.281	6.828
12	Jor phosphate mn	-0.534	0.039	7.847
13	Jor steel	-0.530	0.470	10.059
14	Nat'l alum ind	-1.859	0.350	1.524
15	Ready mix conctr	-0.317	0.028	7.378
16	Al-quds ready mix	-0.632	0.538	12.251
17	Jor pipes manfact	0.148	0.201	15.038
18	Al-dawliyah h&m	-0.632	0.538	11.023
19	Al-rakaez	-0.317	0.032	9.827
20	Sura	-0.487	0.344	1.053
21	Rum group	2.320	0.505	6.578
22	Masafat transport	-1.132	0.197	7.278
23	Jor worsted mill	1.014	0.92	20.425
24	Arabian dev co	1.146	0.780	16.182

*Tabulated t value at the significance value of 0.05

the majority have intermediate values. This indicates that the majority of variations in stock price behaviour across the majority of corporations may be ascribed to the way IT applications are used. Table 4 shows that the impact factor values are strong and favourable in the companies listed (8, 21, 23 and 24). The latter values are, respectively, 0.703, 2.33, 1.014, and 1.146. The values of the determination coefficients are, in order, 71.2, 50.5, 92, and 78%. As a result, most businesses did not experience abnormal returns, which serve as a gauge for the use of IT applications. The anticipated return exceeds the profit realized from the company's stocks. It was discovered that there is a statistically significant relationship, mediated by the actions of the stock prices, between using IT applications and the effectiveness of the Amman Stock Exchange. Furthermore, the high determination coefficients and significant and favourable impact factor values indicate that the usage of IT applications in these organizations has a good influence on their financial performance. The high determination coefficients also show that the employment of IT applications

can explain a considerable percentage of the fluctuation in the efficacy of the Amman Stock Exchange. It should be noted that these findings are based on a specific sample of Amman Stock Exchange firms and may not apply to other companies or stock exchanges. More study is needed to validate these findings and understand the particular manner in which IT applications affect the functioning of the Amman Stock Exchange. Overall, the findings of this table indicate that the usage of IT applications in firms listed on the Amman Stock Exchange has a favourable influence on their financial success as well as the stock exchange's overall efficacy. It should be noted that these findings are based on a specific sample of Amman Stock Exchange firms and may not apply to other companies or stock exchanges.

The findings of the statistical analysis for the relationship between IT and the effectiveness of the Amman Stock Exchange Market, as mediated by the behavior of the stock prices, are presented in Table 5. The level of significance is 0.05. The significance

test's overall value was (0.032), which is less than (0.05).

Based on these findings, the study rejects the following research hypotheses: H02: The effectiveness of the Amman Stock Exchange Market, as mediated by stock price behaviour, is not statistically associated with IT. As a result, it is reasonable to argue that there is a statistically significant relationship between IT and the effectiveness of the Amman Stock Exchange Market, which is mediated through the movement of stock prices.

Table 5. The relationship between IT and the efficiency mediated by the behaviour of the stock prices

	B	R ²	t value	Sig
Constant	-0.517		5.661	0.000
Overall Companies	-0.579	0.381	8.564	0.032

*Tabulated t value at the significance value of 0.05

The findings could also be highlighted because they prevent losses in sales operations. This is because, to full execution of the decision and movement of stock prices, the central control finding validates the existence of financial documents and credit before transferring the selling decision to the electronic exchange system. This revelation also eliminates any possibility of inaccuracy in exchange procedures. Using the internet can reduce the time and movement of stock prices by eliminating the need to go to the stock exchange market or brokerage firms. Instead of visiting this market or similar establishments, one can do exchange operation transactions through the most advanced exchange platforms. Consider how easily the clearance, portfolios, financial status, and purchasing power may be determined. Use might make it easier to swiftly and immediately upload the order. It makes it possible to find the clearing on the same day. Customers who want to enter multiple orders at once may find that using an assist executes the purchase and sale orders very quickly. This is due to some clients who swap many things and demand many simultaneous transactions. Perhaps this will make it simpler for people to participate in the movement of stock values on the Amman Stock Exchange. It connects domestic and international investors with market players in Jordan. Opening the possibility of trading on the Amman Stock Exchange, it offers traders a range of options for stock price movement. Customers and subscribers

trust the market to meet their demands by providing them with information about the movement of stock prices on exchange instruments, which is a final but crucial point.

