Page (iii), Below Section 4.3.3 Add:

Page (iv), Below Section 6.2.1 Add:

Page (iv), Below Section 6.2.2 Add:

Page (iv), Below Section 6.3.4 Add:

Page (v), Below Section 6.4.3 Add:

Change Blume, Lim and MacKinlay to Blume et al. at the following places:

Page	Paragraph	Line		Page	Paragraph	Line		Page	Paragraph	Line
28	3	6		172	1	3		188	1	3
28	3	9		174	2	4		188	2	2
29	1	6		177		Last Line		189	2	2
61	1	4		178	1	2		189	3	2
61	1	7		185	3	3		211	3	3
61	2	3		185	4	3		213	1	6
62	1	2		186	1	5		214	1	1
62	1	12		186	1	11		214	2	2
63	2	3		186	2	14		62	FN 65	
63	3	3		187	Table 6.8	11		188	FN134	
63	4	3		187	1	3		212	FN 141	
65	2	3		187	1	9		226	FN 147	
131	1	1		187	2	2				
170	3	6		187	2	3				

Change Iqbal, Ahmed & Khan to Iqbal et al.

Page	Paragraph	Line
8	1	3
44	2	3
46	1	6
47	Table 2.1	
87	2	1
95	2	3
96	3	3
99	1	2
102	2	4
105	2	5

Change Gray, Mirkovic & Ragunathan to Gray et al.

Page	Paragraph	Line
28	3	6
61	1	4
61	3	4
63	4	3
194	1	3
194	2	10

Change Julio, Kim & Wishbach to Julio et al.

Page	Paragraph	Line
74	3	8
75	1	2
174	2	4
205	2	3

Page 10, 11, 12 Tables 1.1, 1.2, 1.3 and 1.4, unbold the first row font
Page (vi), Delete "." in "7.5." after "5"
Page (vi), Delete ":" in Appendix D heading before "ISLAMIC BOND"
Page (viii), Add "(Low Volatility Firm)" to title of Figure 4.1
Page (iv), After B.7 and B.8 Change "Credit Grades" to CreditGrades"
Page 276 and 277, Change "Credit Grades" to CreditGrades"
Page (viii), Add "Firm" after "(High Volatility)" to the title of Figure 5.2
Page (ix), Figure 5.8 Heading Change "Low" to "High"
Page (ix), Change Heading Figure 5.12 to "(High Volatility, High Debt, Short Maturity)
Page (x), Change Figure C.7 to "Low Volatility Firm"
Page (xii), Change second "Table 7.4" to "Table 7.5"
Page (xviii), Paragraph 2, Line 3 Add "University" after "Monash"
Page (xviii), Paragraph 2, Line 5 change "you" to "his students"
Page (xix), Paragraph, 2, Line 1, Change "Latrobe" to "La trobe"
Page (xix), Paragraph 2, Line 2, Add "University" after "Monash"
Page (xix), Paragraph 3, Line 3, Change "John Dr Watson" to "Dr John Watson"
Page 5, Paragraph 4 , Line 4, Add Footnote "Qard-e-Hasana mode has also been used by National Australian Bank to offer micro loans to Australian Muslims"
Page 3, Footnote 5, Add:
"See Section 1.2.4 for more details on Murabaha Sukuk."
Page 6, Paragraph 3, Line 5 Add Footnote:
"Islamic joint venture is a risk sharing contract where different parties share profit and loss. In contrast, conventional debt financing is a risk shifting contract where loss risk is borne by the borrower. The asymmetric information problem, therefore, becomes all the more important in risk sharing IJV

contracts."

Page 7, Paragraph 2, Line 2 Add Footnote 19:

"The superiority of Islamic joint venture (IJV) over interest based financing from a macro-economic and moral perspective has been extensively discussed in the works of Afghani, Qutub, Maududi, Noursi and Khurshid Ahmed (see Chapra, 1985; Siddiqui, 1983)."

Page 13, Paragraph 2, Line 2, replace "below" by "next page"

Page 261, 3rd Reference, Delete, Page 266, After 10th Reference Add:

"Karim, R. A., & Archer, S. (2007). *Islamic finance: The regulatory challenge*. Singapore: John Wiley & Sons."

Page 16, Paragraph 1, Line 2 change "Paligrini" to "Pellegrini"

Page 18, Paragraph 2, Line 1, Change "The section above" to "The above section".

Page 18, Paragraph 3, Line 3, Delete "see" before "Akerlof"

Page 18, Paragraph 3, Change "Miller & Modigliani" to "Modigliani & Miller".

Page 18, 3rd Paragraph, Line 3, Add "Ross, 1977" after "Akerlof, 1970"

Page 21, Footnote 28 Add:

"For non-AAOIFI compliant countries this might not hold true."

Page 21, Paragraph 1, Line 9, Add Footnote: "This, however, also implies that Islamic bank depositors would be faced with information asymmetry"

Page 26, Paragraph 2, Line 4. "Increased uncertainty of IJV projects will require higher capital adequacy which increases cost".

Page 31, Footnote 33, Add "For more details on IJV please refer to Khan & Bhatti (2008)".

Page 264, After 1st Reference Add:

Khan, M., & Bhatti, I. (1998). *Development in interest free banking*. Hampshire, UK: Palgrave Macmillan.

Page 34, Line 3, Add "Khan & Bhatti, 2008" After "Warde, 2000"

Page 16, Paragraph 1, Line 5, Add Footnote 25

"See Derigs & Marzban (2009) for the impact of different Shariah standards on Islamic capital markets."

Page 35, Paragraph 2, Line 6, Change "Rochet & Xavier" to "Rochet & Freixas"

Page 38, Paragraph 1, (a) Line 5, Change "Gompers, 2001" to Gompers, 1995"

Page 38, Paragraph 1, Line 8, Delete ", 1999" after "Hellmann"

Page 38, Line 8-9 Change "1999" after "Kaplan & Stromberg" to "2001"

Page 40, Paragraph 2, last line replace below by "on the next page"

Page 42, 2nd Paragraph, Line 6, Add

"The framework can also be viewed in terms of Ross (1977) signaling hypothesis."

Page 43, Paragraph 4, Line 8 Change "Rochet & Xavier" to "Rochet & Freixas"

Page 43, Paragraph 4, Lines 10-11, Change "2009" after "Srinivasan," to "2007"

Page 44, Paragraph 1, (a) Line 15, Change "1999" after Stromberg to "2001"

Page 44, Paragraph 1, Line 16, delete "1999" after "Puri"

Page 45, Paragraph 3, (a) Line 9, change "2004" to "2005"

Page 45, Paragraph 3, Last Line Change "1999" to "2001"

Page 48, Paragraph 2, Line 4, change "2002" to "2001"

Page 49, Move Footnote 46 to Page 49.

Page 52, Paragraph 2, Line 6 Add "&" after "Briys"
Page 52, change "w1" and "w2" to "w^1" and "w^2"
Page 264, After 1st Reference Add,
"Kim, I., Ramaswamy, J., & Sundaresan, S. (1993). Does default risk in coupons affect the valuation of corporate bonds: A contingent claims model. *Financial Management*, 22(3), 117-131."
Page 53, Table 2.2, Add "& after "Briys"
Page 261, After 11th Reference Add,
"Gupton, G. M., & Stein, R. M. (2002). Losscal: *Moodys model for predicting loss given default (lgd).* Working Paper No n/a. Moody's Investor Services."
Page 56, Last line, Add Footnote:
"There are theoretical reasons to support the one tailed nature of the hypothesis. IJV bonds are redeemed at maturity at the market value and not the principal value. Given the way structural models are setup this uncertainty in redemption value is likely to cause the survival probability to be lower rather than higher than that of debt bond."
Page 64, Line 4. Add Footnote: "The bankruptcy remote SPV, delinks the underlying asset from the issuer."

Page 66, H3d, Add Footnote after 2008
"This is relative to Islamic bonds issued in years other than 2008."
Page 66, H3e, Add Footnote:
"This is relative to existing Islamic bonds issued in years other than 2009."
Page 67, Paragraph 4, Line 1, Add:
"As discussed in Section 1.2.4.3, debt bonds are Murabaha bonds."
Page 68, Last Line, Add:
"(See Section 1.2.5 on how Shariah committee variable captures Shariah advisor effect)."
Page 76, H4f, Add Footnote:
"In the multivariate probit model it is measured as the probability of IJV issuance (see Section 6.4)."
Page 121, Line 12, after "bond maturity" Add:
"The results suggest that low stock volatility accentuates the term to maturity impact on survival probability."

Page 170, Line 1 & 5 and Line 2 & 5.Change "Wooldridge, 2002 and Greene, 2008" to "Wooldridge, 2009 and Greene, 2003".
Page 172, Paragraph 2, Line 2, after "bond" Add Footnote:
"As discussed in Section 1.2.4.3, these are Murabaha bonds."
Page 188, Footnote 145, Add:
"The daily return is taken for the period 2002 to 2010."
Page 178, Paragraph 2, Line 9 Change "2008" to "2003"
Page 190, Paragraph 3, Line 3, Change "Dooley & Hutchison" to "Hutchison & Dooley".
Page 196, 2nd Paragraph Line 3, Change "Chava, Kumar & Warga, 2009" to "Kumar, Chava & Warga, 2010"

Page 204, 1st Paragraph, Lines 4,7 & 14, Delete "2004"
Page 205, Change the subsection from "6.4.3.3" to "6.4.3.2"
Page 206, Change subsection "6.4.3.1" to "6.4.3.3"
Page 227, Paragraph 1, Line 2, Delete "2004"
Page 229, Paragraph 2, Line 7 Add Footnote.
"The results are consistent with the signaling hypothesis (Ross, 1977)"

Page 230, Paragraph 1, Line 3, Add: "strong" before "preference"
Page 247, Change Table number to 7.5
Page 252, Paragraph 1, Line 3, after "capitalists" Add:
"and VC type financing structures"
Page 253, Delete "." After 7.5
Page 253, Paragraph 1 Line 3, Add:
"Another important implication for Credit Rating agencies is the relevance of firm specific factors to Islamic bonds' Credit Ratings. The results for RQ3 suggest that though unique characteristics of Islamic bonds are having an impact on its credit ratings, many firm specific variables such as leverage and profitability are also key determinants of conventional bonds. Therefore, conventional credit risk models that incorporate these firm specific variables can be remodeled to capture Islamic bonds' credit risk"

Asymmetric Information, Credit Risk and Instrument Characteristics in Islamic Finance

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An independent thesis submitted in fulfilment

of the requirements for the degree of Doctor of Philosophy

Department of Accounting and Finance

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June 2011

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ABBREVIATIONS

AAOIFI	Accounting and Auditing Organization for Islamic Financial Institutions
CDO	Collateralized Debt Obligation
DTA	Debt to Assets
EL	Expected Loss
ENE	Expected Net Earnings
GFC	Global Financial Crisis
IC	Interest Coverage
IFIS	Islamic Finance Information Service
IJV	Islamic Joint Venture
KLSE	Kuala Lumpur Stock Exchange
LA	Log Assets
LTDA	Long Term Debt to Assets
LGD	Loss Given Default
MtB	Market to Book Value
OIS	Operating Income to Sales
OLS	Ordinary Least Square
PD	Probability of Default
PS	Probability of Survival
RQ	Research Question
SARA	Secured Against Real Asset
SE	Standard Error
SSR	Sum of Squared Residuals
VC	Venture Capitalist

ABSTRACT

This thesis investigates whether traditional finance theories can explain the different characteristics of Islamic financial instruments. The work is divided into three sections. The first develops new theoretical models based on asymmetric information and risk averse bank customers to explain the dominance of debt in Islamic banks, even though many consider Islamic joint venture (IJV) funding to be the ideal Islamic mode of financing. The second section focuses on Islamic bonds and examines whether conventional structural credit risk models, such as the Finger et al. (2002) CreditGrades model, truly capture Islamic bonds' underlying risk. The structural models' various extensions have been adjusted for the Islamic bonds' unique characteristics and are tested through simulations to identify if they favour some Islamic bond structures over others. Data from 52 Malaysian Islamic bond issuers is also tested with these models. The third section analyses the determinants of Islamic bond credit ratings using data for 458 Malaysian Islamic bonds and the issuer's choice of Islamic bond type using data for 456 Malaysian Islamic bonds. Here, the impact of firm specific variables, specific events (such as the 2008 AAOIFI recommendations) and specific Islamic instrument characteristics (such as Shariah advisor effect) are analysed using ordered and multinomial probit models.

The findings for the first section suggest that asymmetric information models, when augmented with the risk averse bank customer behaviour, can help explain the lack of IJV Islamic banks. For the second section, the simulation results suggest that conventional structural models and their Islamic extensions have a bias against IJV bonds. Conventional models, however, can be used to capture the risk of secured

against real asset bonds (SARA). The third section shows that firm specific variables (such as leverage and profitability ratios), specific events (2008 AAOIFI recommendation) and Islamic instrument specific characteristics (such as the Shariah-advisor effect) are all significant determinants of Islamic bond ratings as well as the issuer's choice of Islamic bond type.

This work offers several contributions to the literature. It is the first to augment asymmetric information models with risk averse utility function of bank customers to offer a comprehensive explanation of the negligible use of IJV by Islamic banks. Secondly, it is the first to develop Islamic extensions of conventional structural models and analyse how these models favour some Islamic bond structures over others. Thirdly, it is the first to examine the impact of firm variables, specific events and Islamic instrument specific determinants of Islamic bond ratings and the issuer's choice of Islamic bonds.

These findings have several implications for policy makers/regulators, Islamic banks, credit rating agencies and Islamic bond issuers. For policy makers/regulators and Islamic banks, this study may help implement more IJV mode of financing. For credit rating agencies, it should enable them to refine their Islamic bond credit rating models by identifying those variables that have the most impact on the bonds' underlying risk. For corporate issuers, it should help achieve higher credit ratings and better decision making when issuing Islamic bonds.

STATEMENT OF AUTHORSHIP

Except where reference is made, this thesis contains no material previously published or written by another person(s).

This thesis does not contain material extracted in whole or in part from a thesis or report presented by me for another degree or diploma.

Saad Azmat

June 2011

ACKNOWLEDGEMENTS

All praise and thanks be to God for giving me the ability to overcome this stupendous task.

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unconditional love and support, finally, to my 11 months old daughter, for providing me those little moments of joy.

