إقــــرار

أنا الموقع أدناه مقدم الرسالة التي تحمل العنوان:

Predicting Corporate Failure
Using Cash Flow Statement Based Measures

An Empirical Study on the Listed Companies in
the Palestine Exchange

التنبؤ بتعثر الشركات عن طريق مقاييس قائمة التدفق النقدي
دراسة تطبيقية على الشركات المدرجة في بورصة فلسطين

أقر بأن ما اشتملت عليه هذه الرسالة إنما هو نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وإن هذه الرسالة ككل أو أي جزء منها لم يقدم من قبل لنيل درجة أو لقب علمي أو بحثي لدى أي مؤسسة تعليمية أو بحثية أخرى.

DECLARATION

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification

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The Islamic University of Gaza
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بسم الله الرحمن الرحيم

نتيجة الحكم على أطروحة ماجستير

بناءً على موافقة شئون البحث العلمي والدراسات العليا بالجامعة الإسلامية بغزة على تشكيل لجنة الحكم على أطروحة الباحث/ احمد عمر محمد الاستاذ لنيل درجة الماجستير في كلية *التجارة*/ قسم إدارة الأعمال وموضوعها:

التنبؤ بتعثر الشركات عن طريق مقاييس قائمة التدفق النقدي

دراسة تطبيقية على الشركات المدرجة في بورصة فلسطين

Predicting Corporate Failure Using Cash Flow Statement Based Measures An Empirical Study on the Listed Companies in the Palestine Exchange

وبعد المناقشة العلنية التي تمت اليوم السبت 19 ذو الحجة 1436 هـ، الموافق 2015/10/03م الساعة التاسعة والنصف صباحاً بمبنى القدس، اجتمعت لجنة الحكم على الأطروحة والمكونة من:

أ.د فارس محمود أبو معمر	مشرفًا ورئيساً	....
أ.د. يوسف حسين عاشور	مناقشاً داخلياً	....
د. وائل محمد ثابت	مناقشاً خارجياً	....

وبعد المداولة أوصت اللجنة بمنح الباحث درجة الماجستير في كلية *التجارة*/ قسم <u>إدارة الأعمال</u>.

واللجنة إذ تمنحه هذه الدرجة فإنها توصيه بتقوى الله ولزوم طاعته وأن يسخر علمه في خدمة دينه ووطنه.

والله ولي التوفيق ،،،

نائب الرئيس لشئون البحث العلمي والدراسات العليا

أ.د. عبدالرؤوف علي المناعمة

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

﴿يَرْفَعِ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ وَاللَّهُ بِمَا تَعْمَلُونَ خَبِيرٌ﴾

صدق الله العظيم

(سورة المجادلة، آية:11)

Dedication

Dedicated to my family specially my parents and to my lovely fiancé

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Praise be to Allah, Lord of the Worlds, peace and prayers on the prophet Muhammad peace be upon him.

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List of Abbreviations

C.A	Current Asset
C.L	Current Liability
CFS	Cash Flow Statement
EBIT	Earnings before interest and tax
FCF	Free Cash flow
INV	Inventory
IUG	Islamic University of Gaza
LPM	Linear Probability Models
MDA	Multiple Discriminant Analysis
N.I	Net Income
NOPAT	Net Operating Profit After Tax
OCF	Operating Cash Flow
PEX	Palestine Exchange
PNA	Palestinian National Authority
ROIC	Return on Invested Capital

Abstract

The purpose of this study is to test the predictive ability of the cash flow statement ratios concerning corporate failure through developing a mathematical model using financial ratios information. Financial ratios were derived from financial statements publicly available from companies listed in Palestine Exchange.

The study used the descriptive analytical approach to test the hypotheses and to develop the models. Data was extracted over the past five years for 48 company representing the 5-economic sectors in Palestine Exchange. Eleven predicting variables were used, namely the Operating Cash Flow on Current Liabilities, Cash Flow Coverage of Interest, Operating Cash Flow Margin, Operating Cash Flow on Total Assets, Earning Quality, Quick Ratio, Operating Cash Flow on Equity, Operating Cash Flow on Net Income, Operating Cash Flow on Current Assets, Free Cash Flow on Current Liabilities and Operating Cash Flow on Free Cash Flow.

The univariate analysis is used to test the first indicators of predictive variables and the results showed that most variables can predict failure. Furthermore, the study results showed that cash-flow ratios can discriminate firms into failed and non-failed groups in both industrial and service sectors for 3-years before failure. Finally the results showed many models that can be used to predict the failure for each sector in the Palestine Exchange except for the banking sector. The results showed that cash-flow ratios cannot discriminate between institutions in the banking sector or predict its failure. However, the results showed in the industrial sector that the most significant cash-flow ratios are the cash flow coverage of interest ratio, operating cash-flow margin ratio and free cash flow on current liabilities ratio. The investing sector showed that the most significant cash-flow ratio is operating cash-flow on free cash-flow ratio. For insurance sector, operating cash-flow on free cash-flow ratio was also the most significant one. Finally for services sector the most significant ratios are operating cash-flow on current liabilities ratio, operating cash-flow on total sales ratio, earning quality ratio, quick ratio, operating cash-flow on equity ratio and operating cash-flow on current assets ratio. The logistic model was able to discriminate between firms and to predict the failure with an overall accuracy rate equal to (86%, 80%, 80%, 76%, 90%) for the banking, industrial, insurance, investing and service sectors respectively.

The study recommends the investors, Palestine exchange management and government agencies to use the models that have been reached to send early warnings signals to the related parties in order to take the necessary corrective or protective actions and to give more concern on cash flow statement based measures in predicting corporate failure.

الملخص

الهدف من هذه الدراسة هو اختبار القدرة التنبؤية لنسب قائمة التدفقات النقدية المتعلقة بفشل الشركات من خلال تطوير نموذج رياضي باستخدام معلومات النسب المالية، حيث تم اشتقاق النسب المالية من القوائم المالية المتاحة للجمهور من الشركات المدرجة في بورصة فلسطين.

استخدمت الدراسة المنهج الوصفي التحليلي لاختبار الفرضيات وتطوير النماذج، حيث تم استخراج البيانات على مدى السنوات الخمس الماضية لثمانية وأربعون شركة تمثل خمسة قطاعات اقتصادية في بورصة فلسطين. أحد عشر متغير تم استخدامه للتنبؤ بالفشل وهم التدفق النقدي التشغيلي على المطلوبات المتداولة، تغطية التدفقات النقدية للفائدة، هامش التدفقات النقدية التشغيلية، التدفقات النقدية التشغيلية على إجمالي الموجودات، نسبة جودة الدخل، نسبة السيولة السريعة، التدفق النقدي التشغيلي على حقوق المساهمين، التدفقات التشغيلية على صافي الدخل، التدفق النقدي التشغيلي على الأصول الجارية، التدفق النقدي الحر على المطلوبات المتداولة والتدفق النقدي التشغيلي على التدفق النقدي الحر .

التحليل الأحادي تم استخدامه لاختبار المؤشرات الأولية من المتغيرات التي لها قدرة تنبؤية وأظهرت النتائج أن معظم المتغيرات يمكنها التنبؤ بالفشل أيضا أظهرت النتائج أن نسب قائمة التدفقات النقدية يمكنها التنبؤ والتميز بين الشركات في كل من قطاعي الصناعة والخدمات قبل ثلاث سنوات من الفشل. أخيرا أظهرت النتائج العديد من النماذج التي يمكن استخدامها للتنبؤ بالفشل باستثناء نموذج القطاع المصرفي. حيث أظهرت النتائج أن نسب التدفقات النقدية لا تستطيع أن تميز بين المؤسسات في القطاع المصرفي أو أن تتنبأ بالفشل، بينما في القطاع الصناعي أظهرت النتائج أن نسب التدفقات النقدية الأكثر معنوية هي نسبة تغطية التدفقات النقدية للفائدة، نسبة هامش التدفق النقدي التشغيلي و نسبة صافي النقد الحر على المطلوبات المتداولة، وفي قطاع الاستثمار أكثر نسب التدفقات النقدية أهمية هي نسبة التدفق النقدي التشغيلي على صافي النقد الحر، أما بالنسبة لقطاع التأمين نسبة التدفق النقدي التشغيلي على صافي النقد الحر هي ايضاً من اكثر نسب قائمة التدفقات النقدية أهمية، وأخيرا بالنسبة لقطاع الخدمات النسب الأكثر معنوية هي

التدفق النقدي التشغيلي على المطلوبات المتداولة، التدفق النقدي التشغيلي على إجمالي المبيعات، نسبة جودة الدخل، نسبة السيولة السريعة، التدفقات النقدية التشغيلية على حقوق المساهمين و نسبة التدفقات النقدية التشغيلية على الأصول المتداولة.

وكان النموذج اللوجستي قادرا على التمييز بين الشركات والتنبؤ بالفشل بمعدل دقة يساوي (86٪، 80٪، 80٪، 76٪، 90٪) للقطاع المصرفي، الصناعي، التأمين، الاستثمار والقطاع الخدماتي على التوالي .

أوصى البحث المستثمرين، وإدارة بورصة فلسطين والجهات الحكومية إلى استخدام النماذج التي تم التوصل إليها من قبل الباحث لإرسال إشارات تحذير مبكرة إلى الأطراف ذات العلاقة لاتخاذ الإجراءات العلاجية أو الوقائية اللازمة قبل الوقوع بالفشل، وزيادة الاهتمام بمؤشرات قائمة التدفق النقدي التي تساعد على التنبؤ بفشل الشركات.

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Chapter One

General Framework of The Study

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1. Chapter One: Study Framework

The Chapter one is about general framework of the study which includes study problem, objectives, importance, variables, hypothesis, previous studies in both foreign and Arabic studies, general commentary on previous studies and finally the originality of this study.

1.1 Introduction

Business failure is a worldwide problem and one of the most investigated topics within corporate finance. Business failure is the situation that a firm cannot pay lenders, suppliers, shareholders and employees there accruals. Numerous business failure studies have been performed over time using traditional statistical techniques and financial ratios as input variables, starting from the seminal paper of Beaver (1966), which initially proposed using financial ratios as a failure predictor in a univariate context, followed by that of Altman (1968), which proposed a multivariate approach based on discriminant analysis. A number of these studies examined whether cash flow improves the prediction of business failure, this study will use cash flow measures to predict business failure since there is need for reliable models that predict corporate failure to enable the parties concerned to take either preventive or corrective actions.

are many reasons for small business failure such as lack of experience, insufficient capital, poor inventory management, over-investment in fixed assets, poor credit arrangement management and unexpected growth (Ames, 2013).

One of the most significant threats for many businesses today, despite their size and the nature of their operations, is insolvency, the factors that lead businesses to failure vary. Many economists attribute the phenomenon to high interest rates, recession-squeezed profits and heavy debt burdens. Furthermore, industry-specific characteristics, such as government regulation and the nature of operations, can contribute to a firm's financial distress (Charitou, Neophytou, & Charalambous, 2004, p. 465).

Bankruptcy may be defined as a condition in which an organization is unable to meet its debt obligations, or petitions a federal district court for either reorganization of its debts or liquidation of its assets (Altman, 1993). Financial distress, on the other hand, is defined as a low cash-flow state in which a firm incurs losses without being insolvent (Purnanandam, 2008).

The terms "bankruptcy", "failure", "insolvency", "liquidation", "loan default", "credit risk", "corporate distress" and "financial distress" have been used in referring to similar failure concepts (Altman, 1993).

There are many parties affected by business failure like investors, creditors, management, suppliers, employees and the auditors if they failed to report about signals of business failure in their auditing report.

Bankruptcy as a phenomenon has been studied in a lot of countries and we may also encounter several across-countries studies. United States, Canada, Australia, Japan, China, Italy, United Kingdom are but a few of the countries where the most eminent studies in this field are conducted. Fewer studies, if none at all, are found in the developing countries (Palestine in specific) or in the transition economies (Shkurti & Duraj, 2010, p. 37).

The Corporate failure have been identified based on experts viewpoint by comparing the first group the non-failed companies which have not subject to failure condition (judgmental) with the second group of companies that failed and subject to failure condition, if the company has a negative OCF in two consecutive years or more during the study period from 2010-2014.

1.2 Problem Statement

The companies in Palestine Exchange don't adopt financial failure prediction models based on cash-flow based measures. The previous studies in predicting business failure used financial ratios derived from accrual accounting-based financial statements. Therefore, there is need to build corporate failure prediction models based on cash-flow measures to detect the companies that have liquidity problems in the Palestine Exchange.

According to (Ataiwiel, 2008) in his study *"The Extent to Which the Banks Depend on the Financial Analysis to Predict Failure",* the results showed that the commercial banks rely less on financial analysis in predicting financial distress or financial failure.

According to (Ghusain, 2004) in her study *"The Use of Financial Ratios to Predict Corporate Failure"* the study talks that the contracting companies did not use financial analysis in predicting financial failure.

According to (Bhandari & Iyer, 2013, p. 667), most models used to predict business failure used data derived from accrual accounting-based financial statements namely the balance sheet and the income statement. Very few studies used data from cash flow statement (CFS), or used any ratios based on information in CFS.

The objective of this study is to explore the effect of cash flow statement based measures in prediction of corporate failure in Palestine Exchange .

Therefore, the study main question is: Can cash flow ratios predict corporate financial failure for each sector in the Palestine Exchange?

1.3   Study Importance

A. The *financial intermediation offices* in the PEX will benefit from the models that have been reached by the researcher for each sector in the PEX as it facilitates the assessment of companies' performance in addition to predicting the possibility of business failure and to send early warning signals to take corrective or preventive actions.

B. The *investors* will benefit from the models that have been reached for each sector to help them in avoiding risky investments and reduce the risk of losing their money in the PEX.

C. The *government agencies* will benefit from the models that have been reached for detecting companies that may bankrupt in the future in order to help them in avoiding financial crises in the PEX and maintain economic stability.

D. The *auditors* will benefit from of the models that have been reached in assessing company's ability to continue as a "*going concern*".

E. *Creditors and suppliers* will benefit from the models that have been reached to assess the liquidity position of the debtor firm.

F. This study content and findings can enrich the researcher's knowledge and increase his experience in Palestine Exchange moreover increase the researcher opportunities in developing his academic and professional career.

1.4   Study Objectives

The main goal of this study is to test the ability of the CFS ratios to predict corporate failure and to discriminate between failed and non-failed companies for each sector in Palestine Exchange.

Other study objectives are:

A. Identifying significant CFS measures that can predict financial failure in the PEX.

B. Test the ability of the CFS ratios to discriminate between failed and non-failed companies before four years of failure incident in the PEX.

C. Develop a standard model utilizing CFS ratios able to discriminate between healthy and failed companies for each sector in the PEX.

D. Provide some suggestions and recommendations to give more concern in the use of cash flow statement based measures in predicting business failure in the PEX.

1.5   Study Variables

First: Dependent Variable:

Corporate failure in Palestine Exchange which is a dummy variable that has two values, (Y=0) for failed companies and (Y=1) for non-failed companies.

Second: Independent Variables:

Independent variables include *mostly* cash flow ratios.

- ✓ Operating cash flow on current liabilities (OCF/CL).
- ✓ Cash flow coverage of interest (OCF + INTREST + TAX/INT).
- ✓ Operating cash flow margin (OCF/Sales).
- ✓ Operating cash flow return on total assets (OCF/Asset).
- ✓ Earning quality (EBIT/OCF).
- ✓ Quick ratio or acid-test ratio (CA-INV)/CL.
- ✓ Operating Cash flow on Equity (OCF/EQUITY).
- ✓ Operating Cash flow on Net Income (OCF/N.I).
- ✓ Operating Cash flow on Current Assets (OCF/C.A).
- ✓ Free Cash Flow on Current Liabilities (FCF/C.L).
- ✓ Operating Cash flow on Free Cash Flow (OCF/FCF).

After reviewing previous studies the researcher will use CFS ratios which were used by (Bhandari & Iyer, 2013), (Matar & Obaidat, 2007), (Rodgers, 2013) and others. There are 33 type of cash flow ratios were used by researchers, the most significant cash flows ratios that found in the results of the previous studies will be used in this study.

1.6   Study Hypotheses

I. There are differences in cash-flow ratios between failed and non-failed companies in PEX.

II. CFS ratios discriminate between failed and non-failed companies in the first, second, third and fourth years respectively before failure incident in PEX.

III. The following financial ratios in the proposed developed model can predict financial failure in PEX:

- ✓ Operating cash flow on current liabilities (OCF/CL).
- ✓ Cash flow coverage of interest (OCF + INTREST + TAX/INT).
- ✓ Operating cash flow margin (OCF/Sales).
- ✓ Operating cash flow return on total assets (OCF/Asset).
- ✓ Earning quality (EBIT/OCF).
- ✓ Quick ratio or acid-test ratio (CA-INV)/CL.
- ✓ Operating Cash flow on Equity (OCF/EQUITY).
- ✓ Operating Cash flow on Net Income (OCF/N.I).
- ✓ Operating Cash flow on Current Assets (OCF/C.A).
- ✓ Free Cash Flow on Current Liabilities (FCF/C.L).
- ✓ Operating Cash flow on Free Cash Flow (OCF/FCF).

1.7   Study Population

The study population include all public listed companies in the Palestine Exchange that representing five economic sectors for (48) financial institution classified until the end of 2014. The study population was classified into two groups, the first group the non-failed companies which have not subject to failure condition (judgmental)[1], the second group of companies that failed and subject to failure condition, if the company has a negative OCF in two consecutive years or more during the study period from (2010 to 2014). The fifth year is considered the failure year.

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[1] The failure condition has been identified based on reviewing past studies and literatures also based on experts' viewpoints.

1.8   Study Limitations

A. Limit the scope of this study in assessing the impact of only *financial ratios* on the ability of companies to continue, while there are factors or non-financial variables also affect their ability to continue. Such as: the quality of management and the company activity nature and general market, political and economic conditions surrounding the company.

B. The need for Palestine Exchange management in addition to the financial intermediation offices to issue *financial failure standard* in order to guide companies and researchers in identifying failed companies as there is failure standard in other foreign stock exchanges.

C. This study covering the time period from 2010-2014 through the analysis of financial statements over the past five years.

1.9   Previous Studies

A number of published researches/papers in certified journals are viewed for the purpose of this study, focusing on using financial ratios for different purposes. There are a few Palestinian and Arab papers on the topic, the study depends highly on the foreign researches that match study purposes. The researcher will begin with Arabic studies followed by foreign studies and finally report general commentary on previous studies.

1.9.1 Arabic Studies

- (**AbuMoamer**, **2014**)
  "Corporate Bankruptcy Prediction and Equity Returns in Palestinian Banks"

This study aims at finding the best set of financial ratios that can be used to predict the failure of banking institutions and separate between failed and non-failed ones in order to identify the conditions of those institutions earlier, allowing interested parties and regulators to intervene to take appropriate corrective action on time. The researcher used Multiple Linear Discriminant Analysis (Stepwise Analysis) to find the best set of financial indicators that can be used in building this model so that it can discriminate between the failed and non-failed banking institutions before two years of failing. Financial ratios have been calculated for a sample of eight banks, half of them failed and the other half is not and that's for the period between the years (2007-2011). The following proposed model was reached: $Z = 326.940A8 + 37.810A11 - 14.905A1 - 7.261A22 - 2.347$. Test of the model has been done by using financial ratios derived from the sample data analysis and it was found to be able to predict the failure and discriminate between failed and non-failed banking institutions with accuracy Of (75%, 75%, 62.5%) in the first, third and fourth years respectively before failure.

- **(Alkhatib & Al Bzour, 2011)**
  "Predicting Corporate Bankruptcy of Jordanian Listed Companies: Using Altman and Kida Models"

  The purpose of this study is to explore the effect of financial ratios in bankruptcy prediction of Jordanian listed companies through the use of Altman and Kida models. Researchers used Altman and Kida models on the sample companies in both service and industrial sectors. The study sample was including non-financial service and industrial companies for the years 1990-2006. Researchers excluded the banking, insurance and finance sectors from the study because they apply certain disclosure requirements. Altman and Kida models were applied on the sample companies in both service and industrial sectors. The research results showed that of the two models, Altman's model has an advantage in bankruptcy prediction with a 93.8% average predictive ability of the five years prior to the liquidation incident, while the average for Kida's model is 69%. The outcome of the analyses shows that Jordanian listed companies may not be using such models in their financial and credit analyses. Researchers main recommendation is that the best for Jordanian companies that they should at least apply one of these models with high credibility for predicting corporate bankruptcy.

- **(Rammo & Al-Wattar, 2010)**
  "Using Financial Analysis Techniques to Predict the Failure of Contributing Industrial Companies: A Study of a Sample Consisting of Iraqi Contributing Industrial Companies Listed in Iraqi Stock Market"

  The present research aims at finding a reliable technique for failure prediction through applying the Altman Model to a number of Iraqi contributing companies. The importance of the research has come from the importance of the failure subject through many parties related to the company. The research problem exists in that the Iraqi shareholding companies, investors and other parties are not aware of risks that lead the companies to failure in the future. The model was applied on a sample consisted of (17) Iraqi shareholding company after obtaining the necessary information about them. Several findings were attained; the most important of which is Altman Model's accuracy in predicting the failure of Iraqi companies. The study concluded that Altman Model for predicting failure should be adopted as a reliable technique in financial analysis when evaluating the performance of companies.

- **(Ataiwiel, 2008)**
  "The Extent to Which the Banks Depend on the Financial Analysis to Predict Failure: An Empirical Study on the National Commercial Banks in the Gaza Strip"

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The purpose of this thesis is to identify the adoption extent of the national commercial banks on financial analysis to predict failure. The researcher conducted empirical study applied on (65) employees working in banks which have already been identified earlier. Also, the method of comprehensive survey has been used. The results showed that national commercial banks rely on financial analysis significantly, the banks focus to use financial analysis significantly to evaluate performance and decision making, the banks rely less on financial analysis in predicting financial distress or financial failure, banks not interested in giving courses in staff development in the area of predicting failure, the national commercial banks do not use models to predict financial distress effectively.

- **(Matar & Obaidat, 2007)**
  "The Role of Cash Flow Ratios in Improving the Accuracy of Models Based on Accrual Ratios to Predict the Financial Failure of Jordanian Industrial Companies Shareholders"

    The purpose of this study is to identify the role of cash flow ratios in improving the accuracy ability of the traditional models which are used to predict the financial failure of Jordanian industrial companies as a going concern. Researchers used Discriminant Analysis to design a mathematical model based on 30 accrual ratios which were mostly used in related previous studies, on a sample of (36) companies, half of them faced bankruptcy and the other half continued, for the period which extended from 1989 to 2001. Also, the same analysis, sample, and period were used to design another model based on (23) cash flow ratios in addition to the previous accrual ratios. After that, each model was tested on a sample of (37) companies, three of which faced bankruptcy and the others continued, for the period which extended from 2002 to 2005. The findings of the study revealed that the cash flow ratios improve the prediction ability of the models of accrual ratios in regard to the evaluation of Jordanian industrial companies as a going concern.

- **(Enshassi, Al-Hallaq, & Mohamed, 2006)**
  "Causes of Contractor's Business Failure in Developing Countries: The Case of Palestine"

    The objectives of this paper are to report on a research study which aims at exploring the causes of contractor's business failure in Palestine, and investigating their severity from the contractor's point of view. Researchers used a total of 56 factors that may lead to contractors' business failure were identified through a detailed literature review of relevant research studies. The study's results shows that the main causes of business failure were delay in collecting debt from clients (donors), border closure, heavy dependence on bank loans and payment of high interest on these loans, lack of capital, absence of industry

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regulations, low profit margin due to high competition, awarding contracts by client to the lowest bidder, and lack of experience in contract management. The research main recommendations to the Palestinian National Authority (PNA) and local contractors are the PNA should take the risk when donors delay the debts of the contractors, since most contracting companies in the Gaza Strip are small size with lack of capital, the PNA should establish proper industry regulations and suggest the appropriate mechanism for their enforcement, the PNA should connect the contract price with the price index and the PNA should conduct continuous training program, with cooperation of Palestinian Contractor Union and universities in order to improve managerial and financial practice of local contractors, tenders must be awarded to the best respondent bid with accurate cost estimate and not necessarily to the lowest bidders, contracting companies should not increase the number of projects that cannot be controlled, contracting companies should consider political and business environment risk in their estimate and contracting companies should improve their managerial and financial abilities and practice in order to meet the challenge.

- **(Rugby, 2006)**
  "The Use of Financial Ratios to Predict Failure of Jordanian Public Shareholding Companies Using Discriminant and Logit Analysis"

  This study aims to use financial ratios by using discriminant and logistical analysis methods to build statistical models to predict the failure of listed public shareholding companies in the financial market. The researcher used a sample of 26 pairs of failed and successful companies that covers the period from 1991 to 2002 and the researcher has used 25 financial ratio that measures the liquidity, profitability, leverage and activity. The results showed that the discriminant model and logistic model were able to predict the failure of companies one year before it happens with accuracy equal to 96%. Also, to verify the external accuracy of these models, Jackknife approach was used and showed that the results that have been reached were accurate. The researcher mentioned that the ability of these models to predict have decreased as they were in other studies, starting from the second year to the fifth year before the failure year.

- **(Ghusain, 2004)**
  "The Use of Financial Ratios to Predict Corporate Failure: Empirical Study on the Construction Sector in the Gaza Strip"

  The purpose of this thesis is to develop model that can be used to predict the failure of the construction sector companies in the Gaza Strip. The researcher used twenty two financial ratios were calculated for a sample of ten failed companies and sixteen non-failed companies from financial statements for three

years 2000, 2001, 2002. These ratios were analyzed using the statistical method known as the logistic regression to reach the best form of financial ratios that can discriminate between the failed and nonfailed contracting companies. The model was developed: Log odds (kind) = -1.92-4.788R3-1.05R5+0.074R19+0.074R21. The model that was developed contained four financial ratios: net working capital to total assets, the sales to total assets, the debtor to the sales, debtor to current assets. The model managed to accurately re-classify companies in the sample within two groups of failed and nonfailed categories, where the accuracy in discriminating between the failed and nonfailed contracting companies was 91.9% , 86.9% , 86.9% , in 2002 ,2001 and 2000 respectively. The results of this study were that the financial ratios can used to predict company's performance.

- **(Ashour & El-Farra, 2002)**
  "Business Failure in   the Gaza Strip Bankers and Business Experts' Viewpoints"

    This paper examines the problems of high business failure rate in the Gaza Strip. It focuses on the factors, which contributed significantly to business failure in Gaza. These factors include, 'short of funds and lack of ability to manage liquidity', dissatisfaction of banking services, 'poor managerial practices and lack of experience in running businesses', lack of understanding of the concept of company, 'shortage of raw materials and poor maintenance procedures', and lack of understanding of the concept of marketing. The study main recommendations to prevent failure are:

- ✓ It is crucial to undertake further field studies on sub-sectoral levels, to define more specifically suitable programs for vocational training and rehabilitation for each sub-sector. The needs and wants of businesses should be clearly identified. In addition, providing advice and consultations to businesses would help in reducing bankruptcy rate.

- ✓ Merger with a healthy company could help in reducing the bankruptcy rate in Gaza. Large businesses are more likely to survive and grow compared to small ones.

- ✓ Improve universities' education in Gaza and developing interaction between universities and local businesses. In addition, university recruitment terms and conditions should be altered to encourage research and development of local business environment.

- ✓ Improve the efficiency of decision-making and managerial practices in planning, cash-flow management, pricing and marketing, in order to improve the efficiency and competitive position of Gaza's business firms.

1.9.2 Foreign Studies

- **(Quarcoo & Smedberg, 2014)**
  "The Road to Bankruptcy: A Study on Predicting Financial Distress in Sweden"

  This thesis aims to study whether cash flow ratios can predict corporate financial distress in Sweden by employing multiple discriminant analysis. The hypotheses were tested through means of accuracy and the Independent Samples Test. Researchers used a proxy ratio in order to identify financial distress. The proxy was the operating cash flow ratio. Also they used a sample consisted of 227 firms in total within the retail- and service industries. The time period of the study covered 2000-2013. The study results showed that the proxy was unable to separate firms into distressed and non-distressed groups, but rather classified all firms as distressed. Furthermore, the other ratios also failed to do any classification. Finally, they concluded that cash flow ratios cannot predict corporate financial distress for retail and service companies in Sweden.

- **(Bhandari & Iyer, 2013)**
  "Predicting Business Failure Using Cash Flow Statement Based Measures"

  This paper addressed business failure during the economic recession of 2008-2012 years in USA. The purpose of this paper is to build a new model to predict business failure, using mostly cash flow statement based measures as predictors variables and discriminant analysis technique. Researchers used a sample of 100 firms and seven variables. A total of 50 "failed" firms were matched with 50 non-failed firms according to Standard Industrial Classification (SIC) code and size. Researchers use financial statement data for the year prior to failed year were pulled from COMPUSTAT database and they used seven predictor variables were selected, namely Operating cash flow divided by current liabilities, Cash flow coverage of interest, Operating cash flow margin, Operating cash flow return on total assets, Earning quality, Quick ratio and Three-year sales growth. Researchers used The SPSS-19 software to perform discriminant analysis (DA). Research main conclusion was that the DA. Model classified 83.3 percent of original groups cases correctly. The cross-validated approach (Jack-knife or leave-one-out method) correctly classified 79.5 percent of cases. Also, the chi-square test of Wilks' lambda was significant at 0.000 level which means the model as a whole performed very well in predicting business failure.

- **(Mazouz, Crane, & Gambre, 2012)**
  "The Impact of Cash Flow on Business Failure Analysis and Prediction"

  The purpose of this study is to determine whether cash flow impacts business failure prediction using a neural network. The Researchers used a sample of 114 failed and 114 non-failed manufacturing firms selected from the

Compustat database, accrual-based and cash flow-based neural network models were developed utilizing financial ratios as input variables. Also, a Z-test was performed to test for significance of any difference at the 0.05 level between the classification results of the two models. The research results showed that the accrual-based model correctly classified 92.55% of firms overall in a training sample and 77.5% of firms overall in a holdout sample and the cash flow-based model correctly classified 94.15% of firms overall in a training sample and 82.5% of firms overall in a holdout sample, moreover the cash flow-based neural network model outperformed the accrual-based neural network model and the results of the Z-test revealed that the difference in classification accuracies between the two models was not significant. This study does not provide evidence that cash flow improves business failure prediction.

- **(Hines, Kreuze, & Langsam, 2011)**
  "An analysis of Lehman Brothers bankruptcy and Repo 105 transactions"

  The purpose of this paper is to investigate the bankruptcy of Lehman Brothers, with particular focus on its use of Repo 105 transactions. The researchers showed that the use of the Lehman's bankruptcy report produced in part by Anton R. Valukas was used as a basis to explain how Lehman maintained acceptable leverage ratios through the use of Repo 105 transactions to paint a better picture of its financial position than actually existed. The study concludes that Lehman's accounting method choice disguised its real problems, perhaps long enough for bankruptcy to become the only option. The main research conclusion is that Lehman's bankruptcy becomes part of a growing history of business failures where accounting principles have become the focus. The researchers mentioned that the failure of Lehman reminds us that financial reporting must remain transparent, allowing users to make informed decisions with confidence.

- **(Amendola, Bisogno, Restaino, & Sensini, 2011)**
  "Forecasting Corporate Bankruptcy: Empirical Evidence on Italian Data"

  The aim of this paper is to investigate several aspects of bankruptcy prediction within both theoretical and empirical frameworks. In particular, it has focused on the comparison of different techniques used to forecast failure through a balanced sample of companies within a geographical area (the Campania region) located in the south of Italy. This paper's approach is to compare different statistical techniques based on the analysis of financial data for the prediction and diagnosis of the risk of bankruptcy. The paper investigates the determinants of bankruptcy in a specific geographical area (Campania region).The researchers relied on empirical evidence on a data-set of the annual reports of a balanced sample of companies for a given time period has been analysed. The researchers mentioned that findings aim to make a contribution to

current literature as well as to contribute to the elaboration of efficient prevention and recovery strategies.

