

# The Impact of Using Cash Flow Elements and Patterns to Predict Financial Distress

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**Abstract**— The study aims at using the elements of cash flows and their patterns in order to anticipate financial distress applying the model of (Zmijewski, 1984) and Altman (1968) to a sample of industrial companies listed on the Amman Stock Exchange (ASE), in which twenty companies were classified as control, experimental and testing companies. To achieve the objectives of the study, this is to analyze the cash flows statement of companies' sample study during the period of 2010-2017, and to test the methodology for studying the ability to predict the failure of companies using the model of Zmijewski and Altman. In order to test the hypotheses of the study, multiple regression model method is used in addition to the data validity test methods through statistical analysis program (E-views9). The study concluded that Zmijewski model and Altman model had a high ability to predict financial distress. The models agreed that there was an impact of the fourth, fifth, sixth and eighth patterns of cash flows in predicting Financial Distress, the absence of the impact in financing cash flows and the third pattern in predicting Financial Distress. The study recommends industrial companies to use cash flows patterns because of their informative content that are useful and accurate in identifying the financial position of the companies.

**Keywords**— Financial Distress, Cash Flow Elements, Cash Flow Patterns, Zmijewski Model, Altman Model.

## I. INTRODUCTION

This This The cash flow statement is considered one of the most important financial statements that help its users to identify the financial conditions of companies. It helps in obtaining information about the financial resources and how to use them during a specific financial period. Especially, the type of information contains in this statement, which includes details about operational, investment, and financing activities (Vies, 2011). This helps in clarifying its monetary impact, along with indicating the nature of this impact, whether it constitutes cash inflows or outflows, and thus judging the extent of the company's success in achieving cash inflows that cover cash outflows, thus determining the financial strength of the company. The importance of this list stems from its informational content and its contribution to improving the ability of companies to predict future risks. Perhaps the most important of which is the financial distress due to its negative effects on the interest of stakeholders, profit-making institutions, and the national economy as a whole. Since

financial distress is one of the greatest challenges facing administrations, companies must identify indicators that help them to predict their vulnerability to this situation and to develop ways to address it and face it in order for the company to achieve its objectives (Qureshi, 2012). This study is based on the perception of the impact of financial distress on companies and profit-making institutions. In general, pursues to predict financial distress utilizing financial cash-based financial indicators represented in the elements and patterns of cash flows along with financial indicators based on accrual accounting represented in Zmijewski and Altman models. Henceforth, the goal of the study is to determine the effects and patterns of the cash flow statement's components. Which consists of the results of their (operational, investment, and financing) activities in predicting the failure or success of public sharing industrial companies listed on the (ASE) during the period 2010-2017. This will be done by applying the Zmijewski model (Zmijewski, 1984) enforced by the results of the Altman model (Altman, 1968).

The problem of the study

In some cases, companies are exposed to circumstances that indicate future financial risks. Companies should be aware of these events precisely to use them as indicators to appropriately measure, review, and improve performance. This will help in avoiding their tendency towards financial distress so they can use elements and indicators of their cash flows to predict what their future financial situation will be. According to previous studies, it will be important to apply models that provide signals and pieces of evidence about the future financial position of companies based on their current conditions and their cash inflows and cash outflows. The following questions represent the study's predicament in light of the aforementioned:

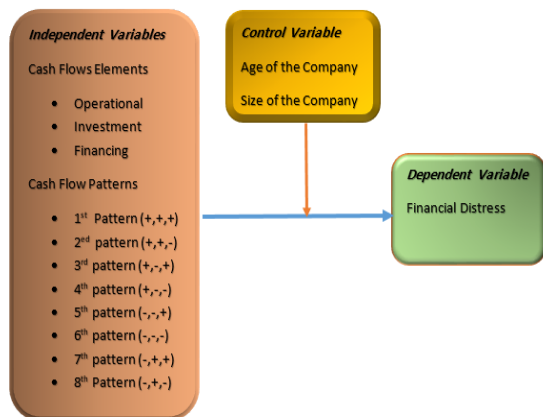
1. Do the components and trends of cash flow from (operational, investment, and financing) activities affect the foretelling of financial trouble in publicly traded industrial enterprises listed on the Amman Stock Exchange?
2. Can Zmijewski's model (Zmijewski, 1984) and Altman's model (Altman, 1968) be applied to industrial companies listed on Amman Stock Exchange to predict their financial distress?