CHAPTER 1: INTRODUCTION

1.1 Introduction:

This thesis investigates whether traditional finance theories offer an adequate explanation of the different characteristics of Islamic financial instruments. Their unique features are analysed to see as to how they affect their usage, credit risk and ratings. A particular focus is the Islamic joint venture[1] (IJV) to explain its negligible use in Islamic banks and bond markets[2], even though many consider it to be the most appropriate mode of financing.[3] Other Islamic instruments are also examined. The work is divided into three sections. The first develops new theoretical models based on asymmetric information and risk averse bank customers to explain the dominance of debt in Islamic banks, even though many consider Islamic joint venture (IJV) funding to be the ideal Islamic mode of financing. The second section focuses on Islamic bonds and examines whether conventional structural credit risk models, such as the Finger et al. (2002) CreditGrades model, truly capture Islamic bonds'

[1] Conventional finance terminology has been used for Arabic Islamic finance concepts to make the work more accessible to non-Arabic speaking audience. Refer to Appendix A for details on the Arabic counterparts of these terms.
[2] Islamic joint venture (IJV) is more commonly known as Musharakah/Mudarabah.
[3] The Shariah (religious) scholars and Islamic finance academicians have always supported IJV as the ideal Islamic alternative to conventional finance because of its equity type, risk-return sharing nature. While debt based contracts have always been viewed as permissible but not ideal. Islamic banks, however, seem to prefer debt based modes of financing over IJV (Usmani, 2002; Chapra, 1985; Siddiqui, 1981).

underlying risk. The structural models' various extensions have been adjusted for the Islamic bonds' unique characteristics and are tested through simulations to identify if they favour some Islamic bond structures over others. Data from 52 Malaysian Islamic bond issuers is also tested with these models. The third section analyses the determinants of Islamic bond credit ratings using data for 458 Malaysian Islamic bonds and the issuer's choice of Islamic bond type using data for 456 Malaysian Islamic bonds. Here, the impact of firm specific variables, specific events (such as the 2008 AAOIFI recommendations) and specific Islamic instrument characteristics (such as Shariah advisor effect) are analysed using ordered and multinomial probit models.

The remainder of Chapter 1 consists of the following sections. Section 1.2 provides an introduction to Islamic finance. Section 1.3 provides the thesis background and motivation along with the research questions. Section 1.4 summarizes the data, methodology and findings associated with each research question. The contribution and implications are summarized in Section 1.5. Section 1.6 outlines the structure of the remainder of the thesis.

1.2 Introduction to Islamic Finance:

This section summarizes the underlying characteristics of Islamic finance so as to distinguish it from conventional finance. It then explains how Islamic financing methods overcome these differences. The initial focus is on Islamic banks and their particular asset and liability structure. After the banks, the discussion moves to the unique characteristics of Islamic capital market instruments with emphasis on the

Islamic joint venture (IJV), secured against real asset (SARA)[4] and debt bonds.[5] Finally, the role of Shariah or religious[6] advisors (particularly for Islamic bonds) and regulatory bodies, such as Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) in ensuring Shariah compliance of Islamic financial instruments is addressed.

1.2.1 Islamic Versus Conventional Finance:

Islamic finance differs from its conventional counterparts due to several prohibitions stemming from Islamic law relating to riba (interest), gharar (uncertainty) and maysir (gambling) (Samdhani, 2007; Ayub, 2007).

'Riba' (interest) literally means an increase or excess (Samdhani, 2007). Its modern day definition, however, includes any excess to the principal amount of loan (see Ayub, 2007).[7] This prohibition reflects that Islam treats money as a medium of exchange and not as a real commodity (see Zuhayli, 2003). This implies that money cannot be sold, rented and loaned for other than the principal amount. One principle of Islamic law that prohibits interest is that of 'No Risk No Return' (Usmani, 2006).[8] From the perspective of Islamic law when considering the incidence of risk or liability, credit risk is ignored as returning the loan is incumbent on the borrower and failure to do is considered a criminal act (Ayub, 2007). This implies that Islamic law

[4] These are commonly known as Ijarah Sukuk.
[5] These are commonly known as Murabaha Sukuk. See Section 1.2.4 for more details on Murabaha Sukuk.
[6] These are Islamic legal experts, responsible for ensuring Shariah compliance of Islamic financial instruments (see Section 1.2.4).
[7] In the literature on Islamic law riba is divided into two categories, riba al-nassiyah and riba al-fadal. The definition of riba used above is riba al-nassiyah. In the context of this thesis we will only be discussing riba al-nassiyah as it is the modern day counterpart of interest (see Usmani, 2002; Ayub, 2007; Zuhayli, 2003).
[8] It can also be expressed as 'No liability No Return' (Usmani, 2006).

treats a loan as risk free and forbids the charging of interest on it. Contrary to common understanding, riba (interest) is not the only prohibition that defines Islamic finance. Another important prohibition is that of ‘gharar’ (uncertainty).

‘Gharar’ literally means to deceive and cheat.[9] Islamic law, however, defines this as the uncertainty in the subject matter of a contract (see Samdhani, 2007). This uncertainty can be associated with price, attributes, quality, identity and time of payment (see Ayub, 2007). Gharar (uncertainty) is very different from the uncertainty and risk concepts of conventional finance. A business profit, for example, can be fraught with uncertainty but that is not categorized as gharar (Samdhani, 2007). Gharar concerns what might impede contract’s completion or cause a dispute. For example if person X buys something from person Y on the condition of deferred payment without first fixing on a price then the contract can be said to contain gharar (uncertainty) as the later price might cause a dispute and deter its completion. An important rule that stems from gharar’s Islamic prohibition is the sale of something that one does not own (Samdhani, 2007). This rule has far reaching implications for Islamic financial intermediation as it implies that all assets have to come under Islamic financial intermediary’s real ownership and hence its risk before it can be sold to the customer.

A prohibition similar to gharar is that of maysir (gambling). ‘Maysir’ or gambling is prohibited in all forms as it involves elements of both riba (interest) and gharar (uncertainty) (see Samdhani, 2007). Day trading, short-selling and forex have

[9] In Arabic language ‘Ghahar’ has multiple meanings including: lure, entice, temp, danger (see Samdhani, 2007; Zuhayli, 2007).

elements of gambling as defined under Islamic law[10] and hence are prohibited (Usmani, 2006).[11]

In addition to the above prohibitions anything contrary to the general principles of Islam is also prohibited under Islamic finance. For example investment in alcohol, pork and pornography is considered unlawful (Ayub, 2007). These above prohibitions mean that Islamic financial methods must preclude them. The next section discusses some of these approaches.

1.2.2 Islamic Compliant Approaches to Financing:

Islamic banks and capital markets must use alternatives to conventional finance that are free from riba (interest), gharar (uncertainty) and maysir (gambling) such as Qard Hasana (interest free loan), Islamic joint venture (Musharakah/Mudarabah) and trade or lease based mode (Murabaha/Ijarah/Salam) (Usmani, 2006; Ayub, 2007)[12].

Qard Hasana is a simple interest free loan where the creditor is only entitled to the principal. It is given mainly for a benevolent purpose (Zuhayli, 2003). Given this mode does not entitle the creditor to any return, it is the least commercially viable mode.[13]

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[10] There exist different interpretations of Islamic law. This research, however, follows AAOIFI standards.

[11] Section 1.2.3 discusses Islamic banking instruments while Section 1.2.4 discusses Islamic capital market instruments that preclude these prohibitions.

[12] There exist other alternatives as well such as ‘Tawaruq’. The focus here, however, is on the most common and the least controversial modes of Islamic finance (see Usmani, 2006; Ayub, 2007).

[13] Qard-e-Hasana mode has also been used by National Australian Bank to offer micro loans to Australian Muslims.

Islamic joint venture (IJV)[14] finance entitles the creditor to an interest free return. They are equity style products based on partnerships, where the creditor instead of lending money and charging interest becomes a partner in the venture. This entitles them to a pre-agreed percentage of the profit, but also to share any loss according to their investment ratio (Zuhayli, 2003). This loss sharing by the capital provider makes the IJV profit permissible as it prevents it from "No Risk No Return" principal discussed in Section1.2.1.

There are two Islamic joint ventures modes of financing, Musharakah and Mudarabah. In Musharakah all parties contribute some part of the total capital. The profit ratio in Musharkah is decided with mutual consent but the loss must be equal to each party's investment proportion (Zuhayli, 2003). For example, if two people start an Islamic joint venture, each contributing 50% of the capital, then the loss has to be shared 50:50, but the profit can be shared in any proportion, such as 80:20.

In a Mudarabah contract only one party provides the capital while the other party provides the expertise (Mudarib). As in Musharkah the profit in Mudarabah can be divided in any pre-agreed ratio. The loss, however, must be borne only by the capital provider and not the party providing the expertise (Mudarib)[15] (Zuhayli, 2003). Another popular mode is trade or lease based financing.[16]

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[14] IJV is discussed here in a general sense relating both to banks and capital market. Its particular application in Islamic banks, however, is discussed in Section 1.2.3, while its application in Islamic capital markets is discussed in Section 1.2.4.

[15] The party contributing with its expertise will also be at loss since it will not receive any profit or other kind of remuneration in the event of loss (Usmani, 2006).

[16] Islamic joint venture is a risk sharing contract where different parties share profit and loss. In contrast, conventional debt financing is a risk shifting contract where loss risk is borne by the borrower. The asymmetric information problem, therefore, becomes all the more important in risk sharing IJV contracts.

Trade or lease based products (Murabaha/Ijarah/Salam/Istisna)[17] are the most utilized of Islamic finance modes; those based on buy and resell or leasing are the most common[18] (Ayub,2007). A typical buy and resell type financing is offered where the customer needs to buy a real asset. Instead of lending the customer money to buy the asset, the bank buys the asset and resells it to the customer at a higher price. The difference provides the bank its return. Lease based financing similarly involves the bank first buying the real asset and then leasing it to the customer. The primary difference between Islamic finance and conventional financial products is that Islamic banks own the underlying assets and, hence, bear their risk of loss (Usmani, 2002). For example, in the event of loss or damage to the leased asset not caused by the customer's negligence, the Islamic bank bears that loss not the customer. It also means all trade based transactions are real asset backed.

Compared to debt or trade based financing or borrowings Islamic joint venture mode of financing is considered ideal for various reasons.[19] Firstly, it is a non-debt based mode of financing. Although interest free debt is permissible in Islam, it is still viewed pejoratively. In contrast, joint ventures are considered blessed (see Iqbal, Ahmed & Khan, 1998). It is also believed that bank financing based on Islamic joint venture would result in a more equitable distribution of wealth (see Chapra, 1985; Siddiqui, 1981). If a heavily debt financed business succeeds, the bank (and its

[17] These are the most popular and widely acceptable modes of financing. However, there are modes other than these, such as Tawarruq, that are also used in some countries (see Ayub, 2007).

[18] The application of these modes of financing on the asset of side of Islamic banks is discussed in Section 1.2.3.2.

[19] The superiority of Islamic joint venture (IJV) over interest based financing from a macro-economic and moral perspective has been extensively discussed in the works of Afghani, Qutub, Maududi, Noursi and Khurshid Ahmed (see Chapra, 1985; Siddiqui, 1983).

depositors) would receive their principal along with the interest which is usually a small portion of the total profit. If the business fails, however, they will suffer part of the loss.[20] This imbalance in wealth, according to Islamic economists can be rectified by Islamic joint ventures where the Islamic banks and, hence, its customers would receive a share of the profit (see Iqbal et al., 1998). Although, IJV is the unanimously considered the ideal Islamic mode of financing, Islamic banks have made negligible use of it (Khan, 2010).

The following Section 1.2.3 analyses the application of Islamic financial modes discussed in this section in Islamic banks, while Section 1.2.4 discuss their applications in Islamic capital markets.

1.2.3 Islamic Banks Financial Structure:

Islamic banks employ different modes of financing on the liability and asset sides of their balance sheet that make them operate more like an investment intermediary than a commercial bank (Chapra, 1985). Islamic financial instruments used on the liability side of Islamic banks are discussed first followed by the asset side.

1.2.3.1 Liability Side of Islamic Banks:

The 'No Risk No Return' principle discussed in Section 1.2.1 implies that Islamic banks cannot guarantee a deposit on which it is offers a return. The only deposit guaranteed is one based on Qard-e-Hasana which offers no return, similar to a conventional bank's current account (Usmani, 2002). An Islamic bank's main

[20] Limited liability means that the borrower has to bear any loss according to the ratio of its investment (Usmani, 2002).

funding is therefore not from conventional savings or term deposits but rather via a joint venture style investment account (Usmani, 2006). These accounts do offer a return to the customers but also requires them to share some risk.

An Islamic joint venture account is typically a relationship between the bank and the customer. As discussed in Section 1.2.2, there are two types of joint venture accounts that can be employed, Musharakah and Mudarabah. In a typical Musharakah relationship, the Islamic bank and its customers share profit according to a pre-agreed ratio but bear any loss according to their investment proportion (Usmani, 2006). This has two implications for Islamic banks. Firstly, since the bank is neither guaranteeing a return nor the principal, it has the right to refuse withdrawals. Secondly, in bankruptcy the customers will be ranked equal to shareholders and will have to bear any loss according to their investment. Where the Islamic joint venture is Mudarabah based, the Islamic bank only acts as the service provider with no liability to guarantee withdrawals. Moreover, in a Mudarabah relationship in case of bankruptcy all the loss has to be borne by the IJV account holders (Zuhayli, 2003; Usmani, 2006; Dusuki & Mukhtar, 2010). This implies that for receiving liquidation payments they will be ranked below the shareholders (refer to Table 1.1 for a summary of the liability side structure of Islamic banks and Table 1.3 for their relative importance on an Islamic bank's balance sheet).

Table 1.1: Islamic Banks' Liability Side Instruments

Conventional Finance	Islamic Finance Equivalent	Comments on Islamic Accounts
Current Account	Interest Free Loan (Qard-e-Hasana)	• The depositor effectively gives Islamic bank an interest free loan. • The bank has to entertain all withdrawal requests.
Savings Account	Islamic Joint Venture (IJV) Account	• The depositor enters into a joint venture relationship with the bank. • Both bank and customers will share any profit. • Depositor will bear any loss. • If required Islamic bank can refuse withdrawal payments.

Source: adapted from Usmani (2006)

1.2.3.2 Islamic Banks' Asset Side:

The prohibition of riba (interest) implies that the bank has to rely on its non-interest based Islamic assets to generate profits. As discussed in Section 1.2.2, Islamic banks can rely on Qard-e-hasana, Islamic joint venture and trade based modes. Table 1.2 below summarises these main financing modes while Table 1.4 shows their relative importance. While Islamic joint venture is the least popular mode of financing, it is considered the most ideal (see Usmani, 2006).

Table 1.2: Islamic Banks' Asset Side Instruments

Conventional Finance	Islamic Finance Equivalent	Comments
Venture Capital	Islamic Joint Venture (IJV)	• Bank receives a pre-determined share of the profit. • Both firm and bank bear loss according to their investment.
Unsecured Loan	Buy and Sell (Trade Based Product)	• It is used when customer needs real assets. • Bank buys real asset and then sells it to customer at higher price with deferred payment.
Secured Loan/Financial Lease	Islamic Lease	• Islamic bank buys and owns the asset before leasing it to the client. • Islamic bank bears the risk of loss of the asset.
Interest Free Loan	Qard-e-Hasana	• Interest free loan usually given for benevolent purposes.

Source: adapted from Usmani (2006)

Table 1.3: Emirates Islamic Bank's Liability Side (2008)

Account Type	Nominal Value (AED thousand)	Percentage
Current Accounts[21]	4,204	15.9%
Islamic Joint Venture (IJV) Accounts	13,680	51.8%
Others	8,517	32.3%
	26,401 = **Total**	100%

Source: Prepared by the author using Emirates Islamic Bank 2008 annual report

Table 1.4: Emirates Islamic Bank's Asset Side (2008)

Financial Mode	Nominal Value (AED thousand)	Percentage
Buy and Sell (Trade Based)	6,577	24.9%
Islamic Lease	6,322	23.9%
IJV	0	0%
Others	13,502	51.2%
	26,401= **Total**	100%

Source: Prepared by the author using Emirates Islamic Bank 2008 annual report

[21] Mainly based on Qard-e-Hasana (Interest free loan).