- **(Zaki, Bah, & Rao, 2011)**
  "Assessing Probabilities of Financial Distress of Banks in UAE"

  The purpose of this research is to identify the main drivers of financial institutions' financial distress in the UAE financial market. The paper estimates a probability distress prediction model using the BankScope Database and the annual reports of UAE financial institutions submitted to UAE Security Exchange Authority. The paper also analyses the impact of macroeconomic information for forecasting financial institutions' financial distress. The results showed that fundamentals of financial institutions in terms of cost income ratio, equity to total assets, total asset growth and ratio of loan loss reserve to gross loans (all these variables with a lag of one year) positively impacted the probability of financial distress in the next year. The researchers report that the recent findings for emerging economies have cast some doubt on the usefulness of macroeconomic information for financial institutions' risk assessment; similar results are found for UAE financial institutions in predicting the probability of financial distress.

- **(Chitnomrath, Evans, & Christopher, 2011)**
  "Corporate Governance and Post-Bankruptcy Reorganization Performance Evidence from Thailand"

  This research seeks to investigate the role of key corporate governance mechanisms in determining a firm's post-bankruptcy performance following reorganization. The study is based on agency theory and uses a unique sample of 111 filing companies whose reorganisation plans have been confirmed by the Thai Central Bankruptcy Court during the period 1999-2002. The results indicate that monitoring and incentive mechanisms are significant determinants of a firm's post-bankruptcy performance. The key monitoring mechanism is ownership concentration, measured by shares held by the largest shareholder, whereas the critical incentive mechanisms are cash compensation and percentage of common shares held by the plan administrator. The results indicate that these mechanisms can mitigate agency problems in previously insolvent companies and increase post-bankruptcy performance over a three year period.

- **(Dikmen, Birgonul, Ozorhon, & Sapci, 2010)**
  "Using Analytic Network Process to Assess Business Failure Risks of Construction Firms"

  The purpose of this study is to identify the determinants of business failure in construction and to predict the failure likelihood of construction

companies by assessing their current situation based on both company-specific and external factors. The researchers used the conceptual model designed based on an extensive literature survey. Also, the analytical network process together with the Delphi method was utilised to compute the importance weights of variables on business failure through interviews and discussions with experts. The applicability of the proposed model was tested on five companies to estimate their failure likelihood by using the findings derived from the analysis. The results suggest the importance of organisational and managerial factors, including the efficiency of the value chain at the corporate level, the appropriateness of organisational decisions, and the availability of intangible resources for the survival of construction companies.

- **(Shkurti & Duraj, 2010)**
  "Using Multiple Discriminant Analysis in The Bankruptcy Prediction in Albania A Study With The State-Owned Enterprises"

  The purpose of this study is to apply the Multiple Discriminant Analysis technique to study the bankruptcy of the state-owned enterprises in Albania. The results showed that the discriminant function derived by this technique had an overall accuracy rate by 94.6 percent when tested on the initial sample and 92.9 percent if tested using the cross-validation method. Also, the variables that best discriminated between bankrupt and non-bankrupt firms were the level of operating profitability and size of investments moreover they mentioned that liquidity or cash flow variables were cited as important predictors of bankruptcy and in other previous studies, did not result important. The main research conclusion is that the economic profitability and good investment opportunities are the main factors that affect the success of the state-owned enterprises in Albania and they argue that often liquidity problems arise quite shortly before the bankruptcy filing, thus it does not allow for inclusion among the early predictors of bankruptcy.

- **(Kpodoh, 2010)**
  "Bankruptcy and Financial Distress Prediction in the Mobile Telecom Industry"

  The purpose of this thesis is to test Altman's Z-score prediction model using sample data from the mobile telecommunication industry in Ghana. The researched used quantitative and qualitative approach based on 'modified single case' design, primary data was collected using questionnaire survey methods, whiles secondary data were mainly sourced from company annual financial reports, industry regulators and industry analysts' reports. Also, the data was analyzed using descriptive statistics, z-score analysis, financial ratio analysis and trending, key solvency ratios were compared with industry averages. The z-scores were compared with z-scores of other companies that went bankrupt in the

past. Corporate governance scores were compared to scores suggested by other researchers as strong indicators of good corporate governance. The researcher main conclusion was that the research findings confirmed the strength and ability of the z-score model in predicting eminent business failure as it predicted accurately the distress positions of the case companies. It also confirmed the correlation between corporate governance and corporate failure. Finally, companies operating in BOP markets ought to adopt and adapt the myriads of marketing strategies available, especially for mobile telecommunication operators, in order to be able to compete effectively and earn positive average margin per user (AMPU) in the midst of declining average revenue per user (ARPU) in the region.

- **(Charitou, Neophytou, & Charalambous, 2004)**
  "Predicting Corporate Failure: Empirical Evidence for the UK"

  The main purpose of this study is to examine the incremental information content of operating cash flows in predicting financial distress and develop reliable failure prediction models for UK public industrial firms. Researchers used neural networks and logit methodology to a dataset of fifty-one matched pairs of failed and non-failed UK public industrial firms over the period 1988–97. They validated the final models using an out-of-sample-period ex-ante test and the Lachenbruch Jackknife procedure. The results indicate that a parsimonious model that includes three financial variables, a cash flow, a profitability and a financial leverage variable, yielded an overall correct classification accuracy of 83% one year prior to the failure. Finally, their models can be used to assist investors, creditors, managers, auditors and regulatory agencies in the UK to predict the probability of business failure.

1.10   General Commentary on Previous Studies

There are several studies addressed the business failure in more than one aspect, there are different studies developed failure models for different sectors and used various methods. Some research used the same model used by the researcher and others did not. For example (Bhandari & Iyer, 2013), (Quarcoo & Smedberg, 2014) and (Matar & Obaidat, 2007), (Mazouz, Crane, & Gambre, 2012) used cash flow statement based measures as predictors variables which have significant predictive power in business failure prediction. Most of these empirical models used data derived from accrual accounting-based financial statements such as (Zaki, Bah, & Rao, 2011), (Shkurti & Duraj, 2010), (Charitou, Neophytou, & Charalambous, 2004), (AbuMoamer, 2014), (Alkhatib & Al Bzour, 2011), (Rammo & Al-Wattar, 2010), (Ataiwiel, 2008), (Rugby, 2006) and (Ghusain, 2004) which the researcher found these studies were important but didn't outperformed cash flow measures in predicting business failure as the results of the cash flow studies concluded. Discriminant analysis (DA) was most widely used technique by (Enshassi, Al-Hallaq, & Mohamed, 2006),   (Mazouz, Crane, & Gambre, 2012), (Shkurti & Duraj, 2010), (AbuMoamer, 2014), (Amendola, Bisogno, Restaino, & Sensini, 2011), (Rugby, 2006), and (Ashour & El-Farra, 2002). In addition to Altman and Kida's models were used by (Alkhatib & Al Bzour, 2011), and (Rammo & Al-Wattar, 2010). Logistic models were used by (Ghusain, 2004), (Charitou, Neophytou, & Charalambous, 2004), and (Rugby, 2006) since the sample that has been used was unbalanced sample of companies, which also applied to this study. Others used Neural Network models such as (Mazouz, Crane, & Gambre, 2012), (Charitou, Neophytou, & Charalambous, 2004). These authors have been evaluated, reviewed and compared their studies on which attempted building of failure prediction models. A few attempts to use cash flow-based data to build business failure prediction models.

After reviewing past studies the researcher concluded that the best model for predicting corporate failure is by using cash flow based measures which increase the predictive ability of the model before financial failure incident based on the results of the previous studies of (Bhandari & Iyer, 2013), (Charitou, Neophytou, & Charalambous, 2004), (Matar & Obaidat, 2007) and (Rodgers, 2013).

1.11 The Originality/Value of This Study

The present study differs from prior corporate failure studies in the following respects:

A. Corporate failure is one of the most investigated topics within corporate finance.

B. The sample companies are not industry specific in Palestine Exchange.

C. The eleven predictors were used by the researcher are logically justified.

D. Logistic regression model produces a more effective classification tool than traditional multivariant discriminate analysis alone when evaluating sets with two discrete dependent variables.

E. Most of the predictor variables use operating cash flow statement information from the cash flow statement and not from accrual accounting-based financial statements, which means the model is very generic in nature.

F. A few articles, papers or studies have been addressing this issue in the developing countries in general or in Palestine in specific

G. This study will make a contribution to current literature as well as to contribute to the elaboration of efficient prevention and recovery strategies.

H. This study represented a fundamental reference point for future researches.

Study Content

This study includes four chapters, the study proposal with the previous studies were presented in chapter one. The literatures review will be covered in four sections in chapter two, the first section includes an overview of corporate failure and bankruptcy, the second section will focus on financial analysis and financial ratios to predict failure, the third section highlight the Palestine Exchange in general and the fourth section will discuss the multiple discriminant model and logistic model. The third chapter includes the study methodology with the data analysis that performed by SPSS-21 software which considered the most common software for social sciences. Finally the fourth chapter will show the study results, conclusions and recommendations.

Chapter Two

Literature Review

2.1 An Overview of Corporate Failure and Bankruptcy

2.2 Financial Analysis and Financial Ratios to Predict Failure

2.3 Overview of Palestine Securities Exchange

2.4 Multiple Linear Discriminant Model VS. Linear Logistic Regression Model

2. Chapter Two: Literature Review

The chapter two includes four sections, the first section presents an overview of corporate failure and bankruptcy, the second section focus on financial analysis and financial ratios to predict failure, the third section highlights the Palestine Exchange in general and finally the four section discuss in briefly MDA model and linear logistic model.

2.1 An Overview of Corporate Failure and Bankruptcy

Section one talks about financial failure definitions, causes of financial distress either internal factors or external factors and a brief discussion of capital structure theories. Also this section presents bankruptcy process, bankruptcy around the world, methods of resolving financial distress, liquidity in bankruptcy and finally failure prediction models.

2.1.1 Financial Distress, Failure, Bankruptcy and Liquidation Definitions

The terms "bankruptcy", "failure", "insolvency", "liquidation", "loan default", "credit risk", "corporate distress" and "financial distress" have been used in referring to similar failure concepts (Altman, 1993).

Financial Distress, Failure, Bankruptcy and Liquidation Definitions shown in table no. (2.1.1.1).

Table 2.1.1.1: Distress, Failure, Bankruptcy and Liquidation Definitions

Financial Distress	Financial Distress is a term in corporate finance used to indicate a condition when promises to creditors of a company are broken or honored with difficulty. Sometimes financial distress can lead to bankruptcy. Financial distress is usually associated with some costs to the company and these are known as Costs of Financial Distress. A common example of a cost of financial distress is bankruptcy costs; these direct costs include auditors' fees, legal fees, management fees and other payments. Cost of financial distress can occur even if bankruptcy is avoided (indirect costs)".	(Wikipedia, 2015)
Financial Failure	Failure from an economic viewpoint; a company is considered to have failed if the realized rate of return on invested capital, with allowances for risk considerations, is significantly and continually lower than prevailing rates on similar investments. Another criterion is insufficient revenues to cover costs and situations where the average return on an investment is below the firm's cost of capital.	(Altman E. , 1968)

Financial Failure	The Corporate failure identified based on experts viewpoint by comparing the first group of the non-failed companies which have not subject to failure condition (judgmental) with the second group of companies that failed and subject to failure condition, if the company has a negative OCF in two consecutive years or more during the study period from 2010-2014.	The Researcher Definition
Bankruptcy	Bankruptcy is a legal status of a person or other entity that cannot repay the debts it owes to creditors. In most jurisdictions, bankruptcy is imposed by a court order, often initiated by the debtor.	(Wikipedia, 2015)
	Bankruptcy is not the only legal status that an insolvent person or other entity may have, and the term bankruptcy is therefore not a synonym for insolvency. In some countries, including the United Kingdom, bankruptcy is limited to individuals, and other forms of insolvency proceedings (such as liquidation and administration) are applied to companies. In the United States, bankruptcy is applied more broadly to formal insolvency proceedings.	(Wikipedia, 2015)
	Bankruptcy is a legal proceeding involving a person or business that is unable to repay outstanding debts. The bankruptcy process begins with a petition filed by the debtor (most common) or on behalf of creditors (less common). All of the debtor's assets are measured and evaluated, whereupon the assets are used to repay a portion of outstanding debt. Upon the successful completion of bankruptcy proceedings, the debtor is relieved of the debt obligations incurred prior to filing for bankruptcy.	(Investopedia, 2015)
Liquidation	Liquidation is the process of dismantling the firm's assets and selling them (either piecemeal or in their entirety) to new management teams. Liquidation is optimal when the value of the firm's existing resources is higher in alternative uses.	(Senbet & Wang, 2010, p. 250)

The financial failure adopted by the researcher throughout this study identified in table no. (2.1.1.1), in which the data analysis conducted based on this definition.

There are differences between bankruptcy and financial distress, in the case of bankruptcy the debtor completely stopped payment of his debts, while in the case of financial distress the debtor's funds are not sufficient to cover his owed debts even if the total assets more than the total liabilities.

Bankruptcy may be defined as a condition in which an organization is unable to meet its debt obligations, or petitions a federal district court for either reorganization of its debts or liquidation of its assets (Altman, 1993). Financial distress, on the other hand, is defined as a low cash-flow state in which a firm incurs losses without being insolvent (Purnanandam, 2008).

Liquidation is the process of dismantling the firm's assets and selling them (either piecemeal or in their entirety) to new management teams. Liquidation is optimal when the value of the firm's existing resources is higher in alternative uses (Senbet & Wang, 2010, p. 250).

There is difference between bankruptcy and liquidation both of the them is independent and has separate events and costs.

A profitable firm with high leverage may remain viable as a going concern, irrespective of bankruptcy, while an unprofitable firm may be liquidated even if it has no debt in its capital structure (Senbet & Wang, 2010, p. 250). Therefore, there are differences between economic distress and financial distress.

2.1.2 Economic Distress and Financial Distress

Financial distress means that the firm's promises to creditors are broken or honored with difficulty. It is directly related to the firm's leverage decision. Economic distress, however, means difficulties arising from the firm's operational inefficiencies. It has no direct linkage to the firm's leverage (Senbet & Wang, 2010, p. 249).

2.1.3 Financial Distress and Financial Failure

There are differences between financial distress and financial failure; financial distress is a condition that precedes the financial failure but not necessary followed by financial failure. We can distinguish between them according to:

2.1.3.1 Financial Distress (Ghusain, 2004):

 A. Low stock returns or retained.
 B. Stop payment of obligations in maturity.

2.1.3.2 Financial Failure (Ghusain, 2004):

 A. Stop completely of payment of obligations.
 B. Stop engagement in any activity.

In the case of financial distress, there is no enough cash (negative OCF) to cover short-term obligations and the net capital is positive. In the case of financial failure, the net capital is negative and total liabilities more than the total assets and the company completely unable to pay debts it's owed to creditors.

2.1.4 Causes of Business Failure

There are many causes of business failure either by external factors or (internal) company-specific factors such as managerial, financial, technical and marketing causes.

A company's intrinsic value is the present value of its expected future free cash flows. There are many factors that can cause this value to decline. These factors include general economic conditions, industry trends, and company-specific problems such as shifting consumer tastes, obsolescent technology, and changing demographics in existing retail locations. Financial factors, such as too much debt and unexpected increases in interest rates, can also cause business failures. The importance of the different factors varies over time, and most business failures occur because a number of factors combine to make the business unsustainable. (Ehrhardt & Brigham, p. 870).

2.1.4.1 Company-Specific Causes (Internal Factors)

Business causes arise when the company's performance falls below expectations due to lack of competiveness, operational issues, or poor leadership. These arise as a result of poor decisions, bad timing, or just bad luck. Financial causes arise either because the company's capital structure is inappropriate given its level of business risk, or poor financial decisions are made by management during the day-to-day operations (Danilov, 2014, p. 15).

Most failures occur because a number of factors combine to make the business unsustainable. Company specific factors can classify according to:

I. **Non-Financial ("Business") Causes**

A. The absence of specialized administrative and technical elements, the existence of conflicts between members of top management, giving priority to the special interests of the shareholders with the owners and the wrong directions for management (Ghusain, 2004, p. 27).

B. The lack of competitiveness of the company's product or service in the market. This can occur for a variety of reasons like the entry of new competitors into the market, a lack of differentiation and pricing power, or shifting consumer tastes. New or existing competitors may provide a better product at the same price, or are able to price at below-market levels due to cost leadership. Either way, customers are no longer willing to purchase the company's offering. If management is not able to adapt the product or service, sales will fall below forecasted levels and the company will eventually fail (Danilov, 2014, p. 16).

C. Unexpected non-debt liabilities such as tort lawsuits or contract liabilities represent another potential source of business failure. Tort claims - a claim that a company has caused personal injury to another individual - can arise various types of businesses, but have been most prevalent in tobacco, silicon and asbestos related sectors. As a result of the potential for large punitive damage awards, a class-action lawsuit can destabilize a sound, profitable business and force it to seek bankruptcy protection (Danilov, 2014, p. 17).

D. Conflict of interest arise as a result of incompatible objectives between owners and the managers of the firm.

II. Financial Causes

Another cause of failure is financial failure which includes high financial leverages, illiquidity due to working capital mismanagement, or high operating leverage due to increased fixed costs.

A. Operating Leverage

The extent to which fixed costs are used in a firm's operations. In business terminology, a high degree of operating leverage, other factors held constant, implies that a relatively small change in sales results in a large change in ROIC (Ehrhardt & Brigham, 2011).

High operating leverage implies that a relatively small change in sales results in a relatively large change in EBIT, net operating profits after taxes (NOPAT), and return on invested capital (ROIC). Other things held constant, the higher a firm's fixed costs, the greater it's operating leverage. Higher fixed costs are generally associated with (1) highly automated, capital intensive firms; (2) businesses that employ highly skilled workers who must be retained and paid even when sales are low; and (3) firms with high product development costs that must be maintained to complete on-going R&D projects (Ehrhardt & Brigham, 2011, p. 604).

The firms that rely highly on operating leverage which will not decline as sales falls will increase its business risk and may lead eventually to business failure.

B. Financial Leverage

Is the extent to which fixed-income securities (debt and preferred stock) are used in a firm's capital structure. Financial risk is the added risk borne by stockholders as a result of financial leverage (Ehrhardt & Brigham, 2011, p. 631) .

Interest and principal payments represent a fixed cost that raises the company's breakeven point in the same manner as operating leverage, thus increasing earnings variability (Danilov, 2014, p. 18).

High levels of debts represent high probability of bankruptcy, increasing debts which mean increasing financial leverage will increase the risk of the company of being unable to meet its financial obligations and for this reason the cost of common equity will increase as well to compensate the increase of business risk.

C. Capital Structure Theories

Additional debt increases the probability of bankruptcy. Capital structures vary among firms within a given industry. There are many theories regarding capital structures that will be highlighting in briefly by the researcher.

- ## Bankruptcy in the Modigliani-Miller World

The corollary of the MM theorem is that corporate bankruptcy is inconsequential to firm value, since the investment decisions are completely separable from the financing decisions. In the perfect and frictionless MM world, the amount of corporate indebtedness has no effect on the value of the firm's assets or on the risk of the total cash flow stream generated by the firm's assets. The capital structure of the firm simply determines how the total cash flow is partitioned between equity holders and debt holders and thus the risk borne by each class of capital providers. Bankruptcy is essentially a transfer of ownership from equity holders to debt holders when the value of assets drops below the value of debt. The complete separation between financing decisions and investment decisions implies that there is no necessary linkage between bankruptcy and the firm's operating performance (Senbet & Wang, 2010, pp. 248-249).

Modigliani and Miller (1963) argue that the tax code favors debt over equity financing by allowing the firm's interest expense to be deducted from gross income for corporate tax purposes, but disallowing deductibility of payments to equity holders (e.g., dividends are not tax

deductible on the personal account). Since an additional dollar of debt generates the marginal benefit of a tax deduction without any offsetting cost in this framework, the firm value is maximized by utilizing as much debt as possible to finance corporate investment decisions (Senbet & Wang, 2010, p. 250).

- **Trade-off Theory**

  The trade-off theory of leverage, in which firms trade off the benefits of debt financing (favorable corporate tax treatment) against higher interest rates and bankruptcy costs (Ehrhardt & Brigham, 2011, p. 613).

  Although that the increase use of debt will increase the tax saving that the company will benefit from it, also it will increase bankruptcy costs which divided into two types: direct costs and indirect costs.

  ### A. Direct Costs

  - ✓ Auditors' fees
  - ✓ Legal fees
  - ✓ Management fees
  - ✓ Other payments and accounting expenses that the company will suffer when it incurred bankruptcy

  ### B. Indirect costs

  - ✓ Lost customers who search for more stable suppliers
  - ✓ Reduction in productivity of managers and line workers who are worried about their future,
  - ✓ Reduction in credit (i.e., accounts payable) offered by suppliers and imposed high interest rates by the lenders.

  According to the theory, the optimal level is reached when further borrowing results in a PV of tax savings that is fully offset by the increases in the PV of bankrupt cost (Danilov, 2014, p. 18).

  As the Debt equity ratio (i.e. leverage) increases, there is a trade-off between the interest tax shield and bankruptcy, causing an optimum capital structure as shown in figure No. (2.1.4.1):
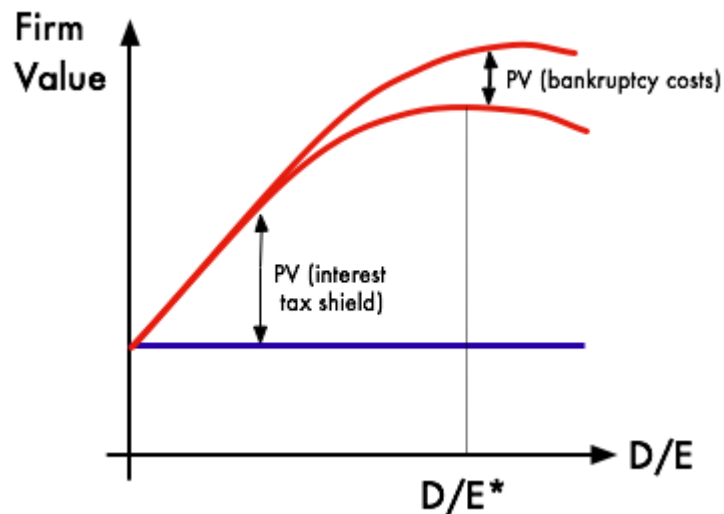
Figure 2.1.4.1: Effect of Financial Leverage on Value

Source: (Wikipedia, 2015)

- **The Pecking Order Theory**

    Firms use internally generated funds first, because there are no flotation costs or negative signals. If more funds are needed, firms then issue debt because it has lower flotation costs than equity and not negative signals, if more funds are needed, firms then issue equity.

    The *pecking order theory* of corporate financing states that firms prefer internal funding over borrowing and debt over equity funding because of information asymmetry. Managers are more informed than (rational) investors, and will prefer to issue equity as a last resort method of financing. Optimistic managers, who know that their stock price is currently undervalued relative to the company's future prospects, will not want to issue undervalued equity. They would rather use internal financing, or if unavailable, issue bonds. Conversely, pessimistic managers who know that their stock is overvalued (and that investors will realize this eventually) prefer to issue debt as well. Any attempt to sell stock would signal to investors that the stock is worth less than the current price, thus forcing down the stock price and lowering the proceeds from the stock issue (Danilov, 2014, p. 19).

2.1.4.2 External Causes

A downturn in the broader economy reduces aggregate demand, exposing weaknesses in marginal firms with uncompetitive products and forcing them to go out of business. A reduction in credit availability can result in liquidity

problems for over-levered companies that would have continued to operate otherwise. While most macroeconomic factors are interrelated, aggregate measures and such as GNP growth, money supply, financial market performance and number new business starts seem to be correlated with increased rates of corporate failure and financial distress (Danilov, 2014, p. 30).

Also inflation, increase prices of raw materials, production materials, power prices, increase costs and lower profits or increase losses are causes of business failure.

Fluctuations in exchange rates increase the value of debts the companies incurred which may results to business failure.

Technological changing and the new products entered the markets and changing human capital may leads to business failure.

There are many studies report and concluded the business failure causes, the researcher will mention some of them:

(Ashour & El-Farra, 2002, p. 2) Summarized the causes of business failure as follow:

- ✓ Short of funds and lack of ability to manage liquidity.
- ✓ Dissatisfaction of banking services.
- ✓ Poor managerial practices and lack of experience in running businesses.
- ✓ Lack of understanding of the concept of company.
- ✓ Shortage of raw materials.
- ✓ Poor maintenance procedures.
- ✓ Lack of understanding of the concept of marketing.

Also (Enshassi, Al-Hallaq, & Mohamed, 2006, p. 1) in their study concluded that the main causes of business failure were:

- ✓ Delay in collecting debt from clients (donors).
- ✓ Border closure.
- ✓ Heavy dependence on bank loans and payment of high interest on these loans.
- ✓ Lack of capital.
- ✓ Absence of industry regulations.
- ✓ Low profit margin due to high competition.
- ✓ Awarding contracts by client to the lowest bidder.
- ✓ Lack of experience in contract field.

2.1.5 Bankruptcy Process

When a company with financial obligations to outside creditors becomes insolvent, its creditors have several options. They can either negotiate directly with the company (i.e. the debtor) to turn things around or choose to pursue legal action against the company. A secured creditor, one that has a claim (i.e. obligation) that is backed by a specific asset, can move to seize the asset and sell it to fulfill the obligation owed to it by the debtor. An unsecured creditor can pursue legal action by suing the debtor to obtain a lien on an asset that it could then seize and sell to fulfill its obligation. Alternatively, instead of pursuing non- bankruptcy legal remedies, the creditors can collectively force the debtor into a bankruptcy proceeding. (The company can also voluntarily enter bankruptcy proceedings in order to seek the court's protection from creditors) (Danilov, 2014, p. 10).

2.1.6 Bankruptcy Around the World[2]

In this part the researcher will highlight bankruptcy around the world especially in United States of America (USA) where the most large and famous firms have filing for bankruptcy.

Lehman Brothers, Washington Mutual, Chrysler, and General Motors all filed for bankruptcy protection during the global economic crisis. What did these four filings have in common with Australia? At the time of filings, the companies' assets totaled over $1.1 trillion dollars, which is about the same size as Australia's annual gross domestic product. With $691 billion in assets, Lehman Brothers holds the record for the largest bankruptcy filing in history. Lehman Brothers had not emerged from bankruptcy when we wrote this (August 2009), but it is unlikely that Lehman Brothers will again operate as a company. Most of its operations and assets have been liquidated and sold piecemeal to other companies, including Barclays (Ehrhardt & Brigham, 2011, p. 869).

When GM filed for bankruptcy on June 1, it became the largest manufacturer in U.S. history to fail. When GM emerged from bankruptcy 40 days later, the U.S. government owned 60.8% of the equity in the "new" GM, with the remaining equity owned by the Canadian government (11.7%), the UAW employee health care trust (17.5%), and former bondholders (10%). Notice that nothing was left for former stockholders (Ehrhardt & Brigham, 2011, p. 869).

Bankruptcy is not occurring only for small firms but also big firms have filing for bankruptcy in the period of 2008-2009 as a result of global economic

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[2] To read more about Bankrupt firms you can access http://www.instantshift.com/2010/02/03/22-largest-bankruptcies-in-world-history/

crisis. Table no. (2.1.6.1) show Largest Public Company Bankruptcy Filings of 1980 to present:

Table 2.1.6.1: Largest Public Company Bankruptcy Filings in USA

Company	Date	Description	Assets*
Lehman Brothers Holdings Inc.	09/15/2008	Investment Bank	$691,063
Washington Mutual, Inc.	09/26/2008	Savings & Loan Holding Co.	327,913
WorldCom, Inc.	07/21/2002	Telecommunications	103,914
General Motors Corporation	06/01/2009	Manufactures & Sells Cars	91,047
CIT Group Inc.	11/01/2009	Bank Holding Company	80,449
Enron Corp.	12/02/2001	Energy Trading / Gas	65,503
Conseco, Inc.	12/18/2002	Financial Services Holding Co.	61,392
Energy Future Holdings Corp.	04/29/2014	Electric Utility Company	40,970
MF Global Holdings Ltd.	10/31/2011	Commodities & Derivatives Broker	40,542
Chrysler LLC	04/30/2009	Manufactures & Sells Cars	39,300
Thornburg Mortgage, Inc.	05/01/2009	Residential Mortgage Lending	36,521
Pacific Gas and Electric Company	04/06/2001	Electricity & Natural Gas	36,152
Texaco, Inc.	04/12/1987	Petroleum & Petrochemicals	34,940
Financial Corp. of America	09/09/1988	Financial Services and Savings and Loans	33,864
Refco Inc.	10/17/2005	Brokerage Services	33,333

IndyMac Bancorp, Inc.	07/31/2008	Bank Holding Company	32,734
Global Crossing, Ltd.	01/28/2002	Global Telecommunications Carrier	30,185
Bank of New England Corp.	01/07/1991	Interstate Bank Holding Company	29,773
General Growth Properties, Inc.	04/16/2009	Real Estate Investment Company	29,557
Lyondell Chemical Company	01/06/2009	Global Manufacturer of Chemicals	27,392

*Pre-Petition assets in $millions

Source: http://www.bankruptcydata.com/largest.asp?y=

On September 26, 2008, Washington Mutual, Inc. and its remaining subsidiary, WMI Investment Corp., filed for Chapter 11 bankruptcy. Washington Mutual, Inc. was promptly delisted from trading on the New York Stock Exchange, and commenced trading via Pink Sheets. All assets and most liabilities (including deposits, covered bonds, and other secured debt) of Washington Mutual Bank's liabilities were assumed by JPMorgan Chase. Unsecured senior debt obligations of the bank of were not assumed by the FDIC, leaving holders of those obligations with little meaningful source of recovery (Instantshift, 2010).

WorldCom's bankruptcy filing in 2002 was the largest such filing in U.S. history. The WorldCom scandal is regarded as one of the worst corporate crimes in history, and several former executives involved in the fraud faced criminal charges for their involvement. Most notably, company founder and former CEO Bernard Ebbers was sentenced to 25 years in prison, and former CFO Scott Sullivan received a five-year jail sentence, which would have been longer had he not pleaded guilty and testified against Ebbers. Under the bankruptcy reorganization agreement, the company paid $750 million to the Securities & Exchange Commission in cash and stock in the new MCI, which was intended to be paid to wronged investors (Instantshift, 2010).

Enron Corporation (former NYSE ticker symbol ENE) was an American energy company based in Houston, Texas. Before its bankruptcy in late 2001, Enron employed approximately 22,000 and was one of the world's leading electricity, natural gas, pulp and paper, and communications companies, with claimed revenues of nearly $101 billion in 2000. Fortune named Enron "America's Most Innovative Company" for six consecutive years. At the end of 2001 it was revealed that its reported financial condition was sustained substantially by institutionalized, systematic, and creatively planned accounting

fraud, known as the "Enron scandal". The Enron scandal, revealed in October 2001, eventually led to the bankruptcy of the Enron Corporation, the dissolution of Arthur Andersen, which was one of the five largest audit and accountancy partnerships in the world. In addition to being the largest bankruptcy reorganization in American history at that time, Enron undoubtedly is the biggest audit failure (Instantshift, 2010).

Thornburg Mortgage Inc. was an American publicly traded corporation headquartered in Santa Fe, New Mexico. Founded in 1993, the company is a real estate investment trust (REIT) that originates, acquires & manages mortgages, with a specific focus on jumbo and super jumbo adjustable rate mortgages.

During the Financial crisis of 2007–2010 the company experienced financial difficulties related to the ongoing subprime mortgage crisis, and on April 1, 2009 Thornburg Mortgage, Inc. and four of its affiliates (collectively, the "Debtors") filed petitions in the United States Bankruptcy Court for the District of Maryland seeking relief under chapter 11 of the United States Bankruptcy Code. After the sale of all remaining assets, it would no longer exist as a going concern. (Instantshift, 2010).