Objectives of the study

This study aims to achieve the following objectives:  
Determine the role of cash flow elements (operational, investment, and financing) in identifying financial distress in the industrial firms listed on the Amman Stock Exchange.

Apply Zmijewski's model (1984) and Altman model (1968)

with respect to the industrial businesses listed on the Amman Stock Exchange to predict financial distress and to use the Altman model as a supporter of Zmijewski model in order to verify the accuracy of the results obtained.



**Study Hypothesis**

In order to achieve the objectives of the study the following hypotheses were formulated:

First main hypothesis:

H01: the elements of the Cash Flow Statement (operational, investment, financing) have no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .

Second main hypothesis:

H02: the patterns of Cash Flow Statements have no statistically significant impact in foreseeing the financial distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .

**II. LITERATURE REVIEW**

Many companies are experiencing financial crises that lead to heavy losses as well as a sharp drop in liquidity, which could threaten the risk of Financial Distress if these crises persist. In order that companies could respond to these crises, they should be fully aware of the financial distress, its causes, and its manifestations. As well as, knowing the forecasting models of Financial Distress to be able to accurately determine its financial situation thus developing plans, designing policies that enable it to address its financial problem, and continue its work to achieve its objectives. Therefore, it is important to build an integrated theoretical framework on financial distress to identify all the information needed by researchers and scholars on this subject.

No	Title	Objective	Result
1	Predicting financial distress companies in the manufacturing and non-manufacturing sectors in Malaysia using macroeconomic variables. (Alifiaha & Tahir, 2018)	Financial distress companies are used as the dependent variable, with financial ratios and macroeconomic indicators as the independent variables, in an effort to predict financial hardship companies in Malaysia's manufacturing and non-manufacturing sectors.	According to this study, the independent variables total assets turnover ratio, current ratio, net income to total assets ratio, and money supply can all be used to predict financial difficulty in Malaysian manufacturing enterprises. However, the debt ratio, working capital ratio, net income to total assets ratio, and money supply were the independent variables that might be utilized to forecast financial hardship for non-manufacturing sector enterprises in Malaysia.
2	Empirical study of the relationship between cash flow management and financial performance of the Jordanian Insurance companies. (Al-Nimer & Sleihat, 2017)	The purpose of the study is to investigate the effects of cash flow management, specifically operating, investing, and financing activities on financial performance and the role played by each of these activities in predicting the financial performance of Jordanian insurance companies (JICs).	According to this survey, when compared to other activities, operating activities' net cash flows are thought to be the largest (financing & investment). In addition, the study concluded that net cash from investment operations was shown to be very important to financial performance.
3	Using Altman's model to predict distress of industrial companies listed on Amman Stock Exchange. (Alrefai, 2017)	The goal of the study was to determine the validity and capability of the Altman model to forecast financial hardship at least two years in advance of the distress's emergence.	The study's findings demonstrated the predictive power of the (Altman, 1968) model for industrial enterprises listed on the Amman Stock Exchange in the two years to come.
4	Using quantitative models and cash flow indicators and their role in forecasting financial distress: An applied study of a sample of Sudanese commercial banks 2012-2014. (Ahmed & Saleh, 2016)	In order to implement the appropriate rules and procedures, the study aimed to give the Sudanese commercial banks crucial information regarding their future tendencies.	The study's findings revealed that according to the Kida, Altman, and Mc Gough models as well as operating cash flow indicators, Sudanese commercial banks are in a state of financial failure. Furthermore, it demonstrated that anticipating financial failure before it occurs helps to solve the issue of financial shortfalls and subsequently to the expansion and sustainability of banks.
5	Cash Flow Statement as an Evidence for Financial Distress. (Sayari & Mugan, 2013)	This study aimed to identify the relationship between the elements of monetary Cash flows and their impact in predicting financial distress using Zmijewski's Model	According to the study's findings, operating cash flow, firm size, and financial difficulty are all negatively correlated. The study also discovered a link between cash flow patterns and predicting financial distress, as well as a relationship between financial cash flow and the company's financial distress.