1.2.4 Islamic Capital Market Instruments:

This section discusses the different type of Islamic bonds summarized in Table 1.6. Islamic joint venture bonds (IJV), secured against real asset (SARA) bonds and debt bonds.[22] Sub-section 1.2.4.1 discusses details of IJV bonds, Section 1.2.4.2 covers SARA bonds, while Section 1.2.4.3 addresses debt bonds.[23]

1.2.4.1 IJV Bonds:

IJV bonds (Musharakah/Mudarabah Sukuk) are unique instruments with characteristics of both debt and equity (see Table 1.5 next page). They allow their holders to become part owners of a particular project. If the project is successful, IJV bond holders receive a share of the profits. They also bear any of its loss according to their investment proportion. IJV bonds also have a maturity date at which the issuer can buy them back at the then market price rather than face value (Usmani, 2006). Their equity type structure implies that, given no arbitrage, there should be a relationship between the market price of a firm's IJV bonds and its ordinary shares. This is because IJV bond holders, like shareholders, are entitled to both profits and losses. Moreover, in case of bankruptcy, IJV bond holders rank equally with shareholders and not higher as is the case for debt bonds.[24] This differentiates IJV default from a normal debt default. In a conventional bond, a default occurs when the debtor fails to repay the principal or the interest payment. In an IJV bond, like an ordinary share, neither the principal nor the return is guaranteed. Therefore, a traditional default event does not exist in IJV bond (Refer to Chapter 4).

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[22] AAOIFI has issued standards for more than 14 types of Islamic bonds. The three discussed here are the most commonly used ones (see Ali, 2008).
[23] The structures discussed here are in line with AAOIFI (2008) Shariah standards.
[24] This price relationship between IJV bonds and ordinary shares is discussed in detail in Chapter 4.

Table 1.5: Comparison of Ordinary Shares and IJV Instruments

Ordinary Shares	IJV Bonds
A contract representing ownership of the entire company including all projects.	A contract representing ownership either of the entire company or in specific projects.
Shareholders have voting rights in the AGM.	IJV holders have no voting rights.
Shareholders may receive dividends and capital gains but none are fixed.	IJV holders receive periodic payments depending on a pre-agreed percentage of the profit. IJV holders, however, bear losses in proportion to their investment.
Ordinary shares do not have a maturity date.	IJV instruments have a maturity date.

Source: Adapted from Usmani (2006)

1.2.4.2 SARA Bonds:

Secured against real asset (SARA) bonds (Ijarah Sukuk) use the concept of lease financing. A typical SARA bond structure involves the originators creating a special purpose vehicle (SPV)[25] and then selling it some of their assets. The SPV then sells SARA bonds representing their ownership to investors and passes the proceeds to the originator. The originator then leases back those assets at a periodic rental rate and also promises to repurchase them at a certain price on the bonds maturity. The SPV passes the rental payment and the original sum to the bond holders. SARA bonds differ from conventional ones in that their holders have the legal and economic ownership of the underlying assets rather than just a charge against them (Usmani, 2006, Ali, 2008). If the initial issuer defaults or goes bankrupt, the bond holder can claim the possession of the underlying asset.

[25] A bankruptcy-remote entity with a legal status distinct from the issuing firm (see Ali, 2005, 2008).

1.2.4.3 Debt Bonds:

Debt bonds (Murabaha Sukuk) are based on buy and resale arrangement. This is where the Islamic bank first buys a real asset and then immediately sells it back to the client at a higher price creating a debt which the client periodically repays. These bonds can be either secured or unsecured depending on their link with the underlying asset.[26] However, they do not represent the ownership of the underlying asset and hence should be less secured than SARA bonds (Ali, 2005, 2008; Howladar, 2006; Dusuki & Mukhtar, 2010). Such bonds are considered non-Shariah compliant in most countries other than Malaysia (Ayub, 2007).

Table 1.6: Islamic Bonds

Islamic Instrument	Additional Islamic Constraints
IJV bonds	• Represent ownership in a particular project rather than the whole venture. • Have a maturity date.
SARA bonds	• Islamic bonds represent ownership of underlying asset.
Debt bonds	• They have to be structured based on buying and reselling of the underlying asset so that a debt is created.

Source: Adapted from Usmani (2006) and AAOIFI (2008)

1.2.5 Shariah Advisors:

It is evident from the above discussion that Islamic financial instrument structures are fraught with complexity requiring due diligence to ensure their Shariah compliance. To meet their Shariah compliance requirements, Islamic institutions, therefore, hire Islamic legal experts called Shariah advisors (Karim, 1990; Karim &

[26] Some of these bonds represent a first charge on the underlying asset and hence can be considered similar to secured conventional bonds (see Howladar, 2006; Dusuki & Mukhtar, 2010).

Archer, 2007). Most Islamic institutions hire either individual Shariah advisors or form Shariah committees (Grais & Pellegrini, 2006). Since interpretation of Islamic law (particularly with regards to contracts) can be subject to different interpretations, Shariah-harmonization is always a challenge when considering new financial structures, especially across countries.[27] This is evident in that Islamic instruments approved in one country may be considered non-Shariah compliant in others. For example, Islamic debt bonds are considered Shariah-compliant in Malaysia but are rejected as impermissible in the Middle East and Pakistan (Usmani, 2002). These differences between Shariah scholars stem from their adherence to particular 'Madahibs' (Islamic school of thought).[28]

1.2.6 Shariah Standards:

The above discussion suggests that differences between Shariah scholars result in lack of Shariah harmonization within the Islamic finance industry. Regulatory bodies such as Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), however, try to harmonize these differences, by devising uniform Shariah standards for most existing instruments. Many countries, like Bahrain, Sudan, Jordan, Qatar, Saudi Arabia, Dubai, Syria, Lebanon, Pakistan, Singapore, and South Africa are trying to adopt these AAOIFI standards.

Shariah standards in the Islamic finance industry have experienced rapid changes in the past few years. In 2008, Accounting and Auditing Organization for Islamic

[27] See Derigs & Marzban (2009) for the impact of different Shariah standards on Islamic capital markets.

[28] They are four major Madahibs (Islamic school of thought), Hanafi, Shafee, Hanbali and Maliki. Each of them is named after their founders.

Financial Institutions (AAOIFI) issued stringent guidelines for Islamic bonds (Usmani, 2007). These were designed to improve their Shariah quality as a large number of Islamic bonds were being issued in a conventional debt bond like manner. The AAOIFI recommendations with regards to IJV, SARA and Islamic debt bonds are discussed below and presented in Appendix F.

The AAOIFI (2008) resolution argued against IJV bonds where the issuer guaranteed the return and the principal irrespective of the firm's performance. This is in sharp contrast to the AAOIFI compliant structure discussed in Section 1.2.4.1 above which requires IJV bonds to be structured in equity like manner where neither the principal nor the return can be guaranteed.

SARA bonds which were structured like conventional secured debt were also criticised by AAOIFI (2008). The Shariah standards required SARA bonds to represent real ownership of the underlying asset as discussed in Section 1.2.4.2 rather than having a first charge on the asset.[29]

Islamic debt bonds with no link to the underlying asset were also reprimanded and considered non Shariah compliant (see Usmani, 2007).

These recommendations issued in 2008 had severe repercussions and caused the Islamic financial industry to experience losses worth billions of dollars (Dusuki & Mukhtar, 2010; Salah, 2010; Wibier & Salah, 2011). Their adverse impact was

[29] SARA bond holders with first charge would only receive payments after undergoing lengthy bankruptcy proceedings. Moreover, a first charge does not result in the full proceeds from the sale of the asset as some cost and expenses might need to be paid (Dusuki & Mukhtar, 2010).

experienced by all countries irrespective of whether they complied with AAOIFI or not. For example, Malaysia which though is an AAOIFI member country follows its own standards developed by Bank Negara Malaysia. Malaysian Islamic finance market, however, also suffered after these announcements (Dusuki & Mukhtar, 2010).

The above section discussed some of the underlying characteristics of the Islamic financial instruments used in Islamic banks and capital markets. Using the understanding of Islamic principles and contracts developed here, Section 1.3 below discusses the background and motivation of the thesis with the view to develop the associated research questions.

1.3 Background and Motivation:

In a Miller and Modigliani world of perfect information, specialized financial institutions, such as banks and venture capitalists, with their abilities to neutralize problems of asymmetric information would not exist (Akerlof, 1970; Ross, 1977; Leland & Pyle, 1977; Diamond, 1984; Ueda, 2004). The capital and investment structures of these institutions would also not matter (Modigliani & Miller, 1958). Credit rating agencies similarly would have no role given the perfect information. In such a world the question of whether an Islamic bank should use IJV or debt financing would be unimportant. The capital markets would be completely transparent and Islamic bond issuers would no longer be concerned over what bond type they should issue or which structure would afford the highest credit ratings. The perfectly informed market would always capture the true risk and return of these

Islamic financial products. Unfortunately, such a world is far from reality. Given the presence of asymmetric information, Islamic banks have to make informed choices regarding which mode of finance, IJV or debt, would maximize its return while minimizing risk. Islamic credit rating agencies would have to upgrade its credit risk models continuously to keep pace with financial innovation. Islamic bond issuers would have to scrutinize the characteristics of Islamic bonds to achieve the highest credit ratings.

The importance of asymmetric information, credit risk and rating to Islamic finance industry provides the underlying motivation for this study and will be discussed here as follows. Asymmetric information and its impact on investment preference of Islamic banks will be covered first in Section 1.3.1. Credit risk models and their relevance to Islamic bonds will then be addressed in Section 1.3.2. Finally the determinants of Islamic bond ratings and type are discussed in Section 1.3.3.

1.3.1 Asymmetric Information and IJV Puzzle:

Asymmetric information results in moral hazard and adverse selection problems which in turn may affect the investment preferences of financial institutions. Private equity and joint venture products are more susceptible to moral hazards and adverse selection than debt.[30] Venture capitalists (hereafter VCs) by the virtue of their better screening, contracting and monitoring skills can more effectively neutralize moral hazards and adverse selection than banks (Kaplan & Stromberg, 2001). To avoid

[30] In joint venture products, as the financial institution bears part of the loss, this may encourage the entrepreneur to take excessive risk. Since the financial institution's return is dependent on profitability, only the best performing companies would be selected (Iqbal, Ahmed & Khan, 1998).

adverse selection problems, VCs use rigorous screening methods so that only around 1% of all applications are funded (Boocock & Woods, 1997; Gompers & Lerner, 2001). Unlike most bank advances, VCs use staged financing whereby funds are provided in a series of payments (often three or more) each conditional on certain objectives being achieved. Their ability to refuse subsequent funding helps keep moral hazard issues in check. VCs also use specialized industry expertise to conduct extensive monitoring. Moreover, their considerable control rights (board seats, voting and refusal rights) further alleviate moral hazard concerns. Compared to VCs, banks are normally less directly involved in their client's business and hold little or no board and voting rights. The VCs ability to tackle asymmetric information problems allows them to offer the joint venture type private equity products which banks tend to avoid (see Landier, 2001; Ueda, 2004).

While asymmetric information can help explain the banks' lack of private equity type products, it is not the sole explanation. The reason is that if the profits were sufficiently large, banks would seek to specialize in VC type funding and so increase their profitability. This, however, does not appear to be the case. Another possible explanation stems from their differences on the liability side. VCs raise their funds for around a 7 year commitment and so can avoid withdrawal risk (Gompers & Lerner, 1999). In contrast, the banks' reliance on short-term depositors exposes them to considerable liquidity and withdrawal risk and in turn makes debt instrument as their preferred investment choice (Ahmed, 2001).

For religious and ethical reasons, Islamic scholars consider joint venture based private equity products as the ideal Islamic alternative to debt based financing

(Siddiqui, 1985; Chapra, 1985).[31] Nevertheless, over the past two decades debt based Islamic products have come to dominate the Islamic bank assets (see Khan, 2010). While asymmetric information can, to some extent, explain the lack of IJV type products, the same cannot be said about withdrawal risk. The reason is that the liability side of Islamic banks itself is mainly joint venture based (as explained earlier in Section 1.2.3.1).[32] Unlike conventional depositors, Islamic customers are more like equity fund investors where the Islamic bank has no obligation to redeem or guarantee the principal (Usmani, 2006). This means that Islamic banks are less prone to withdrawal risk as they may pass any losses to their customers and refuse withdrawal requests.[33] Therefore, withdrawal risk does not fully explain why VC type financing has failed to dominate Islamic banking. A lack of other competing explanations leaves an important research gap in the literature.

One explanation that the prior literature on IJV puzzle has yet to consider is that of risk aversion amongst bank customers, both conventional and Islamic. Islamic bank customers with risk averse utility functions would have a high preference for a stable return on their principal. Hence, they place their money in Islamic banks whose asset side is dominated by fixed income instruments rather than IJVs. Moreover, to be induced into investing with Islamic banks with an IJV dominated asset side, they would require a sufficiently high risk premium. This in turn might exhaust Islamic banks' profits, leaving them with little incentive to utilize IJVs.

[31] Refer to Section 1.2.1 for more details.
[32] This is particularly the case for countries complying with AAOIFI standards. For non-AAOIFI compliant countries this might not hold true. (see Usmani, 2006).
[33] This, however, also implies that Islamic bank depositors would be faced with information asymmetry.

Since no study to the author's knowledge has supplemented the theories of asymmetric information with the risk aversion of customers, this provides the motivation for the first research question.

RQ1: Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?

1.3.2 Credit Risk and Islamic Bonds:

This section focuses on credit risk in Islamic bonds and so develops Research Question 2. Credit risk models play an important role in conventional finance. These models have been continuously updated to capture the risk of new and complex financial instruments (see Duffie & Singleton, 2003; Lando, 2004). Moreover, the cliché that the 'model creates the market' has resonated widely amongst academics and practitioners. Many consider Black & Scholes (1973) as a starting point of the option market's rapid growth while the collateralized debt obligation (CDO) market's phenomenal growth followed the development of Li (2000) copula model. The validity and assumptions of the conventional credit risk models have been regularly challenged and continuously updated. The journey from the initial Merton (1974) credit risk model to the practical Finger et al. (2002) CreditGrades model as well as to the more complex reduced form models (see Duffie & Singleton, 2003) took the conventional finance industry several decades. In comparison, Islamic finance has had no such experience and in most cases it still uses conventional credit risk models, perhaps quite inappropriately, to capture the risk of Islamic bonds. As was discussed in Section 1.2, however, Islamic bonds possess some unique characteristics, e.g. IJV bonds have a more pronounced equity link while SARA bonds offer more protection against default. Conventional credit risk models, which are designed to capture the risk of debt like structures seem to be incapable of capturing the risk of IJV type structures and might even assign them higher default probabilities (lower survival probabilities compared to conventional debt bonds). Researchers, however, have seemingly not challenged the validity nor questioned the ability of conventional credit risk models to identify their underlying risk differences. This research gap motivates the second research question.

RQ2: Can conventional credit risk models be used to assess the risk in Islamic bonds?