From previous cases the researcher can say there are many factors that lead to business failure such as external factors (general economic condition) like global economic crisis that leads to bankrupt many large firms such as Lehman Brothers, Washington Mutual, Chrysler, and General Motors all filed for bankruptcy protection, or internal factors (company-specific factors) such as management causes like fraud that leads to bankrupt many large firms such as Enron and WorldCom.

Bankrupt very large firms or sectors might cause the entire financial system to collapse and eventually harm the economy, for example, the failure of Lehman Brothers in September 2008 contributed to increase the global recession. Government can intervene to reduce failure to protect large firms and thereby protect the economy of the country, like "the government helped arrange the 2008 acquisition of Wachovia by Wells Fargo, the 2008 acquisition of Bear Sterns by JPMorgan Chase, and the 2009 acquisition of Merrill Lynch by Bank of America" (Ehrhardt & Brigham, 2011, p. 870).

In 2008 and 2009 the government provided billions of dollars of financing to General Motors and Chrysler. Even though these companies subsequently went through bankruptcy proceedings in 2009, they avoided liquidation, still have a significant number of employees, and remain major players in the automobile industry. In past years, the government also has intervened to support troubled firms in other critical sectors, such as Lockheed and Douglas Aircraft in the defense industry (Ehrhardt & Brigham, 2011, p. 871).

2.1.7 Resolving Financial Distress

There are many ways to deal with bankruptcy problem either informal (private) or formal (court-supervised) resolutions of financial distress.

First the researcher will discuss the methods of resolution of financial distress outside the bankruptcy court system then the researcher will discussed in briefly methods of formal resolution (court-supervised) in USA.

2.1.7.1 Informal Methods of Resolving Financial Distress

There are many methods to deal with bankruptcy problem outside the court system which include:

A. Debt restructuring.
B. Asset sales.
C. Financing from outside sources.

A. Debt Restructuring.

In the case of an economically sound company whose financial difficulties appear to be temporary, creditors are generally willing to work with the company to help it recover and reestablish itself on a sound financial basis. Such voluntary plans, commonly called *workouts*, usually require a restructuring of the firm's debt, because current cash flows are insufficient to service the existing debt (Ehrhardt & Brigham, 2011, p. 872).

Publicly-held debt contracts and privately-held ones are usually subject to different disclosure and regulatory constraints. The restructuring of public debt is governed primarily by the Trust Indenture Act of 1939. This Act requires *unanimous* consent by the holders of a particular class of debt securities in order to change the debt obligation's maturity, principal, or coupon rate. These stringent voting rules effectively preclude a private restructuring of public corporate debt. As a result, virtually all informal public debt restructurings are accomplished through a tender offer in which debt is repurchased with cash, or by an exchange offer in which existing debt is exchanged for new securities including debt, equity, or a combination of both. The restructuring also often includes covenant modifications (Senbet & Wang, 2010, p. 253).

The advantages of informal reorganization are less costly, relatively simple to create and typically allows creditors to recover more money and sooner.

B. Sales of Assets

An alternative method to handle financial distress is sale of assets which consider a quick way to collect cash and create liquidity in short period.

A partial sell-off of the firm's existing assets generates cash that can be used to reduce outstanding debt or to undertake new investment opportunities. The price received by the seller in an asset sale is ultimately determined by the outcome of a bargaining process between the buyer and the seller. The poor financial condition and the urgent liquidity need of the distressed seller can severely weaken the firm's bargaining position, and therefore reduce the price it receives for the assets. Furthermore, if the sale is conducted under duress from the firm's creditors, the outcome may be that the price received is less than the value of the asset under current management by the distressed firm (Senbet & Wang, 2010, p. 254).

C. Financing From Outside Sources.

Also attracting funds from outside will help the distressed firm to survive. The distressed firm needs sufficient cash to pay employees, suppliers, and other stakeholders. The distressed firm may also have positive net present value projects available that need to be financed. Thus, the firm's ability to attract new capital is crucial for the firm's survival and investment efficiency (Senbet & Wang, 2010, p. 254).

2.1.7.2   Federal Bankruptcy Law[3]

U.S. bankruptcy laws were first enacted in 1898. They were modified substantially in 1938 and again in 1978, and some fine-tuning was done in 1986. In 2005, Congress further modified the bankruptcy code, speeding up bankruptcy proceedings for companies and making it more difficult for consumers to take advantage of provisions that can wipe out certain debts. The primary purpose of the bankruptcy law is to avoid firms that are worth more as ongoing concerns being put out of business by individual creditors, who could force liquidation without regard to the effects on other parties (Ehrhardt & Brigham, 2011, p. 874).

Chapters 1, 3, and 5 contain general provisions applicable to the other chapters. *Chapter 11*, which deals with business reorganization, is the most important section from a financial management viewpoint. *Chapter 7* details the procedures to be followed when liquidating a firm; generally,

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[3] To read more about Bankruptcy Law, see Altman, E. (1993). In *Corporate Financial Distress and Bankruptcy* (2 Ed.). New York, NY: John Wiley & Sons, Inc.

Chapter 7 does not come into play unless it has been determined that reorganization under Chapter 11 is not feasible. Chapter 9 deals with financially distressed municipalities; Chapter 12 covers special procedures for family-owned farms; Chapter 13 covers the adjustment of debts for "individuals with regular income"; and Chapter 15 sets up a system of trustees who help administer proceedings under the act (Ehrhardt & Brigham, 2011, pp. 874-875).

The researcher focused in briefly on chapter 11 which deals with business reorganization and chapter7 that details the procedures to be followed when liquidating a firm which are related to the topic of the study.

2.1.7.3 There are Two Types of Court- Formal (Court-Supervised) Methods of Resolving Financial Distress

Supervised methods to resolve bankruptcy either voluntary bankruptcy or involuntary bankruptcy. Voluntary bankruptcy, a bankruptcy petition filed in federal court by the distressed firm's management. Involuntary bankruptcy, a bankruptcy petition filed in federal court by the distressed firm's creditors. There are many advantages for formal bankruptcy include: avoids holdout problems, due to automatic stay provision avoids common pool problem, Interest and principal payments may be delayed without penalty until reorganization plan is approved, gives debtor exclusive right to submit a proposed reorganization plan for agreement from the parties involved, reduces fraudulent conveyance problem (Ehrhardt & Brigham, 2011).

2.1.8 Liquidation in Bankruptcy

In law and business, liquidation is the process by which a company (or part of a company) is brought to an end, and the assets and property of the company are redistributed. Liquidation is also sometimes referred to as winding-up or dissolution, although dissolution technically refers to the last stage of liquidation. The process of liquidation also arises when customs, an authority or agency in a country responsible for collecting and safeguarding customs duties, determines the final computation or ascertainment of the duties or drawback accruing on an entry (Wikipedia, 2015).

Liquidation may either be compulsory (sometimes referred to as a creditors' liquidation) or voluntary (sometimes referred to as a shareholders' liquidation, although some voluntary liquidations are controlled by the creditors (Wikipedia, 2015).

If a company is "too far gone" to be reorganized, then it must be liquidated. Liquidation should occur when the business is worth more dead than alive, or when the possibility of restoring it to financial health is remote and the

creditors are exposed to a high risk of greater loss if operations are continued (Ehrhardt & Brigham, 2011, p. 885).

Liquidation in bankruptcy is executed by the jurisdiction of a federal bankruptcy court. Chapter 7 of the Federal Bankruptcy Reform Act of 1978 deals with liquidation and there is list of priority of claims in chapter 7 of liquidation (Ehrhardt & Brigham, 2011):

- ✓ Secured creditors.
- ✓ Trustee's administrative costs.
- ✓ Expenses incurred after involuntary case begun but before trustee appointed.
- ✓ Wages due workers within 3 months prior to filing.
- ✓ Unpaid contributions to employee benefit plans that should have been paid within 6 months prior to filing.
- ✓ Unsecured claims for customer deposits.
- ✓ Taxes due.
- ✓ Unfunded pension plan liabilities.
- ✓ General (unsecured) creditors.
- ✓ Preferred stockholders.
- ✓ Common stockholders.

2.1.9 Failure Prediction Models

Some of the earliest research on the topic of using financial ratios to predict financial failure was performed by Beaver (1966) using a univariate analysis method.

The researchers from the past in the sixties began to use financial ratios to predict failure by using various predicting models; the researcher will discuss William Beaver model and Altman's models in briefly.

2.1.9.1 Models for Predicting Bankruptcy

One of the important items in decision making of investors is predicting bankruptcy. Thus, in recent years Academic research community is trying to make exact models for this purpose, including:

- ✓ The William Beaver 1966.
- ✓ Altman models 1968.
- ✓ Kane models in 1972.
- ✓ Aspryngt models in 1978.
- ✓ Ahlsvn models in 1980.
- ✓ Toffler models in 1983.
- ✓ Zmyjvsky models in 1984.
- ✓ Falmr models in 1984.

- ✓ Zavgyn models in 1985.
- ✓ Chi-square models in 1987.
- ✓ Grice models (1998).
- ✓ Fylvsvfr models in 2002.
- ✓ Shyrata mode.

2.1.9.2 William Beaver Model

This model is type of univariate analysis of the company's bankruptcy. Beaver in 1966, selected a collection of 30 financial ratios to assess the health of a company. Then he categorized the ratios into six groups as follows:

Cash flow to total assets, net profit to total assets, total liabilities to total assets, working capital to total assets, current ratio (current assets to current liabilities), the distance of uncertainty (Beaver W. H., 1966).

He provided four principles for his model, as follow:

- ✓ Net cash income of a company, reduces the probability of bankruptcy.
- ✓ High net cash flow from operating companies in the market reduces the risk of bankruptcy.
- ✓ High debt increases the likelihood of bankruptcy.
- ✓ The fixed operating costs will boost the likelihood of bankruptcy.

2.1.9.3 Altman's Z-score

The most well-known quantitative model for predicting bankruptcy is Altman's Z-score, which was developed in 1968 by Edward I. The Z-score is a multiple discriminant analysis which combines ratios in a multivariate context. By taking a sample of 66 companies, Altman examined a list of twenty two possible ratios and finally chose five after numerous tests for the discriminant function. Altman (1968) defined his distress function into:

- ✓ $Z = 1.2 X1 + 1.4X2 + 3.3 X3 + 0.6X4 + .999X5$

Where:

X1 = working capital/total assets;

X2 = retained earnings/total assets;

X3 = earnings before interest and taxes/total assets;

X4 = market value equity/ total debt;

X5 = annual sales /total assets.

In this model:

If: Z < 1.18 bankrupt company

If: 1.81 < Z < 2.675 company in bankruptcy

If: Z > 2.675 the low like hood of bankruptcy.

(Altman E. , 1968, p. 594)

The success of the Altman model was 95%. This model is applicable only to public institutions with commercial nature.

Altman, in 1983, made a revision on model and provided a new model called the Z. The most obvious amendment, was replacing the equity value instead of market value, then the coefficients and limits of the bankruptcy model. The model is formulated as follows:

✓ $Z^` = 0.717x1 + 0.847x2 + 3.107x3 + 0.42x4 + 0.998x5$

If: $Z^` < 1.33$ the very high bankrupt company

If: $1.33 < Z^` < 2.9$ company in the field of bankruptcy

If: $2.9 < Z^`$ the low likhood of company bankruptcy

In 1995, Altman removed the sell ratio to total assets. In his amendments he made changes in coefficients and limits of the bankruptcy model too.

✓ $Z'' = 6.65x1 + 3.26x2 + 6.72x3 + 1.05x4$

In this model:

If: $Z'' < 1.1$ bankrupt company

If: $1.1 < Z'' < 2.6$ company in the field of bankruptcy

If: $2.6 < Z''$ the low likhood of company bankruptcy.

Type of model application

Z =   Bankruptcy prediction of public production institution.

Z'=   Predicting the bankruptcy of both the public and private manufacturing institution.

Z"=   Predicting the bankruptcy of non-manufacturing and service institution.

2.2 Using Financial Analysis and Financial Ratios to Predict Failure

Section two highlights the cash flow statement and presents accounting conventions, financial analysis and types of financial analysis. Also, this section talks about financial ratios, types of financial ratios, the limitations of financial ratios and finally using of accounting ratios to predict financial failure.

2.2.1 The Statement of Cash Flow

A statement reporting the impact of a firm's operating, investing and financing activities on cash flows over an accounting period (Brigham & Houston, 2004, p. 50).

The statement separates activities into three categories:

A. *Operating activities,* which includes net income, depreciation, and changes in current assets and current liabilities other than cash and short-term debt.

B. *Investing activities,* which include investments in or sales of fixed assets.

C. *Financing activities,* which includes cash raised during the year by issuing short-term debt, long-term debt, or stock. Also, since dividends paid or cash used to buy back outstanding stock or bonds reduces the company's cash, such transactions are included here.

Financial failure of many projects results of the lack of the capital that results from ignoring to assess of prepared financial facility needs. The cash flow statement is not the solution as soon as you prepare it you will solve the problems, but it is the report that gives the management a picture of the financial problems of the plant expected to face the facility in the near future. The cash flow planning in the facility one of the most important elements of success of fiscal policy, the lack of a financial planning will make the facility to face one of two things:

✓ The facility may find itself facing cash outflows more than the cash inflows.
✓ The facility face increase in the cash inflows more than the cash outflows and thus there will be money idle without any use.

✓ The preparation of statement of cash flows require to predicts all the processes that affect the volume of cash and put detailed estimates of the amount and timing of cash inflows and outflows resulting from the exercise of any activity within the facility and thus the facility determine all of its operations and identify processes affecting cash flow.

2.2.2 The Objectives of The Cash Flow Statement

There are many objectives of CFS as follow:

A. Cash flow planning helps management to keep the least amount of liquidity to meet the current obligations of the facility and use the largest amount of cash in the assets of the facility for profits.
B. Helps to determine the size of the surplus thus enabling the facility to direct their investments more appropriate in terms of return and in light of the magnitude and timing of the extra money.
C. Cash flows planning help to know the size and time of deficit or surplus cash.
D. Assist in developing policies to face the debts in a timely manner.
E. Enables the list of cash flows to achieve control over cash flows in the enterprise.
F. The statement of cash flows without the other statements is not sufficient to provide the necessary information to employees and other creditors.

2.2.3 Steps to Prepare The Cash Flow Statement

To prepare the statement of cash flows you need to follow these steps:

A. Estimate the cash inflows (receipts)
B. Estimated cash outflows (payments)
C. Compared inflows (receipts) to outflows (payments).
D. Estimate the minimum level of due cash

Firms in financial distress, generally display dramatically different cash flow patterns. Firms in reorganization will generally have a negative cash flow from operations, a positive cash flow from investing activities and a negative cash flow from financing. The positive inflow from investing is usually due to the liquidation of excess assets and negative cash flows from financing as they work to satisfy stakeholders. Distressed firms will also report negative cash flows from operations and investing, but will still be in the process of raising capital

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and reporting a positive cash flow from investing activities. These may be the most dangerous (Danilov, 2014, p. 28).

2.2.4 Definitions and Conventions of Accounting (McLaney, 2009, pp. 46-48)

Accounting is a language that is used to store and communicate economic information about organizations. It has a set of rules. It is particularly important that anyone trying to read accounting statements and draw conclusions from them is clear on the rules of accounting. Severe misunderstandings could arise for someone not familiar with the rules.

2.2.4.1 Going concern convention

In the absence of evidence to the contrary, it is assumed that the business will continue indefinitely. This means, for example, that it will be assumed that a non-current asset will be capable of being used by the business for the whole of its useful life, rather than it being assumed that the business will be forced to dispose of the asset as a result of the business suffering financial collapse. Thus a business can base its depreciation policy on the cost, expected life and disposal proceeds of the particular asset, rather than on the current value of the asset at intermediate points of its life. As a result, the fact that many non-current assets have a current market value below their balance sheet value does not cause the prudence convention to be invoked.

2.2.4.2 Accruals basis

Profit or loss is concerned with net increases or decreases in wealth, not with increases or decreases in cash. Thus when deriving the amount of the expenses that are to be matched to particular revenues, the fact that cash may not yet have been paid is not relevant. For example, the cost of inventories sold, for inclusion in the income statement, will be the same, irrespective of whether or not payment for the inventories concerned has yet been made.

2.2.5 Quarterly Vs. Audited Financial Statement

Most traditional analysis relies on annual financial statements primarily because they have been audited and are therefore are believed to be more reliable than unaudited, quarterly financial statements. Baldwin and Glezen (1992) found that there was no statistical evidence to suggest that quarterly financial statements were less accurate than annual financial statements with regards to assessing solvency and went on further to suggest that quarterly statements provided more timely evidence of insolvency than annually issued statements without a substantial loss of accuracy (Danilov, 2014, p. 29).

2.2.6 Techniques of Financial Statement Analysis (Paramasivan & Subramanian, 2008, p. 14)

Financial statement analysis is interpreted mainly to determine the financial and operational performance of the business concern. A number of methods or techniques are used to analyze the financial statement of the business concern. The following are the common methods or techniques, which are widely used by the business concern.

A. Comparative Statement Analysis:

- ✓ Comparative Income Statement Analysis.
- ✓ Comparative Position Statement Analysis.

B. Trend Analysis.
C. Common Size Analysis.
D. Fund Flow Statement.
E. Cash Flow Statement.
F. Ratio Analysis.

The researcher will discuss the important method of analysis which will be used in this study to predict business failure which is ratios analysis then the researcher will mention the types of financial ratios and finally limitations of the financial ratios.

2.2.7 Ratios Analysis

2.2.7.1 Ratio Analysis Definitions

Financial statements report both on a firm's position at a point in time and on its operations over some past period. However, the real value of financial statements lies in the fact that they can be used to help predict future earnings and dividends. From an investor's standpoint, *predicting the future is what financial statement analysis is all about,* while from management's standpoint, *financial statement analysis is useful both to help anticipate future conditions and, more important, as a starting point for planning actions that will improve the firm's future performance.* Financial ratios are designed to help one evaluate a financial statement (Brigham & Houston, 2004, p. 97).

Ratio analysis involves methods of calculating and interpreting financial

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ratios to analyze and monitor the firm's performance. The basic inputs to ratio analysis are the firm's income statement and balance sheet (Gitman, 2002, p. 49).

Ratio analysis is a commonly used tool of financial statement analysis. Ratio is a mathematical relationship between one number to another number. Ratio is used as an index for evaluating the financial performance of the business concern. An accounting ratio shows the mathematical relationship between two figures, which have meaningful relation with each other (Paramasivan & Subramanian, 2008, pp. 20-21).

Financial ratios are designed to extract important information that might not be obvious simply from examining a firm's financial statements (Ehrhardt & Brigham, 2011, p. 89).

From previous definitions we can say ratio analysis is a tool of financial statement analysis which is a mathematical relationship between two figures that used to analyze, monitor and evaluate financial performance of the firm.

2.2.7.2   Interested Parties

There are many parties involved in financial analysis and every group seek to answer a series of questions that affect their interests by analyzing financial statements and explain its results. These parties are:

    A. Present and potential investors.
    B. Lenders.
    C. Customers and suppliers.
    D. Governmental institutions.

A. Present and potential investors

Investors are more interested in the return on equity because they want to insure the effectiveness of their investments, so they are looking which better to keep their investments or to give up.

Both present and prospective shareholders are interested in the firm's current and future level of risk and return, which directly affect share price (Gitman, 2002, p. 49).

B. Lenders

Banks and creditors are more interested in the debt ratios to insure the project ability to settle its loan. They interested primarily in the short term

liquidity of the company and its ability to make interest and principal payments.

A second concern of creditors is the firm's profitability, they want assurance that the business is healthy (Gitman, 2002, p. 49).

C. Management

Like stockholders, is concern with all aspects of the firm's financial situation, and its attempts to produce financial ratios that will be considered favourable by both owners and creditors. In addition, management uses ratios to monitor the firm's performance (Gitman, 2002, p. 49).

2.2.7.3   Categories of Financial Ratios

Financial ratios can be divided for convenience into five basic categories: liquidity, activity, debt, profitability, market ratios. Liquidity, activity, and debt ratios primarily measure risk. Profitability ratios measure return. Market ratios capture both risk and return (Gitman, 2002, p. 53). These categories beside cash flow ratios will be discussed in briefly. The basic categories of financial ratios is as follow:

A. Liquidity (Solvency) Ratios.

B. Activity Ratios.

C. Leverage Ratios.

D. Profitability Ratios

E. Market Ratios.

A.   Liquidity Ratios

The liquidity of a firm is measured by its ability to satisfy its short-term obligations as they come due. Liquidity refers to the solvency of the firm's overall financial position—the ease with which it can pay its bills. Because a common precursor to financial distress and bankruptcy is low or declining liquidity, these ratios are viewed as good leading indicators of cash flow problems. The two basic measures of liquidity are the current ratio and the quick (acid-test) ratio (Gitman, 2002, p. 54).

B. Activity Ratios

Activity ratios measure the speed with which various accounts are converted into sales or cash—inflows or outflows. With regard to current accounts, measures of liquidity are generally inadequate because differences in the composition of a firm's current assets and current liabilities can significantly affect its "true" liquidity. It is therefore important to look beyond measures of overall liquidity and to assess the activity (liquidity) of specific current accounts. A number of ratios are available for measuring the activity of the most important current accounts, which include inventory, accounts receivable, and accounts payable. The efficiency with which total assets are used can also be assessed (Gitman, 2002, p. 55).

C. Debt Management Ratios

The extent to which a firm uses debt financing, or financial leverage, has three important implications: (1) By raising funds through debt, stockholders can maintain control of a firm without increasing their investment. (2) If the firm earns more on investments financed with borrowed funds than it pays in interest, then its shareholders' returns are magnified, or "leveraged," but their risks are also magnified. (3) Creditors look to the equity, or owner-supplied funds, to provide a margin of safety so the higher the proportion of funding supplied by stockholders, the less risk creditors face. (Ehrhardt & Brigham, 2011, p. 95).

It is also called as leverage ratio, which measures the long-term obligation of the business concern. This ratio helps to understand, how the long-term funds are used in the business concern (Paramasivan & Subramanian, 2008, p. 22).

D. Profitability Ratio

Profitability is the net result of a number of policies and decisions. The ratios examined thus far provide useful clues as to the effectiveness of a firm's operations, but the profitability ratios go on to show the combined effects of liquidity, asset management, and debt on operating results (Brigham & Houston, 2004, p. 98).

There are many measures of profitability. As a group, these measures enable the analyst to evaluate the firm's profits with respect to a given level of sales, a certain level of assets, or the owners' investment. Without profits, a firm could not attract outside capital. Owners, creditors, and management pay close attention to boosting profits because of the great importance placed on earnings in the marketplace (Gitman, 2002, p. 61).

E. Market Value Ratios

A final group of ratios, the market value ratios, relates the firm's stock price to its earnings, cash flow, and book value per share. These ratios give management an indication of what investors think of the company's past performance and future prospects. If the liquidity, asset management, debt management, ratios all look good, then the market value ratios will be high, and the stock price will probably be as high as can be expected (Brigham & Houston, 2004, p. 102).

2.2.7.4 Cash Flow Ratios (About Money, 2015)

Under generally accepted accounting principles, a company can easily report a large income figure, even while its cash reserves are draining away. The cash flow from operations ratio can be used to determine the extent to which cash flow differs from the reported level of either operating income or net income. Any difference in the ratio that varies significantly from one is indicative of substantial noncash expenses or sales in the reported income figures. Cash flow problems are likely if the ratio is substantially less than one (Bragg, 2002, p. 49).

Cash flow analysis uses ratios that focuses on cash flow and how solvent, liquid, and viable the company is. Here are the most important cash flow ratios:

A. Operating Cash Flow Ratio

The operating cash flow ratio is one of the most important cash flow ratios. Cash flow is an indication of how money moves into and out of the company and how you pay your bills. Operating cash flow relates to cash flows that a company accrues from operations to its current debt. It measures how liquidity a firm is in the short run since it relates to current debt and cash flows from operations. Operating Cash Flows Ratio = Cash Flows From Operations/Current Liabilities where: Cash Flows from Operations comes off the Statement of Cash Flows and Current Liabilities comes off the Balance Sheet. If the Operating Cash Flow Ratio for a company is less than 1.0, the company is not generating enough cash to pay off its short-term debt which is a serious situation. It is possible that the firm may not be able to continue to operate.

B. Price/Cash Flow Ratio

The price to cash flow ratio is often considered a better indication of a company's value than the price to earnings ratio. It is a really useful ratio for a company to know, particularly if the company is publicly traded. It compares the company's share price to the cash flow the company generates on a per share basis. Calculate the price/cash flow ratio as follows: Price/cash flow ratio = Share price/Operating cash flow per share where: Share price is usually the closing price of the stock on a particular day and operating cash flow is taken from the Statement of Cash Flows. Some business owners use free cash flow in the denominator instead of operating cash flow. It should be noted that most analysts still use price/earnings ratio in valuation analysis.

C. Cash Flow Margin Ratio

The Cash Flow Margin ratio is an important ratio as it expresses the relationship between cash generated from operations and sales. The company needs cash to pay dividends, suppliers, service debt, and invest in new capital assets, so cash is just as important as profit to a business firm. The Cash Flow Margin ratio measures the ability of a firm to translate sales into cash. The calculation is: Cash flow from operating cash flows/Net sales. The numerator of the equation comes from the firm's Statement of Cash Flows. The denominator comes from the Income Statement. The larger the percentage, the better.

D. Cash Flow from Operations/Average Total Liabilities

Cash flow from Operations/Average total liabilities is a similar ratio to the commonly-used total debt/total assets ratio. Both measure the solvency of a company or its ability to pay its debts and keep its head above water. The former is better, however, as it measures this ability over a period of time rather than at a point in time. This ratio is calculated as follows: Cash flow from Operations/Average Total Liabilities, where: cash flow from operations is taken from the Statement of Cash Flows and average total liabilities is an average of total liabilities from several time periods of liabilities taken from balance sheets. The higher the ratio, the better the firm's financial flexibility and its ability to pay its debts.

2.2.7.5 Limitations of Ratio Analysis (Ehrhardt & Brigham, 2011, p. 109)

A. Many large firms operate different divisions in different industries, and for such companies it is difficult to develop a meaningful set of industry averages. Therefore, industry averages are more applicable to small, narrowly focused firms than to large, multidivisional ones.

B. To set goals for high-level performance, it is best to benchmark on the industry leaders' ratios rather than the industry average ratios.

C. Inflation may have badly distorted firms' balance sheets—reported values are often substantially different from "true" values. Further, because inflation affects depreciation charges and inventory costs, reported profits are also affected. Thus, inflation can distort a ratio analysis for one firm over time or a comparative analysis of firms of different ages.

D. Seasonal factors can also distort a ratio analysis. For example, the inventory turnover ratio for a food processor will be radically different if the balance sheet figure used for inventory is the one just before versus the one just after the close of the canning season. This problem can be minimized by using monthly averages for inventory (and receivables) when calculating turnover ratios.

E. Firms can employ "window dressing" techniques to make their financial statements look stronger.

F. Different accounting practices can distort comparisons.

2.2.7.6 Cautions About Using Ratio Analysis (Gitman, 2002, p. 53)

A. Ratios with large deviations from the norm only indicate *symptoms* of a problem. Additional analysis is typically needed to isolate the *causes* of the problem. The fundamental point is this: Ratio analysis merely directs attention to potential areas of concern; it does not provide conclusive evidence as to the existence of a problem.

B. A single ratio does not generally provide sufficient information from which to judge the *overall* performance of the firm. Only when a group of ratios is used can reasonable judgments be made. However, if an analysis is concerned only with certain *specific* aspects of a firm's financial position, one or two ratios may be sufficient.

C. It is preferable to use *audited financial statements* for ratio analysis. If have not been audited, the data contained in them may not reflect the firm's true financial condition.

2.2.7.7 Using Accounting Ratios to Predict Financial Failure (McLaney, 2009, p. 66)

One objective of ratio analysis is to try to make a judgment about a particular business's ability to survive and to prosper. Originally, interest focused on identifying individual ratios that might represent good indicators of likely financial collapse. Researchers, therefore, sought to be able to make statements such as: if the value for a particular ratio (such as the acid test ratio) fell below a particular threshold figure, the business was then significantly at risk. They attempted to do this by identifying particular ratios that might be good discriminators between potential failures and survivors. The researchers then found a group of businesses that had actually collapsed. They matched this with a second group of non-failed businesses, one of which was as like one of the collapsed group as possible in size, industry and so forth. This provided them with two groups, as far as possible identical, except that all the members of one group had collapsed and none of the second group had. Using past data on all the businesses, attempts were made to examine whether the particular ratios selected were significantly different between the two groups during the period (say, five years) leading up to the date of the collapse of the failed businesses. Where there were significant differences for a specific ratio, it was possible to say that a figure of above a particular level implied that the business was safe, whereas a figure below this benchmark implied that it was at risk. Although researchers achieved some success at identifying ratios that were reasonably good discriminators, thoughts turned to the possibility that combining several quite good discriminator ratios might produce a Z-score (so called) that would be a very good discriminator.

2.3   Overview of Palestine Securities Exchange

This section briefly talks about the emergence and development of the Palestine securities exchange, the objectives of the PEX, the listed companies in the PEX and finally this section presents the cases in which the listed companies will be delisted.

2.3.1 The Emergence and The Development of The Palestine Securities Exchange (Palestine Exchange, 2015)

Founded in 1995, and holding its first trading session in February 1997, the PEX began as the first private sector-owned stock exchange in the Arab world. In 2010, it converted into a public shareholding company with paid-up capital of US $10 million. This transformation was accompanied by a new corporate identity bearing the brand name "Palestine Exchange" and the slogan "Palestine of Opportunities." Committed to the principles of good governance, the PEX listed for trading on April 4, 2012 thus becoming the second Arab exchange to do so. The PEX is registered with the Companies Controller at the Ministry of National Economy under registration number (562601187).

The PEX focuses on attracting regional and international individual and institutional investors, including Palestinian diaspora. Currently, the PEX conducts its business through its head – quarters in Nablus and its representative office in Ramallah. Since its inception as the first fully automated Arab exchange, the PEX has sought to mesh the latest financial market technology with best practice governance and management to ensure maximum transparency, integrity and investor protection.

Along with securities trading, the PEX offers transaction processing services through its Clearing Depository Settlement Center (CDS). These include opening investor accounts, off-floor transactions, issuing share books and ownership certificates. Monitored by the SMARTS market surveillance platform, the HORIZON system carries out trading transactions. Settlement and clearing transactions are carried out through the Clearing Depository & Settlement Center (CDS) electronic system linked to the trading system. During the settlement process, securities are transferred from the seller to the buyer in T+3, while clearing is done through the settlement bank (Arab Bank). HSBC bank acts as a custodian for securities on behalf of foreign investors.

On 31 December 2012, 48 companies with a total market value of some US$2.86 billion were listed on the PEX. They encompassed five economic sectors: banking and financial services, insurance, investment, industry, and services. Shares trade in Jordanian dinars and US dollars. Only ordinary shares trade but there remains the possibility and readiness for trading other securities in the future. On 31 December 2012, nine member securities companies (brokerage

firms) distributed among different cities in the West Bank and Gaza Strip operated in the PEX.

The PEX maintain a regional and international presence through membership in several specialized federations:

- ✓ Federation of Arab Stock Exchanges.
- ✓ Federation of Euro-Asian Stock Exchanges (FEAS).
- ✓ World Federation of Exchanges – WFE (Affiliate Member).
- ✓ Forum of Islamic Stock Exchanges.
- ✓ Africa & Middle East Depositories Association (AMEDA).
- ✓ Association of National Numbering Agencies (ANNA).

2.3.2 The Objectives of Palestine Securities Exchange

Palestine Stock Exchange is trying to achieve many goals, the most important is as follow: (Palestine Exchange, 2015):

- ✓ To provide a safe trading environment that serves investors and protects their interests.
- ✓ To increase the investment awareness of the local community and enhance PEX relation with local, regional and international financial institutions and Associations.
- ✓ To develop domestic investments and attract Palestinian Diaspora & foreign capital.
- ✓ To increase market depth and provide new and diverse financial tools and services.
- ✓ To create a proficient working environment within the PEX by investing in human capital and maintaining state of the art technologies of stock markets.