The stock market's usage of technology, such as artificial intelligence and machine learning, is projected to develop further. This might result in more efficient and accurate decision-making, as well as speedier trade processing. The automation of several stock markets procedures, such as trading and clearing, is also likely to increase. This might result in better efficiency and lower expenses. Mostly with the advancement of technology and automation, the stock market may become more transparent. This might result in better-informed investors and more efficient securities pricing. With the expanding use of technology and automation, the stock market may face additional regulation. This might result in stronger monitoring and investor protection. The stock market is predicted to grow increasingly global as the globe gets more linked. This might lead to more investment possibilities as well as increasing competition.

This observation is consistent with the findings of Nguyen, Bui, & Pham, [39]; Ramezani, Pejmanfar, & Ebrahimi, [41]; Arashi, & Rounaghi, [7]; Adenomon, Maijama'a, & John, [2]; Al-Qudah, et al., [3].

5 Conclusion

According to the findings of this study, businesses use information technology to increase the effectiveness of the Amman Stock Exchange through the behaviour of stock prices. As was already mentioned, there is broad agreement in the literature that IT gives firms numerous chances to design their efficiency of the Amman Stock Exchange and the Behaviour of the Stock Prices. However, previous research focuses mostly on one or a small number of the options offered by IT. The findings of these studies are unquestionably extremely reliable, but it would also be beneficial to consider IT in a broader context and pay close attention to how IT might increase the effectiveness of the Amman Stock Exchange.

The results of this study show that, among the 24 companies listed on the Amman Stock Exchange, Information Technology has had a major negative impact on Amman Stock Exchange efficiency. To improve the operational efficiency of such markets, the report advises expanding the use of IT in emerging stock markets, including the Amman Stock Exchange. Moreover, expanding Amman Stock Exchange's online exchange activities.

Deterring insiders from gathering knowledge exclusively and using it to generate excessive gains at the detriment of outside investors. This can be accomplished by using a strategy based on openness and transparency. However, encourages academics to concentrate on theoretical and empirical elements of asymmetric knowledge and how it affects financial decisions. There is a need to perform additional research on these issues.

Subsequently, the first limitation of this study is that it does not deal with big data and artificial intelligence. In addition, the sample size for this analysis was limited to some companies, as it was the only case that matched the study period. Therefore, this study is exploratory and does not attempt to demonstrate causal relationships between parameters. News anomalous returns are used for this study, either as a measure of market efficiency or data on stock market efficiency and stock price movements, but with well-documented limitations. Other notes: This study was conducted in 2020. This survey is based on 2019 data. In contrast, this study examines how certain key company-level issues are affecting the market. All of these questions need more thorough consideration.

To ensure the efficiency of the Jordanian market exchange, The paper also makes the case for increased Amman Stock Exchange efficiency to uphold efficiency and principles in Jordan, particularly the principle of efficiency and behaviour of stock prices, and to make sure that these principles are put into practice in both private and public businesses rather than just being adopted in theory. Future research will be fascinating when it examines the effectiveness of the stock exchange. Additionally, it is important to look into the Middle Eastern nations to see if their outcomes are like Jordan's or distinct from it, as well as to identify any overlaps, discrepancies, points of compatibility, and areas of conflict.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

- Yaser Ahmad Arabyat, Mutasim Aldabbas and Mohammad Zakaria Alqudah Conducted the Simulation, Original Writing and Optimization.
- Ghaith Abu Alfalayeh and Taha Barakat AlShawawreh Has Implemented Statistical Analysis.
- Mohammad Zakaria Alqudah has organized and executed the Experiments of Section 4.
- Yaser Ahmad Arabyat was Responsible for the Conclusion.

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Conflict of Interest

The authors have no conflict of interest to declare.

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