1.3.3 Islamic Bonds' Credit Ratings:

The factors that determine the corporate credit and, hence, bond ratings have been widely researched. Different combinations of firm specific variables such as debt and profitability ratios have been identified as contributing towards much of the bonds credit riskiness (see Altman, 1993; Kaplan & Urwitz, 1979; Blume, Lim & MacKinlay, 1998; Packer, 2000; Gray, Mirkovic & Ragunathan, 2006). It is also widely accepted that other instrument characteristics, unique to each bond (i.e. security, seniority, tangibility of the assets) may also have a significant impact on credit ratings (Varma & Cantor, 2004). Industry specific and macroeconomic factors are similarly expected to affect credit risk.[34]

[34] Standard and Poor's (2003) report.

Islamic bonds possess unique characteristics which might affect credit ratings over and above the firm and conventional bond specific characteristics.[35] For example, secured against real asset (SARA) Islamic bonds represent the actual ownership of the underlying asset rather than just a first charge.[36] This means that Islamic SARA bonds are more secured and so should have a higher credit rating than their conventional counterparts. As the prior literature has not investigated the impact of these unique Islamic bond characteristics on their credit ratings, this research gap provides the motivation for the third research question.

RQ3: Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?

1.3.4 Determinants of Islamic Bond Type:

An issuer's choice regarding bond maturity, security and convertibility is also dependent on firm, industry and country specific factors (Julio, Kim & Wishbach, 2008). For example, firms with high leverage would have more incentive to issue secured bonds to achieve a higher credit ratings compared to low leverage firms. Like credit ratings, the issuer choice of Islamic bond type should also be determined by Islamic bonds' unique characteristics. For example, all Islamic bonds have to be Shariah-approved. Moreover, as discussed previously in Section 1.2.5, that Shariah advisors differ in their preferences of Islamic bond structures. Some Shariah advisors have a strong aversion for debt bonds, while some have a strong preference for SARA bonds (see Usmani, 2007; Ali, 2008). These differences might affect the

[35] See Section 1.3 for more on Islamic bond characteristics.
[36] A holder with a first charge will be entitled to be the first in line to receive payments in case of a default.

issuer's choice of Islamic bond type. Since this has also seemingly been overlooked in the literature, it provides the motivation for the fourth research question.

RQ4: Are the factors that affect an issuer's choice of bonds the same for conventional and Islamic bonds?

1.4 Data, Methodology and Findings:

This section provides a summary of data, methodology and findings associated with the four research questions. Section 1.4.1 examines the methodology and findings for RQ1. The data, methodology and findings for RQ2 are presented in Section 1.4.2. Section 1.4.3 then analyses the data, methodology and findings for RQ3 and RQ4.

1.4.1 Methodology and Findings for RQ1:

This section will discuss the methodology and findings for the first research question (presented in detail in Chapter 3). Following the work of Leland & Pyle (1977), Diamond (1984) and Ueda (2004) a new theoretical model has been developed to answer Research Question 1. In line with Ueda (2004), it attempts to capture the effect of asymmetric information in IJV financing. The results suggest that presence of asymmetric information results in bank mispricing of risk in an IJV contract. This implies that firms with both high and low success probability would be charged a single rate representing their average risk, rather than a rate that captures their individual risk (see Akerlof, 1970). This means that high profitability firms will be charged a higher rate than what their underlying risk deserves. In contrast, low profitability ones would be charged a lower rate than what they would get in a world with perfect information. It would, hence, only be beneficial for the low profitability firms to involve themselves in an IJV, leaving only firms with low success probability (lemons) in the bank's portfolio. The findings also suggest that moral hazard concerns are not as severe as the adverse selection ones, since they can be neutralized using long-term relationships or punishment strategies.

While this explanation accentuates the role of asymmetric information, it does not really explain why banks do not specialize in VC type screening methods to neutralize asymmetric information, especially when they can generate additional profit by doing so.[37] To address it, this study augments the asymmetric information model with the risk averse utility function of customers. Compared to venture capital investors, bank customers are more risk averse. This implies that they should have a strong preference for fixed and certain returns. A high proportion of IJV in the bank's asset side means that their future returns could be uncertain. Therefore, to place money with Islamic banks with a high share of IJV will require a risk premium. The risk premium would eventually be paid by the firm in the form of higher funding costs. Hence, debt rather than IJV would maximise firms' profit. This minimises the firm's demand for IJV and hence explains the lack of IJV financing by Islamic banks.

1.4.2 Methodology and Findings for RQ2:

RQ2 is answered in two parts: for IJV bonds in Chapter 4 and SARA bond in Chapter 5. For IJV bonds, RQ2 is answered by first developing IJV extensions of Merton (1974) model, first passage model and CreditGrades model. These IJV

[37] Increased uncertainty of IJV projects will require higher capital adequacy which increases cost.

extensions are tested through simulations to show that they hold a bias against IJV bonds. This is because structural models focus on the issuer's repayment abilities while IJV bond returns can be greater (or lower) than the principal. Real data from 52 Malaysian Islamic bond issuers is also used. The Islamic bond credit rating data is taken from the IFIS database while firm specific data for the issuers is taken from Datastream and Compustat. The data is used to generate survival probabilities and credit scores for the IJV extensions to compare them with those of the original models and credit ratings. The results suggest these IJV extension models generate considerably lower survival probabilities and credit scores. This implies that if IJV bonds are rated using structural models they would be assigned lower credit ratings. In summary the results show that conventional credit risk models should not be used to capture the risk of IJV bonds.

Chapter 5 answers RQ2 from the perspective of SARA bonds. It is argued that unlike IJV bonds, SARA bonds have a number of features common with conventional debt including the bond aiming to provide a safe principle and a periodic return. Therefore, in essence a structural model should be capable of capturing its underlying risk. However, as SARA bonds represent ownership of the underlying asset, their recovery rate should be higher than secured conventional bonds. This is because ownership of the underlying asset should reduce their financial distress cost (see Chapter 5). Moreover, the volatility (uncertainty) in this recovery rate depends on the underlying asset's price. It was tested if these differences in SARA bonds' recovery rate have a considerable impact on their survival probability and hence their credit ratings. Given the nature of SARA bonds' recovery rate, simulation analysis using the CreditGrades model was employed. The results showed that SARA bonds higher recovery rates and asset dependent uncertainty do not have much impact on their survival probability and so not cause it to differ from that of a secured conventional bond. The impact of the higher recovery rate on SARA bonds' expected loss given default, however, was more profound. In summary, the results showed that conventional credit risk models can be used to capture the risk of SARA bonds.

1.4.3 Data, Methodology and Findings for RQ3 and RQ4:

This section discusses the data related to Research Questions 3 and 4 and then their respective methodology and findings.

1.4.3.1 Data for RQ3 and RQ4:

The data for RQ3 consists of 458 Malaysian corporate Islamic bonds while that for RQ4 consists of 456 issues. The study has been restricted to Malaysia for it is by far the largest issuer of Islamic bonds.[38] The sample period is from 2002 to 2010. Islamic bonds issued prior to 2002 have been excluded as there was data for only one issuer for that period. The data for sovereign government bonds have also been omitted as the focus is only on corporate issuers (See Blume et al., 1998; Gray et al., 2006). Banks and other financial institutions are similarly excluded as their financial ratios are not always comparable to other corporate firms (See Blume et al., 1998). Given the nature of some of the variables used for RQ3 and RQ4 (for example beta), only companies listed on the Kuala Lumpur Stock Exchange (KLSE) are considered. The methodology and findings for RQ3 are discussed next.

[38]The inclusion of a small sample from a cross section of countries would have created a sample bias (see Wooldrige, 2009 and Greene, 2003).

1.4.3.2 Methodology and Findings for RQ3:

RQ3 is tested using ordered probit model (as shown in Equation 6.11). The model captures the effect of firm specific, specific events and Islamic instrument specific variables on Islamic bond ratings. Firm specific variables include: operating margin, long-term debt leverage, total debt leverage, interest coverage, firm size, market model beta and standard error (see Blume et al., 1998). Specific events include the changing Shariah standards by AAOIFI in 2008 (captured by 2008 year dummy) and the sub-prime financial crisis in 2009 (captured by GFC year dummy representing 2009 and 2010). Islamic instrument specific effect is captured by bond type and Shariah-advisor effect. Dummy variables for IJV and SARA bonds are included to represent bond type effect. Shariah advisor effect is estimated by including a dummy variable for bonds approved by Shariah committees as opposed to individual advisors. The robustness of the model is tested by including dummy variables for manufacturing, agriculture, property and energy sectors (as shown in Equation 6.12).

These findings suggest that firm specific variables are a vital component of credit risk for Islamic bonds. Most of the firm specific variables had an impact on Islamic bonds very similar to that of conventional bonds. The results also showed that specific events affect Islamic bond ratings. Islamic credit ratings for newly issued Islamic bonds were found to be higher in 2008. This reflects the importance of the stringent measures taken by AAOIFI to the various structures of Islamic bonds and their credit ratings. Islamic bond rating also increased during the sub-prime financial crisis. This corroborates the assertion that Islamic finance industry is insulated from external shocks in the conventional industry. For the Islamic instrument specific effect, IJV bonds were shown to have higher ratings than debt bonds while SARA bonds were found to have an insignificant impact on Islamic bonds' credit ratings. This implies that IJV bonds are not structured in an equity like manner while many of SARA bond do not represent ownership of the underlying asset. Shariah advisor effect (captured by Shariah committee) was shown to have a positive impact on credit ratings reflecting that products approved by Shariah committees have better structures and should receive higher ratings. In summary, the findings suggest that Islamic bond ratings are not only affected by firm specific variables but also specific events and Islamic instrument specific variables.

1.4.3.3 Methodology and Findings for RQ4:

RQ4 was tested by multinomial probit model (as shown in Equation 6.13). The objective was to infer the impact of firm specific variables, changes in Shariah standards and Shariah advisor effect on issuer's choice of Islamic bond type. The firm specific variables include: operating margin, long-term debt leverage, and total debt leverage, market to book value, interest coverage, firm size, market model beta and standard error. The changing Shariah standards is captured by the 2008 year dummy. Shariah advisor effect is estimated by including a dummy variable for bonds approved by Shariah committees as opposed to individual advisors. The robustness of the model is tested by including dummy variables for manufacturing, property and agriculture sector in the model (as shown in Equation 6.14).

These findings suggest that firm specific variables affect an issuer's choice of IJV and SARA bonds in a conventional debt bond like manner. However, changing

Shariah standards also affects issuer's choice as the results showed that in the aftermath of AAOIFI recommendations, issuer's aversion for IJV bonds increased. The results also implied that IJV bonds are less likely to be approved by Shariah committees.

1.5 Contribution and Implications:

The thesis extends the current literature in many ways and offers four contributions in areas of Islamic banking and capital markets. It is the first study to augment asymmetric information models with risk averse utility function of depositors to offer a comprehensive explanation of the negligible use of IJV in Islamic banks. It is the also the first to provide evidence that conventional credit risk model are incapable of capturing the risk of IJV bonds.[39] Moreover, it is the first to show that for credit risk purposes, SARA bonds can be treated like secured conventional bonds. Finally, it is the first to examine the firm specific, specific events and Islamic instrument specific determinants of Islamic bond ratings and the issuer's choice of Islamic bonds.

The findings will have many implications for Islamic banks, policy maker/regulator, credit rating agencies and Islamic bond issuers. This study may encourage Islamic banks to facilitate IJV mode of financing by establishing venture capital institutions. For the policy makers/regulators, the findings suggest that conventional credit risk models have a bias against IJV type structures which results in their lower credit ratings. So policy makers/regulators might instead encourage credit rating agencies to develop better models for IJV bonds. The analysis would enable credit rating

[39] Here the study is referring to AAOIFI compliant IJV bonds with equity type structure.

agencies to develop models for Islamic bonds by treating IJV bonds as equity rather than debt type instruments. The findings also suggest that credit rating agencies can use conventional credit risk models to capture SARA bond risk. It should further help them to identity firm specific, specific events and Islamic instrument specific variables that have a significant impact on the underlying risk and ratings of Islamic bonds. The study should also help corporate issuers to exercise better judgement when issuing Islamic bonds by identifying variables that affects issuer's choice of Islamic bond type.

1.6 Thesis Organisation:

Chapter 1 has provided a necessary introduction to the underlying features of Islamic financial instruments. It then moved on to discuss the background and motivation for this study leading to the development of research questions. The chapter then provided a summary of the data, methodology and finding for each research question. Lastly, it discussed the contribution and implications of the research.

The remainder of the thesis is structured as follows. Chapter 2 provides an extensive literature review and hypotheses development. Chapter 3 focuses on the role of asymmetric information and risk averse customers in Islamic banks and outlines the methodology and findings for RQ1. Chapter 4 revolves around credit risk modelling in IJV and provides data, methodology and findings for RQ2. Chapter 5 approaches RQ2 from the SARA bond perspective and discusses the relevant methodology and results. Chapter 6 discusses the data and methodology for the determinants of Islamic bonds' credit ratings and issuer decision of Islamic bond type and presents the findings for RQ3 and RQ4. Finally, Chapter 7 provides the contribution, implications and suggestion for future research along with the concluding remarks.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction:

Chapter 1 provided an overview of the thesis. It discussed the relevant features of Islamic finance and identified the motivation and research questions to be addressed. As each of the four research questions is encapsulated by a distinct strand of literature, this chapter examines their associated theories in order to develop their relevant hypotheses. The role of asymmetric information and risk averse depositors in explaining the Islamic banks' failure to employ IJV financing (RQ1) is addressed first in Section 2.2. This is followed by a discussion of structural models of credit risk and their ability to capture Islamic bonds’ underlying risk (RQ2) in Section 2.3. Section 2.4 then examines the importance of firm and Islamic instrument specific characteristics and their relationship with Islamic bonds' credit ratings (RQ3). The focus then shifts in Section 2.5 to the determinants of issuer's choice of Islamic bond type (RQ4). The chapter ends with Section 2.6 which summarises the discussion.

2.2 Asymmetric Information and IJV Puzzle (RQ1):

This section examines the literature on asymmetric information given that Research Question 1 is: “*Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?*” It starts with the importance of asymmetric information and its resulting adverse selection and moral hazard problems. Different banking techniques to neutralize adverse selection are then considered followed by a discussion of venture capitalists’ methods to overcome it. The ability to offset adverse selection in joint venture of both of them is then compared. The analysis is extended to Islamic banks resulting in the development of Hypotheses H1a and H1b. The focus then shifts to moral hazard in banking and venture capital. This discussion helps in making inference for moral hazard in Islamic banks and leads to the formulation of Hypothesis H1c. Finally, the risk averse behaviour of Islamic bank customers is discussed to formulate Hypothesis H1d.

2.2.1 Importance of Asymmetric Information:

In the absence of asymmetric information, banks and other financial institutions would not exist. In such a world borrowers would find willing lenders, who perfectly informed about their risk would charge them accordingly. In a world with asymmetric information, however, financial intermediation can perform tasks that individual lenders and borrower might not be able to perform efficiently. Cost effective screening and monitoring are two such tasks (see Rochet & Freixas, 2008 for a detailed analysis). These allow financial intermediaries to neutralize asymmetric information problems including adverse selection and moral hazard.