2.3.3 The Listed Companies in PEX

The PEX encompassed five economic sectors: banking and financial services, insurance, investment, industry, and services sectors. The economic sectors and the listed companies for each sector in the PEX at the end of 2014 are shown in appendix no. (2).

2.3.4 Delisting Companies

Following Palestinian capital market authority approval, PEX may delist listed companies shares in the following events (Palestine Exchange, 2015):

A. If it appears that material information was stated in the listing application or any material documents supplied were incorrect, forged, misleading, or missing or the Company failed to submit required documents to the PEX upon request.

B. If the number of shareholders decreased below 50 shareholders for companies listed in the Second Market for a period of 3 consecutive months during one year.

C. If it appears from the audit report that the company is unable to meet its debt obligations, or unable to finance its activities, or its net shareholders equity to the paid capital is less than 20%.

D. If the listed company ceases to exist as a corporate entity because of a merger with other company (ies) or because of liquidation.

E. If the company shares or bonds were not traded for an entire one year, or the listing was suspended for over a year without adjusting the company its status pursuant to the Securities Trading Rule as issued by the PEX.

F. If the company violates any of its obligations as stipulated in the listing agreement or Law or PEX rules.

G. In all other events that infringe the protected rights of the investors or to serve public interest.

H. If the listing of the foreign company shares where they were originally listed in a foreign exchange was delisted.

I. If the foreign company no longer has a branch in Palestine or legal representative for more than one month.

2.4 Multiple Linear Discriminant VS. Logistic Regression Model

Section four presents the statistical models for predicting corporate failure in briefly. First this section presents MDA and then logistical model which used in this study to predict corporate failure.

2.4.1 Multiple Linear Discriminant Model

2.4.1.1 Multiple Linear Discriminant Model Definition

MDA is a statistical technique used to classify an observation into one of several *a priori* groupings dependent upon the observation's individual characteristics. It is used primarily to classify and/or make predictions in problems where the dependent variable appears in qualitative form, e.g., male or female, bankrupt or non-bankrupt. Therefore, the first step is to establish explicit group classifications. The number of original groups can be two or more. After the groups are established, data are collected for the objects in the groups; MDA then attempts to derive a linear combination of these characteristics which "best" discriminates between the groups. If a particular object, for instance a corporation, has characteristics (financial ratios) which can be quantified for all of the companies in the analysis, the MDA determines a set of discriminant coefficients. When these coefficients are applied to the actual ratio, a basis for classification into one of the mutually exclusive groupings exists. The MDA technique has the advantage of considering an entire profile of characteristics common to the relevant firms, as well as the interaction of these properties. A univariate study, on the other hand, can only consider the measurements used for group assignments one at a time (Altman E. , 1968, p. 592).

2.4.1.2 Justification for Not Using Multiple Linear Discriminant Model

A. Discriminatory analysis requires a set of non-failure companies similar to a set of failure companies in terms of the volume of activity, the type of activity and the size of capital and assets.

B. Discriminatory analysis requires that the dependent variable in the study to be descriptive variable and its best used when the dependent variable has more than two categories.

C. Discriminant analysis imposes certain statistical requirements on predictors: multivariate normality of independent variables and equal variance-covariance matrices of groups.

2.4.2   Linear Logistical Regression Model

2.4.2.1   Logistic Model Definition

Logistic model is one of the linear probability models (LPM) which discuss the probability of the event occurring and this happen by using a group of independent variables whether it is dummy or continuous variables and the dependent variable is a dummy variable which have two values like (1,0), (yes & no), (failed & non-failed) or nominal like (male & female), (white or black) (Miqdad M. I., 2014).

The purpose of this model to predict the probability of occurrence of an event or the emergence of the event by using several predictor variables that may be either numerical or categorical.

The linear probability models include three types of models as follow:

- ✓ Linear Logistic Models (LLM).
- ✓ Linear Probit Models (LPM).
- ✓ Linear Discriminant Models (LDM).

The logistic model is the most common model that used by the researchers because it is not complex like other LPM and the results of this model can be read and interpreted easily.

2.4.2.2   Linear Logistic Regression Model

The logistical model can be expressed by using linear logistical function that explains the relationship between independent and dependent variables as follow:

$$\text{Logit (Y)} = a + b_1 X_1 + b_2 X_2 + \ldots b_k X_k \quad \ldots\ldots\ldots\ldots(1)$$

<div align="right">(Miqdad M. I., 2014, p. 191)</div>

<u>Where:</u>

(Y) = represent a dummy variable which means it has non continuous value but only has two values like (1 or 0), (failed or non-failed).

(X) = represent independent variables which may be a quantitative variable like continues variable or qualitative like dummy variable, ordinal and nominal variables.

(a) = intercept of y-axis.

(b) = coefficient of the variables.

We can convert the Logit function, in the function number (1), to exponential function by computing the odds as follow:

Odds (Y=1) $= e^{\,logit\,(Y)}$ …………………………………….…(2)

(Miqdad M. I., 2014, p. 191)

We can replace the logit (Y) in the function no. (2) by the value of the function No. (1), so we can express the odds function as follow:

Odds (Y=1) $= e^{\,(a\,+\,b1x1\,+\,b2x2+\,.....bkxk)}$ ....(3)

(Miqdad M. I., 2014, p. 191)

We can convert odds function to probability function where (Y=1) by using the function No.(4) and this function express the probability of the occurrence of the event or the emergence of the event in the model.

P(Y=1) = odds (Y=1) / [1 + odds (Y=1)] …………………….…(4)

(Miqdad M. I., 2014, p. 191)

The function No. (4) can convert to the function no. (5) as follow:

P(Y=1) $= e^{\,(a\,+\,b1x1\,+\,b2x2+\,.....bkxk)}/1 + e^{\,(a\,+\,b1x1\,+\,b2x2+\,.....bkxk)}$.….(5)

(Miqdad M. I., 2014, p. 191)

Finally we can formulate the final function as follow:

- In the event of occurrence:

P(Y=1) $= 1/1 + e^{\,-(a\,+\,b1x1\,+\,b2x2+\,.....bkxk)}$ ………. (6)

(Miqdad M. I., 2014, p. 191)

- The function No.(7), in the event of non-occurrence will be as follow:

P(Y=0) = 1- P(Y=1) ………………….…(7)

(Miqdad M. I., 2014, p. 191)

2.4.2.3 Interpretation of The Results

The interpretation of the results is the most important step after the analysis and there are two types of results uses:

A. To know the direction and existence of the relationship.

B. Predicting probability of an event occurrence.

2.4.2.4 How The Model Might Fit The Data

Chi^2 test is the corresponding test for "F" test in linear regression model which used for testing how fit of the data in the model.

If chi^2 value statistically significant in which the sig. level is less than 5% then we can refuse the null hypothesis and accept the relationship exits which means we accept the occurrence of the event by independent variables used in the model (Miqdad M. I., 2014, p. 194).

If chi^2 value is not statistically significant in which the sig. level is more than 5% then we can accept the null hypothesis and reject the relationship exits which means we reject the occurrence of the event by independent variables used in the model.

Chapter Three

Study Methodology and Data Analysis

3.1 Study Methodology

3.2 Data Analysis

3. Chapter Three: Study Methodology and Data Analysis

The chapter three presents the methodology of the study in section one which includes the study design, statistical tests, methods of data collection, study population and study procedure. Also, this chapter at section two presents the data analysis which includes descriptive statistics, testing the variables normality, testing hypothesis. Finally presenting the models that have been reached and their predictive ability.

3.1 Study Methodology

Section one presents study methodology which includes the study design, statistical tests, methods of data collection, study population and study procedures.

3.1.1 The Study Design

This study used the descriptive analytical methodology since it is the most suitable for this type of study by depending on the descriptive approach in the presentation of the theoretical aspect of the study then used the analytical approach in the presentation of the practical aspects and finally conducting the necessary tests.

3.1.2 Statistical Tests

The statistical analyses and necessary tests were conducted on the available financial data to test the study hypotheses and to measure the models accuracy rates concerning corporate failure prediction. The statistical software, SPSS, is used to analyze the inputs based on the data of the study through the following measures and tests:

A. Frequencies and percentages were used.

B. Descriptive statistics were used.

C. Kolmogorov–Smirnov test to know the type of data if it follows a normal distribution or not (1-sample Ks).

D. T-tests to explore differences between groups of variables.

E. Hosmer Lemeshow test for overall fit of logistic regression model.

F. Logistic analysis were used to build a failure prediction model.

G. Variance influence factor (VIF) to test multicollinearity problem.

3.1.3 Data Collection

3.1.3.1 Secondary Data

A. Collect financial data from financial statements publicly available from the listed companies in Palestine Exchange over the past five years.
B. Books, journals, academic thesis, and related publications in the academic fields.
C. Palestine Exchange Publications.
D. Periodic reports.

3.1.4 Study Population

Study population include all public listed companies in the Palestine Exchange that representing five economic sectors for (48) financial institution classified until the end of 2014 as shown in the table no. (3.1.4.1). The study population was classified into two groups, the first group is non-failed companies which have not subject to failure condition (judgmental)[4], the second group of companies that failed and subject to failure condition and that if the company has a negative OCF in two consecutive years or more during the study period from (2010 to 2014). The fifth year is considered the failure year.

A. Failed and non-failed companies for each sector are shown in the tables no. (3.1.4.2), (3.1.4.3), (3.1.4.4), (3.1.4.5) and (3.1.4.6).

B. The comprehensive survey was conducted on all sectors in the PEX and the study did not focus on specific sector.

C. Bonds of commercial bank was excluded from the study population since it has no relation to the topic of the study.

D. The data of Palestine Securities Exchange (PSE) company was excluded from the banking sector analysis to focus only on the banking institutions so the data of this company will not affect on the results of the banking institutions.

E. The data of PHARMCARE company for 2014 is not available by the company so this year was excluded from the industry sector analysis.

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[4] The failure condition has been identified based on reviewing past studies and literatures also based on experts' viewpoints.

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Table 3.1.4.1: The Study Population

Name of The Economic Sector	No. of Companies
Insurance Sector	7
Banking Sector and Financial Services	8
Services Sector	12
Investment Sector	9
Industrial Sector	12
(5) Economic Sectors	**(48) company, Total Study Population**

Table 3.1.4.2: Failed and Non-Failed Companies[5]
(Banking Sector)

Failed Companies	Non-Failed Companies
Palestine Islamic Bank	Bank of Palestine
Arab Islamic Bank	Palestine Commercial Bank
Quads Bank	Palestine Investment Bank
	The National Bank

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[5] You can review more details on how the companies have been classified into failed and non-failed in Appendix no. (1).

Table 3.1.4.3: Failed and Non-Failed Companies
(Industries Sector)

Failed Companies	Non-Failed Companies
The Vegetable Oil Industries	Jerusalem Pharmaceuticals
Palestine Plastic Industries	Arab Company for Paints Products
Jerusalem Cigarette	Birzeit Pharmaceuticals
Al-Shark Electrode	The National Industry
	Golden Wheat Mills
	Palestine Poultry
	National Aluminum and Profile
	Dar Al-Shifa Pharmaceuticals

Table 3.1.4.4: Failed and Non-Failed Companies
(Insurance Sector)

Failed Companies	Non-Failed Companies
Al-Mashrq Insurance Co.	National Insurance Company
Palestinian Insurance Company	Ahleia Insurance Group
	Trust International Insurance
	Al-Takaful Palestinian Insurance
	Global United Insurance

Table 3.1.4.5: Failed and Non-Failed Companies
(Investment Sector)

Failed Companies	Non-Failed Companies
Jerusalem Real Estate Investment Co.	Union Construction and Investment
Palestine Investment and Development	Arab Investors
Al-Aqariya Trading Investment	Palestine Industrial Investment
	Palestine Real Estate Investment
	Palestine Development & Investment
	Arab Palestinian Investment

Table 3.1.4.6: Failed and Non-Failed Companies
(Services Sector)

Failed Companies	Non-Failed Companies
GlobalCom Telecommunications	Palestine Telecommunications
The Arab Hotel Company	Arab Palestinian Shopping Centre
Arab Real Estate Establishment	Palestinian Dist.& Logistical Services
Nablus Surgical Center	Palestine Electric
	Wataniya Palestine Mobile Telecomm.
	Al-Wataniah Towers
	The Ramallah Summer Resorts
	PalAqar Company for Estate Management & Development

3.1.5 Study Procedures

A. The financial statements collected for 48 company representing five different economic sectors in PEX which include the balance sheet, income statement and cash flow statement covering a period of five years from 2010 to 2014.

B. Financial statements consolidated in one form because of the different forms, different currencies and different elements for each company. The consolidated forms contained all necessary elements to conduct ratios analysis.

C. The U.S dollar determined as common currency of the financial statements for companies at common exchange rate = 3.8 NIS/$ and common exchange rate = .7 $/JD

D. The financial ratios calculated by Ms Excel software.

E. The statistical significant ratios determined by SPSS-21 software.

3.1.6 Predictor Variables

Failure prediction models used accrual accounting-based measures. Researchers in the past have used cash flow data but with mixed results. Cash Shortage and bad financial performance are often-cited reasons for financial distress.

Why cash flow? (Bhandari & Iyer, 2013, pp. 668-669)

Ever since accrual accounting system was adopted for recording and reporting business transactions, balance sheets and income statements were the main source of information for academics, analysts and investors for their research and decision-making purposes. The importance of cash flow, though intuitive was not realized until the accounting regulators and textbook authors started emphasizing CFS. "*Cash is King*" phrase is now widely understood and respected. Obviously because cash is what buys things, pays wages and salaries; services and pays debt; and compensates stockholders (owners) not accounting income! Inadequate cash can lead to default on accrued payables and ultimate bankruptcy. The most important and useful information in CFS is operating cash flow (OCF). A business is supposed to operate profitably and generate cash. OCF is that number! Another cash flow measure known as free cash flow (FCF) is used by many academics and analysts. Although FCF is useful for internal analysis and decision-making purposes, it is a vague concept because there are many different versions of this measure. Computation and disclosure of FCF is

not mandated by accounting regulatory agencies whereas OCF is. OCF is clearly defined, meticulously calculated and universally disclosed as a part of CFS.

The rationale for selecting these eleventh measures as explanatory variables is as follows:

- *Operating cash flow divided by current liabilities (OCF/CL).*

  This ratio measures a firm's liquidity by comparing actual cash flow with the short-term obligations. Lower the value of this ratio more the likelihood of business failure. This ratio used by (Bhandari & Iyer, 2013), (Rodgers, 2013) and (Matar & Obaidat, 2007).

- *Cash flow coverage of interest (OCF + INT + Tax/INT).*

  The numerator of this ratio is OCF plus interest and taxes paid. The denominator consists of both short- and long-term interest. This ratio measures a firm's ability to service (cover) interest obligation on debt. It is similar to the times interest earned (TIE) ratio which is based on data derived from the income statement. Higher the value of this ratio means lessen the chance of default on interest payment by a firm (Bhandari & Iyer, 2013, p. 670).

- *Operating cash flow margin (OCF/Sales).*

  This ratio is similar to traditional profit margin ratio. It is calculated by dividing net sales into OCF, thereby measuring the ability of a firm to translate sales into cash this ratio is a more appropriate measure of a firm's operating profitability and liquidity as opposed to accrual accounting-based profit margin ratio. There are at least four different profit margin ratios depending upon which profit (gross profit, operating profit, pre-tax profit or net profit) is in the numerator. But there is only one OCF margin ratio. This is another reason why the proposed ratio is more useful measure than net profit margin ratio (Bhandari & Iyer, 2013, p. 670).

- *Operating cash flow return on total assets (OCF/Asset).*

  This ratio is similar to return on assets (ROA) but instead of net income, cash flow from operation is used in the numerator. This ratio measures cash generating ability of all the assets, i.e. assets provided by both creditors and stockholders of the firm. (Bhandari & Iyer, 2013), (Rodgers, 2013) and (Matar & Obaidat, 2007) have used this ratio.

- *Quality of earning (EBIT/OCF).*

  The quality of earnings usually refers to the degree of conservatism in a firm's reported earnings. The operating income (or earnings before interest and taxes) divided by OCF is one such measure. A value less than one signals that (accrual) income is of lesser quality and of impending financial trouble (Bhandari & Iyer, 2013, p. 670).

- *Quick ratio (acid-test ratio).*

  This is a traditional but highly popular measure of corporate liquidity. Current assets minus inventories are divided by current liabilities. The "quick" assets are cash, marketable securities, receivables and pre-paid items. A lower value of this ratio is associated with firm under distress.

- *Operating cash flow return on Equity (OCF/EQUITY).*

  This ratio is similar to return on equity (ROE) but instead of net income, cash flow from operation is used in the numerator. This ratio measures cash financed by stockholders.

- *Operating cash flow return on Net Income (OCF/N.I)* used by (Rodgers, 2013).

- *Operating cash flow return on current Assets (OCF/C.A)* used by (Rodgers, 2013).

- *Operating cash flow return on free cash flow (OCF/FCF)* used by (Rodgers, 2013).

- *Free cash flow on current liabilities (FCF/C.L)* used by (Rodgers, 2013).

3.2   Data Analysis

Section two presents the results of the data analysis, the models that have been reached for each sector and interpretation of the results. The data analysis includes descriptive statistics, test normality of variables and testing hypothesis. We will present the models with variables coefficients for each sector in PEX in addition to the predictive ability of the models that have been reached for four years before failure.

3.2.1 Descriptive Statistics

3.2.1.1 Firms Statistics

<u>Banking Sector</u>

The number and percent of failed and non-failed banks can be seen in Table no. (3.2.1.1).

Table 3.2.1.1: Status Statistics
(Banking Sector)

	Frequency	Percent
Failed	3	42.9%
Non-Failed	4	57.1%
Total	7	100%

The three Failed Banks as mentioned earlier are:

- ✓ Palestine Islamic Bank.
- ✓ Arab Islamic Bank.
- ✓ Quads Bank.

Industry Sector

The number and percent of failed and non-failed companies can be seen in Table no.(3.2.1.2).

Table 3.2.1.2: Status Statistics
(Industry Sector)

	Frequency	Percent
Failed	4	33.3%
Non-Failed	8	66.7%
Total	12	100%

The four failed companies are as follow:

- ✓ The Vegetable Oil Industries.
- ✓ Palestine Plastic Industries.
- ✓ Jerusalem Cigarette.
- ✓ Al-Shark Electrode.

Insurance Sector

The number and percent of failed and non-failed companies can be seen in Table no.(3.2.1.3).

Table 3.2.1.3: Status Statistics
(Insurance Sector)

	Frequency	Percent
Failed	2	28.6%
Non-Failed	5	71.4%
Total	7	100%

The two failed companies are as follow:

- ✓ Al-Mashrq Insurance Company.
- ✓ Palestinian Insurance Company.

Investing Sector

The number and percent of failed and non-failed companies can be seen in Table no.(3.2.1.4).

Table 3.2.1.4: Status Statistics
(Investing Sector)

	Frequency	Percent
Failed	3	33.3
Non-Failed	6	66.7
Total	9	100

The three failed companies are as follow:

- ✓ Jerusalem Real Estate Investment Co.
- ✓ Palestine Investment and Development.
- ✓ Al-Aqariya Trading Investment.

Services Sector

The number and percent of failed and non-failed companies can be seen in Table no.(3.2.1.5).

Table 3.2.1.5: Status Statistics
(Services Sector)

	Frequency	Percent
Failed	4	33.3
Non-Failed	8	66.7
Total	12	100

The four failed companies are as follow:

- ✓ GlobalCom Telecommunications.
- ✓ The Arab Hotel Company.
- ✓ Arab Real Estate Establishment.
- ✓ Nablus Surgical Centre.

3.2.1.2   Ratios Statistics

Banking Sector

The means and standard deviations of the ratios can be seen in Table no. (3.2.1.6), the correlation matrix for the 11 indicators was also carried out in order to investigate the bivariate linear relations among the variables of interest can be found in Table no. (3.2.1.7).

Table 3.2.1.6: Ratios Statistics
(Banking Sector)

No.	Ratios	Failed Cases=15		Non-Failed Cases =20	
		Mean	Std. Deviation	Mean	Std. Deviation
X1	OCF/C.L	-0.08	0.22	0.03	0.06
X2	OCF+INTEREST+TAX/INTEREST	-58.96	183.34	5.86	8.00
X3	OCF/SALES	-0.57	2.09	0.72	1.53
X4	OCF/T.A	-0.01	0.08	0.02	0.05
X5	EBIT/OCF	1.43	7.01	0.13	1.08
X6	Quick Ratio	2.26	0.93	1.15	0.05
X7	OCF/EQUITY	-0.10	0.55	0.17	0.37
X8	OCF/N.I	-8.69	20.17	-5.45	84.89
X9	FCF/C.L	0.03	0.20	0.02	0.06
X10	OCF/FCF	35.28	58.15	184.27	535.26
X11	OCF/C.A	-0.02	0.09	0.02	0.05

As shown in the table no. (3.2.1.6) there are differences in the ratios mean of failed and non-failed banks as shown in the following ratios:

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Cash flow coverage of interest (X2).
- ✓ Operating cash flow margin (X3).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Operating cash flow return on Equity (X7).
- ✓ Operating cash flow return on current Assets (X11).

These ratios shown a negative value for failed banks in comparison with non-failed banks, the differences in the mean of these ratios is due to failed banks that have a negative operating cash flow (OCF).

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Table 3.2.1.7: Correlations of Ratios
(Banking Sector)

	X1	X2	**X3**	**X4**	X5	X6	**X7**	X8	X9	X10	**X11**
X1	1	.870**	.896**	.874**	0.051	-.534**	.824**	.361*	.794**	0.115	.906**
X2	.870**	1	.662**	.652**	0.067	-.451**	.604**	0.16	.671**	0.065	.676**
X3	.896**	.662**	1	.959**	0.042	-.491**	.958**	.567**	.674**	0.191	.984**
X4	.874**	.652**	.959**	1	0.034	-.434**	.939**	.532**	.673**	0.127	.970**
X5	0.051	0.067	0.042	0.034	1	0.238	0.044	0.036	0.088	-.002	0.045
X6	-.534**	-.451**	-.491**	-.434**	0.238	1	-.468**	-.095	-.027	-.161	-.486**
X7	.824**	.604**	.958**	.939**	0.044	-.468**	1	.503**	.586**	0.164	.973**
X8	.361*	0.16	.567**	.532**	0.036	-.095	.503**	1	.347*	0.078	.519**
X9	.794**	.671**	.674**	.673**	0.088	-.027	.586**	.347*	1	-.013	.691**
X10	0.115	0.065	0.191	0.127	-.002	-.161	0.164	0.078	-.013	1	0.135
X11	.906**	.676**	.984**	.970**	0.045	-.486**	.973**	.519**	.691**	0.135	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

As shown in the table no. (3.2.1.7) there are many variables have high correlation such as:

- ✓ X1 has high correlation with X2,X3,X4,X7,X11
- ✓ X3 has high correlation with X1,X4, X7, X11.
- ✓ X4 has high correlation with X1,X3, X7, X11.
- ✓ X7 has high correlation with X3, X4, X11.
- ✓ X11 has high correlation with X1, X3, X4,X7.

The correlation matrix investigates the bivariate linear relations among the variables of interest. We considered those correlation coefficients greater or equal to |0.80| to be significant; highlighting that any correlations below that value are not harmful for an appropriate variable selection.

The high correlation between variables can affect on the model results and the data analysis therefore we will *remove* high correlated ratios (X1,X3,X4,X7,X11) to solve this problem (Colinearity Problem).

Multicollinearity can be evaluated from the Variance Inflation Factor (VIF, no more than 10) and Tolerance values (no less than 0.1).

Industry Sector

The means and standard deviations of the ratios can be seen in Table no. (3.2.1.8) while the correlations between the ratios can be found in Table no. (3.2.1.9).

Table 3.2.1.8: Ratios Statistics
(Industry Sector)

No.	Ratios	Failed Cases=20		Non-Failed Cases =39	
		Mean	Std. Deviation	Mean	Std. Deviation
X1	OCF/C.L	-0.09	0.67	0.498	0.634
X2	OCF+INTEREST+TAX/INTEREST	50.41	305.01	37.777	90.819
X3	OCF/SALES	-0.01	0.11	0.131	0.129
X4	OCF/T.A	0.00	0.06	0.079	0.087
X5	EBIT/OCF	-7.05	21.08	-0.973	12.597
X6	Quick Ratio	1.98	1.49	2.557	2.153
X7	OCF/EQUITY	0.00	0.10	0.113	0.133
X8	OCF/N.I	-0.27	1.71	1.746	4.073
X9	FCF/C.L	0.10	0.63	0.515	0.917
X10	OCF/FCF	-0.63	5.92	-2.270	9.340
X11	OCF/C.A	-0.01	0.15	0.153	0.147

As shown in the table no. (3.2.1.8) there are differences in the ratios mean of failed and non-failed industrial companies as shown in the following ratios:

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Operating cash flow margin (X3).
- ✓ Operating cash flow return on Net Income (X8).
- ✓ Operating cash flow return on current Assets (X11).

These ratios shown a negative value for failed companies in comparison with non-failed one, the differences in the mean of these ratios is due to failed companies that have a negative operating cash flow (OCF).

Table 3.2.1.9: Correlations of Ratios
(Industry Sector)

	X1	X2	**X3**	**X4**	X5	X6	**X7**	X8	X9	X10	**X11**
X1	1.000	.374**	.787**	.666**	0.138	.353**	.557**	.300*	.377**	.404**	.750**
X2	.374**	1.000	.312*	0.121	0.079	0.207	0.072	0.043	.354**	0.129	0.225
X3	.787**	.312*	1.000	.901**	0.163	0.098	.833**	.395**	.624**	.273*	.878**
X4	.666**	0.121	.901**	1.000	0.152	0.037	.982**	.362**	.602**	.285*	.895**
X5	0.138	0.079	0.163	0.152	1.000	-0.177	0.142	0.084	0.042	-0.056	0.162
X6	.353**	0.207	0.098	0.037	-0.177	1.000	-.026-	0.037	0.133	0.210	0.019
X7	.557**	0.072	.833**	.982**	0.142	-0.026	1.000	.347**	.585**	0.255	.860**
X8	.300*	0.043	.395**	.362**	0.084	0.037	.347**	1.000	0.039	0.052	.382**
X9	.377**	.354**	.624**	.602**	0.042	0.133	.585**	0.039	1.000	0.103	.422**
X10	.404**	0.129	.273*	.285*	-.056-	0.210	0.255	0.052	0.103	1.000	.267*
X11	.750**	0.225	.878**	.895**	0.162	0.019	.860**	.382**	.422**	.267*	1.000

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

As shown in the table no. (3.2.1.9) there are many variables which have high correlation, as follow:

- ✓ X3 has high correlation with X4,X7,X11.
- ✓ X4 has high correlation with X3,X7,X11.
- ✓ X7 has high correlation with X3,X4,X11.
- ✓ X11 has high correlation with X3,X4,X7.

The correlation matrix investigates the bivariate linear relations among the variables of interest. We considered those correlation coefficients greater or equal to |0.80| to be significant; highlighting that any correlations below that value are not harmful for an appropriate variable selection.

The high correlation between variables can affect on the model results and the data analysis therefore we will *remove* high correlated ratios (X4,X7,X11) to solve this problem (Colinearity Problem).

Multicollinearity can be evaluated from the Variance Inflation Factor (VIF, no more than 10) and Tolerance values (no less than 0.1)[6].

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[6] For more information on multicollinearity test you can review Appendix no. (2).

Insurance Sector

The means and standard deviations of the ratios can be seen in Table no. (3.2.1.10) while the correlations between the ratios can be found in Table no. (3.2.1.11).

Table 3.2.1.10: Ratios Statistics
(Insurance Sector)

No.	Ratios	Failed Cases=10		Non-Failed Cases =25	
		Mean	Std. Deviation	Mean	Std. Deviation
X1	OCF/C.L	-0.04	0.08	0.07	0.10
X3	OCF/SALES	-0.09	0.14	0.29	0.80
X4	OCF/T.A	-0.04	0.07	0.04	0.06
X5	EBIT/OCF	0.03	2.01	0.73	3.11
X6	Quick Ratio	0.59	0.12	1.00	0.24
X7	OCF/EQUITY	-0.03	2.16	0.11	0.18
X8	OCF/N.I	-4.04	19.67	1.40	2.15
X9	FCF/C.L	-0.01	0.04	0.04	0.11
X10	OCF/FCF	3.57	15.17	1.38	2.60
X11	OCF/C.A	-0.09	0.16	0.07	0.09

As shown in the table no. (3.2.1.10) there are differences in the ratios mean of failed and non-failed insurance companies as shown in the following ratios:

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Operating cash flow margin (X3).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Operating cash flow return on Equity (X7).
- ✓ Operating cash flow return on Net Income (X8).
- ✓ Free cash flow on current liabilities (X9).
- ✓ Operating cash flow return on current Assets (X11).

These ratios shown a negative value for failed companies in comparison with non-failed one, the differences in the mean of these ratios is due to that some failed companies have a negative operating cash flow (OCF) and other has a low free cash flow.

Table 3.2.1.11: Correlations of Ratios
(Insurance Sector)

	X1	X3	**X4**	X5	X6	X7	X8	X9	X10	**X11**
X1	1.000	-.016-	.973**	0.119	.506**	0.220	0.298	.547**	-.275-	.917**
X3	-.016-	1.000	-.013-	0.055	0.145	0.017	0.086	0.098	0.054	0.036
X4	.973**	-.013-	1.000	0.107	.507**	0.246	0.316	.434**	-.351-*	.961**
X5	0.119	0.055	0.107	1.000	0.124	0.031	0.047	0.022	-.015-	0.092
X6	.506**	0.145	.507**	0.124	1.000	0.004	0.164	.450**	-.260-	.486**
X7	0.220	0.017	0.246	0.031	0.004	1.000	0.154	0.004	.444**	0.141
X8	0.298	0.086	0.316	0.047	0.164	0.154	1.000	0.272	0.018	0.282
X9	.547**	0.098	.434**	0.022	.450**	0.004	0.272	1.000	-.018-	.357*
X10	-.275-	0.054	-.351-*	-.015-	-.260-	.444**	0.018	-.018-	1.000	-.500-**
X11	.917**	0.036	.961**	0.092	.486**	0.141	0.282	.357*	-.500-**	1.000

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

As shown in the table no. (3.2.1.11) there are many variables which have high correlation, as follow:

- ✓ X1 has high correlation with X4, X11.
- ✓ X4 has high correlation with X1, X11.
- ✓ X11 has high correlation with X1, X4.

The correlation matrix investigates the bivariate linear relations among the variables of interest. We considered those correlation coefficients greater or equal to |0.80| to be significant; highlighting that any correlations below that value are not harmful for an appropriate variable selection.

The high correlation between variables can affect on the model results and the data analysis therefore we will *remove* high correlated ratios (X4,X6,X1) to solve this problem (Colinearity Problem).

Multicollinearity can be evaluated from the Variance Inflation Factor (VIF, no more than 10) and Tolerance values (no less than 0.1).

Investing Sector

The means and standard deviations of the ratios can be seen in Table no. (3.2.1.12) while the correlations between the ratios can be found in Table no. (3.2.1.13)

Table 3.2.1.12: Ratios Statistics
(Investing Sector)

No.	Ratios	Failed Cases=15		Non-Failed Cases =30	
		Mean	Std. Deviation	Mean	Std. Deviation
X1	OCF/C.L	-1.44	5.96	0.46	1.77
X2	OCF+INTEREST+TAX/INTEREST	3.70	14.91	1.85	12.16
X3	OCF/SALES	0.02	20.77	0.19	0.52
X4	OCF/T.A	-0.01	0.08	0.03	0.04
X5	EBIT/OCF	-0.24	7.12	-3.36	33.30
X6	Quick Ratio	17.26	25.33	3.70	6.13
X7	OCF/EQUITY	-0.01	0.10	0.05	0.08
X8	OCF/N.I	0.15	3.79	1.34	2.84
X9	FCF/C.L	-2.16	6.01	-0.10	0.85
X10	OCF/FCF	-0.07	5.03	-3.12	7.34
X11	OCF/C.A	-0.05	0.30	0.14	0.24

As shown in the table no. (3.2.1.12) there are differences in the ratios mean of failed and non-failed services companies as shown in the following ratios:

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Operating cash flow return on Equity (X7).
- ✓ Operating cash flow return on current Assets (X11).

