

# The Impact of Big Data on the Nexus between Financial Leverage and Stock Price Prediction

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## Abstract

This research explores the impact of financial leverage on stock price prediction among listed industrial Jordanian companies. Moreover, the effect of big data as a moderating variable on the relationship between financial leverage and stock price prediction. The study uses two types to measure financial leverage according to the terms [short-term and long-term]. The study results point out that only short-term leverage influences stock price prediction among listed industrial Jordanian companies, which it maybe because short-term leverage has a direct impact on a firm situation compared with long-team leverage that resorts it to achieve long-term goals. Furthermore, the findings provide an original contribution by asserting that big data plays a main moderating role when making decisions regarding investment, where it helps in expecting stock prices in companies with financial leverage.

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## 1. Introduction

No one can ignore the importance of expected stock prices for stakeholders, especially investors and management members [1]. The expected prices of a stock signal its potential for gains or losses. If the predicted price is higher than the current price, it suggests that shareholders believe the company will grow its profits in the future. This positive outlook means shareholders are likely pleased with the management's performance, which in turn increases the chances that executives will retain their positions and receive higher compensation [2].

To achieve the interests requested by shareholders, the management members may resort to plans and policies to increase the expected returns of stocks, and among these plans considered crucial and require study are resorting to debt and changing in leverage ratio, therefore, bearing higher risks to increase working capital to achieve more profits and maximizing investors' wealth [3-5].

The prior research on the impact of corporate capital structure and financial leverage on shareholders' wealth and stock price is well-established and has been extensively examined by researchers such as [5]. In addition, capital markets in developing economies like Jordan are generally less efficient compared to those in advanced economies, primarily due to information asymmetry. This disparity in the availability and quality of information results in market investors in developing economies having unequal access to relevant data, leading to inefficiencies. Consequently, conclusions and inferences drawn from data in advanced economies are unlikely to be accurate for developing economies [6]. Therefore, it is expected that big data will play a crucial role in helping investors analyze historical management and company performance, make informed decisions, and predict stock prices based on existing financial leverage.

Beside big data helps the investors in expecting the stock price, leading companies have become to use big data in business practices to enhance the understanding of markets behaviours, optimizing current efficiencies, and enabling future forecasting for better decision-making [7, 8]. Oussous, Benjelloun [9] mentioned that big data is crucial in putting and developing polices and plans tailored to specific managerial contexts such as changing capital structure and incensing the ratio of financial leverage. Additionally, the immense volume, velocity, and variety of

data generated provide stakeholders with unprecedented opportunities to derive actionable insights and support their decision-making processes [10].

Many previous and recent studies such as Chen and Chiang [11], Guo, Legesse [12], and Sharma, Bhardwaj [13] have tried to identify the factors that affect expected stock returns and prices. Few of them focus on the influence of financial leverage on stock price like [12, Claassen, Dam [14], and Ibrahim and Isiaka [6]. However, this study makes an original contribution by using big data as a moderating variable to explain how it helps to understanding the nexus between corporate financial leverage and expected stock price among Jordanian listed companies.

## **2. Related Literature and Theoretical Framework**

### **2.1 The impact of financial leverage on stock price prediction**

Projected profits denote the forecasted financial performance derived from prior and current operations, market trends, and future estimations. These indicators are important for all stakeholders, especially investors, aiding investment choices, resource distribution, and strategic financial planning. Precisely predicting these earnings is crucial for companies to uphold investors and shareholder trust and support short and long-term growth plans.

While investors rely on projected stock prices to guide their investment decisions, other critical factors, such as financial leverage, also play a significant role. Both small and large companies may seek financing or loans to meet their business needs, expand geographically, increase product offerings, or enhance capital investments. This can lead to increased profits and returns for the company and its shareholders. Do, Nguyen [15] noted that leverage can be a investment strategy, where some investors prefer companies that utilize leverage, while others may be interested solely in all-equity companies [without leverage]. These different preferences, known as leverage clienteles, can lead to return movement among leveraged stocks and unleveraged ones.

Based on leverage clienteles thought, leverage considered a method to enhance potential returns, plays a crucial role in investment decisions [6, 12, 15]. High leverage can amplify both gains and losses, making it a double-edged sword. When investors observe robust expected earnings, they may be more inclined to accept higher leverage, anticipating that the company's strong financial performance will cover debt obligations and generate substantial returns.