Adverse selection occurs when one of the contracting parties has better information than others about its risk nature, especially when it is costly for the less informed party to obtain that information (see Akerlof, 1970).[40] In the context of bank loan contracts, borrowing firms are always in an advantageous position owing to their better knowledge about their probability of success. This allows them to make more informed decisions about whether the cost of borrowing is truly representative of their underlying risk. Banks, realizing their lack of superior information available to firms, compensate by adding a premium in loan price. For example, if banks' past experience suggests that 20% of the shortlisted firms are likely to perform poorly, then each firm will be charged as if it might belong to this poorly performing category. This implies that firms with low risk and high expected profitability would pay more than their underlying risk. In contrast, firms with high risk and low expected profitability would pay less. So only high risk firms would have the incentive to borrow. Such a scenario would leave only poor performing firms in banks' portfolios (see Akerlof, 1970).

Moral hazard may occur when asymmetric information causes a change in the behaviour of the contracting parties. In the bank-firm, relationship moral hazard stems from the firms' incentive to indulge in excessive risk taking behaviour. Since firms have limited liability[41], default would only entitle the banks to the net proceeds from the firms' assets. If this does not cover the full principal, the banks suffer accordingly. If this risk is foreseeable, the banks can compensate by charging a

[40] Akerlof (1970) calls it a lemon market when the buyers for used cars are unable to differentiate between good and bad quality. Hence, they agree only to pay a price representing the average car quality. The good car sellers, however, refuse to sell at that price causing the average quality of the cars to deteriorate further.

[41] Upon default the presence of limited liability protects the owners as they cannot be held liable for more than the capital they have invested in the firm.

premium. Once the loan is approved, however, the firms can indulge in unanticipated excessive risk taking behaviour causing moral hazard concerns (see Akerlof, 1970). Banking' techniques used to neutralize adverse selection are discussed next.

2.2.2 Banking Techniques to Neutralize Adverse Selection:

Banks discern valuable information from observing attributes such as high collateral, high owner's capital, good reputation, high net worth and low leverage. Good collateral may help to mitigate the banks' asymmetric information concerns by ensuring repayment (see Bester, 1985; Chan & Thakor, 1987). By investing a significant proportion of the owner's capital, entrepreneurs also send positive signals about the project's quality (see Leland & Pyle, 1977). Reputational effect may also limit adverse selection problems as the fear of a reputational blemish might cause firms to choose less risky projects (see Diamond, 1989). High net worth and low leverage is also a signal of firm having less risk. Lack of these attributes, however, can impede the transmission of market signals reflecting the firm's true characteristics (Diamond, 1984, 1989). To compensate for the risk resulting from adverse selection, banks may either charge high payments or refrain from offering products to risky firm. Therefore, new firms from industries more prone to asymmetric information problems, such as technology, have a better chance of venture capitalist than bank funding (Gompers, 1995; Hellmann, 1998). The venture capitalists' methods to overcome adverse selection are discussed next.

2.2.3 Venture Capitalists' Methods to Overcome Adverse Selection:

Venture capitalists (hereafter VCs), by the virtue of their better screening, contracting and monitoring skills, can more effectively neutralize moral hazards and adverse selection than banks (Kaplan & Stromberg, 2001). They do this by using rigorous selection methods so that only a small proportion (around 1%) of all applications is funded (Boocock & Woods, 1997; Gompers, 1995). Moreover, VCs do not just provide finance but also attempt to add value through their management and technical assistance (see Admati & Pfleiderer, 1994; Berglöf, 1994; Gompers, 1995; Hellmann 1998, 2002; Hellmann & Puri, 2000; Kaplan & Strömberg, 2001; Lerner, 1995; Sahlman, 1990). They gain these market and technical expertise from their portfolio investments in related industries, enabling them to neutralise adverse selection effectively. The banks' and VCs' abilities to neutralize adverse selection in joint venture are compared next.

2.2.4Adverse Selection in Joint Venture:

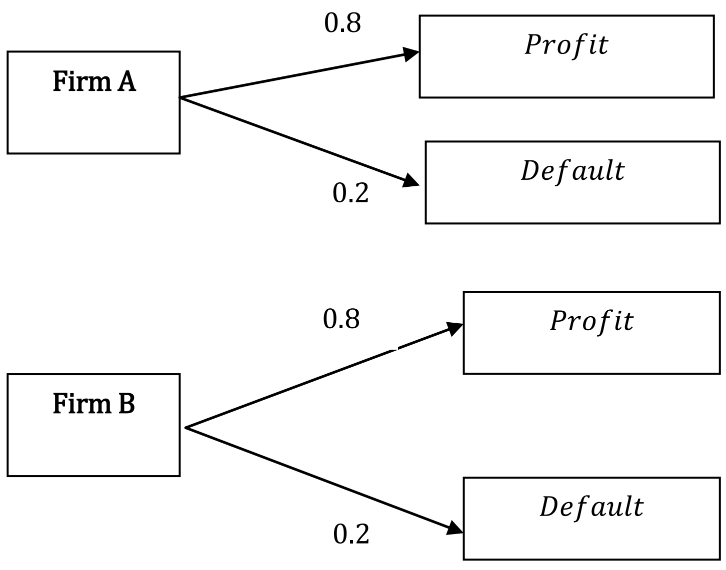
Joint venture financing is more susceptible to adverse selection than debt as the financier's return varies with the firm's performance. The financier[42] shares the profit if the firm is successful and the loss with its failure. Therefore, the financier needs to know the different expected profit and loss making states and the associated probability of each occurring. This uncertainty exposes the contract to asymmetric information problems (see Gompers, 1995; Ueda, 2004). In contrast, the maximum return on debt is independent of the firm's high profitability while the loss is bounded by the firm's net assets. As the decision to offer debt requires knowledge of

[42] The funder can be either bank or VC.

only the firm’s ability to return the principal and the accrued interest, a detailed understanding of the firm’s different profit and loss making states is not a pre-requisite. Therefore, compared to joint ventures, debt contracts are somewhat less prone to asymmetric information (see Warde, 2000; Ueda, 2004).

In the presence of asymmetric information VC type screening, contracting and monitoring becomes important and welfare enhancing (see Chan, 1983). This is because joint venture products are particularly fraught with uncertainty. Take the case of two firms, A and B, that require $100 million for a new project. If they finance through bank debt, the probability of them repaying is 0.8 while their default probability is 0.2. The Figure 2.1 below shows their different profitability states and the associated probabilities of each occurring.

Figure 2.1: Expected Profitability (First Stage)



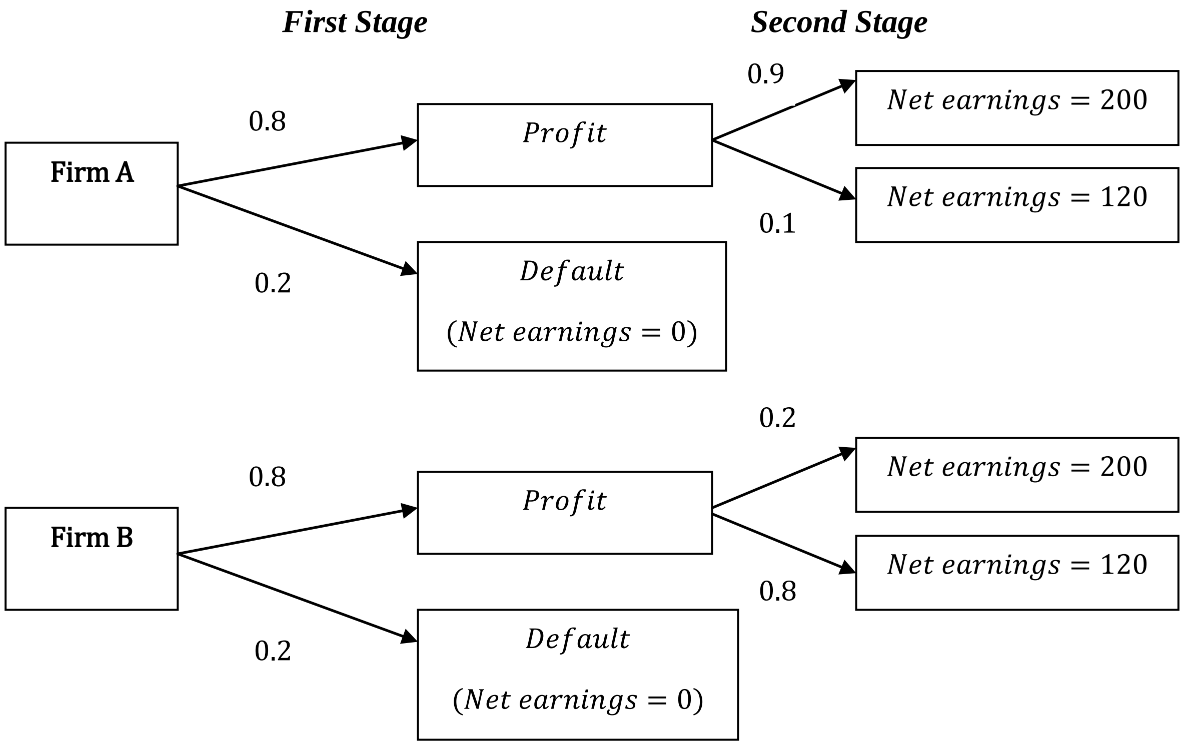
Source: Prepared by the author

It is assumed that banks screening methods enable them to discern the default probability of each firm. The bank, therefore, would know that both have a default probability of 0.2 and, hence, would charge them a rate of return representing their default risk.

Assume now that firm A has a high expected profitability. If it succeeds (and not defaults), it has a 0.9 probability of having net-earnings[43] of $200 million and 0.1 probability that they will be $120 million. Firm B, however, has a lower expected profitability. If it succeeds (and not defaults) it only has a 0.2 probability of having $200 million in net-earnings and 0.8 probability of having $120 million. For simplicity, it is assumed that in the event of default both firms have a zero net-earnings. This second stage probability outcomes are shown in Figure 2.2 on the next page.

[43]These are net-earnings before the servicing of debt.

Figure 2.2: Expected Profitability (Second Stage)



Source: Prepared by the author

If each firm approaches the funder (either bank or VC) for joint venture financing, knowledge of this second stage outcomes becomes all the more important. This is because the funder's return in a joint venture varies with the firm's performance. Assume now that the funder is a VC with screening and monitoring skills that can infer the second stage probabilities of both firms. It would therefore calculate each firm's expected net-earnings as follows.[44]

$$Firm\ A\ Expected\ Earnings = 0.8 * 0.9 * 200 + 0.8 * 0.1 * 120 + 0.2 * 0 = 153.6 \tag{2.1}$$

$$Firm\ B\ Expected\ Earnings = 0.8 * 0.2 * 200 + 0.8 * 0.8 * 120 + 0.2 * 0 = 108.8 \tag{2.2}$$

[44]Expected earnings = probability * earnings

Since firm A has higher expected earnings, the VC might offer it a lower profit sharing ratio[45] then compared to firm B. Assume now that firm A and B approach a bank for a joint venture type funding. Since banks do not specialize in VC type screening, they can only discern the firm's default probabilities. Their screening and selection methods, moreover, would make them incapable of inferring these second stage probabilities. If banks know from past experience that 50% of all the approaching firms are of type A and 50% are of type B, banks would calculate the expected net-earnings as follows:

$$Expected\ Earnings = 0.5 * ENE^{46}\ Firm\ A + 0.5 * ENE\ Firm\ B \tag{2.3}$$

$$Expected\ Earnings = 0.5 * 153.6^{47} + 0.5 * 108.8^{48} = 131.2 \tag{2.4}$$

Banks would negotiate a profit rate with both firm A and B based on their average expected earnings as calculated in Equation 2.4. This implies that firm A would be charged more than its underlying risk and firm B would be charged less. Therefore, only firm B would have an incentive to approach banks for joint venture funding while firm A would prefer debt. This would leave only firms with low expected profitability firm B) in the banks' joint venture portfolio.[49] If, however, banks employ VC type screening, they can charge each firm according to their underlying risk. This would make both A and B indifferent between choosing joint venture or debt funding.

[45] In the context of VC it can also be referred to as the equity sharing ratio.
[46]ENE = Expected Net Earnings
[47]See Equation 2.1 for calculation.
[48]See Equation 2.2 for calculation.
[49] The framework can also be viewed in terms of Ross (1977) signaling hypothesis.

Given Islamic banks are similar to conventional banks in their screening criteria, it provides the basis for building a theoretical model based on asymmetric information to test the following hypotheses.

H1a: In the absence of asymmetric information, firms will be indifferent between choosing IJV or debt.

H1b: In the presence of asymmetric information, firms with high (low) probability of success will prefer debt over IJV (IJV over debt).

2.2.5 Moral Hazard in Banking:

Moral hazard in banking results from excessive risk taking firm behaviour. Banks use various means to neutralize moral hazards including covenants, lending to reputable borrowers, long-term funding relationships and threat of litigations (Diamond, 1984, 1989). Covenants such as debt ratios limitations, enable banks to restrain moral hazard behaviour by restricting the entrepreneur from reckless borrowing (Beneish & Press, 1993; Smith, 1993; Chava & Roberts, 2008; Demiroglu & James, 2010). Potential reputation loss also acts as a self-restraining mechanism for firms making risky investment (Rochet & Freixas, 2008). Long-term funding relationships may also help mitigate the existence of moral hazard by enabling the bank to punish any misdemeanour in subsequent periods (Boot, 2000; Bharath, Dahiya, Saunders & Srinivasan, 2007). The threat of being caught and legally punished also acts as a deterrent especially in countries where property rights are strongly protected (see Merges, 1992; Landier, 2001).

2.2.6 Moral Hazard in VC:

The moral hazard problem is much more severe among VCs than banks. This is because the return from VCs joint ventures is dependent on firm's actual performance. As the firm shares its profit with the VC, the firm has an incentive to under-report it. Moreover, the firm is under no obligation to return the principal and VC has to share any losses. This provides the motivation to indulge in excessive risk taking behaviour (Kaplan & Stromberg, 2001). VCs attempt to overcome such moral hazard concerns through staged financing, active monitoring and controlling of board and voting rights (see Sahlman, 1990; Gompers, 1995). With staged financing, VCs typically start with small investments and provide additional rounds of financing subject to the firm achieving specific performance targets. The threat of no subsequent funding keeps excessive risk taking and misreporting in check. Board and voting rights also enables VCs to monitor firms and take remedial action (Kaplan & Stromberg, 2001). VCs can also use their board and voting power to replace poor performing managers (see Sahlman, 1990; Admati & Pfleiderer, 1994; Berglöf, 1994; Lerner, 1995; Gompers, 1995; Hellmann, 1998, 2002; Kaplan & Strömberg, 2001; Hellmann & Puri, 2000).

2.2.7 Moral Hazard in Islamic Banks:

Islamic bank's IJV funding also suffers from moral hazard problem resulting from misreporting and excessive risk taking (see Bacha, 1995, 1997; Khan, 1995; Iqbal et al., 1998; Warde, 2000, Khan & Bhatti, 2008). As an Islamic bank shares in the IJV business profit, this might motivate the entrepreneur to under report its profitability. Similarly as the Islamic bank also bears part of the downward risk; the entrepreneur might indulge in excessive risk taking behaviour. Similar to conventional banks, Islamic banks might use long-term relationships or litigation threat to neutralize moral hazards. The following hypothesis is developed to test if these conventional banking methods to neutralize moral hazard are sufficient for Islamic banks or whether VC type monitoring is required.