These ratios shown a negative value for failed companies in comparison with non-failed one, the differences in the mean of these ratios is due to failed companies that have a negative operating cash flow (OCF).

Table 3.2.1.13: Correlations of Ratios
(Investing Sector)

	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11
X1	1	0.117	.689**	.687**	0.002	-.462-**	.508**	0.235	.708**	-.062-	.470**
X2	0.117	1	0.013	0.191	0.025	-.113-	0.192	-.111-	0.032	0.15	.319*
X3	.689**	0.013	1	.533**	0.004	-.102-	.388**	0.043	.595**	-.013-	.344*
X4	.687**	0.191	.533**	1	0.039	-.236-	.847**	.560**	.407**	-.177-	.762**
X5	0.002	0.025	0.004	0.039	1	0.055	0.055	0.04	-.019-	-.033-	0.045
X6	-.462-**	-.113-	-.102-	-.236-	0.055	1	-.212-	0.039	-.744-**	0.133	-.184-
X7	.508**	0.192	.388**	.847**	0.055	-.212-	1	.466**	.315*	-.219-	.661**
X8	0.235	-.111-	0.043	.560**	0.04	0.039	.466**	1	0.068	-.176-	.425**
X9	.708**	0.032	.595**	.407**	-.019-	-.744-**	.315*	0.068	1	-.077-	0.247
X10	-.062-	0.15	-.013-	-.177-	-.033-	0.133	-.219-	-.176-	-.077-	1	-.013-
X11	.470**	.319*	.344*	.762**	0.045	-.184-	.661**	.425**	0.247	-.013-	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

We considered those correlation coefficients greater or equal to |0.80| to be significant; highlighting that any correlations below that value are not harmful for an appropriate variable selection.

As shown in the table no. (3.2.1.13) there are low correlation between variables therefore the data will lead to more accurate results.

Multicollinearity test is necessary to determine the potential similarities with other independent variables in the model.

Multicollinearity can be evaluated from the Variance Inflation Factor (VIF, no more than 10) and Tolerance values (no less than 0.1).

Services Sector

The means and standard deviations of the ratios can be seen in Table no. (3.2.1.14) while the correlations between the ratios can be found in Table no. (3.2.1.15)

Table 3.2.1.14: Ratios Statistics
(Services Sector)

No.	Ratios	Failed Cases=20		Non-Failed Cases =40	
		Mean	Std. Deviation	Mean	Std. Deviation
X1	OCF/C.L	-0.20	0.36	0.35	0.53
X2	OCF+INTEREST+TAX/INTEREST	-14.16	42.34	25.67	49.08
X3	OCF/SALES	-0.40	0.64	0.22	0.34
X4	OCF/T.A	-0.04	0.08	0.06	0.10
X5	EBIT/OCF	2.58	4.96	-1.34	5.68
X6	Quick Ratio	0.94	0.66	1.32	1.40
X7	OCF/EQUITY	-0.07	0.14	0.08	0.19
X8	OCF/N.I	11.45	50.59	3.12	25.98
X9	FCF/C.L	-0.26	0.71	0.08	1.12
X10	OCF/FCF	2.18	5.90	-19.82	78.46
X11	OCF/C.A	-0.28	0.64	0.18	0.35

As shown in the table no. (3.2.1.14) there are differences in the ratios mean of failed and non-failed investing companies as shown in the following ratios:

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Cash flow coverage of interest (X2).
- ✓ Operating cash flow margin (X3).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Quality of earning (X5).
- ✓ Operating cash flow return on Equity (X7).
- ✓ Free cash flow on current liabilities (X9).
- ✓ Operating cash flow return on Free cash flow (X10)
- ✓ Operating cash flow return on current Assets (X11).

These ratios shown a negative value for failed companies in comparison with non-failed one, the differences in the mean of these ratios is due to failed companies that have a negative operating cash flow (OCF).

Table 3.2.1.15: Correlations of Ratios
(Services Sector)

	X1	X2	X3	**X4**	X5	X6	**X7**	X8	X9	X10	X11
X1	1	.566**	.639**	.872**	-.004-	.381**	.759**	0.023	.269*	-.081-	.728**
X2	.566**	1	.716**	.643**	-.028-	0.056	.555**	-.038-	-.049-	-.116-	.607**
X3	.639**	.716**	1	.635**	-.092-	0.189	.577**	-.003-	0.102	-.138-	.705**
X4	.872**	.643**	.635**	1	-.009-	0.128	.940**	0.109	0.047	-.093-	.643**
X5	-.004-	-.028-	-.092-	-.009-	1	-.011-	-.040-	0.008	0.025	-.007-	-.066-
X6	.381**	0.056	0.189	0.128	-.011-	1	0.09	0.078	.755**	0.101	0.228
X7	.759**	.555**	.577**	.940**	-.040-	0.09	1	0.126	0.021	-.070-	.580**
X8	0.023	-.038-	-.003-	0.109	0.008	0.078	0.126	1	0.017	0.079	0.078
X9	.269*	-.049-	0.102	0.047	0.025	.755**	0.021	0.017	1	-.004-	0.131
X10	-.081-	-.116-	-.138-	-.093-	-.007-	0.101	-.070-	0.079	-.004-	1	-.143-
X11	.728**	.607**	.705**	.643**	-.066-	0.228	.580**	0.078	0.131	-.143-	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

As shown in the table no. (3.2.1.15) there are two variables which have high correlation, as follow:

- ✓ X4 has high correlation with X1, X7.
- ✓ X1 has high correlation with X4.
- ✓ X7 has high correlation with X4.

The correlation matrix investigates the bivariate linear relations among the variables of interest. We considered those correlation coefficients greater or equal to |0.80| to be significant; highlighting that any correlations below that value are not harmful for an appropriate variable selection.

The high correlation between variables can affect on the model results and the data analysis therefore we will *remove* high correlated ratio (X4) to solve this problem (Colinearity Problem).

Multicollinearity can be evaluated from the Variance Inflation Factor (VIF, no more than 10) and Tolerance values (no less than 0.1).

3.2.2 Testing for Normality

The data was run through SPSS using the Kolmogorov-Smirnov and Shapiro-Wilk tests. The output table of the normality testing should show significance above 0.05 for variables to be considered *normal*. The variables tested for each sector to test their normality.

Banking Sector

Table 3.2.2.1: Tests of Normality
(Banking Sector)

No.	Ratios	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
X1	OCF/C.L	0.201	35	0.001	0.774	35	0.000
X2	OCF+INTEREST+TAX/INTEREST	0.338	35	0.000	0.653	35	0.000
X3	OCF/SALES	0.105	35	.200[*]	0.953	35	0.141
X4	OCF/T.A	0.117	35	.200[*]	0.948	35	0.095
X5	EBIT/OCF	0.402	35	0.000	0.349	35	0.000
X6	Quick Ratio	0.393	35	0.000	0.687	35	0.000
X7	OCF/EQUITY	0.108	35	.200[*]	0.986	35	0.926
X8	OCF/N.I	0.364	35	0.000	0.452	35	0.000
X9	FCF/C.L	0.210	35	0.000	0.770	35	0.000
X10	OCF/FCF	0.385	35	0.000	0.329	35	0.000
X11	OCF/C.A	0.103	35	.200[*]	0.955	35	0.161

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

A sample Q-Q plot is presented in Figure no.(3.2.2.1) below, showing the Q-Q plot for ratio 1 (Operating cash flow divided by current liabilities). As the sample size is less than 50 we will use significance level of Shapiro-Wilk test. By comparing the curve with the significance level presented in Table no. (3.2.2.1) , one can infer that the data is not normal for X1.

As shown above in the table no. (3.2.2.1) X1,X2,X5,X6,X8,X9 and X10 show a significance level below 0.05 therefore they will be considered not normal, X3,X4,X7,X11 show a sig. level above 0.05 therefore they will be considered normal ratios.
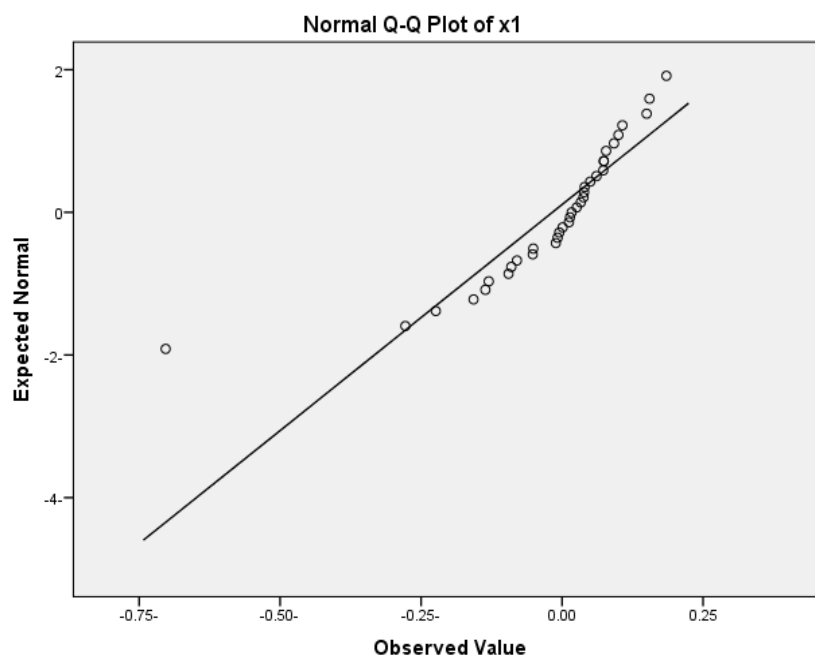
Figure 3.2.2.1: Q-Q Plot of X1.

<u>**Industry Sector**</u>

Table 3.2.2.2: Tests of Normality
(Industry Sector)

No.	Ratios	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
X1	OCF/C.L	0.204	59	0.000	0.811	59	0.000
X2	OCF+INTEREST+TAX/INTEREST	0.375	59	0.000	0.361	59	0.000
X3	OCF/SALES	0.128	59	0.017	0.952	59	0.022
X4	OCF/T.A	0.136	59	0.009	0.869	59	0.000
X5	EBIT/OCF	0.428	59	0.000	0.430	59	0.000
X6	Quick Ratio	0.165	59	0.000	0.829	59	0.000
X7	OCF/EQUITY	0.153	59	0.002	0.815	59	0.000
X8	OCF/N.I	0.199	59	0.000	0.762	59	0.000
X9	FCF/C.L	0.285	59	0.000	0.764	59	0.000
X10	OCF/FCF	0.165	59	0.000	0.866	59	0.000
X11	OCF/C.A	0.116	59	0.045	0.954	59	0.026

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As the sample size is more than 50 we will use significance level of Kolmogorov-Smirnov test. By examining the significance level presented in Table no. (3.2.2.2) , one can infer that the data is not normal.

As shown above in the table no. (3.2.2.2), all variables show a significance level below 0.05 therefore they will be considered not normal ratios.

Insurance Sector

Table 3.2.2.3: Tests of Normality
(Insurance Sector)

No.	Ratios	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
X1	OCF/C.L	0.106	35	.200[*]	0.980	35	0.762
X3	OCF/SALES	0.294	35	0.000	0.578	35	0.000
X4	OCF/T.A	0.082	35	.200[*]	0.986	35	0.929
X5	EBIT/OCF	0.221	35	0.000	0.761	35	0.000
X6	Quick Ratio	0.143	35	0.068	0.961	35	0.243
X7	OCF/EQUITY	0.312	35	0.000	0.561	35	0.000
X8	OCF/N.I	0.386	35	0.000	0.362	35	0.000
X9	FCF/C.L	0.153	35	0.037	0.897	35	0.003
X10	OCF/FCF	0.267	35	0.000	0.673	35	0.000
X11	OCF/C.A	0.116	35	.200[*]	0.923	35	0.018

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As the sample size is less than 50 we will use significance level of Shapiro-Wilk test. By examining the significance level presented in Table no. (3.2.2.3), one can infer that the data is not normal for all ratios except X1, X4, X6 and X11 show a significance level above 0.05 therefore they will be considered normal.

Investing Sector

Table 3.2.2.4: Tests of Normality
(Investing Sector)

No.	Ratios	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
X1	OCF/C.L	0.352	45	0.000	0.563	45	0.000
X2	OCF+INTEREST+TAX/INTEREST	0.359	45	0.000	0.484	45	0.000
X3	OCF/SALES	0.377	45	0.000	0.423	45	0.000
X4	OCF/T.A	0.151	45	0.012	0.933	45	0.012
X5	EBIT/OCF	0.422	45	0.000	0.417	45	0.000
X6	Quick Ratio	0.374	45	0.000	0.533	45	0.000
X7	OCF/EQUITY	0.135	45	0.038	0.962	45	0.151
X8	OCF/N.I	0.236	45	0.000	0.747	45	0.000
X9	FCF/C.L	0.393	45	0.000	0.519	45	0.000
X10	OCF/FCF	0.278	45	0.000	0.737	45	0.000
X11	OCF/C.A	0.174	45	0.002	0.925	45	0.006

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As the sample size is less than 50 we will use significance level of Shapiro-Wilk test. By examining the significance level presented in Table no. (3.2.2.4), one can infer that the data is not normal for all ratios except X7 show a significance level above 0.05 therefore X7 will be considered normally distributed.

Services Sector

Table 3.2.2.5: Tests of Normality
(Services Sector)

No.	Ratios	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
X1	OCF/C.L	0.166	60	0.000	0.941	60	0.006
X2	OCF+INTEREST+TAX/INTEREST	0.251	60	0.000	0.778	60	0.000
X3	OCF/SALES	0.188	60	0.000	0.844	60	0.000
X4	OCF/T.A	0.103	60	0.177	0.973	60	0.208
X5	EBIT/OCF	0.314	60	0.000	0.634	60	0.000
X6	Quick Ratio	0.205	60	0.000	0.524	60	0.000
X7	OCF/EQUITY	0.158	60	0.001	0.969	60	0.137
X8	OCF/N.I	0.438	60	0.000	0.286	60	0.000
X9	FCF/C.L	0.340	60	0.000	0.454	60	0.000
X10	OCF/FCF	0.385	60	0.000	0.331	60	0.000
X11	OCF/C.A	0.150	60	0.002	0.877	60	0.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

As the sample size is more than 50 we will use significance level of Kolmogorov-Smirnov test. By examining the significance level presented in Table no. (3.2.2.5) , one can infer that the data is not normal for all ratios except X4 show a significance level above 0.05 therefore X4 will be considered normally distributed.

3.2.3 Testing Hypothesis

3.2.3.1 Testing Hypothesis I

"There are Differences in Cash-Flow Ratios Between Failed and Non-Failed Companies in the PEX.".

This hypothesis is aimed at testing whether the ratios selected are different between financially distressed firms and non-financially distressed firms, This will be a first *indicator* whether flow-based ratios can be used as predictors or not. However, it should be noted that the answer to this hypothesis does not build the answer to whether or not flow-based ratios can predict financial distress; this is the task of Hypothesis no.(3).

This test provides evidence of those variables to be considered as candidates for model building.

In order to test this hypothesis we will perform a non-parametric test a 2-Independent Samples T-Test (Mann-Whitney U Test) since it has no specific assumptions to apply on the data sample.

It is obtained by examining the means between two groups to find out whether there is a statistically significant difference between the groups. In our case, a significance level below .05 is acceptable. This will bring an answer to whether the means of the ratios are statistically different between the two groups.

Banking Sector

See Table no. 3.2.3.1 below for a short summary of test statistics of Hypothesis I.

Table 3.2.3.1: Univariate Test of The Variables
(Banking Sector)

Test Statistics	X1	X2	**X3**	X4	X5	X6	X7	**X8**	X9	X10	X11
Mann-Whitney U	98.5	103	88	108	103	100	99	74	112	139	96.5
Asymp. Sig. (2-tailed)	0.086	0.117	0.039	0.161	0.117	0.096	0.089	0.011	0.205	0.714	0.074

None of the ratios were statistically significant between the two groups, as the significance for the two-tailed test was above 0.05 for every ratio except X3, X8 which have a sig. level below 0.05.

The following ratios show statistically significant differences in the means of ratios between the two groups.

✓ Operating cash flow margin (X3).

✓ Operating cash flow return on Net Income (X8).

Industry Sector

See Table no. 3.2.3.2 below for a short summary of test statistics of Hypothesis I.

Table 3.2.3.2: Univariate Test of The Variables
(Industry Sector)

Test Statistics	**X1**	**X2**	**X3**	**X4**	X5	X6	**X7**	**X8**	X9	X10	**X11**
Mann-Whitney U	146	239	129	116	307	319	102	132	322	336	131
Asymp. Sig. (2-tailed)	0.000	0.014	0.000	0.000	0.184	0.256	0.000	0.000	0.276	0.387	0.000

The ratios X5,X6,X9,X10 were not statistically significant between the two groups, as the significance for the two-tailed test were above 0.05.

The following ratios show statistically significant differences in the means of ratios between the two groups.

✓ Operating cash flow divided by current liabilities (X1).
✓ Cash flow coverage of interest (X2).
✓ Operating cash flow margin (X3).
✓ Operating cash flow return on total assets (X4).
✓ Operating cash flow return on Equity (X7).
✓ Operating cash flow return on Net Income (X8).
✓ Operating cash flow return on Free cash flow (X10)
✓ Operating cash flow return on current Assets (X11).

Insurance Sector

See Table no. 3.2.3.3 below for a short summary of test statistics of Hypothesis I.

Table 3.2.3.3: Univariate Test of The Variables
(Insurance Sector)

Test Statistics	**X1**	**X3**	**X4**	X5	**X6**	X7	X8	X9	X10	**X11**
Mann-Whitney U	47	42	47	88	3	99	113	78	123	47
Asymp. Sig. (2-tailed)	0.004	0.002	0.004	0.177	0.000	0.333	0.648	0.086	0.942	0.004

The ratios X5,X7,X8,,X9,X10 were not statistically significant between the two groups, as the significance for the two-tailed test were above 0.05.

The following ratios show statistically significant differences in the means of ratios between the two groups.
- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Operating cash flow margin (X3).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Quick ratio (X6).
- ✓ Operating cash flow return on current Assets (X11).

Investing Sector

See Table no. 3.2.3.4 below for a short summary of test statistics of Hypothesis I.

Table 3.2.3.4: Univariate Test of The Variables
(Investing Sector)

Test Statistics	**X1**	**X2**	X3	**X4**	X5	**X6**	**X7**	X8	X9	X10	**X11**
Mann-Whitney U	136	103	187	140	195	138	136	209	176	150	126
Asymp. Sig. (2-tailed)	0.032	0.002	0.360	0.041	0.470	0.036	0.032	0.691	0.238	0.071	0.017

The ratios X3,X5,X8,X9,X10 were not statistically significant between the two groups, as the significance for the two-tailed test were above 0.05.

The following ratios show statistically significant differences in the means of ratios between the two groups.

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Cash flow coverage of interest (X2).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Quick ratio (X6).
- ✓ Operating cash flow return on Equity (X7).
- ✓ Operating cash flow return on current Assets (X11).

Services Sector

See Table no. 3.2.3.5 below for a short summary of test statistics of Hypothesis I.

Table 3.2.3.5: Univariate Test of The Variables
(Services Sector)

Test Statistics	**X1**	**X2**	**X3**	**X4**	X5	X6	**X7**	X8	X9	**X10**	**X11**
Mann-Whitney U	125	157	108	152	230	322	157	395	353	274	193
Asymp. Sig. (2-tailed)	0.000	0.000	0.000	0.000	0.008	0.221	0.000	0.938	0.461	0.048	0.001

The ratios X5,X6,X8,X9 were not statistically significant between the two groups, as the significance for the two-tailed test were above 0.05.

The following ratios show statistically significant differences in the means of ratios between the two groups.

- ✓ Operating cash flow divided by current liabilities (X1).
- ✓ Cash flow coverage of interest (X2).
- ✓ Operating cash flow margin (X3).
- ✓ Operating cash flow return on total assets (X4).
- ✓ Operating cash flow return on Equity (X7).
- ✓ Operating cash flow return on Free cash flow (X10)
- ✓ Operating cash flow return on current Assets (X11).

3.2.3.2 Testing Hypothesis II

"Can CFS Ratios Discriminating Between Failed and Non-Failed Companies in The First, Second, Third and Fourth Years Respectively Before Failure Incident in the PEX".

In order to ascertain the usefulness of the model, it was tested for accuracy.

We will perform the following procedures:

- ✓ T-test used to test the difference between accuracy rates in the classification based on logistic regression model and the accuracy rates in predicting that attributable to the accident and that is in the years 2010,2011,2012,2013 by the two sets of companies.
- ✓ Extract classification tables for distressed and non-distressed companies in these years to measure the percentage of accuracy in the prediction by comparing what actually observed of the two sets of non-distressed companies and distressed companies and the classification based on the regression model (Predicted).

Banking Sector

Table 3.2.3.6: T-Test Statistics for Means Differences
(Banking Sector)

Ratios	Fourth Year Before Failure 2010		Third Year Before Failure 2011		Second Year Before Failure 2012		First Year Before Failure 2013		Year of Failure 2014	
	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)
x1	5	0.724	2	0.157	5	0.724	4	0.480	2	0.108
x2	5	0.724	4	0.480	5	0.724	3	0.289	2	0.157
x3	5	0.724	2	0.157	5	0.724	4	0.480	3	0.289
x4	5	0.724	2	0.157	4	0.480	4	0.480	4	0.480
x5	2	0.157	4	0.480	4	0.480	2	0.157	4	0.480
x6	4	0.480	4	0.480	4	0.480	4	0.480	4	0.480
x7	5	0.724	2	0.157	4	0.480	4	0.480	3	0.289
x8	1	0.077	2	0.157	5	0.724	3	0.289	4	0.480
x9	4	0.480	4	0.480	3	0.289	3	0.289	6	1.000
x10	4	0.480	5	0.724	6	1.000	3	0.289	5	0.724
x11	5	0.724	2	0.157	4	0.480	4	0.480	3	0.289

∗(Sig. level = 0.05)

In the first step, a t-test for the means differences was performed in order to evaluate the capability of each variable to discriminate between the two groups, failure and healthy companies in the four years of interest.

As we seen in the table no. (3.2.3.6) none of the ratios were statistically significant between the two groups, as the significance for the two-tailed test were above 0.05 for every ratio.

Classifications correct and incorrect will be presented as the proportions of Type I and Type II errors.

Table 3.2.3.7: Type I and Type II Errors.

Actual Group Membership	Predicted Group Membership	
	Bankrupt	Non-Bankrupt
Bankrupt	H	M1
Non-Bankrupt	M2	H

Source: (Altman E. , 1968, p. 599)

The H's stand for correct classifications (Hits) and the M's stand for misclassifications (Misses). M1 represents a Type I error and M2 a Type II error.

The sum of the diagonal elements equals the total correct "hits," and when divided into the total number of firms classified (Altman E. , 1968, p. 599).

Table 3.2.3.8: Classification Table 2010 [a]
(Banking Sector)

Observed		No. Banks	Predicted	
			Failed	Non-Failed
Status	Failed	3	0	3 100%
	Non-Failed	4	0	4 100%

a. The cut value is .500

Accuracy rate = 57%
Error rate = 43%

91

As we see from table no. (3.2.3.8) we have spotted 3 errors in prediction for this year.

- ✓ Three failed companies classified as a non-failed companies, this is type I of errors. The classification results show that the fourth year before the failure that the logistic model cannot predict any of the failed banks accurately where the type I of errors is 100%.

- ✓ The model has classified all non-failed banks accurately that is meaning there are no errors of type II.

- ✓ The total accuracy rate for this year is $\{(4+0)/7\}= 57\%$.

- ✓ Total errors rate for this year is $\{(3+0)/7\} = 43\%$.

Table 3.2.3.9:Accuracy Rates & Type I, II Errors
(Banking Sector)

Years	Accuracy Rate	Error Type I	Error Type II
2010	57%	100%	-
2011	-	-	-
2012	-	-	-
2013	-	-	-
2014	-	-	-

*The cut value is .500

From the previous results and from what we presented in tables no. (3.2.3.6), (3.2.3.9) we can conclude that the CFS ratios neither can predict failure nor discriminate between failed and non-failed companies in the years before failure incident.

Industrial Sector

Table 3.2.3.10: T-Test Statistics for Means Differences
(Industrial Sector)

Ratios	Fourth Year Before Failure 2010		Third Year Before Failure 2011		Second Year Before Failure 2012		First Year Before Failure 2013		Year of Failure 2014	
	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)
x1	3	0.030	6	0.090	15	0.800	3	0.030	3	0.040
x2	6	0.090	9	0.200	11	0.390	10	0.300	10	0.440
x3	3	0.030	3	0.030	12	0.500	5	0.060	2	0.020
x4	2	0.020	3	0.020	14	0.730	3	0.030	2	0.020
x5	13	0.610	15	0.870	14	0.730	0	0.010	12	0.710
x6	11	0.400	12	0.500	15	0.870	13	0.610	14	1.000
x7	3	0.030	2	0.020	11	0.400	4	0.040	0	0.010
x8	6	0.090	7	0.130	9	0.230	0	0.010	2	0.020
x9	16	1.000	2	0.020	7	0.130	7	0.130	10	0.450
x10	14	0.730	15	0.870	5	0.060	14	0.730	12	0.710
x11	4	0.040	4	0.042	15	0.870	4	0.040	2	0.020

∗(Sig. level = 0.05)

As we see from table no. (3.2.3.10) suggest selecting ratios as potential predictors of the failure status, the indicators for which P-value less than 0.05.

Table 3.2.3.11:Accuracy Rates & Type I, II Errors
(Industrial Sector)

Years	Accuracy Rate	Error Type I	Error Type II
2010	66.7%	100%	-
2011	66.7%	100%	-
2012	-	-	-
2013	91.7%	25%	-
2014	81.8%	25%	14%

*The cut value is .500

From the previous results and from what we presented in tables no. (3.2.3.10), (3.2.3.11) we can conclude that the CFS ratios can predict failure and discriminate between failed and non-failed companies in the years before failure incident *except* 2012 year.

Insurance Sector

Table 3.2.3.12: T-Test Statistics for Means Differences
(Insurance Sector)

Ratios	Fourth Year Before Failure 2010		Third Year Before Failure 2011		Second Year Before Failure 2012		First Year Before Failure 2013		Year of Failure 2014	
	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)
x1	0	0.053	0	0.053	1	0.121	4	0.699	5	1.000
x3	0	0.053	0	0.053	2	0.245	3	0.439	4	0.699
x4	0	0.053	0	0.053	1	0.121	5	1.000	5	1.000
x5	1	0.121	1	0.121	4	0.699	2	0.245	3	0.439
x6	0	0.053	1	0.121	0	0.053	0	0.053	0	0.053
x7	5	1.000	5	1.000	0	0.053	5	1.000	5	1.000
x8	1	0.121	3	0.439	3	0.439	5	1.000	4	0.699
x9	0	0.053	3	0.439	5	1.000	2	0.245	4	0.699
x10	1	0.121	2	0.245	0	0.053	5	1.000	3	0.439
x11	0	0.053	0	0.053	1	0.121	5	1.000	5	1.000

∗(Sig. level = 0.05)

As we seen in the table no. (3.2.3.12) none of the ratios were statistically significant between the two groups, as the significance for the two-tailed test were above 0.050 for every ratio.

Table 3.2.3.13:Accuracy Rates & Type I, II Errors
(Insurance Sector)

Years	Accuracy Rate	Error type I	Error Type II
2010	-	-	-
2011	-	-	-
2012	-	-	-
2013	-	-	-
2014	-	-	-

*The cut value is .500

From the previous results and from what we presented in tables no. (3.2.3.12), (3.2.3.13) we can conclude that the CFS ratios neither can discriminate between failed and non-failed companies nor predict failure in the years before failure incident.

Services Sector

Table 3.2.3.14: T-Test Statistics for Means Differences
(Services Sector)

Ratios	Fourth Year Before Failure 2010		Third Year Before Failure 2011		Second Year Before Failure 2012		First Year Before Failure 2013		Year of Failure 2014	
	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)
x1	3	0.027	1	0.011	9	0.234	5	0.062	9	0.234
x2	3	0.026	1	0.010	9	0.231	8	0.167	11	0.387
x3	3	0.027	1	0.011	8	0.173	6	0.089	4	0.042
x4	2	0.017	1	0.011	12	0.497	4	0.033	11	0.396
x5	11	0.396	10	0.308	10	0.308	2	0.017	13	0.610
x6	12	0.497	12	0.497	15	0.865	13	0.610	13	0.610
x7	2	0.017	1	0.011	13	0.610	4	0.033	10	0.308
x8	14	0.734	13	0.610	6	0.089	12	0.497	11	0.396
x9	8	0.148	9	0.234	10	0.308	13	0.552	14	0.734
x10	9	0.234	9	0.234	14	0.734	8	0.174	2	0.017
x11	6	0.089	8	0.174	10	0.308	5	0.062	11	0.396

∗(Sig. level = 0.05)

As we see from table no. (3.2.3.14) suggest selecting ratios as potential predictors of the failure status, the indicators for which P-value less than 0.05.

Table 3.2.3.15:Accuracy Rates & Type I, II Errors
(Services Sector)

Years	Accuracy Rate	Error Type I	Error Type II
2010	66.7%	100%	-
2011	66.7%	100%	-
2012	-	-	-
2013	83.3%	50%	13%
2014	75%	25%	13%

*The cut value is .500

From the previous results and from what we presented in tables no. (3.2.3.14), (3.2.3.15) we can conclude that the CFS ratios can predict failure and discriminate between failed and non-failed companies in the years before failure incident *except* the year 2012.

Investing Sector

Table 3.2.3.16: T-Test Statistics for Means Differences
(Investing Sector)

Ratios	Fourth Year Before Failure 2010		Third Year Before Failure 2011		Second Year Before Failure 2012		First Year Before Failure 2013		Year of Failure 2014	
	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)	Mann-Whitney	Sig. (2-tailed)
x1	6	0.439	5	0.302	8	0.796	0	0.020	7	0.606
x2	8	0.787	2	0.043	4	0.189	2	0.059	6	0.418
x3	7	0.606	5	0.302	5	0.302	0	0.020	6	0.439
x4	9	1.000	6	0.437	8	0.796	0	0.020	4	0.197
x5	7	0.606	3	0.121	8	0.796	7	0.606	6	0.439
x6	5	0.302	3	0.121	5	0.302	7	0.606	7	0.606
x7	7	0.606	5	0.302	8	0.796	0	0.020	4	0.197
x8	4	0.197	7	0.606	7	0.606	8	0.796	6	0.439
x9	8	0.796	2	0.071	2	0.071	4	0.197	3	0.121
x10	2	0.071	8	0.796	4	0.197	8	0.796	8	0.796
x11	6	0.439	5	0.302	8	0.796	0	0.020	4	0.197

∗(Sig. level = 0.05)

As we see from table no. (3.2.3.16) none of the ratios were statistically significant between the two groups, as the significance for the two-tailed test were above 0.05 for every ratio *except* 2011, 2013.

Table 3.2.3.17:Accuracy Rates & Type I, II Errors
(Investing Sector)

Years	Accuracy Rate	Error Type I	Error Type II
2010	-	-	-
2011	66.7%	100%	-
2012	-	-	-
2013	66.7%	100%	-
2014	-	-	-

*The cut value is .500

From the previous results and from what we presented in tables no. (3.2.3.16), (3.2.3.17) we can conclude that the CFS ratios cannot predict failure or discriminate between failed and non-failed companies in the years before failure incident *except* the year 2011, 2013.