Prior searchers use trade-off theory to explain how leverage may impact on future stock prices. The trade-off theory explains that firms aim to balance these factors to maximize their value. By finding the optimal level of leverage, companies can enhance expected stock price while managing the associated risks. Akhtar, Yusheng [16] and Poursoleiman, Mansourfar [17] argue that it can enhance profitability during periods of growth, it increases financial risk, especially in volatile markets or economic downturns. Companies with high leverage must manage their debt carefully to ensure that interest payments and principal repayments do not erode their earnings. Therefore, accurate projections of expected earnings and stock price are essential for investors to evaluate the sustainability of leverage and its impact on long-term financial health.

There is mix results in previous studies about the relation between leverage and stock prices, some studies such as Teng, Si [18] found that there is a positive relation between leverage and future stock prices, in addition Do, Nguyen [15] noted that shares in leveraged companies are related to high future earnings compared to shares in zero-leverage companies. Claassen, Dam [14] point out that the leverage creates fluctuations in profits, stock returns and prices, while Johnson, Chebonenko [4] assert that leverage negatively influence on future stock price.

Based on previous discussions in mixed results of studies and trade-off theory which emphasize that companies can support and increase future earnings by leverage, we can hypothesize that corporate leverage may have an influence on future earnings and stock returns. Specifically, companies with corporate leverage are likely to get higher expected earnings and stock returns compared to zero-leverage companies. Hence, the hypothesis in the study is:

*H1: companies with leverage have higher expected stock price than zero-leverage companies.*

### **2.2 The impact of big data on stock price prediction and leverage**

In general, any decision taken by corporate management needs relevant and reliable data. Thus, Companies need different data regarding operations and know market needs, customer preferences, and other useful data that management requires. By analysing this data, corporate management can make informed decisions that enhance efficiency, optimize resources, and build strategic plans [19]. Data-driven decision-making helps corporate management reduce financial risks, avoid failure, identify growth opportunities, expect the future, and improve performance. Therefore, the leading companies build big data that allows them to refer to it to make successful decisions that help them stay ahead [20].

Big data refers to the vast volumes of data generated by a great variety of multiple sources. This data, when effectively harnessed, can provide deep insights and read the future which was previously difficult. Big data

analytics enables companies to process and analyse massive datasets quickly and accurately, uncovering patterns and trends that inform multiple decisions [21]. The ability to analyse big data gives companies a unique edge, allowing them to innovate, predict the market future, and respond to unusual changes [22, 23].

The management that uses big data can assess credit risk by analysing vast amounts of financial and non-financial data [21]. Predictive models can be built to forecast future earnings and default probabilities, enabling companies to make more informed decisions about the level of leverage they can safely assume. In addition, it can help companies analyse the cost of different financing options by comparing interest rates, terms, and conditions from various lenders, as well as identify the most cost-effective sources of debt and equity, optimizing their capital structure [24].

Not only big data helps companies in managing or making decisions regarding financial leverage, but it helps also stakeholders including corporate managers, shareholders, and investors in expecting future earnings. Al-Dmour, Saad [25] and Sardi, Sorano [26] noted that the availability of information in big data about the previous and current performance, corporate situation, market, and global economy provides a base to expect corporate earnings and stock price. Furthermore, big data can uncover potential growth opportunities by analysing trends in consumer behaviour and market demands, which will support companies in deciding when and where to invest borrowed capital. Leveraging debt to finance high-potential projects identified through big data can enhance returns and improve overall financial performance.

Despite the fluctuating of stock return and prices is one of a highly challenging fields due to its unpredictability, using big data helps stakeholders build similar patterns in historical share returns or price data to predict share prices with high accuracy and determine key proxies such as financial leverage and stock return that significantly influence the prices [27, 28]. Signalling theory indicate that big data enhances and improves stakeholders' decisions, this will return to create the trust of stakeholders and corporate management, especially big data allows for real-time data analysis and reporting. This can lead to more timely and relevant signals, increasing their reliability and value to stakeholders [29].