What distinguishes this study from previous studies?

This study is distinguished as it is applied in the Jordanian context, as well as it utilized two models to predict Financial distress contrary to other studies that used only one model. The scarcity of previous studies utilizing the first model (Zmijewski's model) enhances the study, as the study utilized the model (Zmijewski, 1984) to predict financial distress enforced by the model (Altman, 1968). Henceforth, applying Zmijewski's model enforced by Altman's model is considered the first study in Jordan. The study has identified a new type of company for the purposes of classifying the study sample. All

domestic and foreign previous studies have used only two types to classify companies, which are control companies and experimental companies. While the current study added a new class of companies called test companies to represent the companies that are excluded when categorizing the study sample since the financial situation of this type of companies is difficult to predict. Accordingly, the current study is characterized as one of the first studies in the Arab world that combined the application of Zmijewski's model with Altman's model on three types of companies, namely, control, experimental and test companies.

### III METHODOLOGY

The In order to achieve the goal of this study, the analytical method will be used, which is to evaluate the cash flow statement of the companies consisting of the study sample during the period 2010-2017. The study used an experimental approach to investigate how well organizations can be identified to be in financial distress, using both (the Zmijewski) model and (the Altman) model. After applying the two models to companies and determining whether the company is distressed or not distressed, the study sample will be divided into control companies representing (H, I, J, K, L, M, N) and experimental companies representing (A, B, C, D, E, G, R, F) and test companies representing (O, P, Q, S, T). The two models then are applied to those companies to predict

#### The study's sample and population

The population of the study comprised all industrial companies listed in (ASE) totaled 63 companies according to (ASE) at the end of 2017. The sample of the study was of the purposive type where 20 companies were selected according to certain conditions: The Company should not be established after 2010; the company should not be merged or suspended during the study period that the company financial statements are available. Then the selected companies are classified into three categories (control companies, experimental companies, and test companies), whereby control companies represent non-distressed companies, experimental companies represent distressed companies, and test companies represent companies with a changing financial situation between one fiscal year and another that cannot be judged whether it is distressed or not.

#### Hypotheses Testing and Discussion

The E-views package is used to apply a regression analysis test. The first regression model is designed to test the first hypothesis according to Zmijewski's model and the second regression model is designed to test the same hypothesis according to Altman's model. The first hypothesis states "the elements of Cash Flow Statement (operational, investment, financing) have no statistically significant impact on the ability to foresee financial distress of the industrial enterprises listed on the (ASE) at " $\alpha \leq 0.05$ ".

In order to test the impact of the elements of Cash Flow Statement separately in predicting the Financial Distress of the

companies consisting the sample of the study, a virtual variable was used for each cash flow (operational, investment, financing) as well as the size of the company and its age were used as control variables. The following equation represents the used regression model:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e^{\wedge}$$

Table 2: Zmijewski's Model

Fixed-Effects Regression				
Z	Coef.	Std. Err.	Z	P>z
Operational Cash Flows x1	-0.169	0.078	-2.173	0.035* *
Investment Cash Flows x2	0.086	0.043	1.989	0.061* *
Financing Cash Flows x3	0.336	0.171	1.967	0.049* *
Age of the Company x4	0.071	0.021	3.446	0.001* *
Size of the Company x5	-0.750	0.318	-2.360	0.018* *

Table 2 illustrates the findings of the examination of the elements' effects of Cash Flows in Predicting Financial Distress according to Altman's Model.

Table 3: Altman's Model

Fixed-Effects Regression				
Z	Coef.	Std. Err.	Z	P>z
Operational Cash Flows x1	-0.169	0.078	-2.173	0.035* *
Investment Cash Flows x2	0.086	0.043	1.989	0.061* *
Financing Cash Flows x3	0.336	0.171	1.967	0.049* *
Age of the Company x4	0.071	0.021	3.446	0.001* *
Size of the Company x5	-0.750	0.318	-2.360	0.018* *

Table 3 illustrates the findings of the examination of the elements' effects of Cash Flows in Predicting Financial Distress according to Altman's Model.