H1c: Where long-term relationships or threat of punishment exist, IJV banking can operate even in the presence of moral hazard.

2.2.8 Risk Averse Bank Depositors:

While asymmetric information can explain the banks' lack of joint venture type products, it is not the sole explanation. If profits were sufficiently large, banks would simply adopt VC type monitoring and screening to increase profitability. This, however, does not appear to be the case. Another possible explanation stems from differences on their liability side. The conventional banks reliance on short-term depositors exposes them to considerable liquidity and withdrawal risk. The threat of bank runs provides considerable aversion towards joint ventures whose return is uncertain and long-term. In the presence of these risks, debt instruments have become bank's preferred investment choice (Ahmed, 2001; 2005). In contrast, VCs raise their funds with around 7 years commitment and, hence, are less susceptible to withdrawal risk (Gompers & Lerner, 1999). Moreover, the high return that the VC investors receive compensates for any liquidity risk (Hellmann & Puri, 1999, 2000; Kaplan & Strömberg, 2001).

As argued in Section 1.2, Islamic banks' liabilities differs from conventional banks in that Islamic banks are normally under no obligation to return the account holder's principal amount (apart from current accounts). Their main funding, therefore, is not from the savings or term deposits of a conventional bank but rather from joint venture styled accounts. Such accounts are protected from withdrawal risk as the bank has the authority to refuse withdrawals (Iqbal et al., 1998; Ahmed, 2001; Usmani, 2006). Hence, this risk does not really explain the lack of IJV products in Islamic banks. Another explanation of the IJV puzzle, ignored in the literature is their risk averse customer base. While VCs raise their funds from institutional investors, Islamic banks rely on more risk averse customers (Ahmed, 2001; Gompers & Lerner, 1999). Their high risk aversion implies that a high risk premium would be required before investing with Islamic banks providing mainly IJV financing. This is because large IJV assets would mean higher uncertainty for account holders' return. This additional cost would eventually be paid by the IJV contracting firm (refer to Table 2.1 for a summary of these and previous arguments). The premium paid to assuage risk averse bank customers would further dissuade firms from using IJV. The discussion motivates the following hypothesis:

H1d: In the presence of risk averse Islamic bank customers, firms would prefer debt over IJV.

Table 2.1: Summary of IJV Characteristics and Hypotheses

IJV Facts	Problem	Hypothesis
The bank and the firm do not agree on a single price (profit rate for IJV).	Inefficient pricing resulting from asymmetric information. (Ueda, 2004)	**H1a, H1b**
Only high risk firm want to do IJV with Islamic banks.	Adverse Selection. (Iqbal et al., 1998; Akerloff, 1970; Lyland & Pyle, 1977)	**H1b**
In IJV the firms have an incentive to: • Misreport profit. • Indulge in risky behaviour.	Moral Hazard. (Bacha, 1995; 1997; Khan, 1995; Akerloff, 1970; Diamond, 1984; Warde, 2000)	**H1c**
Depositors have the following attributes: • Risk averse. • Require a higher premium to support IJV financing.	Risk Averse Utility Function. (Lyland & Pyle, 1977; Ahmed, 2001)	**H1d**

Source: Prepared by the author

2.3 Structural Models, Credit Risk and Islamic Bonds (RQ2):

This section analyses the literature on credit risk modelling given Research Question 2, that is: *"Can conventional credit risk models be used to assess the risk in Islamic bonds?"* It starts with an overview of credit risk models and specifically discusses the Merton (1974) model, first-passage models and CreditGrades model. It then examines the nature of credit risk in Islamic bonds (both IJV and SARA) leading to the formulation of Hypotheses H2a to H2e.

2.3.1 Overview of Credit Risk Models:

Credit risk modelling literature can be divided into three broad categories: traditional methods, structural models and intensity or reduced form models. The traditional methods involve a non-modelling approach and mainly use historical data to infer default probability (Ammann, 2001). Structural models compare firm value with that of its debt. In contrast, intensity or reduced form models, rather than linking default to a firm's financials, adopt a default process.[50] For reasons mentioned later in the section this study focuses on structural models. These structural models infer the default probability by comparing the value of the firm's assets with that of its debt (Duffie & Singleton, 2003). The firm value comprises of an equity and debt component. By comparing the firm value with that of its debt in essence the structural models establish a strong link between credit and equity markets (Finger et al., 2002). Structural models in turn can be divided into two categories: firm value models and first-passage models. The firm value models compare the value of the

[50] The default process is a one jump process where it can go from no-default to default with a particular probability governed by the intensity of default. Some of the intensity models have been developed by Jarrow & Turnbull (1995), Jarrow et al. (1997), Duffie & Singleton (1999). For a detailed analysis intensity models see Duffie & Singleton (2003).

firm with that of its debt only at a typical maturity date. Firm value models, therefore, only experience default at maturity. First passage models, in contrast, assume that default can occur any time during the bond's life. The Merton (1974) model, a type of firm value model, is analysed next.

2.3.2 Merton Model:

Taking the initial inspiration from Black & Scholes (1973), the Merton's (1974) framework view equity holders as owning the firm's assets and buying a put option from the debt holders. In case of default, the equity holders could exercise the put option and extinguish their debt. As default can occur only at maturity, the Merton (1974) model calculates the survival probability[51] by comparing the asset value at maturity with that of its debt. This is captured by Equation 2.5 below.

$$P\ (V_T > D) \tag{2.5}$$

Where V_T is the asset value of the firm at maturity.

The standard models assume that the assets value Vt follows a geometric brownian[52] motion:

$$\frac{dVt}{Vt} = \sigma dW_t\ +\ \mu dt\text{Type equation here.} \tag{2.6}$$

Where μ is asset drift, σ is asset volatility and $W$is a standard Brownian motion. Consequently the risk neutral probability of survival is as follows.[53]

[51] Probability of firm not defaulting.
[52] Brownian motion is continuous stochastic process used for modelling random behaviour.
[53] Detailed proof of the Merton (1974) model is presented in Appendix B.

$$P(Z) > (\frac{\log(\frac{D}{V_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}) \quad (2.7)$$

Here V is the asset value, D is total debt while T is the term to maturity of the bond. Though Merton (1974) model offers an intriguing approach to risk measurement, its assumption of maturity dependent default is unrealistic. This problem is remedied by the first passage models which incorporate the assumption of default occurring anytime during bond maturity (Duffie & Singleton, 2003). The first passage models are discussed next.

2.3.3 First Passage Models:

In the first passage model default occurs when the firm's asset value falls below a typical default boundary[54] irrespective of the maturity date. The survival probability of a simplistic first passage model can be represented by Equation 2.8 below.[55]

$$P\ (V_t > D) \quad (2.8)$$

Where$0 < t \leq T$

In the first passage model shown in Equation 2.8 above the debt level represents the default boundary. Most of its extensions alter the default boundary (see Meissner, 2005 for a detailed review). This is examined next.

[54] For a simplistic case the debt level can be taken as the default boundary. In this simplistic first passage model, therefore, default occurs once the firm value falls below the debt level anytime during the maturity of the bond.

[55] Detailed proof of the first passage model is presented in Appendix B.

2.3.3.1 First Passage and Default Boundary:

This section focuses on the first passage models' default boundaries and how they are modified to develop alternative extensions.[56] It particularly focuses on the impact of term to maturity and their recovery rate.

Default boundary *Vd* represents the cut off point which when reached by the firm value *V* results in default. Most first passage models include a safety covenant, which give the asset holders the right to enforce bankruptcy once the asset value *V* goes below the default boundary *Vd.* Moreover, once the default boundary is reached, the bond holders can claim the firm's assets *Vd* (Black and Cox, 1976). In the simplistic first passage model, debt level is taken to be the default boundary, implying that on default the bond holder's principal debt would keep intact. This assumption is unrealistic as it implies a perfect recovery rate. In reality, the default boundary should be dependent on multiple factors including the time to maturity and the recovery rate (see Duffie & Singleton, 2003; Meissner, 2005).

Term to maturity was first incorporated in the default by Black and Cox (1976). They assume an exponential default boundary of $V_d = Ce^{-\gamma(T-t)}$, where C and γ are constants determined exogenously. As it nears maturity, the default boundary *Vd* and the amount the bond holder receives on default increases.[57] A slightly variant of the default boundary is used by Brennan and Schwartz (1980) who assume a constant

[56] The discussion here should enable the reader to relate to the Islamic extensions of the conventional models developed in Chapter 4 as this study has extended them by varying the default boundaries of the original models.
[57] The default boundary for the IJV bonds discussed in Chapter 4 is time dependent.

default boundary independent of the time to maturity. This implies that the amount the bond holders receive on default is independent of maturity.

Recovery rate is another important determinant of the default boundary.[58] It is incorporated by Longstaff & Schwart (1995) who use a constant default boundary k and recovery rate w. Both k and w are determined exogenously. They also assume that the senior debt would have higher recovery rate than junior debt. One shortcoming of their model is that the payout on default can be at times greater than the firm's value. This is corrected by Briys & de Varenne (1997) who ensures that the payout on default cannot exceed the asset value. They do this by using a default boundary which is dependent on the price P of the risk free bond and face value F of the risky bond. Their boundary is given by $V_d = kFP$. Their model also assigns different recovery rates for default occurring pre-maturity and at maturity. If the default occurs before maturity, then the fraction w1 of the asset value is paid. If occurring at maturity, fraction w2 of the asset value is paid. These different variants of default boundaries are discussed in Table 2.2.

The discussion here introduces the reader to the versatility of the first passage models and their flexibility to incorporate the unique characteristics of different Islamic financial instruments. It further motivates the development of Islamic extension of these models later in Chapter 4. Section 2.3.4 below discusses another variant of the first passage model, the CreditGrades model.

[58] The default boundary for SARA bonds discussed in Chapter 4 is dependent on the recovery rate.

Table 2.2: First Passage Model Default Boundaries

Model	Default Boundary	Recovery Rate
Black and Cox (1976)	$V^d = ke^{-\gamma(T-t)}$	V
Longstaff & Schwart (1995)	$V^d = k$	w
Kim, Ramaswamy & Sundaresan (1993)	$V^d = k^a$	$\min(V, F)$ $\min(w(t)P(t,T), V)$
Nielsen, Saa-Requejo, & Santa-Clara (1993)	$V^d = k(t)^b$	$wP(t,T)$
Briys & de Varenne (1997)	$V^d = kFP(t,T)$	$w_1 V, if\ V(T) < F$ $w_2 V^d(t)^d$

Source: Adapted from Ammann (2002, p.55)

[a] Set to $k = c\gamma^{-1}$ where γ denote the rate of cash-flows out of the firm. c is the bond coupon rate.

[b] Increases at the rate of return on their risky bond.

[c] Applies if default does not occur before the maturity of the bond.

[c] Applied if default has occurred before maturity.

2.3.4 CreditGrades Model:

CreditGrades is a first passage model jointly developed by four leading credit market institutions: The RiskMetrics Group, JP Morgan, Goldman Sachs and Deutsche Bank. It attempts to rectify the unrealistically low short-term spread generated by previous first passage models (Finger et al., 2002).[59] The CreditGrades model achieves this by assuming an uncertain recovery rate. This uncertainty is reflected in the default boundary by causing the firm value to hit the default boundary unexpectedly. Equations 2.9, 2.10 and 2.11 below capture this.

$$\bar{L} = \boldsymbol{E}L \tag{2.9}$$

$$\lambda^2 = \mathrm{Var}\log(L) \tag{2.10}$$

$$\mathrm{LD} = \bar{L}De^{\lambda Z - \frac{\lambda^2}{2}} \tag{2.11}$$

The recovery rate L follows a lognormal distribution with mean $\bar{L}$and percentage standard deviation λ. Z is a standard normal random variable. The random variable Z is independent of the Brownian motion W. Z is unknown at t = 0 and is only revealed at the time of default. Equation 2.17 below gives the model's default probability.

$$V_0 e^{\sigma W_t - \frac{\sigma^2 t}{2}} > \bar{L}De^{\lambda Z - \frac{\lambda^2}{2}} \tag{2.12}$$

$$X_t = \sigma W_t - \lambda Z - \frac{\lambda^2}{2} - \frac{\sigma^2 t}{2} \tag{2.13}$$

$$X_t > log(\frac{\bar{L}D}{V_0}) - \lambda^2 \tag{2.14}$$

[59] The reason is that asset value cannot reach the default boundary quick enough through pure diffusion (see Finger et al., 2002).

$$EX_t = -\frac{\sigma^2}{2}(t + \frac{\lambda^2}{\sigma^2}) \tag{2.15}$$

$$VarX_t = \sigma^2\left(t + \frac{\lambda^2}{\sigma^2}\right) \tag{2.16}$$

$$P(t) = \phi\left(-\frac{A_t}{2} + \frac{\log d}{A_t}\right) - d \,.\, \phi\left(-\frac{A_t}{2} - \frac{\log d}{A_t}\right) \tag{2.17}$$

$$d = \frac{V_0 e^{\lambda^2}}{\bar{L}D} \tag{2.17a}$$

$$A_t^2 = \sigma^2 t + \lambda^2 \tag{2.17b}$$

2.3.5 Credit Risk in Islamic Bonds:

This section discusses the unique characteristics of Islamic (IJV and SARA) bonds and analyses the extent to which structural models capture their underlying risk. Credit risk in IJV bonds is examined first leading to the development of Hypotheses H2a and H2b. This followed by the analysis of credit risk in SARA bonds resulting in Hypothesis H2c to H2e.

2.3.5.1 Credit Risk in IJV Bonds:

As argued in Chapter 1, Section 1.2.4, IJV bonds have much in common with equity. Foremost is their shared risk and return characteristic in which the bond holders are entitled to a proportion of the venture’s profit as well as are liable for its downward risk (Usmani, 2002; Howladar, 2006). This introduces uncertainty in IJV redemption value at maturity, as it can be less or more than the IJV bond’s initial principal. It is evident from the previous discussion in Section 2.3.1 that the Merton (1974), first passage and CreditGrades models are designed to capture the credit risk of conventional debt bonds which aim to return the principal to bond holders at maturity. IJV bonds, however, have an uncertain redemption value. This uncertainty, therefore, has to be incorporated first in the default boundary of Merton (1974), first passage and CreditGrades model to produce IJV extensions.[60] The greater challenge that remains, however, is that structural credit risk models focus at calculating the probability of returning only the principal. In contrast, an IJV bond's final return can be greater or less than the principal. Therefore, an IJV bond holder might not only be interested in the principal but also the probability of the different profitability states that the bond might generate. Just by incorporating the IJV redemption value uncertainty in the default boundary and ignoring these profitability states can cause these IJV extensions to assign artificially low survival probabilities to IJV bonds. This bias can be captured by comparing the survival probabilities generated by the original structural models with those of their IJV extension. If these IJV extensions assign significantly lower probabilities then it can be argued that these models may have a bias against IJV type structures. The above discussion motivates the following hypothesis.

H2a: Structural models IJV extensions generate significantly lower survival probabilities than the original models.[61]

[60] This is discussed later in Chapter 4.