Numerous studies focus in importance of big data in making decisions such as capital structure and borrowing loans, and how can manage the capital to improve the earnings and stock returns by suggesting plan and policies have built by historical data. Therefore, it is expected that big data analytics impacts on financial leverage managing and stock price prediction. By leveraging big data, firms can gain deeper insights into market conditions, consumer behaviour, and operational performance. This enables them to anticipate stock price, make more informed decisions, managing corporate capital, and achieve the desired performance success. Therefore, this paper investigates the big data as a moderator on the nexus between financial leverage and stock price prediction. Thus, the hypothesis is:

*H2: Big data moderates the nexus between financial leverage and stock price prediction.*

### **3. Data Collection**

#### **3.1 Sample**

This paper focus on non-financial firms listed on the Amman Stock Exchange. Those firms were specifically chosen due to differences in the characteristics of certain items within financial annual reports compared to other sectors. Data collection was from 2018 to 2022 to give full image about the relationship between financial leverage and stock price prediction, and the impact of big data on this relationship between them.

#### **3.2 Measurement of variable**

##### **3.2.1 Financial Leverage**

Financial leverage is one of the strategies used to increase the future return on investment for firms, it points out the debt-to-equity ratio, which is calculated by dividing a company's total liabilities by its shareholders' equity. This ratio serves as an indicator of the extent to which a firm is utilizing debt to finance its growth and operations. However, a higher debt-to-equity ratio implies that a firm is more leveraged, which means that it depends on it to support its capital. In other words, this can enhance returns in coming periods to improve the firm performance. The financial leverage is not always good, as it creates more risk, as the firm must meet its debt obligations regardless of its financial situation. Thus, financial leverage is good in case the firm manages it in the right way.

This paper has an original contribution by using two types of financial leverage—short-term and long-term. Short-term leverage indicates borrowing with repayment due within a year, which offers the benefit of quick access to capital for immediate needs and operational flexibility. whilst, long-term leverage means borrowing with repayment schedules extending beyond one year, providing the advantage of stable, long-term funding for substantial investments and projects without the pressure of immediate repayment but more risk to achieve a high return to cover the interests.

### 3.2.2 Big Data

This study used binary to measure big data, any firm that depends on big data in its work takes 1, otherwise takes 0 which means it does not have big data. The binary method is considered one of the simple methods to classify businesses according to their implementation of big data in making decisions for the level of all departments in the firm, this makes the analysis of the effects on different variables easy and obvious.

### 3.2.3 Stock Price Prediction

The stakeholders use many techniques to try to forecast the future price movements of a company's shares, where accurate stock price prediction is essential for current and future investors to make decisions and try to optimize their investments. Stock price prediction is measured using a combination of quantitative methods such as statistical analysis, machine learning algorithms, and technical indicators, as well as qualitative approaches like market sentiment analysis and expert opinions. However, key metrics for evaluating the accuracy of stock price predictions include mean squared error [MSE], root mean squared error [RMSE], and mean absolute error [MAE]. These metrics indicate the predicted stock prices based on actual prices; this provides a full image of stock movements. In this paper, the following model was used:

$$SP_{it+1} = \alpha + \beta [SP_{it}] \quad (1)$$

### 3.3 Methodology

Hierarchical analysis was used in this study to investigate the impact of moderating and independent variables [big data and financial leverage] on the dependent variable- stock price prediction. This method helps the analysts to give clear results about the influence of independent variables on dependent variables, and then know the impact of moderating variables on both of them with control variables. The control variables usually are firm characteristics, such as return on assets ratio, firm size, and firm type, which they were used as control variables in this paper to investigate the influence of big data on the association between financial leverage and stock price prediction. However, it is expected that the control variables can gain a more nuanced understanding of how the interplay between all variables.

The following model was used to test the hypotheses of the study:

$$SPP_{it} = \beta_0 + \beta_1 [STFL]_{it} + \beta_2 [LTFL]_{it} + \beta_3 [ROA]_{it} + \beta_4 [FS]_{it} + \beta_5 [ST]_{it} + \beta_6 [BD]_{it} + \beta_6 [BD * STFL]_{it} + \beta_6 [BD * LTFL]_{it} + \epsilon_{it} \quad (2)$$

Where:

$SPP_{it}$ : Stock price prediction for company i at year t;

$STFL_{it}$ : Short term-financial leverage for company i at year t;

$LTFL_{it}$ : Long term-financial leverage for company i at year t;

$ROA_{it}$ : Return on assets for company i at year t;

$FS_{it}$ : Firm size for company i at year t;

$ST_{it}$ : Sector type for company i at year t;

$BD_{it}$ : Big data for company i at year t; and

$BD * STFL_{it}$ : interaction term between big data and short term-leverage.

$BD * LTFL_{it}$ : Interaction term between big data and long term-leverage.