Based on the above, the hypotheses will be accepted or rejected as follows:

H01\_1: The Operational Cash Flows have no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at " $\alpha \leq 0.05$ ".

Table 3 illustrates the results of regression analysis of the impact of the elements of monetary Cash Flows in predicting financial distress according to Zmijewski's Model for industrial companies (sample of the study). The value of the coefficient of operational Cash Flows equals (-0.169) indicating a negative relationship with Financial Distress at P=0.035 which is less than. This means that if the Cash Flows are increased by one JD, the financial distress will be decreased by 0.169 points.

Based on this and according to Zmijewski's Model, we accept the alternative hypothesis and reject the null hypothesis, which states, "The Operational Cash Flows have a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at " $\alpha \leq 0.05$ ". This result agrees with (Sayari & Mugan, 2013), (Ahmed & Saleh, 2016), and (Al-Nimer & Sleihat, 2017). Table 3 illustrates the results of regression analysis of the impact of the elements of monetary Cash Flows in predicting financial distress according to Altman's Model for industrial companies (sample of the study). The value of the coefficient of operational Cash Flows equals (0.483) indicating a positive relationship with Financial Distress at  $P=0.173$ . This means that if the Cash Flows are increased by one JD, the financial distress will be increased by 0.483 points. Based on this and according to Altman's Model, we fail to reject the null hypothesis stating, "The Operational Cash Flows have no statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at " $\alpha \leq 0.05$ ". This result disagrees with the study (Ahmed & Saleh, 2016) because of the difference in the population and the sample of the study where the study (Ahmed & Saleh, 2016) was applied in Sudan.

H01\_2: the investment Cash Flows have no statistically significant impact in predicting Financial Distress of the industrial companies listed on Amman Stock Exchange at " $\alpha \leq 0.05$ ".

It is observed from table 2 that the value of the coefficient of investment Cash Flows equals (0.086) indicating a positive relationship with Financial Distress at  $P=0.061$  which is greater than 0.05. This means that the increase in Cash Flows does not affect the financial distress. Based on this and according to Zmijewski's Model, we fail to reject the null hypothesis stating, "The investment Cash Flows have no statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at " $\alpha \leq 0.05$ ". This result agreed with (Sayari & Mugan, 2013) and disagreed with the study (Al-Nimer & Sleihat, 2017). This could be attributed to the fact that this study was applied to industrial Companies listed on (ASE) while (Al-Nimer & Sleihat, 2017) applied to Jordanian insurance companies. Table 3 illustrates the value of the coefficient of investment Cash Flows equals (0.189) indicating to a positive relationship with Financial Distress at  $P=0.083$ . This means that if the Cash Flows are increased by one JD, the financial distress will be increased by 0.189 points. Based on this and according to Altman's Model, we accept the alternative hypothesis and reject the null hypothesis, which states, "The investment Cash Flows have a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at " $\alpha \leq 0.05$ ". This hypothesis has not been tested in any previous studies.

H01\_3: the financing Cash Flows have no statistically significant impact in predicting Financial Distress of the industrial companies listed on Amman Stock Exchange at " $\alpha \leq 0.05$ ".

It is observed from table 2 that the coefficient's value of

financing Cash Flows equals (0.336) indicating a positive relationship with Financial Distress at  $P=0.049$  which is less than 0.05. This means that if the Cash Flows are increased by one JD, the financial distress will be increased by 0.336 points. Based on this and according to Zmijewski's Model, we reject the null hypothesis stating, "The financing Cash Flows have no statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at " $\alpha \leq 0.05$ ". This result agreed with (Sayari & Mugan, 2013) and disagreed with the study (Al-Nimer & Sleihat, 2017). Table 3 illustrates the value of the coefficient of financing Cash Flows equals (-0.635) indicating a negative relationship with Financial Distress at  $P=0.058$  which is less than 10%. This means that if the Cash Flows are increased by one JD, the financial distress will be decreased by 0.635 points. Based on this and according to Altman's Model, we fail to reject the null hypothesis stating, "The financing Cash Flows have no statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at " $\alpha \leq 0.05$ ". and this impact was a negative one. This hypothesis has not been tested in any previous studies.