[61] There are theoretical reasons to support the one tailed nature of the hypothesis. IJV bonds are redeemed at maturity at the market value and not the principal value. Given the way structural models are setup this uncertainty in redemption value is likely to cause the survival probability to be lower rather than higher than that of debt bond.

The effectiveness of structural models' IJV extensions can also be tested by comparing how they rank[62] firms in terms of their credit risk (see Finger et al., 2002). Rankings generated using credit ratings can also be used for comparison. A high positive association[63] between the IJV extensions' rankings and those of the original models (or credit ratings[64]) reflect their sound working. In contrast, a negative association might reflect a bias against IJV financing. For example, the CreditGrades model might rank a firm in the top 10% percent of the least risky bond issuers but CreditGrades IJV extension might rank it in the bottom 10%. This discussion motivates the following hypothesis.

H2b: There is a negative association between credit risk rankings generated by the structural models' IJV extensions and their original counterparts and credit ratings.

2.3.5.2 Credit Risk in SARA Bonds:

As discussed in Section 1.2.4 SARA bond holders, unlike IJV bond holders, receive periodic rental payments that are independent of firm performance. Moreover, at maturity the issuer repurchases the bond holder's ownership entitlement at a pre-determined amount, which in most cases represents the principal (Usmani, 2006). Therefore, the current conventional structural models, which focus on returning the principal, should calculate SARA bonds underlying risk. Certain adjustments may need to be incorporated, however, in the original structural models to capture the true risk of SARA bonds. The foremost adjustment is that SARA bonds represent

[62] Ranking can be generated using survival probabilities.
[63] Two measures of association have been used in Chapter 4: correlation coefficient and Kendall's tau.
[64] Most Islamic bonds are rated using conventional credit risk models, therefore, rankings generated using issuer's credit ratings can also be used to compare with the results of structural models' IJV extension.

ownership of the underlying asset (Usmani, 2002; Howladar, 2006). This implies that in case of default their holders can claim possession of the underlying asset and, hence, the proceeds from its sale. In contrast, a secured conventional bond only has a first charge on the asset; the bond holders are not really owners. Therefore, these bond holders would only receive payments after undergoing lengthy bankruptcy proceedings. Moreover, a first charge does not result in the full proceeds from the sale of the asset as some cost and expenses might need to be paid. Real ownership also gives SARA bonds bankruptcy remoteness from the originator. This implies that if the issuer becomes bankrupt, while the underlying asset is still performing, SARA bond holders will receive uninterrupted payments (Dusuki & Mukhtar, 2010). These features make SARA bonds more secured and their recovery rate higher than secured conventional bonds.[65] Moreover, real ownership of underlying asset also means that the SARA bonds expected recovery rate might be affected by the volatility in the underlying asset's price. Hence, recovery rate and its volatility[66] may have to be adjusted in the structural models to capture SARA bond risk.

The importance of the model's recovery rate adjustments in the model can be checked by measuring survival probability sensitivity with changes in recovery rate and its volatility. If the survival probability is highly sensitive to these changes, it would imply that SARA bonds' recovery rate characteristics have to be incorporated

[65] Here the reference is to AAOIFI compliant SARA bonds and not the non-AAOIFI compliant bonds which do not represent ownership of the underlying asset (see Usmani, 2007; Howladar, 2009).
[66] Referred to as the uncertainty in recovery rate in the CreditGrades framework (see Finger et al., 2002).

in the models to truly capture its underlying risk.[67] The discussion here motivates the following hypothesis.

H2c: Structural models' survival probabilities change significantly with an increase in recovery rate.

H2d: Structural models' survival probabilities change significantly with an increase in recovery rate uncertainty (volatility).

Other than the survival probabilities, the recovery rate also affects loss given default (LGD), and hence the bond's expected loss (EL). These are important measure of credit risk and ratings and are calculated as follows (Gupton & Stein, 2002).

$$EL = (1 - Survival\ Probability)(LGD) \tag{2.18}$$

$$LGD = 1 - Recovery\ Rate \tag{2.19}$$

$$EL = (1 - Survival\ Probability)(1 - Recovery\ Rate) \tag{2.20}$$

If the change in survival probability with an increase in recovery rate is not significant (as tested by H2a), then the bond's expected loss (EL) should decrease (see Equation 2.20 above). Such a decrease in expected loss reflects the importance of SARA bonds' recovery rate when measuring its credit risk and ratings. The discussion motivates the following hypothesis.

H2e: Expected loss decreases with an increase in recovery rate and Vice Versa.

[67] From a theoretical perspective the direction of this change is unclear as a change in default boundary is capable of producing both negative and positive changes (see Finger et al., 2002).

2.4 Determinants of Bond Ratings (RQ3):

This section discusses credit ratings literature in the light of Research Question 3, that is, "*Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?*" It starts with an overview of the impact of financial ratios on credit risk. It then provides a detailed analysis of different firm specific variables (such as debt and profitability ratios) shown to have an impact on conventional bond ratings. Along with examining their effects, the section discusses their relevance and likely impact on Islamic bonds' credit ratings. This in turn leads to the formulation of Hypotheses H3a, H3b and H3c. Other than firm specific variables, the prior literature has shown that credit ratings change due to specific events (like the tightening of credit risk standards and financial crises). This section extends this argument to Islamic bonds to infer the impact of two events, the changing of Shariah-standards and the sub-prime financial crisis, on Islamic bond ratings. This helps to develop Hypotheses H3d and H3e. The focus then shifts to Islamic instrument specific characteristics such as bond type effect and Shariah advisor effect and their likely impact on Islamic bond ratings. This enables the formulation of Hypotheses H3f, H3g and H3h.

2.4.1 Overview of Impact of Financial Ratios on Credit Risk:

The tendency to predict corporate creditworthiness and bankruptcy risk using financial ratios is well established in the finance literature. Different combinations of financial ratios have been used in Z-scores and other regression analyses to determine credit risk (Altman, 1968). Credit rating agencies have also developed models that translate firm specific financial ratios into credit ratings (see S&P Credit

Rating Report, 2003). Most disclose their key financial variables: profitability, income, interest coverage and leverage ratios. Their significance and impact have also been confirmed by many empirical studies (see Altman, 1993; Kaplan & Urwitz, 1979; Blume et al., 1998; Pecker, 2000; Gray et al., 2006). Ratios such as profitability, income, interest coverage have been found to impact credit ratings positively, while other ratios such as leverage, exert a negative influence (Blume et al., 1998).

2.4.2 Financial Ratios Impact on Conventional and Islamic Bond Credit Risk:

This section compares the impact of different financial ratios on both conventional and Islamic bonds ratings and leads to the development of Hypothesis H3a, H3b and H3c. Following Blume et al. (1998), the financial ratios examined include: operating margin, long-term debt and total debt, interest coverage, firm size, market beta, standard error and time.

Operating margin is a measure of profitability and a reflection of the company's return on each dollar of sales. A high ratio, therefore, is likely to be accompanied by higher credit ratings. This has also been empirically tested for conventional finance industry (see Blume et al., 1998; Gray et al., 2006). Islamic bonds, like conventional bonds, should also experience a higher rating with increased profitability of the issuing firm. A higher operating margin ratio, therefore, should have a positive impact on Islamic bond ratings.

Long-term debt and total debt are both measures of firm's leverage and should have a negative impact on conventional bond ratings (see Blume et al., 1998). Some empirical studies, however, have found that only long-term debt has a significantly negative impact on bond ratings. In contrast, total debt is found to be insignificant. One possible explanation is that total debt is composed of long-term debt and short-term debt.[68] If the empirical models contain variables for both total debt and long-term debt together then the total debt variable may just be capturing the effect of short-term debt.[69] Furthermore, their impact on credit ratings is affected by the bond's maturities. If bonds have long-term maturities, short-term debt is likely to have less impact than long-term debt on their ratings and vice versa. Therefore, studies that have reported significant results for long-term debt but insignificant for short term debt should have longer maturity bonds in their sample (see Blume et al., 1998). Extending this argument to Islamic bonds, the impact of long-term and total debt is unlikely to be homogenous for different Islamic bond types. This is because Islamic debt bonds typically have shorter maturities while SARA bonds have longer maturities.[70] Long-term debt, therefore, should have more of a negative impact on SARA bonds, while total debt should affect debt bonds more.[71]

Interest coverage ratio captures the issuer's ability to pay the interest on the outstanding debt. A higher coverage is likely to be accompanied by higher credit ratings. These ratios might seem to be irrelevant to Islamic bonds, as interest is

[68] Total debt = Short term debt + Long term debt
[69] In the presence of long-term debt variable in the regression model, the coefficient of total debt would represent a change in credit rating assuming long-term debt is constant. Therefore, the total debt coefficient would only capture the impact of short-term debt in credit ratings (see Blume et al., 1998).
[70] The cost involved in structuring a real asset backed SARA bonds implies that it is only feasible for long-term bonds (see Usmani, 2006; Dusuki & Mukhtar, 2010).
[71] IJV bonds are mixed in terms of maturity.

forbidden under Islamic law. Accounting standards, however, force many Islamic issuers to prepare their balance sheets in a conventional format and, hence, they have to display the return on Islamic instruments under 'interest' (see Nasir & Zainol, 2006). Interest coverage ratio, therefore, should also have a positive impact on Islamic bond credit ratings.

Firm size has a positive impact on conventional bond ratings. As bigger firms tend to be more experienced, have better product lines and more diverse sources of revenue, they are less likely to fail (Blume et al., 1998). These benefits should extend to Islamic bonds implying that the firm size should have a positive effect on their bond ratings.

Standard error is a measure of individual stock volatility and captures the unique risk of the firm. High unique risk results in low credit ratings for conventional bonds (Blume et al., 1998). Its effect on credit ratings for SARA and Islamic debt bonds should be similar to that of conventional bonds. Its impact, however, on IJV bonds should be greater as they have a more pronounced link with equity.

The market model beta is a measure of stock price change in response to market movements. It captures systematic risk and, hence, has a negative impact on conventional bond ratings (Blume et al., 1998; Gray et al., 2006). The impact of market beta on Islamic bond ratings, however, depends upon how insulated the Islamic financial industry is from systematic shocks in the conventional system.[72] It

[72] There is hardly any literature on how a systematic shock in conventional finance industry would affect the Islamic finance industry and vice versa.

can be argued that the Islamic financial industry in general and Islamic bond markets in particular are in a class of their own with Islamic bonds having distinct structures and stronger fundamentals[73] compared to conventional bonds.[74] Therefore, they may not be affected directly by systematic shocks in the conventional financial system and any negative impact would be more of a spill-over effect[75] (see Wibier & Salah, 2011). The discussion of the variables above motivates the following hypothesis.

H3a: Operating margin, interest coverage and firm size are positive determinants of Islamic bonds' credit ratings, ceteris paribus.

H3b: Leverage ratios and standard errors are negative determinants of Islamic bonds' credit ratings, ceteris paribus.

H3c: Market model beta is an insignificant determinant of Islamic bonds' credit ratings, ceteris paribus.

2.4.3 Event Specific Effects on Islamic Bond Ratings:

This section examines the impact of event specific effects on Islamic bond ratings. The section starts with analysing their nature and its application to conventional bond ratings. It then extends the analysis to Islamic bond ratings and investigates the impact of changing Shariah standards leading to the development of Hypothesis H3d. This is followed by the discussion of the sub-prime financial crisis and its impact on Islamic bond ratings resulting in Hypothesis H3e.

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[73] SARA bonds represent ownership in the underlying asset, hence, are more secured than secured conventional bonds (see Howladar, 2006; Usmani, 2006; Dusuki & Mukhtar, 2010).

[74] The bankruptcy remote SPV, delinks the underlying asset from the issuer.

[75] However, in case of a systematic shock directly affecting the Islamic finance industry, the impact should be greatest on IJV bonds because of their equity type nature.

Event specific effects capture the tendency of credit ratings to change due to occurrence of particular events, holding all other factors constant. For example, Blume et al. (1998) found that US bond ratings fell over 1978 to 1995. They attribute this decline to the credit rating agencies' increasingly stringent standards. Other specific events such as a financial crisis might also affect credit ratings. Following the subprime crisis, rating agencies have tightened their credit rating standards resulting in numerous conventional bond rating downgrades (see Brunnermeier, 2009). Islamic bond ratings should also be affected by event specific effects.

Shariah standards in the Islamic finance industry have experienced rapid changes in the past few years. In 2008, Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) issued stringent guidelines for Islamic bonds. These were designed to improve their Shariah quality.[76] The standards required SARA bonds to represent real ownership of the underlying asset (AAOIFI, 2008). Islamic debt bonds were also heavily criticised and were expected to have some link with the underlying asset (see Usmani, 2007).[77][78] These better standards, therefore, should positively impact the credit ratings of Islamic bonds issued during[79] and after 2008. This motivates the following hypothesis.

H3d: Islamic bonds issued during 2008[80] have higher ratings, *ceteris paribus*.

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[76] Refer to Section 1.2.5 (Chapter1) and 2.4.4.2 (Chapter 2) for a detailed discussion of how changing Shariah standards might improve credit quality.
[77] IJV bonds were also the focus of severe criticism. However, the impact of the suggested IJV structure on credit ratings is more obscure. Moreover, the suggested structured has not been popular in the new issues (see Khan, 2010; Salah, 2011).
[78] See Chapter 1, Section 1.2.5.
[79] The unofficial announcement was made at the end of 2007. The official standards, however, were issued at the start of 2008 (Usmani, 2007; AAOIFI, 2008).
[80] This is relative to Islamic bonds issued in years other than 2008.

The sub-prime financial crisis is another event specific effect whose impact on Islamic bond ratings can be measured. In theory its impact on Islamic bonds should not be significant. This is because Islamic bonds belong to a unique industry which is expected to be insulated from any direct shock in the conventional finance industry (Wibier & Salah, 2011). The above discussion motivates the following hypothesis.

H3e: Holding firm specific variables constant, credit ratings of newly issued Islamic bonds[81] have not declined during the sub-prime financial crisis in 2009.

2.4.4 Islamic Instrument Specific Characteristics:

This section analyses those Islamic bonds' unique characteristics that might affect their credit risk. It focuses first on Islamic bond type effect and develops Hypotheses H3f and H3g. This is followed by analysis of Shariah advisor effect resulting in Hypothesis H3h.

2.4.4.1 Islamic Bond Type Effect:

As discussed in Section 2.3, conventional credit risk models and rating processes focus at the issuer's ability to return the principal. Moreover, recovery rates, security and seniority rules are important determinants of risk reduction (S&P Credit Rating Report, 2003). A secured bond, therefore, should receive a higher rating than an unsecured bond. As argued previously in Section 1.2.4 IJV, SARA and debt bonds

[81] This is relative to existing Islamic bonds issued in years other than 2009.

all have different security and seniority structures which could affect their credit ratings.

IJV bonds are the least secured of all bonds (see Section 1.2.4.1 in Chapter 1). They have a close resemblance to equity in that the issuer can pass losses to the bond holders. The issuer neither guarantees the principle nor ensures the return (Usmani, 2007). Moreover, in case of bankruptcy they are given a treatment similar to shareholders. Therefore, all other things equal, an IJV bond should have the lowest of all bond ratings.[82]

SARA bonds are more secured than secured conventional bonds (see Section 1.2.4.2 in Chapter 1). This is because the bond holders at default can claim the ownership and hence the sale proceeds of the underlying asset (Usmani, 2006; Dusuki & Mukhtar, 2010). Therefore, after controlling for other variables, these bonds should have the highest credit ratings of all the Islamic bonds.