3.2.3.3 Testing Hypothesis III

"The Following Financial Ratios in The Proposed Developed Model Can Predict Financial Failure in the PEX".

- ✓ Operating cash flow on current liabilities (OCF/CL).
- ✓ Cash flow coverage of interest (OCF + INTREST + TAX/INT).
- ✓ Operating cash flow margin (OCF/Sales).
- ✓ Operating cash flow return on total assets (OCF/Asset).
- ✓ Earning quality (EBIT/OCF).
- ✓ Quick ratio or acid-test ratio (CA-INV)/CL.
- ✓ Operating Cash flow on Equity (OCF/EQUITY).
- ✓ Operating Cash flow on Net Income (OCF/N.I).
- ✓ Operating Cash flow on Current Assets (OCF/C.A).
- ✓ Free Cash Flow on Current Liabilities (FCF/C.L).
- ✓ Operating Cash flow on Free Cash Flow (OCF/FCF).

"Logistic regression is an attractive alternative to discriminant analysis. Its empirical results parallel those of multiple regression in terms of their interpretation and the casewise diagnostic measures available for examining residuals and it handles categorical independent variable easily whereas in discriminant analysis the use of dummy variables created problems with the variance covariance equalities. Logistic regression requires less restrictive statistical assumptions so the use of logit analysis essentially avoids all of the problems discussed with respect to discriminant analysis. Even if the assumptions are met, many researchers prefer logistic regression because it is similar to multiple regression. It has straightforward statistical tests, similar approaches to incorporating metric and nonmetric" (Vuran, 2009, p. 55).

The univariate analysis (t-test) provides evidence of those variables to be considered as candidates for model building. However, in a multivariate setting it may be the case that a collective set of variables might achieve a better degree of discrimination power between the two groups of firms. Therefore, in order to avoid potential bias and improve the overall performance, we supplemented our model development process with further variable selection techniques. Starting from the previous results, we use the *stepwise* method to determine the final set of variables to be included in the discrimination model. In particular we refer to a step-by-step backward selection. The procedure begins with all variables in the model and at each step the weight of each variable is evaluated to determine which one will contribute most to the discriminatory power of the model.

Logistic Regression analyses are conducted with the representative ratios using SPSS software. To select the best set of discriminating ratios *stepwise* selection criteria is applied. The empirical results are explained later for each sector of the study.

Banking Sector

Before the estimation process begins, *Hosmer and Lemeshow* test is used to measure the overall fit of the model. This statistical test measures the correspondence of the actual and the predicted values of the dependent variable.

Table 3.2.3.18: Hosmer Lemeshow Test
(Banking Sector)

Step	Chi-Square	Df	Sig.
1	24.147	7	0.001

Hosmer Lemeshow Test used for overall fit of Logistic Regression Model. As we seen from table no. (3.2.3.18) the significant level is below 0.05 so we can conclude that the model is not fit for prediction and in the researcher opinion this is because of the small number of the cases in the population of the study.

In order to ascertain the usefulness of the model, it was tested for accuracy as shown in table no. (3.2.3.19).

Table 3.2.3.19: Classification Table
(Banking Sector)

Observed		No. CASES	Predicted	
			Failed	Non-Failed
Status	Failed	15	10 67%	5 33%
	Non-Failed	20	0	20 100%

Accuracy rate = 85.7%
Error rate = 14.3%

The accuracy of the corporate failure prediction model is measured by a cut-off point of 0.5, which means that any values below or equal to 0.5 are grouped in "Failed" category and use a code of "0" in the binary logistic regression equation and any values higher than 0.5 are grouped in "Non-Failed" category and use a code of "1" in the binary logistic regression equation. The predicted results are compared to observational data to obtain the necessary level of accuracy.

As we see from table no. (3.2.3.19) we have spotted 5 errors in prediction for the entire model. Although the average success rate of the model for each group was high, the model was not fit. The model was correct 100% of the time when classifying non-failed cases and 67% of the time in classifying failed cases.

Five failed cases classified as a non-failed case and this is type I of errors with a percent of 33% and there is no mistake in classifying Healthy or non-failed cases. The average success rate for the entire model was 85.7% of the time.

After applying Stepwise procedure along with the statistical screening we can refine the significant ratios as we seen in Table no. (3.2.3.20), we selected as a predictor for failure model the Quick ratio or acid-test ratio (CA-INV)/CL which has a sig. level below 0.10. This is the only sig. ratio that we have reached but this is not cash-flow ratio.

Table 3.2.3.20: Variables in the Equation
(Banking Sector)

Ratios	B	S.E.	Wald	Df	Sig.	Exp(B)
x6	-2.933	1.216	5.818	1	0.016	0.053
Constant	4.629	1.578	8.602	1	0.003	102.408

The probability of corporate failure is measured using the cut-off values, as follow:

(**0**……...…….**Failed** ………**0.5**……… **Non-Failed** ………**1**)[7]

F F F F F F F F F F F F F F F   N N N N N N N N N N N

From Previous Results We conclude that Cash-Flow Ratios Neither Can Predict Financial Failure nor Able to Separate Banks into Distressed and Non-Distressed Groups in the Banking Sector.

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[7] For more number details on how the cut-off point discriminate between the two groups you can review Appendix no. (2).

For graphical details on how the cut-off point discriminate between the two groups you can review Appendix no. (1).

Industrial Sector

Before the estimation process begins, *Hosmer and Lemeshow* test is used to measure the overall fit of the model. This statistical test measures the correspondence of the actual and the predicted values of the dependent variable.

Table 3.2.3.21: Hosmer Lemeshow Test
(Industrial Sector)

Step	Chi-Square	df	Sig.
3	5.05	8	0.752

Hosmer Lemeshow Test used for overall fit of Logistic Regression Model. As we seen from table no. (3.2.3.21) the significant level is above 0.05 so we can conclude that the model is fit for prediction.

In order to ascertain the usefulness of the model, it was tested for accuracy as shown in table no. (3.2.3.22).

Table 3.2.3.22: Classification Table
(Industrial Sector)

Observed		No. CASES	Predicted	
			Failed	Non-Failed
Status	Failed	20	14 70%	6 30%
	Non-Failed	39	4 10%	35 90%

Accuracy rate = 83.1 %
Error rate = 16.9%

The accuracy of the corporate failure prediction model is measured by a cut-off point of 0.5, which means that any values below or equal to 0.5 are grouped in "Failed" category and use a code of "0" in the binary logistic regression equation and any values higher than 0.5 are grouped in "Non-Failed" category and use a code of "1" in the binary logistic regression equation. The predicted results are compared to observational data to obtain the necessary level of accuracy.

As we see from table no. (3.2.3.22) we have spotted 10 errors in prediction for the entire model. The average success rate of the model for each group was high, the model was fit. The model was correct 90% of the time when classifying healthy cases and 70% of the time in classifying failed cases.

Six failed cases classified as a non-failed case and this is type I of errors with a percent of 30% and there are four healthy cases or non-failed cases classified as failed cases and this is type II of errors with a percent of 10%. The average success rate for the entire model was 83.1% of the time.

After applying Stepwise procedure along with the statistical screening we can refine the significant ratios as we seen in Table no. (3.2.3.23).

We selected as a predictor for failure model the following ratios which have a sig. level below 0.10.

- ✓ X2 = Cash flow coverage of interest (OCF + INTREST + TAX/INT).

- ✓ X10 = Free Cash Flow on Current Liabilities (FCF/C.L).

- ✓ X3 = Operating cash flow margin (OCF/Sales).

While the other ratios that have a sig. level above 0.10 have been excluded from the significant predictors or from the developed Logistic Regression Model.

Table 3.2.3.23: Variables in the Equation
(Industrial Sector)

Ratios	B	S.E.	Wald	Df	Sig.	Exp(B)
X2	-0.005	0.002	3.832	1	0.05	0.995
X10	-0.171	0.07	6.01	1	0.014	0.843
X3	26.052	7.619	11.69	1	0.001	2.06E+11
Constant	-0.49	0.44	1.241	1	0.265	0.613

The sign of the original coefficients indicates the direction of the relationship. A positive coefficient decrease the probability of failure whereas the negative value increase the probability of failure due to the fact that they reduce e^{-y} toward zero with the result that the financial distress (probability function) approaches 1/1, or 100 percent.

Using Table no. (3.2.3.23), the Logistic Regression Model can be written in form of Logit equation, Odds equation and Probability equation.

- ✓ Logit (Y) = (- 0.49 - 0.005 X2 + 26.052 X3 - 0.171 X10)
- ✓ Odds = Exp. $^{(- 0.49 - 0.005\ X2 + 26.052\ X3 - 0.171\ X10)}$
- ✓ Prob. (Y) = 1 / 1 + e $^{- (- 0.49 - 0.005\ X2 + 26.052\ X3 - 0.171\ X10)}$

Where:

- ▪ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).

- ▪ X2 = Cash flow coverage of interest (OCF + INTREST + TAX/INT).

- ▪ X10 = Free Cash Flow on Current Liabilities (FCF/C.L).

- ▪ X3 = Operating cash flow margin (OCF/Sales).

The probability of corporate failure is measured using the cut-off values, as follow:

(0……...…….**Failed** ………**0.5**……… **Non-Failed** ………**1)**
F F F F F F F F F F F F F F F   N N N N N N N N N N N

The model independent variables (ratios) can explain 58% of changes in the dependent variable as Nagelkerke R^2 explained.

Table 3.2.3.24:Model Summary
(Industrial Sector)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	56.103	0.281	0.389
2	51.448	0.336	0.465
3	43.704	0.417	**0.578**

From Previous Results We Conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Industrial Sector.

Insurance Sector

Before the estimation process begins, *Hosmer and Lemeshow* test is used to measure the overall fit of the model. This statistical test measures the correspondence of the actual and the predicted values of the dependent variable.

Table 3.2.3.25: Hosmer Lemeshow Test
(Insurance Sector)

Step	Chi-Square	df	Sig.
1	9.039	7	0.25

Hosmer Lemeshow Test used for overall fit of Logistic Regression Model. As we seen from table no. (3.2.3.25) the significant level is above 0.05 indicating effectiveness of the proposed failure prediction model.

In order to ascertain the usefulness of the model, it was tested for accuracy as shown in table no. (3.2.3.26).

Table 3.2.3.26: Classification Table
(Insurance Sector)

Observed		No. CASES	Predicted	
			Failed	Non-Failed
Status	Failed	10	4 40%	6 70%
	Non-Failed	25	1 4%	24 96%

Accuracy rate = 80 %
Error rate = 20 %

The accuracy of the corporate failure prediction model is measured by a cut-off point of 0.5, which means that any values below or equal to 0.5 are grouped in "Failed" category and use a code of "0" in the binary logistic regression equation and any values higher than 0.5 are grouped in "Non-Failed" category and use a code of "1" in the binary logistic regression equation. The predicted results are compared to observational data to obtain the necessary level of accuracy.

As we see from table no. (3.2.3.26) we have spotted 7 errors in prediction for the entire model. The average success rate of the model for each group was moderate, the model was fit. The model was correct 96% of the time when classifying healthy cases and 40% of the time in classifying failed cases.

Six failed cases classified as a non-failed case and this is type I of errors with a high percent of 70% which means a dangerous classification could result and cost the interested partied more money as they wrongly predict the company to continue with no problems in liquidity and there is one non-failed case classified as failed case and this is type II of errors with a percent of 4% which is very low. The average success rate for the entire model was 80 % of the time.

After applying Stepwise procedure along with the statistical screening we can refine the significant ratios as we seen in Table no. (3.2.3.27).

We selected as a predictor for failure model the following ratio which has a sig. level below 0.10:

Y = Binary variable has two values (0 =Failed, 1= Non-Failed).

X11 = Operating Cash flow on Free Cash Flow (OCF/FCF).

This is the only sig. ratio that we have reached, while the other ratios that have a sig. level above 0.10 have been excluded from the significant predictors or from the developed Logistic Regression Model.

Table 3.2.3.27: Variables in the Equation
(Insurance Sector)

Ratios	B	S.E.	Wald	Df	Sig.	Exp(B)
X11	11.431	4.551	6.309	1	0.012	92155.78
Constant	0.915	0.449	4.154	1	0.042	2.496

The sign of the original coefficients indicates the direction of the relationship. A positive coefficient decrease the probability of failure whereas the negative value increase the probability of failure due to the fact that they reduce e-^{y} toward zero with the result that the financial distress (probability function) approaches 1/1, or 100 percent.

The probability of corporate failure is measured using the cut-off values, as follow:

(**0**……...…….**Failed** ………**0.5**……… **Non-Failed** ………**1**)

F F F F F F F F F F F F F F F   N N N N N N N N N N N

The model independent variable (ratio) can explain 38% of the changes in dependent variable as Nagelkerke R^2 explained and 62% is explained by other ratios.

Table 3.2.3.28:Model Summary
(Insurance Sector)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	31.067	0.266	0.381

From Previous Results We conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Insurance Sector.

Investing Sector

Before the estimation process begins, *Hosmer and Lemeshow* test is used to measure the overall fit of the model. This statistical test measures the correspondence of the actual and the predicted values of the dependent variable.

Table 3.2.3.29: Hosmer Lemeshow Test
(Investing Sector)

Step	Chi-Square	df	Sig.
1	6.544	7	0.478

Hosmer Lemeshow Test used for overall fit of Logistic Regression Model. As we seen from table no. (3.2.3.29) the significant level is above 0.05 indicating effectiveness of the proposed failure prediction model.

In order to ascertain the usefulness of the model, it was tested for accuracy as shown in table no. (3.2.3.30)

Table 3.2.3.30: Classification Table
(Investing Sector)

Observed		No. CASES	Predicted	
			Failed	Non-Failed
Status	Failed	15	6 40%	9 60%
	Non-Failed	30	2 6.7%	28 93.3%

Accuracy rate = 75.6 %
Error rate = 24.4 %

As we see from table no. (3.2.3.30) we have spotted 11 errors in prediction for the entire model. The average success rate of the model for each group was good, the model was fit. The model was correct 93.3% of the time when classifying healthy cases and 40% of the time in classifying failed cases.

Nine failed cases classified as a non-failed case and this is type I of errors with a percent of 60 % and there is two non-failed cases classified as failed cases and this is type II of errors with a percent of 6.7 %. The average success rate for the entire model was 75.6 % of the time.

After applying Stepwise procedure along with the statistical screening we can refine the significant ratios as we seen in Table no. (3.2.3.31).

We selected as a predictor for failure model the following ratios which have a sig. level below 0.10:

- ✓ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).

- ✓ X6 = Quick ratio or acid-test ratio (CA-INV)/CL.

- ✓ X11 = Operating Cash flow on Free Cash Flow (OCF/FCF).

This is the only sig. ratios that we have reached, while the other ratios that have a sig. level above 0.10 have been excluded from the significant predictors or from the developed Logistic Regression Model

Table 3.2.3.31: Variables in the Equation
(Investing Sector)

Ratios	B	S.E.	Wald	Df	Sig.	Exp(B)
X6	-0.058	0.031	3.439	1	0.064	0.943
X11	2.587	1.482	3.045	1	0.081	13.291
Constant	1.031	0.414	6.212	1	0.013	2.805

The sign of the original coefficients indicates the direction of the relationship. A positive coefficient decrease the probability of failure whereas the negative value increase the probability of failure due to the fact that they reduce e^{-y} toward zero with the result that the financial distress (probability function) approaches 1/1, or 100 percent.

 The only CFS ratio that can predict failure is X11= OCF/FCF.

The probability of corporate failure is measured using the cut-off values, as follow:

(0……...……**Failed** ………**0.5**……… **Non-Failed** ………**1)**

F F F F F F F F F F F F F F F   N N N N N N N N N N N

The independent variables (ratios) can explain 29% of the changes in dependent variable as Nagelkerke R^2 explained and the remaining 71% is explained by other independent variables.

Table 3.2.3.32:Model Summary
(Investing Sector)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
12	46.647	0.211	0.292

From Previous Results We conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Investing Sector.

Services Sector

Before the estimation process begins, *Hosmer and Lemeshow* test is used to measure the overall fit of the model. This statistical test measures the correspondence of the actual and the predicted values of the dependent variable.

Table 3.2.3.33: Hosmer Lemeshow Test
(Services Sector)

Step	Chi-Square	df	Sig.
5	6.052	8	0.641

Hosmer Lemeshow Test used for overall fit of Logistic Regression Model. As we seen from table no. (3.2.3.33) the significant level is above 0.05 indicating effectiveness of the proposed failure prediction model.

In order to ascertain the usefulness of the model, it was tested for accuracy as shown in table no. (3.2.3.34).

Table 3.2.3.34: Classification Table
(Services Sector)

Observed		No. CASES	Predicted	
			Failed	Non-Failed
Status	Failed	20	16 80%	4 20%
	Non-Failed	40	2 5%	38 95%

Accuracy rate = 90 %
Error rate = 10 %

As we see from table no. (3.2.3.30) we have spotted 6 errors in prediction for the entire model. The average success rate of the model for each group was high, the model was fit. The model was correct 95% of the time when classifying healthy cases and 80% of the time in classifying failed cases.

Four failed cases classified as a non-failed case and this is type I of errors with a percent of 20 % and there is two non-failed cases classified as failed cases and this is type II of errors with a percent of 5%. The average success rate for the entire model was 90 % of the time.

After applying Stepwise procedure along with the statistical screening we can refine the significant ratios as we seen in Table no.(3.2.3.35).

We selected as a predictor for failure model the following ratios which have a sig. level below 0.10:

- ✓ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).
- ✓ X1 = Operating cash flow on current liabilities (OCF/CL).
- ✓ X3 = Operating cash flow margin (OCF/Sales).
- ✓ X5 = Earning quality (EBIT/OCF).
- ✓ X6 = Quick ratio or acid-test ratio (CA-INV)/CL.
- ✓ X7 = Operating Cash flow on Equity (OCF/EQUITY).
- ✓ X9 = Operating Cash flow on Current Assets (OCF/C.A).

This is the sig. ratios that we have reached, while the other five ratios that have a sig. level above 0.10 have been excluded from the significant predictors or from the developed Logistic Regression Model.

Table 3.2.3.35: Variables in the Equation
(Services Sector)

Ratios	B	S.E.	Wald	Df	Sig.	Exp(B)
X1	6.871	3.35	4.208	1	0.04	964.083
X3	3.629	1.988	3.334	1	0.068	37.69
X5	-0.542	0.253	4.604	1	0.032	0.581
X6	-1.782	0.918	3.763	1	0.052	0.168
X7	-9.447	4.542	4.325	1	0.038	.000
X9	2.692	1.334	4.075	1	0.044	14.764
Constant	2.566	1.098	5.458	1	0.019	13.009

The sign of the original coefficients indicates the direction of the relationship. A positive coefficient decrease the probability of failure whereas the negative value increase the probability of failure due to the fact that they reduce e-^{y} toward zero with the result that the financial distress (probability function) approaches 1/1, or 100 percent.

Using Table no. (3.2.3.35), the Logistic Regression Model can be written in form of Logit equation, Odds equation and Probability equation.

- ✓ Logit (Y) = (2.566 + 6.871 X1 + 3.629 X3 - 0.542 X5 - 1.782 X6 - 9.447 X7 + 2.692 X9).
- ✓ Odds = Exp. $^{(2.566 + 6.871 X1 + 3.629 X3 - 0.542 X5 - 1.782 X6 - 9.447 X7 + 2.692 X9)·}$
- ✓ Prob. (Y) = 1 / 1 + e $^{- \text{Logit (Y)}}$

Where:

- Y = Binary variable has two values (0 =Failed, 1= Non-Failed).
- X1 = Operating cash flow on current liabilities (OCF/CL).
- X3 = Operating cash flow margin (OCF/Sales).
- X5 = Earning quality (EBIT/OCF).
- X6 = Quick ratio or acid-test ratio (CA-INV)/CL.
- X7 = Operating Cash flow on Equity (OCF/EQUITY).
- X9 = Operating Cash flow on Current Assets (OCF/C.A).

The probability of corporate failure is measured using the cut-off values, as follow:

(0……...……**Failed** ………**0.5**……… **Non-Failed** ………**1)**

F F F F F F F F F F F F F F F   N N N N N N N N N N N

The independent variables (ratios) can explain 67% of the changes in dependent variable as Nagelkerke R^2 explained and the remaining 33% is explained by other independent variables.

Table 3.2.3.36:Model Summary
(Services Sector)

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
5	37.118	0.48	0.667

From Previous Results We conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Services Sector

Chapter Four

Study Results , Conclusions and Recommendations

4.1 Study Results

4.2 Study Conclusions

4.3 Study Recommendations

4.4 Study in Future

4. Chapter Four: Study Results, Conclusions and Recommendations

4.1 Study Results

The chapter four shows the study results after theoretical framework and empirical study on the listed companies have been presented. Also, the study conclusions and recommendations will be presented.

4.1.1 Results of Testing Hypothesis I

"Hypothesis I tested if there are Differences in Cash-Flow Ratios between Failed and Non-Failed Companies in PEX", we will present the most important results of hypothesis I for each sector in the study. The univariate analysis is used to test the first indicators of the predictive variables this is not mean this measures can predict failure this is the purpose of hypothesis III.

4.1.1.1 Banking Sector

None of the ratios were statistically significant between the two groups, as the significance for the two-tailed test were above 0.05 for every ratio except X3, X8 which have a sig. level below 0.05.

X3 = Operating cash flow margin (OCF/Sales),

X8 = Operating Cash flow on Net Income (OCF/N.I).

4.1.1.2 Industrial Sector

The results showed that there are sig. differences in the means of ratios between failed and non-failed companies in the following ratios, Operating cash flow divided by current liabilities (X1), Cash flow coverage of interest (X2), Operating cash flow margin (X3), Operating cash flow return on total assets (X4), Operating cash flow return on Equity (X7), Operating cash flow return on Net Income (X8), Operating cash flow return on Free cash flow (X10) and Operating cash flow return on current Assets (X11).

4.1.1.3 Insurance Sector

The results showed that there are sig. differences in the means of ratios between failed and non-failed companies in the following ratios, Operating cash flow divided by current liabilities (X1), Operating cash flow margin (X3), Operating cash flow return on total assets (X4), Quick ratio (X6) and Operating cash flow return on current Assets (X11).

4.1.1.4 Investing Sector

The results showed that there are sig. differences in the means of ratios between failed and non-failed companies in the following ratios, Operating cash flow divided by current liabilities (X1), Cash flow coverage of interest (X2), Operating cash flow return on total assets (X4), Quick ratio (X6), Operating cash flow return on Equity (X7) and Operating cash flow return on current Assets (X11).

4.1.1.5 Services Sector

The results showed that there are sig. differences in the means of ratios between failed and non-failed companies in the following ratios, Operating cash flow divided by current liabilities (X1), Cash flow coverage of interest (X2), Operating cash flow margin (X3), Operating cash flow return on total assets (X4), Operating cash flow return on Equity (X7), Operating cash flow return on free cash flow (X10) and Operating cash flow return on current Assets (X11).

4.1.2 Results of Testing Hypothesis II

Hypothesis II tested if "Can CFS Ratios Discriminating Between Failed and Non-Failed Companies in the First, Second, Third and Fourth Years Respectively before Failure Incident".

The researcher used classification tables (multivariate test) to measure the accuracy rate of the prediction before four years of failure. Also, the researcher used t-test (univariate test) to confirm the result that the model can discriminate between the two groups in the years before failure.

4.1.2.1 Banking Sector

After testing the model we conclude that the CFS ratios cannot predict and discriminate between failed and non-failed banks in the years before failure incident.

4.1.2.2 Industrial Sector

After testing the model we conclude that the CFS ratios can predict failure and discriminate between failed and non-failed industrial companies with accuracy rate (92%, 67%, 67%) in the years 2013, 2011, 2010 respectively before the failure incident which mean it is a useful tool to send early warning signals to related parties to take either preventive or corrective actions.

4.1.2.3 Insurance Sector

After testing the model neither the classification tables nor the t-test can predict failure and discriminate between failed and non-failed insurance companies in the years before failure incident, we conclude that CFS ratios cannot predict failure for insurance sector in the years before failure incident.

4.1.2.4 Investing Sector

After testing the model we conclude that the CFS ratios cannot predict and discriminate between failed and non-failed investing companies in the years before failure incident *except* 2011, 2013 with a low prediction accuracy rate equal 67%.

4.1.2.5 Services Sector

After testing the model we conclude that the CFS ratios can predict failure and discriminate between failed and non-failed services companies with accuracy rate (83.3%, 67%, 67%) in the years 2013, 2011, 2010 respectively before the failure incident, which mean it is a useful tool to send early warning signals to related parties to take either preventive or corrective actions.

4.1.3　Results of Testing Hypothesis III

"Hypothesis III tested if The Financial Ratios in the Proposed Developed Model Can Predict Financial Failure".

Logistic Regression analyses are conducted with the representative ratios using SPSS program. To select the best set of discriminating ratios *stepwise* selection criteria is applied. The empirical results are explained later for each sector of the study.

4.1.3.1 Banking Sector

After applying Stepwise procedure along with the statistical screening we can refine the significant ratios we selected as a predictor for failure model, the Quick ratio or acid-test ratio (CA-INV)/CL which has a sig. level below 0.05. This is the only sig. ratio that we have reached but this is not cash-flow ratio.

$$\text{Prob. } (Y) = 1 / 1 + e^{-(-4.629 - 2.933 X6)}$$

The logit function derived had an overall accuracy rate by 86 %.

We conclude that Cash-Flow Ratios Cannot Either Predict Financial Failure or Unable to Separate Banks into Distressed and Non-Distressed Groups in the Banking Sector.

4.1.3.2 Industrial Sector

The standard model has been reached after applying the logistic analysis is as follow:

$$\text{Prob. (Y)} = 1 / 1 + e^{-(-0.49 - 0.005\, X2 + 26.052\, X3 - 0.171\, X10)}$$

Where:
- ✓ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).
- ✓ X2 = Cash flow coverage of interest (OCF + INTREST + TAX/INT).
- ✓ X10 = Free Cash Flow on Current Liabilities (FCF/C.L).
- ✓ X3 = Operating cash flow margin (OCF/Sales).

The model has an overall prediction accuracy of 80 %.

A. The proposed model contributes to give a clear picture of the current and future financial position of the companies listed in the industrial sector which is serve as a tool used to send early warning signals to related parties to take either preventive or corrective actions.

B. We Conclude that Cash-Flow Ratios Can Predict Financial Failure and Discriminate Between Distressed and Non-Distressed Companies in the Industrial Sector.

4.1.3.3 Insurance Sector

The standard model that has been reached after applying the logistic analysis is as follow:

$$\text{Prob. (Y)} = 1 / 1 + e^{-(0.915 + 11.431\, X11)}$$

Where:
- ✓ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).
- ✓ X11 = Operating Cash flow on Free Cash Flow (OCF/FCF).

The model has an overall prediction accuracy of 80 %.

We conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Insurance Sector.

4.1.3.4 Investing Sector

The standard model that has been reached after applying the logistic analysis is as follow:

$$\text{Prob. (Y)} = 1 / 1 + e^{-(1.031 - 0.058 X6 + 2.587 X11)}$$

Where:

- ✓ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).
- ✓ X6 = Quick ratio or acid-test ratio (CA-INV)/CL.
- ✓ X11 = Operating Cash flow on Free Cash Flow (OCF/FCF).

The model has an overall prediction accuracy of 76 %.

A. The proposed model contributes to give a clear picture of the current and future financial position of the companies listed in the Investing sector which is serve as a tool used to send early warning signals to related parties to take either preventive or corrective actions.

B. We conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Investing Sector.

4.1.3.5 Services Sector

The standard model that has been reached after applying the logistic analysis is as follow:

$$\text{Prob. (Y)} = 1 / 1 + e^{-(2.566 + 6.871 X1 + 3.629 X3 - 0.542 X5 - 1.782 X6 - 9.447 X7 + 2.692 X9).}$$

Where:

- ✓ Y = Binary variable has two values (0 =Failed, 1= Non-Failed).
- ✓ X1 = Operating cash flow on current liabilities (OCF/CL).
- ✓ X3 = Operating cash flow margin (OCF/Sales).
- ✓ X5 = Earning quality (EBIT/OCF).
- ✓ X6 = Quick ratio or acid-test ratio (CA-INV)/CL.
- ✓ X7 = Operating Cash flow on Equity (OCF/EQUITY).
- ✓ X9 = Operating Cash flow on Current Assets (OCF/C.A).

The model has an overall prediction accuracy of 90 %.

A. The proposed model contributes to give a clear picture of the current and future financial position of the companies listed in the services sector which is serve as a tool used to send early warning signals to related parties to take either preventive or corrective actions.

B. We conclude that Cash-Flow Ratios Can Predict Financial Failure and Able to Separate Firms into Distressed and Non-Distressed Groups in the Services Sector.

4.1.4 Other Results

A. After reviewing past studies the researcher concluded the best model for predicting corporate failure is by using cash flow-based measures and logistical analysis method which increase the predictive ability of the model before financial failure incident. This study agreed with the previous studies for (Quarcoo & Smedberg, 2014), (Bhandari & Iyer, 2013), (Alawi & Gharaibeh, 2008), (Charitou, Neophytou, & Charalambous, 2004), (Matar & Obaidat, 2007), (Rodgers, 2013) which concluded that the cash flow-based models outperformed the accrual-based models and did not agree with these studies (Quarcoo & Smedberg, 2014), (Mazouz, Crane, & Gambre, 2012), (Shkurti & Duraj, 2010) which concluded that the cash flow models did not improve business failure prediction.

B. Discriminant analysis (DA) was most widely used technique by (AbuMoamer, 2014), (Enshassi, Al-Hallaq, & Mohamed, 2006), (Mazouz, Crane, & Gambre, 2012), (Shkurti & Duraj, 2010), (Amendola, Bisogno, Restaino, & Sensini, 2011), (Rugby, 2006). Also, Altman and Kida's models were used by (Alkhatib & Al Bzour, 2011) and (Rammo & Al-Wattar, 2010) that required restricted assumptions that cannot be applied to this study.

C. Logistical models were used by (Ghusain, 2004), (Charitou, Neophytou, & Charalambous, 2004) and (Rugby, 2006). The sample that has been used in these studies was unbalanced sample of companies with less restrictive assumptions were required in these models. These advantages encouraged the researcher to use the logistic model.

4.2   Study Conclusions

A. The cash-flow based ratios have significant predictive power to predict corporate failure.

B. Despite the great benefit generated by the mathematical models based on the financial ratios and regardless of the ability of these models to predict financial failure, there are many reasons that leading companies to failure. Therefore, it does not require only mathematical models as a single tool to assess the ability of the public shareholding companies to continue, but these models must be linked with any additional information (non-financial indicators) beside factors related to external and internal environment for these companies.

C. The study confirms what have been reached by other researchers on not restricting the prediction of the financial failure on the traditional financial ratios (accrual-based) derived from balance sheet and income statement but failure models must include ratios selected from a cash flow statement (cash flow-based).

D. The models that have been developed for each economic sector have common financial ratios that have been used to discriminate companies and to predict failure as in both insurance and investment sectors for the financial ratio, X11= Operating Cash flow on Free Cash Flow (OCF/FCF) which seem it has a significant discrimination power for companies. Also, the financial ratio X3 = Operating cash flow margin (OCF/Sales) has significant discrimination power for companies in both industrial and services sectors.

E. The high prediction accuracy rates for the models that have been reached, which means the high ability of these models to predict the failure.

F. The models that have been reached will help in sending early warning signals that concern interested parties such as investors, creditors, suppliers, management, government agencies offering them the advantage to take either preventive or corrective actions.

4.3   Study Recommendations

From the results of this study, the study recommends the following:

A. The companies that applied to be listed in the PEX should to adhering International Financial Reporting Standards, issuing audited financial statements and to follow the same accounting procedures as it is stated in the PEX listing regulation in articles no. (7) and no. (8), so the models that have been reached can be applied without problems.

B. The *financial intermediation offices* in the PEX have to consider utilization of the models that have been reached by the researcher for each sector in the PEX as it facilitates the assessment of companies' performance in addition to predicting the possibility of failure and to send early warning signals to take corrective or preventive actions.