The third regression model was designed to test the second main hypothesis according to the Zmijewski model while the fourth regression model was designed to test the same hypothesis according to the Altman model.

H02: the patterns of Cash Flow Statements have no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at " $\alpha \leq 0.05$ ".

The following regression model was created for each pattern to assess the effect of Cash Flow patterns independently in predicting Financial Distress on the study's sample:

$$Y = C_0 + C_1X_6 + \hat{\epsilon}$$

Table 4 illustrates the results of testing the impact of Cash Flows Patterns in Predicting Financial Distress according to the Zmijewski model

Table 4: The results of testing the impact of Cash Flows Patterns in Predicting Financial Distress according to the Zmijewski model

fixed-effects regression				
L.y	Coef.	Std.Err.	Z	P>z
Size of the Company x5	-0.866	0.373	-2.323	0.020**
Age of the Company x4	0.075	0.022	3.343	0.001**
First Pattern d1	-0.762	0.398	-1.911	0.074**
Second Pattern d2	0.194	0.519	0.374	0.708**
Third Pattern d3	-0.732	0.388	-1.888	0.081**
Fourth Pattern d4	-0.326	0.156	-2.085	0.043**
Fifth Pattern d5	-0.341	0.165	-2.063	0.049**
Sixth Pattern d6	-0.240	0.105	-2.294	0.026**
Seventh Pattern d7	-0.115	0.565	-0.204	0.838**
Eighth Pattern d8	0.472	0.233	2.022	0.044**

Table 5 illustrates the results of testing the impact of Cash Flows Patterns in Predicting Financial Distress according to the Altman model.

fixed-effects regression				
	Coef.	Std. Err.	Z	P>z
Size of the Company x5	-0.132	0.037	3.583	0.000**
Age of the Company x4	0.114	0.043	2.651	0.024**
First Pattern d1	0.050	0.027	1.865	0.080** *
Second Pattern d2	0.940	0.366	2.571	0.027** *
Third Pattern d3	-0.383	0.297	-1.291	0.268** *
Fourth Pattern d4	0.662	0.386	1.715	0.083** *
Fifth Pattern d5	-0.645	0.276	-2.340	0.032** *
Sixth Pattern d6	-0.797	0.198	-4.026	0.000** *
Seventh Pattern d7	-0.773	0.383	-2.016	0.035** *
Eighth Pattern d8	-0.465	0.236	-1.971	0.062** *

Based on the above, the hypotheses will be accepted or rejected as follows:

Do  $H_{02.1}$ : *The First pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at " $\alpha \leq 0.05$ ".*

Table 4 illustrates the results of testing the impact of the Patterns of Cash Flows in predicting Financial Distress according to the Zmijewski model. The table demonstrates the coefficient value of the First Pattern (+, +, +) equals (-0.762) at  $P=0.074$  indicating to the negative insignificant relationship between this Pattern and the Cash Flows. Based on this, we will accept the first null sub-hypothesis according to the Zmijewski model stating, "The First pattern of Cash Flow Statement (+, +, +) has no statistically significant impact in identifying Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ ." This result agrees with (Sayari & Mugan, 2013) but disagrees with the studies of (Shamsudin & Kamaluddin, 2015) and (Kordestani et al., 2011) due to the difference in populations and covered periods. Table 5 demonstrates the value of Coef. Of the First Pattern (+, +, +) equals 0.050 at  $P=0.080$  showing that there is a strong correlation between this pattern and financial distress. In light of this, we shall accept the alternative sub-hypothesis and reject the initial Altman Model null hypothesis stating "The First pattern of Cash Flow Statement (+, +, +) has a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$  according to Altman Model." It is worth noticing that this hypothesis has not been tested in any previous study. From the foregoing, we infer that companies whose cash flow is characterized by this pattern have good financial positions and are far from financial distress. However, this type of pattern cannot be used as an indicator to predict financial distress, as it indicates that the cash inflows of the company are

not sustainable and the company remains on it just for a temporary period.