## 4. Study Result

### 4.1 Descriptive results

Table 1 shows the findings of descriptive analysis of the main variables of the study including control variables. In general, this analysis gives an overview of the statistics of the study variables, such as the highest value, lowest value, average, and standard deviation. In details, the arrangement of independent variables values are between 0% to 45% for long term leverage and 4% to 76% for short term with means 6.5% and 30.8% respectively. These findings indicate that most of companies do not depend on long terms liabilities, which means that it is able to depend on its capital to achieve what it aims. Whilst, the short-term leverage considers normal compared to other companies that usually have short-term liabilities to continue in the work.

Table 1 also shows that the mean of stock price prediction for the listed companies in Jordan is 7.4%, this mean that it is expected that most of companies will achieve improvement in stock price. Furthermore, the results show that the companies care about big data in their work, where the mean is 55.8%. This indicate that listed companies in Jordan are keeping pace with modern technology and relying on it in their operational processes and decision-making.

Finally, the descriptive analysis notes the findings of control variables [company size, return on assets, and sector type], where all of the results consider normal values compare to Jordanian previous researches such as Karajeh [30].

**Table 1:** Descriptive Statistics

Variable	Min	Max	Mean	Std. Dev
SPP	<b>-1.08</b>	<b>1.82</b>	<b>0.07</b>	<b>0.08</b>
STFL	<b>0.04</b>	<b>0.76</b>	<b>0.30</b>	<b>0.16</b>
LTFL	<b>0.00</b>	<b>0.45</b>	<b>0.06</b>	<b>0.08</b>
ROA	<b>-0.58</b>	<b>15.78</b>	<b>0.58</b>	<b>2.55</b>
FS	<b>6.56</b>	<b>9.07</b>	<b>7.45</b>	<b>0.55</b>
ST	<b>1.00</b>	<b>7.00</b>	<b>4.06</b>	<b>1.92</b>
BD	<b>0.00</b>	<b>1.00</b>	<b>0.55</b>	<b>0.49</b>

#### 4.2 Correlation Test

Table 2 explains the correlation analysis for the variables of the study, this analysis provides initial findings for the nexus of big data, financial leverage, and stock price prediction. The results indicate that STFL and LTFL have a negative nexus with SPP, where  $r = -0.344$  and  $-0.190$  respectively. These results do not support the hypothesis that states “companies with high financial leverage have higher expected stock price than zero-leverage companies”, this means that the stock price prediction is high once the company has low financial leverage, therefore, the sample companies are not able to professionally use the leverage to achieve high earnings cover the interests of borrowings. Furthermore, this result supports Johnson, Chebonenko [4] findings which note that leverage negatively influences future stock price.

The findings in Table 2 show no correlation between BD and STFL, but a negative correlation exists between BD and LTFL with significance = 1%, therefore BD helps management to manage LTFL. In addition, the BD does not correlate with SPP, this means that BD alone does not help the stakeholders in expectation the future return and stock prices. However, the regression analysis is important to show if BD moderates the relationship between financial leverage and SPP, where the correlation test is considered initial for the hypothesis test.

Control variables have normal mixed results with dependent, independent, and moderating variables. In detail, ROA has positive correlations with STFL and SPP. FS has a positive nexus with SPP, which means that the SPP is high for big companies compared to small companies. Furthermore, Table 2 shows that there is no correlation between FS and both STFL and LTFL, despite that the big firms usually prefer borrowing to support their operations and performance. Finally, ST correlates with STFL and LTFL.

**Table 2:** Correlation Test

Variable	SPP	STFL	LTFL	ROA	FS	ST	BD
SPP	<b>1</b>						
STFL	<b>-.344***</b>	<b>1</b>					
LTFL	<b>-.190**</b>	<b>.207**</b>	<b>1</b>				
ROA	<b>.175*</b>	<b>.155*</b>	<b>-.132</b>	<b>1</b>			

FS							
	<b>.195**</b>	<b>.122</b>	<b>.136</b>	<b>.111</b>	<b>1</b>		
ST						<b>1</b>	
	<b>-.055</b>	<b>.324***</b>	<b>-.152*</b>	<b>.236***</b>	<b>.079</b>		
BD							<b>.180**</b>
	<b>.071</b>	<b>-.006</b>	<b>-.332***</b>	<b>.045</b>	<b>.083</b>		<b>1</b>

Note: \* Correlation is significant at the 0.1 level, \*\* Correlation is significant at the 0.05 level, and \*\*\* Correlation is significant at the 0.01 level

### 4.3 Correlation Test

Table 3 explains the findings of hierarchical and multiple regression to test the hypotheses, where three models were used. The first model shows the impact of short- and long-term leverage on stock price prediction and control variables. Model 2 consists of model 1 plus adding big data to investigate the effect of big data on stock price prediction. Finally, adding the interaction term of big data and leverage to examine the influence of big data as a moderator on the relationship between leverage and stock price prediction.