C. The *investors* have to consider utilization of the models that have been reached for each sector to help them in avoiding risky investments and reduce the risk of losing their money in the PEX.

D. The *government agencies* have to consider utilization of the models that have been reached for detecting companies that may bankrupt in the future in order to help them in avoiding financial crises in the PEX and maintain economic stability.

E. The *auditors* have to consider utilization of the models that have been reached in assessing company's ability to continue as a "*going concern*".

F. *Creditors and suppliers* have to consider utilization of the models that have been reached to assess the liquidity position of the debtor firm.

G. To conduct more studies in predicting business failure using cash-flow based measures and to give more concern in cash flow statement measures.

4.4 Research in Future

Based on the findings and results of this study there are some suggestions for future researches.

The prediction of business failure has been largely investigated in the literature over the last few decades from both theoretical and empirical side.

It is recommended further studies in this area where this study considered from the eminent studies in the field of companies failure prediction by using cash-flow based measures and the statistical method the logistic model.

The researcher recommends the following future researches for PhD and MBA students:

A. Predicting Corporate Bankruptcy Using Multiple Discriminant Analysis on the Listed Companies in the PEX.

B. Predicting Corporate Bankruptcy Using Neural Network Models on the Listed Companies in the PEX.

C. Predicting Corporate Bankruptcy Using Altman and Kida Models on the Listed Companies in the PEX.

D. Prediction of Business Failure: a Comparison of Discriminant and Logistic Regression Analyses.

E. Predicting Corporate Bankruptcy on Private Companies.

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Appendix (1)

6.1 Observed Groups and Predicted Probabilities

6.1.1 Banking Sector

6.1.2 Industry Sector

6.1.3 Insurance Sector

6.1.4 Investing Sector

6.1.5 Services Sector

6. Appendix (1)

6.1   Observed Groups and Predicted Probabilities

6.1.1 Banking Sector

```
        8 +|                                                      |+
          ||                                                      ||
  F       ||                                                      ||
  R     6 +|                                         n            |+
  E       ||                                         n            ||
  Q       ||                                       n n            ||
  U       ||                                       n n            ||
  E     4 +|f                                      n nf           |+
  N       ||f                                      n nf           ||
  C       ||f                                      nnnf           ||
  Y       ||f                                      nnnf           ||
        2 +|fff f                               nnnnnnf           |+
          ||fff f                               nnnnnnf           ||
          ||fff f                               nnnnnnff          ||
          ||fff f                               nnnnnnff          ||
Predicted ─────────────────────────────────────────────────────────
  Prob:    0            .25           .5           .75          1
  Group:   ffffffffffffffffffffffffffffffffffffnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn

          Predicted Probability is of Membership for non-failed
          The Cut Value is .50
          Symbols: f - failed
                   n - non-failed
          Each Symbol Represents .5 Cases.
```

6.1.2 Industrial Sector

```
                Observed Groups and Predicted Probabilities

  16 +                                                                     +
     |                                                                     |
 F   |                                                                     |
 R 12 +                                                                   +
 E   |                                                                 n   |
 Q   |                                                                 n   |
 U   |                                                                 n   |
 E  8 +                                                                n  +
 N   |                                                                 n   |
 C   |                                                                 n   |
 Y   |                                                                 n   |
   4 +                                                             n n n+
     |                                               n             nnn n   |
     |             n     f   n                n nn           n     nnnnn   |
     |fff       ff   fff  f ffnff n           fnfn   fn f f n n n  n nnfnn |
Predicted ───────────────────────────────────────────────────────────────
  Prob:  0          .25         .5          .75           1
  Group: ffffffffffffffffffffffffffffffffffffffnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn

         Predicted Probability is of Membership for non-failed
         The Cut Value is .50
         Symbols: f - failed
                  n - non-failed
         Each Symbol Represents 1 Case.
```

6.1.3 Insurance Sector

```
              Observed Groups and Predicted Probabilities

      8 ┤                                                              ┼
        │                                                              │
  F     │                                                              │
  R     │                                                              │
  E     │                                                              │
  Q   6 ┤                                                              ┼
  U     │                                                              │
  E     │                                                       n      │
  N     │                                                       n      │
  C     │                                               n       n      │
  Y   4 ┤                                               n       n      ┼
        │                                               n       n      │
        │                                       n       n       n      │
        │                                       n       n       n      │
      2 ┤                               f       n   nn  n      nn      ┼
        │                               f       n   nn  n      nn      │
        │     f   f   f        n   f    nf nf f n n nnnn  fn  nfnn      │
        │     f   f   f        n   f    nf nf f n n nnnn  fn  nfnn      │
Predicted ─────────────────────────────────────────────────────────────
   Prob:  0          .25         .5          .75          1
  Group:  ffffffffffffffffffffffffffffffffffnnnnnnnnnnnnnnnnnnnnnnnnnnnnn

         Predicted Probability is of Membership for non-failed
         The Cut Value is .50
         Symbols: f - failed
                  n - non-failed
         Each Symbol Represents .5 Cases.
```

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6.1.4 Investing Sector

```
                Observed Groups and Predicted Probabilities

      32 +                                                            +
         |                                                            |
   F     |                                                            |
   R  24 +                                             n              +
   E     |                                             n              |
   Q     |                                             n              |
   U     |                                             n              |
   E     |                                             n              |
   N  16 +                                             n              +
   C     |                                             n              |
   Y     |                                             n              |
         |                                             n              |
       8 +                                             nn             +
         |                                             ff             |
         |                                             ff             |
         |      f f      f      f      f         nn nnn ff            |
Predicted ──────────────────────────────────────────────────────────
   Prob:  0          .25         .5         .75          1
   Group: ffffffffffffffffffffffffffffffffffffnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn

         Predicted Probability is of Membership for non-failed
         The Cut Value is .50
         Symbols: f - failed
                  n - non-failed
         Each Symbol Represents 2 Cases.
```

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6.1.5 Services Sector

```
              Observed Groups and Predicted Probabilities

       16 +                                                       +
          |                                                     n |
        F |                                                     n |
        R |                                                     n |
        E  12 +                                                 n-+
        E |                                                     n |
        Q |                                                     n |
        U |                                                     n |
        E   8 +                                                 n-+
        N |                                                     n |
        C |                                                     n |
        Y |  f                                                  n |
        4 -+f                                                   n-+
          | f                                              nn  n |
          | ff                         fn   n          n  nnn n nnn n |
          | ff n f  f  f      f        ffff f n nn    nfn    f  nnnnn fnnnn |
Predicted ─────────────────────────────────────────────────────────
    Prob:  0         .25         .5         .75          1
   Group:  ffffffffffffffffffffffffffffffffffnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnnn

          Predicted Probability is of Membership for non-failed
          The Cut Value is .50
          Symbols: f - failed
                   n - non-failed
          Each Symbol Represents 1 Case.
```

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Appendix (2)

7.1 Financial Ratios

      7.1.1 Banking Sector

      7.1.2 Industrial Sector

      7.1.3 Insurance Sector

      7.1.4 Investing Sector

      7.1.5 Services Sector

7.2 Economic Sectors

      7.2.1 Economic Sectors

      7.2.2 Banking Sector

      7.2.3 Industrial Sector

      7.2.4 Insurance Sector

      7.2.5 Investing Sector

      7.2.6 Services Sector

7.3 Group Membership

      7.3.1 Banking Sector

      7.3.2 Industrial Sector

      7.3.3 Insurance Sector

      7.3.4 Investing Sector

      7.3.5 Services Sector

7.4 Multicollinearity Test

      7.4.1 Banking Sector

      7.4.2 Industrial Sector

      7.4.3 Insurance Sector

      7.4.4 Investing Sector

      7.4.5 Services Sector

7. Appendix (2)

7.1 Financial Ratios
7.1.1 Banking Sector

Banks\Ratios	Years	Failure	OCF	OCF/ CL	OCF+INT.+ TAX/INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
Bank of Palestine (BOP)	2010	1	+	0.039	16.070	0.873	0.035	0.775	1.086	0.329	1.792	-0.003	-13.830	0.036
	2011	1	-	-0.052	-8.302	-0.992	-0.046	-0.652	1.097	-0.388	-2.219	-0.035	1.466	-0.047
	2012	1	+	0.017	5.328	0.369	0.015	1.934	1.091	0.140	0.806	0.054	0.323	0.016
	2013	1	-	0.050	8.953	1.060	0.045	0.643	1.091	0.419	2.611	0.020	2.578	0.046
	2014	1	+	0.107	15.605	2.228	0.094	0.298	1.098	0.816	5.681	0.055	1.935	0.097
PALESTINE ISLAMIC BANK (ISBK)	2010	0	-	-0.278	-431.621	-2.408	-0.086	-0.081	3.428	-0.638	-19.219	-0.031	9.018	-0.090
	2011	0	+	0.001	16.227	0.012	0.000	26.377	2.790	0.004	0.047	0.068	0.021	0.001
	2012	0	+	0.155	243.514	1.177	0.048	0.353	3.051	0.351	3.489	0.303	0.511	0.051
	2013	0	-	-0.157	-167.014	-1.172	-0.049	-0.361	3.013	-0.391	-3.799	0.056	-2.819	-0.052
	2014	0	-	-0.130	-87.675	-1.136	0.048	-0.332	2.586	-0.420	-3.765	-0.025	5.249	-0.050
ARAB ISLAMIC BANK (AIB)	2010	0	+	0.185	187.579	1.628	0.059	-0.101	2.834	0.350	-7.403	0.234	0.793	0.065
	2011	0	-	-0.703	-428.936	-5.554	-0.191	-0.024	3.338	-1.007	-64.513	-0.590	1.192	-0.211
	2012	0	-	-0.224	-125.739	-2.219	-0.074	-0.038	2.709	-0.484	-42.675	0.081	-2.775	-0.083
	2013	0	-	-0.090	-59.376	-1.101	-0.033	-0.321	2.441	-0.248	-4.412	0.141	-0.638	-0.037
	2014	0	-	-0.080	-49.041	-1.029	-0.030	-0.336	2.446	-0.252	-4.131	0.132	-0.603	-0.033
PALESTINE COMMERCIAL BANK (PCB)	2010	1	-	-0.008	0.245	-0.213	-0.007	-2.786	1.141	-0.041	-0.639	-0.008	0.144	-0.007
	2011	1	+	0.038	4.838	0.896	0.031	0.432	1.153	0.186	8.870	0.038	0.371	0.033
	2012	1	-	-0.136	-9.648	-3.453	-0.114	-0.318	1.141	-0.755	-340.911	-0.136	1.213	-0.119
	2013	1	+	0.078	9.358	2.457	0.068	0.133	1.102	0.568	140.831	0.078	0.725	0.071
	2014	1	-	-0.051	-3.766	-1.430	-0.044	-0.328	1.114	-0.342	-10.355	-0.051	1.045	-0.046

Banks\Ratios	Years	Failure	OCF	OCF/ CL	OCF+INT.+ TAX/INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
PALESTINE INVESTMENT BANK (PIBC)	2010	1	+	0.040	8.464	0.771	0.031	0.408	1.201	0.132	10.293	0.007	5.810	0.033
	2011	1	-	-0.011	0.016	-0.191	-0.008	-2.361	1.184	-0.029	-0.742	-0.046	0.231	-0.009
	2012	1	+	0.014	6.177	0.275	0.011	1.157	1.144	0.042	1.522	-0.047	-0.308	0.013
	2013	1	+	0.092	23.716	1.721	0.070	0.188	1.139	0.298	10.323	0.123	0.746	0.080
	2014	1	+	0.074	11.212	1.573	0.058	0.307	1.153	0.271	6.580	0.049	1.514	0.064
QUDS BANK (QUDS)	2010	0	-	-0.005	1.029	-0.126	-0.004	-4.690	1.034	-0.037	-0.426	-0.019	21.908	-0.005
	2011	0	-	-0.095	-10.206	-1.882	-0.084	-0.252	1.053	-0.717	-8.546	-0.111	77.303	-0.090
	2012	0	+	0.033	4.321	0.655	0.029	0.654	1.062	0.239	4.236	0.027	155.828	0.031
	2013	0	+	0.150	13.219	3.031	0.130	0.190	1.061	1.067	14.632	0.121	120.860	0.141
	2014	0	+	0.074	9.384	1.550	0.066	0.360	1.001	0.623	6.080	0.042	143.317	0.074
THE NATIONAL BANK (TNB)	2010	1	+	0.012	2.451	0.295	0.009	0.832	1.245	0.051	6.994	0.039	179.791	0.010
	2011	1	+	0.073	10.243	2.625	0.062	0.161	1.133	0.521	26.824	0.025	1082.630	0.065
	2012	1	+	0.061	5.938	1.714	0.046	0.401	1.229	0.317	8.050	0.105	76.652	0.050
	2013	1	+	0.026	3.104	0.790	0.020	1.037	1.237	0.189	2.888	0.001	2212.548	0.021
	2014	1	+	0.100	7.208	3.088	0.077	0.279	1.227	0.652	11.746	0.091	129.775	0.082

7.1.2 Industrial Sector

Company\ Ratios	Years	Failure	OCF	OCF/ CL	OCF+INT.+ TAX/INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
JERUSALEM PHARMACEUTICALS CO. (JPH)	2010	1	-	-0.009	3.505	-0.003	-0.001	-77.320	3.168	-0.002	-0.015	-0.019	0.643	-0.003
	2011	1	+	0.454	24.812	0.158	0.065	0.635	2.914	0.131	1.996	0.143	4.541	0.167
	2012	1	+	0.409	23.654	0.195	0.072	0.235	2.092	0.073	17.976	-0.091	-4.517	0.138
	2013	1	+	0.103	11.062	0.044	0.020	2.344	2.175	0.029	0.631	0.050	2.072	0.035
	2014	1	+	0.307	29.063	0.148	0.073	0.511	1.733	0.111	2.734	0.139	2.202	0.124
ARAB COMPANY FOR PAINTS PRODUCTS (APC)	2010	1	+	1.178	-	0.528	0.388	0.493	1.758	0.602	2.179	1.850	6.558	0.481
	2011	1	+	1.011	-	0.418	0.360	0.363	1.574	0.584	3.394	3.358	-4.981	0.455
	2012	1	+	0.238	-	0.100	0.079	1.674	1.450	0.125	0.614	2.584	-4.403	0.105
	2013	1	+	0.457	-	0.151	0.126	1.432	1.814	0.183	0.687	1.505	5.032	0.164
	2014	1	+	0.695	-	0.199	0.189	0.726	1.955	0.274	1.340	1.927	5.051	0.244
BIRZEIT PHARMACEUTICALS (BPC)	2010	1	+	1.091	-	0.252	0.105	1.075	4.310	0.126	0.956	0.876	-8.204	0.197
	2011	1	+	0.654	124.953	0.229	0.086	1.009	3.213	0.109	1.174	1.796	-4.628	0.156
	2012	1	+	1.139	261.424	0.358	0.137	0.768	3.644	0.172	1.652	1.451	2.937	0.251
	2013	1	+	0.362	436.628	0.107	0.041	2.415	4.026	0.052	0.489	1.350	-1.042	0.075
	2014	1	+	0.804	282.687	0.341	0.122	0.557	3.038	0.160	2.020	2.514	2.222	0.211
THE NATIONAL INDUSTRY CO. (NCI)	2010	1	+	0.867	61.673	0.110	0.079	0.346	5.192	0.088	3.038	0.238	3.642	0.140
	2011	1	+	-0.123	-6.700	-0.009	-0.006	-0.807	10.250	-0.006	-1.478	0.500	-0.246	-0.010
	2012	1	+	0.791	-	0.079	0.061	0.332	6.280	0.067	3.505	-0.259	-3.048	0.107
	2013	1	+	0.948	-	0.105	0.093	0.926	5.032	0.106	1.325	0.271	3.505	0.165
	2014	1	+	0.517	-	0.069	0.068	1.092	3.662	0.080	1.425	-0.071	-7.240	0.122

Company\Ratios	Years	Failure	OCF	OCF/CL	OCF+INT.+TAX/INT	OCF/SALES	OCF/T.A	EBIT/OCF	QUICK RATIO	OCF/EQUITY	OCF/N.I	FCF/C.L	OCF/FCF	OCF/C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
THE VEGETABLE OIL INDUSTRIES (VOICE)	2010	0	+	0.079	3.508	0.029	0.008	2.488	1.938	0.009	0.049	0.735	0.108	0.030
	2011	0	-	-1.605	-54.610	-0.256	-0.071	-2.128	3.103	-0.076	-0.475	-1.614	0.994	-0.283
	2012	0	+	1.335	1313.960	0.186	0.048	3.891	4.752	0.051	0.260	1.745	0.765	0.195
	2013	0	-	-0.104	-	-0.019	-0.004	-63.010	4.533	-0.005	-0.016	1.001	-0.104	-0.016
	2014	0	-	-0.095	-	-0.019	-0.005	-51.322	4.187	-0.005	-0.020	0.294	-0.323	-0.019
PALESTINE PLASTIC INDUSTRIES (LADAEN)	2010	0	-	-0.126	-10.117	-0.091	-0.028	2.535	0.755	-0.036	0.381	-0.077	1.641	-0.083
	2011	0	-	-0.036	-0.282	-0.019	-0.006	16.421	0.862	-0.008	-0.058	-0.019	1.870	-0.020
	2012	0	-	-0.069	-0.910	-0.050	-0.015	9.712	0.941	-0.020	0.098	0.021	-3.195	-0.043
	2013	0	+	0.158	5.313	0.111	0.038	-4.487	0.881	0.054	-0.212	-0.046	-3.408	0.102
	2014	0	+	0.064	2.916	0.060	0.020	-8.670	0.779	0.031	-0.109	0.016	3.904	0.053
JERUSALEM CIGARETTE (JCC)	2010	0	-	-0.054	-	-0.016	-0.032	-1.032	0.494	-0.088	-1.196	-0.017	3.165	-0.062
	2011	0	-	-0.069	-	-0.022	-0.035	-0.233	0.674	-0.085	-3.592	0.033	-2.088	-0.070
	2012	0	+	0.365	-	0.080	0.169	0.291	0.468	0.355	4.364	0.029	12.478	0.383
	2013	0	-	-0.037	-	-0.009	-0.019	-0.839	0.317	-0.043	-1.684	-0.078	0.477	-0.049
	2014	0	-	-0.060	-	-0.022	-0.039	2.033	0.804	-0.072	0.492	0.005	-12.499	-0.074
GOLDEN WHEAT MILLS (GMC)	2010	0	-	-0.126	-10.117	-0.091	-0.028	2.535	0.755	-0.036	0.381	-0.077	1.641	-0.083
	2011	0	-	-0.036	-0.282	-0.019	-0.006	16.421	0.862	-0.008	-0.058	-0.019	1.870	-0.020
	2012	0	-	-0.069	-0.910	-0.050	-0.015	9.712	0.941	-0.020	0.098	0.021	-3.195	-0.043
	2013	0	+	0.158	5.313	0.111	0.038	-4.487	0.881	0.054	-0.212	-0.046	-3.408	0.102
	2014	0	+	0.064	2.916	0.060	0.020	-8.670	0.779	0.031	-0.109	0.016	3.904	0.053

Company\Ratios	Years	Failure	OCF	OCF/CL	OCF+INT.+TAX/INT	OCF/SALES	OCF/T.A	EBIT/OCF	QUICK RATIO	OCF/EQUITY	OCF/N.I	FCF/C.L	OCF/FCF	OCF/C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
PALESTINE POULTRY (AZZIA)	2010	1	+	0.807	53.445	0.249	0.147	1.020	1.036	0.215	1.000	-0.223	-3.624	0.571
	2011	1	+	0.047	3.369	0.019	0.011	-0.296	1.000	0.019	-1.164	-0.024	-1.996	0.040
	2012	1	+	0.153	9.178	0.073	0.043	0.770	0.869	0.071	2.013	-0.004	-35.907	0.148
	2013	1	+	0.695	19.357	0.192	0.146	0.829	1.229	0.206	1.491	0.179	3.878	0.447
	2014	1	+	0.414	18.697	0.110	0.102	0.920	1.074	0.144	1.394	-0.078	-5.271	0.296
AL SHARK ELECTRODE (ELECTRODE)	2010	0	-	-1.898	-289.231	-0.293	-0.123	-0.284	3.503	-0.132	-4.229	0.110	-17.181	-0.331
	2011	0	+	0.324	44.926	0.058	0.027	1.592	2.116	0.029	0.752	-0.466	-0.697	0.074
	2012	0	-	-0.382	-46.245	-0.063	-0.029	-1.162	2.934	-0.032	-1.028	0.380	-1.005	-0.077
	2013	0	-	-0.009	10.042	-0.002	-0.001	-48.293	2.209	-0.001	-0.026	-0.284	0.031	-0.002
	2014	0	+	0.372	28.881	0.067	0.024	1.486	3.369	0.025	0.856	0.148	2.516	0.063
NATIONAL ALUMINUM AND PROFILE (NAPCO)	2010	1	-	-0.058	-0.287	-0.044	-0.026	-0.856	0.594	-0.053	-12.630	0.045	-1.288	-0.062
	2011	1	+	0.069	2.465	0.040	0.030	0.805	0.712	0.066	8.055	0.145	0.479	0.069
	2012	1	+	0.088	2.562	0.053	0.038	0.790	0.612	0.082	6.681	-0.041	-2.125	0.089
	2013	1	+	0.042	1.929	0.028	0.019	2.487	0.612	0.043	0.803	-0.003	-13.164	0.040
	2014	1	+	0.033	1.677	0.022	0.015	3.767	0.542	0.033	0.437	-0.020	-1.673	0.030
DAR AL-SHIFA (PHARMCARE)	2010	1	+	0.425	9.365	0.127	0.070	1.128	1.000	0.095	1.078	-0.156	-2.733	0.197
	2011	1	+	0.068	5.153	0.064	0.031	2.676	0.556	0.057	0.461	0.122	0.559	0.073
	2012	1	+	0.198	6.505	0.099	0.043	1.661	1.099	0.071	0.750	-0.015	-13.238	0.110
	2013	1	+	0.053	3.566	0.030	0.013	4.789	1.062	0.023	0.328	-0.021	-2.549	0.031
	2014	NOT AVAILABLE FOR 2014 BY THE COMPANY												

7.1.3 Insurance Sector

Company\Ratios	Years	Failure	OCF	OCF/CL	OCF+INT.+TAX/INT	OCF/SALES	OCF/T.A	EBIT/OCF	QUICK RATIO	OCF/EQUITY	OCF/N.I	FCF/C.L	OCF/FCF	OCF/C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
NATIONAL INSURANCE CO. (NIC)	2010	1	+	0.086	-	0.184	0.063	1.662	1.107	0.213	0.837	0.193	0.481	0.084
	2011	1	+	0.043	-	0.080	0.029	2.487	1.139	0.096	0.696	-0.106	-0.403	0.038
	2012	1	-	-0.053	-	-0.092	-0.033	-2.709	1.179	-0.098	-0.516	-0.122	0.435	-0.045
	2013	1	+	0.038	-	0.070	0.023	3.676	1.202	0.069	0.380	0.031	1.240	0.032
	2014	1	-	-0.081	-	-0.118	-0.046	-1.025	1.249	-0.123	-1.289	-0.113	0.717	-0.065
AHLEIA INSURANCE GROUP (AIG)	2010	1	+	0.002	-	0.206	0.001	0.605	0.751	0.005	1.653	0.029	0.059	0.002
	2011	1	+	0.021	-	1.023	0.015	2.271	0.648	0.059	0.463	-0.014	-1.548	0.033
	2012	1	+	0.011		-1.106	0.013	-0.998	0.805	0.051	-1.002	0.006	2.986	0.021
	2013	1	+	-0.145	-	3.685	-0.095	-0.424	0.944	-0.302	-2.361	-0.016	8.826	-0.154
	2014	1	-	-0.010	-	-0.181	-0.006	-8.711	0.889	-0.018	-0.122	0.044	-0.218	-0.011
AL-MASHRQ INSURANCE CO. (MIC)	2010	0	-	-0.104	-9.130	-0.128	-0.101	0.983	0.369	1.774	0.877	-0.004	23.290	-0.282
	2011	0	-	-0.140	-9.401	-0.193	-0.137	0.411	0.383	2.462	1.690	-0.004	33.020	-0.365
	2012	0	-	-0.118	-11.645	-0.243	-0.115	0.381	0.526	-5.357	2.036	0.055	-2.140	-0.223
	2013	0	+	0.111	35.666	0.184	0.101	0.139	0.630	1.900	12.306	0.022	5.033	0.175
	2014	0	+	0.054	15.244	0.080	0.040	0.502	0.713	0.175	3.235	-0.002	-22.813	0.075
TRUST INTERNATIONAL INSURANCE (TRUST)	2010	1	+	0.119	-	0.239	0.066	0.524	0.741	0.175	2.536	0.065	1.841	0.161
	2011	1	+	0.062	-	0.124	0.037	0.708	0.806	0.109	1.888	0.011	5.500	0.077
	2012	1	+	0.065	-	0.134	0.042	0.671	0.787	0.124	1.936	0.049	1.335	0.083
	2013	1	+	0.063	-	0.104	0.041	0.845	0.757	0.126	1.184	-0.068	-0.931	0.083
	2014	1	+	0.035	-	0.054	0.021	1.988	0.808	0.054	0.824	0.049	0.698	0.043

Company\ Ratios	Years	Failure	OCF	OCF/ CL	OCF+INT.+ TAX/INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
Palestinian Insurance Company (PICO)	2010	0	-	-0.019	-	-0.044	-0.016	3.137	0.711	-0.125	0.309	-0.022	0.864	-0.027
	2011	0	-	-0.042	-	-0.098	-0.035	-0.449	0.676	-0.259	-2.426	-0.078	0.534	-0.062
	2012	0	-	-0.027	-	-0.096	-0.024	0.251	0.640	-0.183	0.685	0.007	-3.689	-0.043
	2013	0	-	-0.077	-	-0.293	-0.066	-0.047	0.621	-0.563	-58.886	-0.077	0.992	-0.124
	2014	0	-	-0.019	-	-0.061	-0.015	-4.989	0.595	-0.088	-0.200	-0.029	0.657	-0.032
Al-Takaful Palestinian Insurance (TIC)	2010	1	+	0.259	-	0.641	0.112	0.681	1.625	0.204	1.785	0.366	0.707	0.159
	2011	1	+	0.035	-	0.086	0.017	1.107	1.232	0.036	1.200	0.105	0.335	0.028
	2012	1	+	0.163	-	0.486	0.082	0.752	0.919	0.172	1.690	0.127	1.288	0.178
	2013	1	+	0.153	-	0.549	0.083	0.372	0.836	0.191	2.640	0.047	3.275	0.183
	2014	1	+	0.137	-	0.365	0.080	1.202	0.813	0.208	1.137	-0.039	-3.523	0.169
Global United Insurance (GUI)	2010	1	+	0.054	-	0.094	0.029	0.287	1.309	0.062	8.230	0.227	0.239	0.041
	2011	1	+	0.245	-	0.213	0.166	0.295	1.137	0.539	3.874	0.036	6.803	0.216
	2012	1	+	0.197	-	0.171	0.136	0.839	1.207	0.459	1.660	0.084	2.349	0.163
	2013	1	+	0.166	-	0.159	0.118	0.231	1.137	0.445	5.420	0.079	2.101	0.146
	2014	1	+	0.004	-	0.005	0.003	11.005	1.079	0.011	0.181	-0.034	-0.126	0.004

7.1.4 Investing Sector

Company\ Ratios	Years	Failure	OCF	OCF/ CL	OCF+INT.+ TAX/INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
JERUSALEM REAL ESTATE INVESTMENT CO. (JREI)	2010	0	+	0.085	57.537	0.074	0.024	1.889	1.171	0.035	0.597	0.012	7.212	0.072
	2011	0	+	0.236	-	0.197	0.068	0.529	1.116	0.103	2.043	-0.014	-16.938	0.212
	2012	0	-	-0.017	-0.707	-0.048	-0.005	2.654	0.941	-0.008	0.309	0.047	-0.364	-0.018
	2013	0	-	-0.029	-2.495	-	-0.011	9.336	0.621	-0.020	0.104	-0.036	0.812	-0.047
	2014	0	+	0.008	1.239	0.733	0.002	-24.319	0.508	0.004	-0.035	-0.009	-0.912	0.015
UNION CONSTRUCTION AND INVESTMENT (UCI)	2010	1	+	2.249	-	0.385	0.056	0.696	13.097	0.058	1.436	-0.160	-14.044	0.159
	2011	1	+	1.205	-	0.127	0.016	2.563	28.477	0.016	0.449	1.186	1.016	0.040
	2012	1	+	8.281	-	2.051	0.192	0.093	14.268	0.200	12.021	-3.936	-2.104	0.557
	2013	1	+	0.367	-	0.181	0.011	0.926	10.452	0.011	1.280	-1.514	-0.242	0.034
	2014	1	+	1.969	-	0.666	0.093	0.130	7.160	0.098	8.372	1.186	1.661	0.264
ARAB INVESTORS (ARAB)	2010	1	+	0.350	-	0.965	0.017	0.666	0.393	0.018	1.501	0.061	5.741	0.891
	2011	1	+	0.111	5.785	0.344	0.006	6.669	0.233	0.007	0.155	-0.136	-0.820	0.477
	2012	1	-	-4.046	-47.139	-1.461	-0.028	0.220	6.904	-0.029	4.160	0.381	-10.627	-0.586
	2013	1	+	0.262	-	0.093	0.002	4.994	8.978	0.002	0.200	0.245	1.071	0.029
	2014	1	+	0.025	-	0.040	0.001	-67.749	1.765	0.001	-0.015	-0.143	-0.173	0.014
PALESTINE INDUSTRIAL INVESTMEN (PIIC)	2010	1	+	0.622	43.298	0.210	0.095	1.113	1.197	0.126	1.001	-0.095	-6.519	0.378
	2011	1	+	0.015	0.015	0.006	0.003	8.561	0.963	0.004	0.169	-0.079	-0.187	0.012
	2012	1	+	0.121	0.121	0.058	0.026	1.052	0.896	0.038	1.581	-0.024	-5.100	0.109
	2013	1	+	0.515	0.515	0.159	0.090	1.158	1.217	0.118	1.041	0.198	2.599	0.331
	2014	1	+	0.113	0.113	0.037	0.024	3.396	1.089	0.032	0.368	-0.059	-1.925	0.080