$H_{02.2}$ : *The Second pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the coefficient value of the Second Pattern (+, +, -) equals (0.194) at  $P=0.708$  indicating the positive insignificant relationship between this Pattern and the Cash Flows. Based on this, we will accept the second null sub-hypothesis according to the Zmijewski model stating, "The second pattern of Cash Flow Statement (+, +, -) has no statistically significant impact in identifying Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ ." This result agrees with (Sayari & Mugan, 2013) but disagrees with the studies of (Shamsudin & Kamaluddin, 2015) and (Kordestani et al., 2011). Table 5 demonstrates the value of Coef. The Second Pattern (+, +, -) equals 0.940 at  $P=0.027$  showing that there is a direct link between this pattern and financial trouble. In light of this, we will accept the alternative sub-hypothesis and reject the second null sub-hypothesis based on the Altman Model which states as "The Second pattern of Cash Flow Statement (+, +, -) has a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$  according to Altman Model." It is worth noticing that this hypothesis has not been tested in any previous study. We conclude from the foregoing, the second pattern of cash flows (+, +, -) carries signs of financial distress, despite the fact that the operating pursuits' net cash flow is positive, it does not sufficiently cover the financing activities undertaken by the company. Since the net cash flow is from investment activities Positive, there is an indication of a lack of financial strength, if so, the administration is encouraged to engage in operations that involve buying and selling assets in order to balance the cash inflows from investing with the cash outflows from financing.

$H_{02.3}$ : *The Third pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the coefficient value of the Third Pattern (+, -, +) equals (-0.732) at  $P=0.081$  indicating the negative insignificant relationship between this Pattern and the Cash Flows. Based on this, we will accept the third null sub-hypothesis according to the Zmijewski model stating, "The third pattern of Cash Flow Statement (+, -, +) has no statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ ." This result agrees with (Sayari & Mugan, 2013) and (Shamsudin & Kamaluddin, 2015) but disagrees with the study of (Kordestani et al., 2011). Table 5 demonstrates the value of Coef. Of the third Pattern (+, -, +) equals (-0.383) at  $P=0.268$  indicate a negative correlation between this pattern and financial distress. Based on this, we will accept the third null sub-hypothesis according to the Altman Model stating "The third pattern of Cash Flow Statement (+, -, +) has a statistically significant impact in predicting Financial Distress of the industrial

companies listed on (ASE) at  $\alpha \leq 0.05$  according to Altman Model.” It is worth noticing that this hypothesis has not been tested in any previous study. We infer from the above that companies characterized by the third pattern of cash flows (+, -, +) enjoy different profitable investment opportunities. Although the cash flows generated from operating activities still do not cover the cash needed for investment activities and providing enough cash for investment, the solution followed by most companies is to increase the capital through borrowing, after obtaining the appropriate financing, a portion of it is used to invest in profitable activities. Therefore, the company is expected to achieve a large operating cash flow in the future.

*H<sub>02\_4</sub>: The Fourth pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the coefficient value of the fourth Pattern (-, -, +) equals (-0.326) at  $P=0.043$  indicating a negative significant relationship between this Pattern and the Cash Flows. Based on this, we will reject the fourth null sub-hypothesis according to the Zmijewski model stating, “The fourth pattern of Cash Flow Statement (-, -, +) has a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ .” Table 5 demonstrates the value of Coef. The fourth Pattern (-, -, +) equals (0.662) at  $P=0.083$  indicating a positive significant relationship at  $\alpha \leq 0.1$  between this pattern and financial distress according to the Altman model. We conclude that companies that achieve this pattern are considered to be in a good financial position and away from financial distress. The fourth (+, -, -) pattern is considered the optimal pattern of cash flows and confirms that the proper financial position of the company and its divergence from financial risks depends on the company’s ability to create Net operating cash flows sufficient to finance its investments in addition to paying its debts or buying its shares. This result agrees with (Sayari & Mugan, 2013), (Shamsudin & Kamaluddin, 2015), and (Kordestani et al., 2011). It is worth noticing that this hypothesis has not been tested in any previous study.