The findings in Table 3 show that STFL negatively impacts SPP in the study's sample companies [B= -72.7% at Sig =0]. This means that it is expected to increase the stock price for the companies that have low short-term leverage, where the increasing debt creates risks and challenges to professionally use the working capital to achieve earnings cover the interest of leverage and expected profit ratio. since most investors prefer not to take risks, which in turn will reduce the demand for buying shares and thus lower their price. This result supports Johnson, Chebonenko [4] findings that noted that the leverage is negatively influence on SPP.

Despite the STFL negatively influence on SPP, table 3 shows that LTFL does not influence on SPP [sig = 16.7%]. The reason behind that it maybe that it is normal that those companies depend on self-financing and have no long-term debt or low long-term debt, then it is not a big deal for attracting investors to buy the stock. However, this result is considered original because most of the prior researchers such as Claassen, Dam [14] and Do, Nguyen [15] study assert that there is a nexus between financial leverage and stock price.

By adding big data in Model 2, the result in Table 3 shows that big data as an independent variable is not related to SPP [B = 0.2%, sig = 96.7%], but Model 3 provides new evidence that the interaction term between financial leverage and big data play a main role in impacting on SPP. The increasing R2 from 23.3% in model 2 to 26.4% in model 3 means that big data influences as a moderator between financial leverage and SPP. This means that existing data with identifying the amount of financial leverage helps the investor to make decisions in increasing the request to buy shares, which in turn impacts stock price.

Regarding control variables, the results show that both ROA and FS positively influence SPP [B = 2.5% and 13.9% respectively]. Furthermore, Table 3 explains that ST does not play any role in impacting SPP. However, the size of companies is usually important in studies, in which the abilities of big companies are totally different compared to small-size companies.

**Table 3:** Regression test

Variables	Model 1		Model 2		Model 3	
	B	Sig.	B	Sig.	B	Sig.
STFL	<b>-.727***</b>	<b>.000</b>	<b>-.727***</b>	<b>.000</b>	<b>-.375</b>	<b>.124</b>
LTFL	<b>-.489</b>	<b>.167</b>	<b>-.484</b>	<b>.197</b>	<b>-.507</b>	<b>.244</b>
ROA	<b>.025**</b>	<b>.026</b>	<b>.025**</b>	<b>.026</b>	<b>.027**</b>	<b>.016</b>
FS	<b>.139***</b>	<b>.006</b>	<b>.139***</b>	<b>.006</b>	<b>.129***</b>	<b>.010</b>
ST	<b>-.003</b>	<b>.850</b>	<b>-.003</b>	<b>.848</b>	<b>-.006</b>	<b>.692</b>

BD		<b>.002</b>	<b>.967</b>	<b>.223*</b>	<b>.061</b>
BD*STFL				<b>-.691**</b>	<b>.038</b>
BD*LTFL				<b>-.146</b>	<b>.853</b>
R <sup>2</sup>	<b>23.3%</b>	<b>23.3%</b>	<b>26.4%</b>		
Adjust R <sup>2</sup>	<b>19.9%</b>	<b>19.2%</b>	<b>21.1%</b>		

Note. \* Significant at the 0.1 level [2-tailed], \*\* significant at the 0.05 level [2-tailed], and \*\*\* significant at the 0.01 level [2-tailed].

## 5. Conclusion

This paper aims to study if both financial leverage [short and long-term] impact stock price prediction and if the companies that use big data in making decisions help in expecting stock price in companies with financial leverage. Using two types of financial leverage and big data as a moderator are the main contributions of the study, where limited prior studies using those variables to expect the stock prices. The findings indicate that short-term financial leverage negatively impacts stock price prediction. In addition, this study asserts that big data helps stakeholders to expect stock prices in case of existing financial leverage in industrial Jordanian listed firms. However, the findings show that long-term financial leverage does not impact stock price prediction, it is may that long-term leverage is related to strategies that need time to achieve and reflect on stock price compared with short-term financial leverage.

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