Company\Ratios	Years	Failure	OCF	OCF/CL	OCF + INT + TAX + /INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
PALESTINE REAL ESTATE INVESTMENT (PRICO)	2010	1	+	0.248	5.604	0.137	0.035	1.407	1.731	0.047	1.073	-0.027	-9.088	0.129
	2011	1	+	0.169	5.493	0.151	0.036	1.687	1.634	0.052	0.843	0.286	0.592	0.100
	2012	1	+	0.162	6.144	0.225	0.032	0.123	1.354	0.045	-2.698	-0.023	-7.176	0.118
	2013	1	+	0.214	8.235	0.580	0.038	-0.442	0.942	0.056	-1.595	-0.204	-1.047	0.216
	2014	1	+	0.127	4.755	0.571	0.029	0.957	0.615	0.044	1.400	-0.006	-22.178	0.197
PALESTINE DEVELOPMENT & INVESTMENT (PADICO)	2010	1	+	0.136	2.809	0.103	0.016	4.503	0.753	0.223	0.267	-0.130	-1.053	0.149
	2011	1	+	0.135	2.592	0.115	0.016	2.925	0.812	0.025	0.456	0.147	0.914	0.150
	2012	1	-	-0.104	0.126	-0.105	-0.014	-2.839	0.692	-0.215	-0.582	-0.098	1.056	-0.129
	2013	1	+	0.074	1.934	0.079	0.011	4.141	0.513	0.017	0.347	-0.038	-1.921	0.122
	2014	1	-	-0.002	1.053	-0.002	0.000	-150.278	0.552	0.000	-0.011	-0.015	0.130	-0.003
PALESTINE INVESTMENT & DEVELOPMENT (PID)	2010	0	-	-12.775	-	-25.195	-0.118	0.284	45.929	-0.120	3.520	-5.999	2.130	-0.278
	2011	0	-	-1.194	-	-4.793	-0.012	2.774	35.790	-0.013	0.361	-5.156	0.232	-0.033
	2012	0	+	7.987	-	63.772	0.121	0.817	28.173	0.124	1.295	7.597	1.051	0.284
	2013	0	-	-16.985	-	-22.640	-0.103	-0.675	74.262	-0.105	-1.481	-19.635	0.865	-0.229
	2014	0	+	2.742	-	6.985	0.018	2.018	61.039	0.018	0.496	-8.061	-0.340	0.045
ARAB PALESTINIAN INVESTMENT (APIC)	2010	1	-	-0.042	0.562	-0.012	-0.020	-3.105	0.786	-0.051	-0.692	0.015	-2.706	-0.034
	2011	1	+	0.114	3.507	0.027	0.053	0.822	0.807	0.136	5.246	-0.004	-27.615	0.094
	2012	1	+	0.002	1.443	0.001	0.001	71.280	0.808	0.002	0.030	-0.021	-0.097	0.002
	2013	1	+	0.083	3.404	0.019	0.036	2.433	0.919	0.091	0.773	0.032	2.578	0.058
	2014	1	+	0.179	5.102	0.035	0.074	1.081	0.959	0.179	1.639	0.049	3.625	0.121
AL-AQARIYA TRADING INVESTMENT (ALQARYIA)	2010	0	+	0.827	-	2.681	0.154	0.280	1.603	0.189	4.204	1.018	0.813	0.516
	2011	0	-	-1.419	-	-5.152	-0.125	-0.096	1.987	-0.138	-12.292	-1.845	0.769	-0.714
	2012	0	+	0.082	-	1.095	0.012	-1.625	1.814	0.015	-0.615	0.303	0.270	0.045
	2013	0	-	-0.690	-	-16.943	-0.092	0.303	1.589	-0.107	3.296	-0.322	2.144	-0.434
	2014	0	-	-0.439	-	-0.471	-0.077	2.205	2.314	-0.095	0.449	-0.343	1.278	-0.190

7.1.5 Services Sector

Company\ Ratios	Years	Failure	OCF	OCF/ CL	OCF + INT + TAX + /INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
GLOBALCOM TELECOM. (GCOM)	2010	0	-	-0.404	-52.942	-0.665	-0.018	9.520	0.846	-0.019	0.105	-2.534	0.159	-0.427
	2011	0	-	-0.325	-186.281	-2.601	-0.127	1.525	0.357	-0.142	0.693	0.229	-1.509	-0.919
	2012	0	-	-1.337	-15.557	-1.011	-0.084	2.351	0.682	-0.091	0.415	-1.975	0.677	-1.781
	2013	0	-	-0.082	-1.849	-0.172	-0.017	18.169	0.233	-0.022	0.054	-0.095	0.868	-0.320
	2014	0	-	-0.179	-14.651	-0.636	-0.057	2.221	0.138	-0.084	0.438	-0.228	0.784	-1.167
THE ARAB HOTLE COMPANY (AHC)	2010	0	-	-0.077	-9.292	-0.960	-0.015	0.114	0.403	-0.023	4.735	0.064	-1.200	-0.156
	2011	0	-	-0.612	-4.998	-0.737	-0.091	0.479	0.208	-0.144	3.960	-0.095	6.453	-1.728
	2012	0	-	-0.005	0.938	-0.008	-0.001	10.959	0.171	-0.002	0.037	0.014	-0.354	-0.019
	2013	0	-	-0.046	0.503	-0.075	-0.011	0.956	0.209	-0.018	0.390	-0.020	2.313	-0.159
	2014	0	-	-0.047	0.835	-0.030	-0.004	-1.575	0.379	-0.008	0.222	0.050	-0.929	-0.077
ARAB REAL ESTATE ESTABLISHMENT (ARE)	2010	0	-	-0.180	-	-0.174	-0.105	1.382	1.275	-0.258	0.724	-0.116	1.552	-0.141
	2011	0	+	0.011	-	0.007	0.006	2.036	1.324	0.015	0.578	0.031	0.367	0.009
	2012	0	-	-0.079	-	-0.056	-0.050	-0.131	1.264	-0.137	-9.001	-0.054	1.478	-0.063
	2013	0	-	-0.048	-	-0.066	-0.036	3.102	1.082	-0.146	0.322	-0.025	1.906	-0.045
	2014	0	-	-0.083	-	-0.646	-0.064	1.111	1.091	-0.290	0.900	-0.038	2.188	-0.076
PALESTINE TELECO. (PALTEL)	2010	1	+	1.445	65.749	0.423	0.260	0.633	2.065	0.366	1.657	0.066	21.948	0.671
	2011	1	+	1.700	83.730	0.453	0.292	0.602	1.884	0.391	1.849	-0.064	-26.488	0.871
	2012	1	+	1.218	116.225	0.405	0.241	0.712	1.425	0.323	1.805	-0.148	-8.245	0.813
	2013	1	+	1.292	139.504	0.457	0.258	0.713	1.345	0.341	1.869	-0.020	-66.148	0.945
	2014	1	+	0.701	71.693	0.327	0.155	0.865	1.107	0.223	1.369	-0.069	-10.124	0.621

Company\Ratios	Years	Failure	OCF	OCF/ CL	OCF + INT + TAX + /INT	OCF/ SALES	OCF/ T.A	EBIT/ OCF	QUICK RATIO	OCF/ EQUITY	OCF/ N.I	FCF/ C.L	OCF/ FCF	OCF/ C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
ARAB PALESTINIAN SHOPPING CENTERS (PLAZA)	2010	1	+	0.100	3.804	0.036	0.037	-0.123	0.605	0.080	-1.655	0.004	28.673	0.108
	2011	1	+	0.004	1.057	0.001	0.002	-25.966	0.638	0.005	-0.027	-0.016	-0.275	0.005
	2012	1	-	-0.203	-2.305	-0.077	-0.081	0.488	0.551	-0.229	1.334	-0.005	41.675	-0.257
	2013	1	+	0.256	3.646	0.043	0.063	-0.023	0.458	0.089	-2.710	-0.001	-396.994	0.272
	2014	1	-	-0.482	-60.002	-0.093	-0.136	0.203	0.324	-0.215	-4.108	0.019	-25.971	-0.690
PALESTINIAN DIST. & LOGISTICS SERVICES (WASSEL)	2010	1	+	0.337	19.195	0.198	0.128	0.179	1.531	0.232	153.910	0.046	7.267	0.205
	2011	1	+	0.028	7.289	0.019	0.013	-11.329	1.267	0.033	-0.077	0.010	2.699	0.021
	2012	1	-	-0.514	-47.025	-0.288	-0.186	0.145	1.515	-0.505	6.039	0.024	-21.300	-0.320
	2013	1	+	0.069	13.653	0.057	0.040	-0.016	0.960	0.114	-5.537	-0.114	-0.599	0.067
	2014	1	-	-0.202	-13.652	-0.192	-0.109	1.644	1.033	-0.383	0.561	0.078	-2.583	-0.184
NABLUS SURGICAL CENTER (NSC)	2010	0	-	-0.798	-	-0.502	-0.247	-0.292	1.941	-0.381	-3.423	-0.524	0.032	-0.011
	2011	0	-	-0.250	-	-0.020	-0.087	-4.071	1.889	-0.014	-0.276	0.062	21.822	0.597
	2012	0	+	0.311	-	0.257	0.113	0.670	1.987	0.191	1.693	-0.084	-6.921	0.314
	2013	0	+	0.070	-	0.069	0.031	3.004	1.667	0.062	0.374	0.164	1.135	0.192
	2014	0	+	0.120	-	0.123	0.056	0.017	1.612	0.115	226.101	0.061	12.861	0.435
PALESTINE ELECTRIC (PEC)	2010	1	+	-0.017	0.734	-0.014	-0.003	-20.121	1.292	-0.005	-0.061	-0.524	1.522	-0.388
	2011	1	+	1.355	19.692	0.763	0.194	0.420	1.880	0.292	2.725	-0.096	0.253	-0.012
	2012	1	+	0.580	15.135	0.405	0.109	0.759	1.500	0.152	1.453	0.284	1.095	0.152
	2013	1	+	0.187	10.135	0.190	0.044	0.984	0.707	0.066	1.144	-0.084	-0.833	0.040
	2014	1	+	0.790	36.836	0.617	0.144	0.154	1.406	0.191	7.917	-0.010	-12.135	0.072

Company\Ratios	Years	Failure	OCF	OCF/CL	OCF + INT + TAX + /INT	OCF/SALES	OCF/T.A	EBIT/OCF	QUICK RATIO	OCF/EQUITY	OCF/N.I	FCF/C.L	OCF/FCF	OCF/C.A
		Y	Y	X1	X2	X3	X4	X5	X6	x7	x8	X9	x10	X11
WATANIYA PALESTINE MOBILE TELECOMM. (WATANIYA)	2010	1	-	-0.514	-2.142	-0.865	-0.094	1.379	1.679	-0.204	0.589	1.194	-0.430	-0.303
	2011	1	+	0.051	1.363	0.028	0.007	-9.566	1.089	0.016	-0.081	-1.517	-0.034	0.045
	2012	1	+	0.267	3.121	0.157	0.045	-1.331	1.259	0.117	-0.555	0.306	0.873	0.208
	2013	1	+	0.350	4.917	0.229	0.073	-0.786	1.041	0.224	-0.960	-0.039	-8.995	0.331
	2014	1	+	0.278	4.863	0.234	0.074	-0.569	0.784	0.267	-1.208	-0.171	-1.628	0.345
AL-WATANIAH TOWERS (ABRAJ)	2010	1	+	0.719	-	0.215	0.016	1.326	2.611	0.016	0.945	-0.439	-1.639	0.275
	2011	1	+	1.041	-	0.290	0.022	2.259	9.353	0.022	0.517	6.333	0.164	0.111
	2012	1	+	0.563	133.266	0.466	0.033	0.530	0.933	0.037	2.004	-2.033	-0.277	0.604
	2013	1	+	0.324	-	0.255	0.019	1.592	1.126	0.020	0.710	-0.047	-6.939	0.288
	2014	1	+	0.671	-	0.362	0.026	0.397	1.849	0.027	3.234	-0.037	-17.959	0.363
THE RAMALLAH SUMMER RESORTS (RSR)	2010	1	+	0.144	31.384	0.258	0.020	0.438	0.726	0.028	3.929	0.118	1.217	0.185
	2011	1	+	0.352	71.280	1.121	0.067	-0.005	0.480	0.100	-51.979	-0.032	-10.942	0.667
	2012	1	+	0.015	8.529	0.046	0.003	1.797	0.469	0.004	0.811	-0.039	-0.396	0.032
	2013	1	-	-0.120	-29.313	-0.327	-0.017	-0.109	0.531	-0.022	-3.656	-0.042	2.853	-0.220
	2014	1	+	0.189	74.868	0.750	0.031	-0.178	0.473	0.042	-3.806	-0.001	-296.253	0.393
PalAqar Company for Estate & Management Development (PALQAR)	2010	1	+	0.174	80.535	0.625	0.101	-0.455	0.678	0.244	-2.139	0.034	5.081	0.230
	2011	1	+	0.274	158.836	0.390	0.118	0.964	0.928	0.210	1.125	0.025	11.069	0.276
	2012	1	+	0.181	-	0.270	0.070	0.174	1.062	0.117	8.430	-0.027	-6.770	0.160
	2013	1	+	0.313	-	0.418	0.113	-0.345	1.114	0.182	-2.310	0.104	3.010	0.270
	2014	1	+	0.111	-	0.155	0.045	-2.089	1.009	0.077	-0.435	0.062	1.789	0.107

7.2   Economic Sectors

7.2.1 Economic Sectors

Name of The Economic Sector	No. of Companies
Insurance Sector	7
Banking Sector and Financial Services	8
Services Sector	12
Investment Sector	9
Industrial Sector	12
(5) Economic Sectors	**(48) Company, Total Study Population**

7.2.2 Banking and Financial Services Sector

No.	Company Name	Symbol	Market class	Currency
1	ARAB ISLAMIC BANK	AIB	2	USD
2	BANK OF PALESTINE	BOP	1	USD
3	PALESTINE ISLAMIC BANK	ISBK	1	USD
4	PALESTINE COMMERCIAL BANK	PCB	2	USD
5	PALESTINE INVESTMENT BANK	PIBC	2	USD
6	PALESTINE SECURITIES EXCHANGE	PSE	2	USD
7	AL QUDS BANK	QUDS	2	USD
8	THE NATIONAL BANK	TNB	1	USD

Source: (Palestine Exchange, 2015)

7.2.3 Industry Sector

No.	Company Name	Symbol	Market class	Currency
1	ARAB COMPANY FOR PAINTS PRODUCTS	APC	2	JOD
2	PALESTINE POULTRY	AZIZA	2	JOD
3	BIRZEIT PHARMACEUTICALS	BPC	1	USD
4	AL SHARK ELECTRODE	ELECTRODE	2	JOD
5	GOLDEN WHEAT MILLS	GMC	2	JOD
6	JERUSALEM CIGARETTE	JCC	1	JOD
7	JERUSALEM PHARMACEUTICALS	JPH	2	USD
8	PALESTINE PLASTIC INDUSTRIES	LADAEN	2	JOD
9	NATIONAL ALUMINUM AND PROFILE	NAPCO	2	JOD
10	THE NATIONAL CARTON INDUSTRY	NCI	2	USD
11	DAR AL-SHIFA PHARMACEUTICALS	PHARMACARE	2	USD
12	THE VEGETABLE OIL INDUSTRIES	VOIC	2	JOD

Source: (Palestine Exchange, 2015)

1.2.4 Insurance Sector

No.	Company Name	Symbol	Market class	Currency
1	AHLIEA INSURANCE GROUP	AIG	2	USD
2	GLOBAL UNITED INSURANCE	GUI	2	USD
3	AL MASHRIQ INSURANCE	MIC	2	USD
4	NATIONAL INSURANCE	NIC	2	USD
5	PALESTINE INSURANCE	PICO	2	USD
6	AL-TAKAFUL PALESTINIAN INSURANCE	TIC	2	USD
7	TRUST INTERNATIONAL INSURANCE	TRUST	2	USD

Source: (Palestine Exchange, 2015)

7.2.5 Investing Sector

No.	Company Name	Symbol	Market class	Currency
1	ARAB PALESTINIAN INVESTMENT "APIC"	APIC	2	USD
2	AL-AQARIYA TRADING INVESTMENT	AQARIYA	2	JOD
3	ARAB INVESTORS	ARAB	2	JOD
4	JERUSALEM REAL ESTATE INVESTMENT	JREI	2	USD
5	PALESTINE DEVELOPMENT & INVESTMENT	PADICO	1	USD
6	PALESTINE INVESTMENT & DEVELOPMENT	PID	2	JOD
7	PALESTINE INDUSTRIAL INVESTMENT	PIIC	2	JOD
8	PALESTINE REAL ESTATE INVESTMENT	PRICO	2	JOD
9	UNION CONSTRUCTION AND INVESTMENT	UCI	1	USD

Source: (Palestine Exchange, 2015)

7.2.6 Services Sector

No.	Company Name	Symbol	Market class	Currency
1	AL-WATANIAH TOWERS	ABRAJ	2	USD
2	THE ARAB HOTELS	AHC	2	JOD
3	ARAB REAL ESTATE ESTABLISHMENT	ARE	2	JOD
4	GLOBALCOM TELECOMMUNICATIONS	GCOM	2	USD
5	NABLUS SURGICAL CENTER	NSC	2	JOD
6	PALAQAR FOR REAL ESTATE DEV.& MANAGEMENT	PALAQAR	2	JOD
7	PALESTINE TELECOMMUNICATIONS	PALTEL	1	JOD
8	PALESTINE ELECTRIC	PEC	2	USD
9	ARAB PALESTINIAN SHOPPING CENTERS	PLAZA	2	JOD
10	THE RAMALLAH SUMMER RESORTS	RSR	2	JOD
11	PALESTINIAN DIST. & LOGISTICS SERVICES	WASSEL	2	USD
12	WATANIYA PALESTINE MOBILE TELECOMM.	WATANIYA	2	USD

Source: (Palestine Exchange, 2015)

7.3   Groups membership

7.3.1 Banking Sector

Company	Year	Original Group	Predicted Group	Probability
BOP	2010	non-failed	non-failed	0.809
BOP	2011	non-failed	non-failed	0.804
BOP	2012	non-failed	non-failed	0.807
BOP	2013	non-failed	non-failed	0.807
BOP	2014	non-failed	non-failed	0.803
ISBK	2010	failed	failed	0.004
ISBK	2011	failed	failed	0.028
ISBK	2012	failed	failed	0.013
ISBK	2013	failed	failed	0.015
ISBK	2014	failed	failed	0.049
AIB	2010	failed	failed	0.024
AIB	2011	failed	failed	0.006
AIB	2012	failed	failed	0.035
AIB	2013	failed	failed	0.074
AIB	2014	failed	failed	0.073
PCB	2010	non-failed	non-failed	0.783
PCB	2011	non-failed	non-failed	0.777
PCB	2012	non-failed	non-failed	0.783
PCB	2013	non-failed	non-failed	0.802
PCB	2014	non-failed	non-failed	0.796
PIBC	2010	non-failed	non-failed	0.751
PIBC	2011	non-failed	non-failed	0.761
PIBC	2012	non-failed	non-failed	0.781
PIBC	2013	non-failed	non-failed	0.784
PIBC	2014	non-failed	non-failed	0.777
QUADS	2010	failed	non-failed	0.831
QUADS	2011	failed	non-failed	0.823
QUADS	2012	failed	non-failed	0.82
QUADS	2013	failed	non-failed	0.82
QUADS	2014	failed	non-failed	0.845
TNB	2010	non-failed	non-failed	0.726
TNB	2011	non-failed	non-failed	0.787
TNB	2012	non-failed	non-failed	0.736
TNB	2013	non-failed	non-failed	0.731
TNB	2014	non-failed	non-failed	0.737
Accuracy Rate			**86%**	

7.3.2 Industrial Sector

Company	Year	Original Group	Predicted Group	Probability
JPH	2010	non-failed	failed	0.333
JPH	2011	non-failed	non-failed	0.939
JPH	2012	non-failed	non-failed	0.995
JPH	2013	non-failed	non-failed	0.562
JPH	2014	non-failed	non-failed	0.945
APC	2010	non-failed	non-failed	1
APC	2011	non-failed	non-failed	1
APC	2012	non-failed	non-failed	0.946
APC	2013	non-failed	non-failed	0.93
APC	2014	non-failed	non-failed	0.979
BPC	2010	non-failed	non-failed	0.999
BPC	2011	non-failed	non-failed	0.997
BPC	2012	non-failed	non-failed	0.999
BPC	2013	non-failed	non-failed	0.6
BPC	2014	non-failed	non-failed	0.999
NCI	2010	non-failed	non-failed	0.811
NCI	2011	non-failed	failed	0.343
NCI	2012	non-failed	non-failed	0.89
NCI	2013	non-failed	non-failed	0.838
NCI	2014	non-failed	non-failed	0.927
VOICE	2010	failed	non-failed	0.557
VOICE	2011	failed	failed	0.001
VOICE	2012	failed	failed	0.119
VOICE	2013	failed	failed	0.275
VOICE	2014	failed	failed	0.283
LADEN	2010	failed	failed	0.043
LADEN	2011	failed	failed	0.214
LADEN	2012	failed	failed	0.224
LADEN	2013	failed	non-failed	0.951
LADEN	2014	failed	non-failed	0.596
JCC	2010	failed	failed	0.19
JCC	2011	failed	failed	0.331
JCC	2012	failed	failed	0.368
JCC	2013	failed	failed	0.309
JCC	2014	failed	non-failed	0.746
GMC	2010	non-failed	failed	0.402

GMC	2011	non-failed	non-failed	0.922
GMC	2012	non-failed	non-failed	0.598
GMC	2013	non-failed	non-failed	0.993
GMC	2014	non-failed	non-failed	0.96
AZZIZA	2010	non-failed	non-failed	0.998
AZZIZA	2011	non-failed	non-failed	0.582
AZZIZA	2012	non-failed	non-failed	0.999
AZZIZA	2013	non-failed	non-failed	0.977
AZZIZA	2014	non-failed	non-failed	0.96
ELECRODE	2010	failed	failed	0.022
ELECRODE	2011	failed	non-failed	0.717
ELECRODE	2012	failed	failed	0.149
ELECRODE	2013	failed	failed	0.356
ELECRODE	2014	failed	non-failed	0.665
NAPCO	2010	non-failed	failed	0.196
NAPCO	2011	non-failed	non-failed	0.613
NAPCO	2012	non-failed	non-failed	0.776
NAPCO	2013	non-failed	non-failed	0.923
NAPCO	2014	non-failed	non-failed	0.59
PHARMCARE	2010	non-failed	non-failed	0.962
PHARMCARE	2011	non-failed	non-failed	0.742
PHARMCARE	2012	non-failed	non-failed	0.987
PHARMCARE	2013	non-failed	non-failed	0.671
Accuracy Rate			**80%**	

7.3.3 Insurance Sector

Company	Year	Original Group	Predicted Group	Probability
NIC	2010	non-failed	non-failed	0.867
NIC	2011	non-failed	non-failed	0.794
NIC	2012	non-failed	non-failed	0.599
NIC	2013	non-failed	non-failed	0.783
NIC	2014	non-failed	non-failed	0.543
AIG	2010	non-failed	non-failed	0.719
AIG	2011	non-failed	non-failed	0.785
AIG	2012	non-failed	non-failed	0.76
AIG	2013	non-failed	failed	0.3
AIG	2014	non-failed	non-failed	0.688
MIC	2010	failed	failed	0.09
MIC	2011	failed	failed	0.037
MIC	2012	failed	failed	0.163
MIC	2013	failed	non-failed	0.949
MIC	2014	failed	non-failed	0.855
TRUST	2010	non-failed	non-failed	0.94
TRUST	2011	non-failed	non-failed	0.858
TRUST	2012	non-failed	non-failed	0.866
TRUST	2013	non-failed	non-failed	0.866
TRUST	2014	non-failed	non-failed	0.803
PICO	2010	failed	non-failed	0.647
PICO	2011	failed	non-failed	0.551
PICO	2012	failed	non-failed	0.604
PICO	2013	failed	failed	0.377
PICO	2014	failed	non-failed	0.634
TIC	2010	non-failed	non-failed	0.939
TIC	2011	non-failed	non-failed	0.775
TIC	2012	non-failed	non-failed	0.95
TIC	2013	non-failed	non-failed	0.953
TIC	2014	non-failed	non-failed	0.945
GUI	2010	non-failed	non-failed	0.8
GUI	2011	non-failed	non-failed	0.967
GUI	2012	non-failed	non-failed	0.941
GUI	2013	non-failed	non-failed	0.93
GUI	2014	non-failed	non-failed	0.723
Accuracy Rate			**80%**	

7.3.4 Investing Sector

Company	Year	Original Group	Predicted Group	Probability
JRIE	2010	failed	non-failed	0.752
JRIE	2011	failed	non-failed	0.753
JRIE	2012	failed	non-failed	0.755
JRIE	2013	failed	non-failed	0.758
JRIE	2014	failed	non-failed	0.76
UCI	2010	non-failed	non-failed	0.597
UCI	2011	non-failed	failed	0.371
UCI	2012	non-failed	non-failed	0.58
UCI	2013	non-failed	non-failed	0.635
UCI	2014	non-failed	non-failed	0.68
ARAB	2010	non-failed	non-failed	0.761
ARAB	2011	non-failed	non-failed	0.763
ARAB	2012	non-failed	non-failed	0.683
ARAB	2013	non-failed	non-failed	0.655
ARAB	2014	non-failed	non-failed	0.746
PIIC	2010	non-failed	non-failed	0.752
PIIC	2011	non-failed	non-failed	0.755
PIIC	2012	non-failed	non-failed	0.755
PIIC	2013	non-failed	non-failed	0.752
PIIC	2014	non-failed	non-failed	0.753
PRICO	2010	non-failed	non-failed	0.746
PRICO	2011	non-failed	non-failed	0.747
PRICO	2012	non-failed	non-failed	0.75
PRICO	2013	non-failed	non-failed	0.755
PRICO	2014	non-failed	non-failed	0.759
PADICO	2010	non-failed	non-failed	0.757
PADICO	2011	non-failed	non-failed	0.756
PADICO	2012	non-failed	non-failed	0.758
PADICO	2013	non-failed	non-failed	0.76
PADICO	2014	non-failed	non-failed	0.759
PID	2010	failed	failed	0.171
PID	2011	failed	failed	0.275
PID	2012	failed	failed	0.375
PID	2013	failed	failed	0.036
PID	2014	failed	failed	0.077

APIC	2010	non-failed	non-failed	0.757
APIC	2011	non-failed	non-failed	0.756
APIC	2012	non-failed	non-failed	0.756
APIC	2013	non-failed	non-failed	0.755
APIC	2014	non-failed	non-failed	0.755
ALQARYIA	2010	failed	non-failed	0.747
ALQARYIA	2011	failed	non-failed	0.743
ALQARYIA	2012	failed	non-failed	0.745
ALQARYIA	2013	failed	non-failed	0.748
ALQARYIA	2014	failed	non-failed	0.739
Accuracy Rate			**76%**	

7.3.5 <u>Services Sector</u>

Company	Year	Original Group	Predicted Group	Probability
GCOM	2010	failed	failed	0
GCOM	2011	failed	failed	0
GCOM	2012	failed	failed	0
GCOM	2013	failed	failed	0
GCOM	2014	failed	failed	0.096
AHC	2010	failed	failed	0.137
AHC	2011	failed	failed	0.021
AHC	2012	failed	failed	0.024
AHC	2013	failed	non-failed	0.769
AHC	2014	failed	non-failed	0.926
ARE	2010	failed	failed	0.45
ARE	2011	failed	failed	0.298
ARE	2012	failed	non-failed	0.687
ARE	2013	failed	failed	0.425
ARE	2014	failed	failed	0.436
PALTEL	2010	non-failed	non-failed	0.999
PALTEL	2011	non-failed	non-failed	1
PALTEL	2012	non-failed	non-failed	0.998
PALTEL	2013	non-failed	non-failed	0.999
PALTEL	2014	non-failed	non-failed	0.979
PLAZA	2010	non-failed	non-failed	0.836
PLAZA	2011	non-failed	non-failed	1
PLAZA	2012	non-failed	non-failed	0.858
PLAZA	2013	non-failed	non-failed	0.944
PLAZA	2014	non-failed	non-failed	0.577
WASSEL	2010	non-failed	non-failed	0.67
WASSEL	2011	non-failed	non-failed	0.998
WASSEL	2012	non-failed	non-failed	0.511
WASSEL	2013	non-failed	non-failed	0.54
WASSEL	2014	non-failed	non-failed	0.829
NSC	2010	failed	failed	0.003
NSC	2011	failed	failed	0.479
NSC	2012	failed	failed	0.426
NSC	2013	failed	failed	0.191
NSC	2014	failed	non-failed	0.508
PEC	2010	non-failed	non-failed	1

PEC	2011	non-failed	non-failed	1
PEC	2012	non-failed	non-failed	0.986
PEC	2013	non-failed	non-failed	0.87
PEC	2014	non-failed	non-failed	0.997
WATANYIA	2010	non-failed	failed	0.063
WATANYIA	2011	non-failed	non-failed	0.884
WATANYIA	2012	non-failed	non-failed	0.96
WATANYIA	2013	non-failed	non-failed	0.896
WATANYIA	2014	non-failed	non-failed	0.778
ABRAJ	2010	non-failed	non-failed	0.829
ABRAJ	2011	non-failed	non-failed	1
ABRAJ	2012	non-failed	non-failed	0.587
ABRAJ	2013	non-failed	non-failed	0.926
ABRAJ	2014	non-failed	non-failed	0.99
RSR	2010	non-failed	non-failed	0.953
RSR	2011	non-failed	non-failed	0.999
RSR	2012	non-failed	non-failed	0.707
RSR	2013	non-failed	failed	0.441
RSR	2014	non-failed	non-failed	0.996
PALQAR	2010	non-failed	non-failed	0.946
PALQAR	2011	non-failed	non-failed	0.855
PALQAR	2012	non-failed	non-failed	0.835
PALQAR	2013	non-failed	non-failed	0.952
PALQAR	2014	non-failed	non-failed	0.935
Accuracy Rate			**90%**	

7.4   Multicollinearity Test

7.4.1 <u>Banking Sector</u>

Variable	Tolerance	VIF	Result
X1	0.018	55.421	**Multicollinearity***
X2	0.130	7.689	No Multicollinearity
X3	0.022	46.246	**Multicollinearity***
X4	0.052	19.114	**Multicollinearity***
X5	0.811	1.233	No Multicollinearity
X6	0.211	4.734	No Multicollinearity
X7	0.024	42.380	**Multicollinearity***
X8	0.480	2.082	No Multicollinearity
X9	0.114	8.764	No Multicollinearity
X10	0.834	1.199	No Multicollinearity
X11	0.007	133.583	**Multicollinearity***

* VIF ≥ 10 and *Tolerance* $\leq 0,1$

7.4.2 <u>Industrial Sector</u>

Variable	Tolerance	VIF	Result
X1	0.167	5.988	No Multicollinearity
X2	0.600	1.666	No Multicollinearity
X3	0.069	14.416	**Multicollinearity***
X4	0.009	116.081	**Multicollinearity***
X5	0.900	1.112	No Multicollinearity
X6	0.665	1.505	No Multicollinearity
X7	0.013	76.512	**Multicollinearity***
X8	0.743	1.347	No Multicollinearity
X9	0.347	2.886	No Multicollinearity
X10	0.766	1.305	No Multicollinearity
X11	0.104	9.585	No Multicollinearity

* VIF ≥ 10 and *Tolerance* $\leq 0,1$

7.4.3 <u>Insurance Sector</u>

Variable	Tolerance	VIF	Result
X1	0.028	35.813	**Multicollinearity***
X3	0.858	1.165	No Multicollinearity
X4	0.018	56.489	**Multicollinearity***
X5	0.958	1.044	No Multicollinearity
X6	0.625	1.601	No Multicollinearity
X7	0.541	1.847	No Multicollinearity
X8	0.818	1.222	No Multicollinearity
X9	0.416	2.404	No Multicollinearity
X10	0.335	2.985	No Multicollinearity
X11	0.041	24.346	**Multicollinearity***

* VIF ≥ 10 and *Tolerance* $\leq 0,1$

7.4.4 <u>Investing Sector</u>

Variable	Tolerance	VIF	Result
X1	0.258	3.872	No Multicollinearity**
X2	0.770	1.299	No Multicollinearity**
X3	0.215	4.649	No Multicollinearity**
X4	0.113	8.883	No Multicollinearity**
X5	0.987	1.013	No Multicollinearity**
X6	0.204	4.909	No Multicollinearity**
X7	0.262	3.822	No Multicollinearity**
X8	0.449	2.228	No Multicollinearity**
X9	0.147	6.807	No Multicollinearity**
X10	0.854	1.171	No Multicollinearity**
X11	0.365	2.737	No Multicollinearity**

**VIF ≤ 10 and *Tolerance* $\geq 0,1$

7.4.5 <u>Services Sector</u>

Variable	Tolerance	VIF	Result
X1	0.104	9.648	No Multicollinearity
X2	0.369	2.708	No Multicollinearity
X3	0.351	2.850	No Multicollinearity
X4	0.040	24.798	**Multicollinearity***
X5	0.973	1.028	No Multicollinearity
X6	0.343	2.914	No Multicollinearity
X7	0.090	11.126	**Multicollinearity***
X8	0.880	1.136	No Multicollinearity
X9	0.408	2.450	No Multicollinearity
X10	0.932	1.074	No Multicollinearity
X11	0.337	2.970	No Multicollinearity

* VIF ≥ 10 and *Tolerance* $\leq 0,1$