*H<sub>02\_5</sub>: The Fifth pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the value of coefficients off the fifth pattern (+, -, -) equals (-0.341) at  $P=0.049$  indicating to Negative significant relationship between this pattern and financial distress. The companies that follow this pattern of cash flow suffer from a financial weakness within a relatively short period, and this pattern justifies the company's movement towards growth, despite the weak cash flows from operating activities, The management borrows money to get the funding it needs, and then it invests in various opportunities. In light of the aforementioned, we accept the alternative sub-hypothesis while rejecting the fifth null sub-hypothesis proposed by the Zmijewski and Altman models stating “The Fifth pattern of Cash Flow Statement has a statistically significant impact in

predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ .” The impact was negative in agreement with (Sayari & Mugan, 2013), (Shamsudin & Kamaluddin, 2015), and in contrast with (Kordestani et al., 2011). The Altman Model also shows that the fifth Cash Flows pattern has a statistically significant negative impact on forecasting financial distress. It is worth noticing that this hypothesis has not been tested in any previous study.

*H<sub>02\_6</sub>: The Sixth pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the value of the coefficient Of the Sixth pattern (-, -, -) equals (-0.240) at  $P=0.026$  indicating to Negative significant relationship between this pattern and financial distress. Table 5 demonstrates that the coefficient Value equals (-0.797) at  $P=0.000$  indicating a negative significant relationship between this pattern and financial distress. It should be noted that companies who benefit from this unusual pattern experience financial distress because the previously saved cash will be used for operational, investment, and financing operations even while there is a negative cash flow from operating activities. It is obvious that if operational activities do not produce adequate liquidity, stored liquidity would eventually run out. In light of the aforementioned, we accept the alternative sub-hypothesis while rejecting the sixth null sub-hypothesis proposed by the Zmijewski and Altman models stating “The Sixth pattern of Cash Flow Statement has a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ .” The impact was negative in agreement with (Sayari & Mugan, 2013), (Shamsudin & Kamaluddin, 2015), and (Kordestani et al., 2011). The sixth Cash Flows pattern has a statistically significant negative influence on forecasting financial distress, according to the Altman Model. It is important to note that no prior study has attempted to evaluate this concept.

*H<sub>02\_7</sub>: The Seventh pattern of the Cash Flow Statement has no statistically significant impact in predicting Financial Distress of the industrial companies listed on Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the coefficient value of the seventh Pattern (-, +, +) equals (-0.115) at  $P=0.838$  indicating the negative insignificant relationship between this Pattern and the Cash Flows. Based on this, we will accept the seventh null sub-hypothesis according to the Zmijewski model stating, “The seventh pattern of Cash Flow Statement (-, +, +) has no statistically significant impact in identifying Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ .” This result agrees with (Sayari & Mugan, 2013) and (Shamsudin & Kamaluddin, 2015) but disagrees with the study of (Kordestani et al., 2011). In Table 5, the coefficients of the seventh pattern are shown to be (-, +, +) equals (-0.773) at  $P=0.035$ , demonstrating a substantial negative correlation between this pattern and financial distress. This leads us to reject the seventh Altman Model null sub-hypothesis and embrace the alternative sub-hypothesis that states as “The seventh pattern of Cash Flow

Statement (+, +, -) has a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$  according to Altman Model.” It is important to note that no prior study has attempted to evaluate this concept. The above leads us to the conclusion that the second pattern of cash flows (+, +, -) indicates that the company is in financial distress even though its net cash flow from operations is positive and covers some of its financing needs. The administration is driven to engage in activities that involve investing and selling the assets in order to ensure that the cash inflows from the investment activities balance the cash outflows from the financing activities because the net cash flow from investment activities is positive, which is a sign of a lack of financial strength.

*H<sub>02.s</sub>: The Eighth pattern of the Cash Flow Statement has no statistically significant impact in predicting the Financial Distress of the industrial companies listed on the Amman Stock Exchange at  $\alpha \leq 0.05$ .*

Table 4 demonstrates the coefficient value of the eighth Pattern (-, +, -) equals (0.472) at  $P=0.044$  indicating to a positive significant relationship between this Pattern and the Cash Flows. Table 5 demonstrates that the value of coefficient of the eighth Pattern (-, +, -) equals (-0.465) at  $P=0.162$  indicating to the negative insignificant relationship between this pattern and Financial distress. Companies that achieve this type of cash flow experience liquidity problems due to the negative cash flow of both operational and financing activities. So, the company attempts to sell the assets to meet its cash needs. If the problem of cash shortages is not resolved, the company will sell some valuable assets that it owns to cover cash needs to continue its activities. In addition to this, the continuation of this case will lead to a decrease in credibility as well as a decrease in the creditors’ confidence in the company, and as a result, the external credit decreases. At the same time, the noticeable decrease in the cash inflows leads to a worse situation, which may result in the company entering into a difficult financial crisis. Based on this, we will reject the eighth null sub-hypothesis and accept the alternative sub-hypothesis according to the Zmijewski model stating, “The eighth pattern of Cash Flow Statement (-, +, -) has a statistically significant impact in predicting Financial Distress of the industrial companies listed on (ASE) at  $\alpha \leq 0.05$ .” This result agrees with (Sayari & Mugan, 2013) but disagrees with the study of (Kordestani et al., 2011) and (Shamsudin & Kamaluddin, 2015). There is also, a statistically significant negative impact of the eighth pattern of Cash Flows in predicting financial distress according to the Altman Model. It is worth noticing that this hypothesis has not been tested in any previous study.

#### IV RESULTS

Based on the statistical analysis and testing of the study hypotheses, the results reached can be summarized as follows:

1. Zmijewski model succeeded in identifying the financial distress of all the study sample companies for the year 2015, which indicates that the model has a high ability to identify

financial failure before 5 consecutive years, and its success rate in predicting financial failure for the year 2016 was (95%). This ratio showed the ability of the model to predict financial distress 6 years before its occurrence. The model also succeeded in predicting the financial distress of 17 companies out of 20 companies for the year 2017, where its success rate in that year reached (85%). This ratio shows the ability of the model to predict financial failure 7 years before its occurrence, and we notice from these high rates that the Zmijewski model has a high ability to predict the financial distress of industrial companies listed on the (ASE), and this result was consistent with the study of (Sayari & Mugan, 2013).

2. The success rate of the Altman model in predicting the financial distress of companies (sample of the study) for 2015 was (88%), which indicates that the model has the ability to identify financial distress before 5 years of its occurrence. The success rate of the model in predicting financial default for the year 2016 reached (76%), which indicates its ability to forecast financial failure 6 years before its occurrence. The model also had a success rate of 77% in forecasting the financial failure of businesses for the research sample from 2017. This ratio shows how well the model can foresee financial failure 7 years in advance. The Altman model can infer the financial distress of industrial companies listed on the (ASE) from these ratios. Nonetheless, it should be highlighted that using the research variables, the Zmijewski model is more capable of predicting financial distress than the Altman model. This result was consistent with both (Altman et al., 2014) and (Abdel Rahman, 2012).
3. Altman model confirmed the result of the Zmijewski model that there is a statistically significant impact of financing cash flows on the prediction of financial distress. The two models agreed on the existence of the effects of the fourth, fifth, sixth, and eighth patterns of cash flow on the prediction of financial distress. Also, there was consensus that the third cash flow pattern had little bearing on identifying financial distress in industrial companies listed on the (ASE).

#### Recommendations

1. Paying attention to the elements of cash flow because it contains information about the sources and movement of funds within the company, which helps in judging the company’s success in achieving cash inflows covering cash outflows and thus determining the financial strength of the company.
2. As a result of their valuable and accurate informational content in determining a company’s financial status, the industrial companies listed on the (ASE) should employ patterns of cash flow.
3. It is necessary that the board of directors of each company disclose the pattern of cash flows achieved for each year within the financial ratios that are disclosed annually with reference to the result of the pattern as it carries signs of the financial position of the company.

4. It is necessary to adopt experimental companies as part of a sample of any study because of the accuracy and enhancement it gives to the results of the model used. The importance of this type of company increases when applying more than one model to the same sample.

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