Debt bonds are very similar to conventional bonds (see Section 1.2.4.3 in Chapter 1)[83]. These bonds, therefore, have a lower rating than SARA bonds which are more secured (Howladar, 2006; Dusuki & Mukhtar, 2010). They should, however, have higher ratings than IJV bonds as debt bond holders rank higher than IJV bond holders to receive payments upon default. The above discussion motivates the following hypothesis.

[82] As discussed in Section 2.3, the rating process only focuses at returning the principal and largely ignores the different profitability states that IJV bonds are capable of generating.
[83] “As discussed in Section 1.2.4.3, debt bonds are Murabaha bonds.

H3f: SARA bonds have higher ratings than IJV and debt bonds, *ceteris paribus*.

H3g: IJV bonds have lower ratings than debt bonds, *ceteris paribus*.

2.4.4.2 Shariah Advisor Effect:

As discussed in Section 1.2.5 all Islamic bonds must be approved by Islamic legal scholars called Shariah advisors. Given that the Islamic finance industry is still in its infancy and harmonized accounting and Shariah standards are just beginning to emerge, the Shariah advisors' preference for different Islamic bond structures may have a significant impact on credit ratings. As discussed in Section 1.2.5, the lack of Shariah harmonization in Islamic finance industry means different Shariah-advisors may approve quite different structures (Karim, 1990; Karim & Archer, 2007). Some scholars, for example, may approve SARA bonds where the underlying asset does not come under the ownership of the bond holders (Howladar, 2006; Dusuki & Mukhtar, 2010). These bonds are just like secured conventional bonds, where the bond holder has a first charge on the asset. As discussed in Section 2.3.5.2 bonds that do not represent ownership of underlying asset, upon default receive payments only after undergoing lengthy bankruptcy proceedings. Moreover, a first charge as opposed to real ownership does not necessarily entitle bond holders to full proceeds from the sale of the assets and hence may results in a lower recovery rate. Therefore, Shariah advisor preferences would affect Islamic bond structures and hence their underlying credit ratings (See Section 1.2.5 on how Shariah committee variable captures Shariah advisor effect).

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As mentioned previously, Islamic bond issuers may hire either individual advisor or a committee comprised of multiple Shariah advisors (Grais & Pellegrini, 2006). The latter should ensure that bond structures are less influenced by any individual Shariah-advisor preferences. Moreover, Shariah committees may adopt more stringent standards so as to comply with the opinions of all their scholars. This means that bonds approved by Shariah committees should have better structures, and, hence, higher credit ratings. The above discussion motivates the following hypothesis.

H3h: Islamic bonds approved by Shariah committees have higher credit ratings than those approved by individual advisors, *ceteris paribus*.

2.5 The Issuer’s Choice of Islamic Bond Type (RQ4):

This section discusses the literature on issuer’s choice of bond type in the light of Research Question 4, that is, “*Are the factors that affect an issuer's choice of bonds the same for conventional and Islamic bonds?*” The section starts with an overview of determinants of conventional bond ratings. It then investigates those elements that are particularly relevant to Islamic bonds. The focus here is on literature that explores factors affecting corporate issuance of equity as opposed debt. The idea is to infer the determinants of issuer’s choice of IJV bond with equity like structure. This motivates Hypotheses H4a and H4b. The section then analyses the determinants of conventional secured and unsecured bonds. This strand of literature is extended to Islamic bonds to examine the determinants of the issuer’s choice of SARA bonds, which are more secured than Islamic debt bonds. This leads to the formulation of Hypotheses H4c, H4d and H4e. The impact of changing Shariah-standards on the issuer’s choice of Islamic bonds is investigated to formulate Hypothesis H4f. Finally, the impact of Islamic instrument specific variables such as Shariah advisor effect is discussed resulting in the development of Hypothesis H4g.

2.5.1 Overview of Determinants of Conventional Bond Rating:

Conventional bonds differ in terms of many characteristics including maturity and security. This diversity is caused by a range of factors. Bond maturity, for example, may be affected by the firm’s risk. Low quality firm with high risk may have an aversion for short-term debt as their poor cash position could result in frequently rollovers (Flannery, 1986). The decision to issue secured as opposed to unsecured bonds may be affected by factors such as firm performance and project risk.

Companies that perform poorly or want to start risky projects may use secured bonds to attract reluctant investors (Berger & Udell, 1990). Since Islamic bonds have certain similarities with conventional bonds, implications can be drawn for them by analysing the determinants of conventional bonds characteristics. The next section analyses the literature on the determinants of debt and equity ratios to generate implications for issuer's choice of IJV bonds.

2.5.2 Determinants of Issuer's Choice of IJV Bonds:

As discussed previously in Section 1.2.4 in Chapter 1, IJV bonds have a number of features similar to equity. Capital structure theories, therefore, can be used to analyse issuer's choice of IJV bond type. This section analyses two particular capital structure theories: the trade off theory and pecking order theory. It also analyses the literature that reconciles their differences resulting in the development of Hypothesis H4a and H4b.

The trade-off theory of capital structure tries to balance the tax advantage of debt against its cost of financial distress (see Modigliani & Miller, 1958).[84] The theory would be irrelevant in an ideal Miller-Modigliani world, where the choice of capital structure would not affect the firm value. Deviations from ideal assumptions, like asymmetric information, taxes and financial distress costs, however, makes choice of capital structure important. With debt and equity having both costs and benefits, there is always an optimal level of capital structure which balances them. It can, therefore, be inferred from the trade off theory that tax rates and financial distress

[84] There are also agency costs associated with equity, which negatively affect its favourability over debt (see Jensen and Meckling, 1976; Myers, 1977; Stulz, 1990; Hart and Moore, 1995). However, some of them are not present in IJV bonds.

cost would be important determinants of issuer's choice of IJV over SARA and debt bonds. IJV bonds, however, in most jurisdictions are given similar treatment to SARA and debt bonds for tax purposes (see Ali, 2005, 2008). The presence of distress cost may affect the issuer's preference for IJV bonds as being equity in nature IJV bonds are not susceptible to default.[85] The pecking order theory is discussed next.

Pecking order theory is based on the idea that in a world with asymmetric information, capital structure is an important source of market signals about the nature of the firm (see Ross, 1977). The theory assumes that managers are better informed than investors, resulting in adverse selection (Myers & Majluf, 1984). Since investors know that managers possess superior knowledge, they view equity issuance as negative signals about an overvalued share price. This cost makes firms prefer internal as opposed to external financing. If external financing becomes inevitable, however, firms prefer debt over equity as issuing debt avoids the negative signals associated with equity financing. This strand of literature implies that all things being equal, a firm should prefer SARA and debt bonds, which have more similarities with conventional debt, than the equity type IJV bonds.

There is another strand of literature that uses theoretical arguments from both the trade-off and pecking order theories and empirically examines the impact of different factors on the firm's debt-equity ratio (see Marsh, 1982; Jalilvand & Harris, 1984; Titman & Wessels, 1988; Bayless & Chaplinsky, 1993; Rajan & Zingales, 1995;

[85] Here the discussion on AAOIFI compliant IJV bonds who like ordinary shares have no default and hence, would endure no financial distress cost. In the real world though, IJV bonds are being issued in a very debt like manner and could face a default and hence would have to bear financial distress cost.

Graham, 1996; Jung et al., 1996; Hovakimian et al., 2001). This strand of literature argues that firms target a particular debt-equity ratio. If the actual ratio differs from the target, the firm would change their debt or equity to adjust it. (see Marsh, 1982; Hovakimian et al., 2001). This line of argument implies that debt-equity ratio would be affected by two types of factors: those that shift the target ratio and those that cause deviations from the target. Factors such as cost of financial distress, bankruptcy risk, size, asset composition may affect the target level of debt (see Marsh, 1982). In contrast, the primary catalyst for deviation from the target ratio is over or under-valued stocks (see Hovakimian et al., 2001). If stocks are over-valued, issuing equity would be less costly. This in turn might induce firms to issue equity irrespective of their target ratio. However, if stocks are under-valued, issuing equity would be costly (Ross, 1977; Myers & Majluf, 1984). Hence, firms may restrain from issuing it.

Extending the above arguments to IJV bonds suggest that if the firm's current debt is higher relative to its targeted level, then to readjust to their target, firms may prefer IJV over SARA and debt bonds. In contrast, if the current debt level is lower relative to the target, firms should prefer SARA or debt bonds over IJV bonds. The above reasoning also suggests that since it is more costly to issue equity type instruments for undervalued firms, they should prefer SARA or debt bonds over IJV. Overvalued firms, however, should prefer IJV over SARA and debt bonds. This discussion motivates the following hypotheses.

H4a: Higher current debt, relative to targeted debt, results in firms preferring IJV over SARA and debt bonds and vice versa.

H4b: Holding other firm specific variables constant, firms with higher market to book value should prefer IJV over SARA and debt bonds and vice versa.

2.5.3 Issuer's Choice of SARA and Debt Bonds:

This section discusses the determinants of issuer's decision of conventional bond security and seniority. It then extends the analysis to Islamic bonds (SARA and Debt) to develop Hypotheses H4c, H4d and H4e.

Security and seniority determination of conventional bonds is explained by opposing views in the literature. One argument states that secured debt is suitable for a highly levered firm with potential growth opportunities as it allows the financing of profitable projects otherwise rejected if financed through unsecured debt (see Stulz & Johnson, 1985). The opposing view states that secured debt is the only way for poorly performing firms to raise finance (see Berger & Udell, 1990). According to this view, high risk firms with limited growth opportunities would tend to issue secured debt. The empirical evidence, as presented by Julio et al. (2008), supports the latter view. They find that firms issuing secured debt tend to be small, highly levered, have low cash flow, low stock returns and limited growth options. This analysis can be extended to Islamic bonds.

SARA and debt Islamic bonds differ in terms of seniority and security. SARA bonds are secured and represent ownership of the underlying asset. Their bond holders upon default are entitled to the underlying asset's sale proceeds. In contrast, Islamic debt bonds are less secured in nature as they do not represent underlying asset ownership.

They, however, rank above IJV bonds. The views of Berger & Udell (1990) and Julio et al. (2008) can be extended to Islamic bonds to suggest that highly levered, poor performing and high risk firms might prefer SARA over debt bonds. In contrast, firm with lower leverage, high profitability and low risk may prefer debt bonds over SARA bonds. In line with the discussion in Section 2.5.2, high leverage can be captured by total and long-term debt ratios. Profitability can be represented by operating margin and interest coverage ratios and risk can be measured by market beta and standard errors. The discussion here motivates the following hypothesis.

H4c: Firms with high leverage (total and long-term debt) prefer SARA over debt bonds and vice versa.

H4d: Firm having high profitability (operating margin and interest coverage ratio) prefer debt over SARA bonds and vice versa.

H4e: Firms having higher risk (market beta and standard error) prefer SARA over debt bonds and vice versa.

2.5.4 The Impact of Changing Shariah Standards:

This section examines the impact of changing Shariah standards on the issuer's choice of Islamic bond. Particularly the focus is on the AAOIFI recommendation in 2008.

Shariah standards in the Islamic finance industry have experienced rapid changes in the past few years. In 2008, Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI) issued stringent guidelines for Islamic bonds. These were designed to improve their Shariah quality (Usmani, 2007). These recommendations were particularly critical of prevalent IJV structures and suggested stringent alternatives (see Section 2.5.4 Chapter 2).[86] This suggests that issuer's aversion for IJV bond should increase in 2008.[87] The discussion motivates the following hypothesis.

H4f: Issuer's aversion for IJV bonds[88] increased in 2008, *ceteris paribus*

2.5.5 Shariah Advisor Effect:

This section examines the impact of Islamic instrument specific effect. Particularly, the focus is on Shariah advisor effect leading to the development of Hypothesis H4f.

A Shariah advisor effect originates from lack of harmonization of Shariah standards for Islamic bonds. As explained previously in Section 1.2.5, Shariah scholars have different opinions with regards to the Shariah compliance of particular Islamic bond types. For example some even consider Islamic debt bonds to be non-Shariah compliant. Furthermore, others also have a strong repulsion for particular structures of IJV bonds. In contrast, SARA bonds are the least controversial of Islamic bonds (Usmani, 2002). Following the discussion in Section 2.5.5, the effect of Shariah advisor preferences can be captured by comparing bonds approved by Shariah

[87] These standards also required SARA bonds to represent real ownership of the underlying asset (AAOIFI, 2008) while Islamic debt bonds were also criticised and were expected to have some link with the underlying asset (see Usmani, 2007). As argued in Section 2.4.3 for RQ3 that this should result in better structures for SARA and Islamic debt bonds. However, whether this should result in issuer preferring one of these bonds over the other is ambiguous. Their impact only on IJV bonds is therefore hypothesized here.

[88] In the multivariate probit model it is measured as the probability of IJV issuance (see Section 6.4).

committees against those approved by individual advisors. The rationale is that a Shariah committee with multiple members is less likely to be affected by individual preferences and, hence, should approve bonds that comply with the preference of all their advisors. Shariah committees, therefore, should have a higher probability of approving the least controversial SARA bonds than debt and IJV bonds. The issuer's choice of Islamic bond type, hence, should be affected by whether the issuer has hired a Shariah committees or individual advisor. The discussion motivates the following hypothesis.

H4g: SARA bonds, in contrast to debt and IJV bonds are more likely to be approved by Shariah committees than individual advisors.

2.6 Conclusion:

This chapter analysed theoretical background and existing literature related to the four research questions developed in Chapter 1, with the aim to develop testable hypotheses to help answer them (these are shown in Table 2.3). For Research Question 1 this chapter analysed the role of adverse selection, moral hazard and risk averse depositor in explaining the IJV puzzle. It then examined the relevance of structural credit risk models to Islamic bonds as part of Research Question 2. Finally, it analysed firm specific and Islamic instrument specific variables that might affect the credit rating and issuer's choice of Islamic bond type to answer Research Question 3 and 4. The next Chapter 3 analyses the methodology and results associated with Research Question 1.

Table 2.3: Summary of the Four Research Questions and their Hypotheses

Research Question 1: Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?	
H1a: In the absence of asymmetric information, firms will be indifferent between choosing IJV or debt.	**H1b:** In the presence of asymmetric information, firms with high (low) probability of success will prefer debt over IJV (IJV over debt).
H1c: Where long-term relationships or threat of punishment exist, IJV banking can operate even in the presence of moral hazard.	**H1d**: In the presence of risk averse Islamic bank customers, firms would prefer debt over IJV.
Research Question 2: Can conventional credit risk models be used to assess the risk in Islamic bonds?	
H2a: Structural models IJV extensions generate significantly lower survival probabilities than the original models.	**H2b:** There is a negative association between credit risk rankings generated by the structural models' IJV extensions and their original counterparts and credit ratings.
H2c: Structural models' survival probabilities change significantly with an increase in recovery rate.	**H2d:** Structural models' survival probabilities change significantly with an increase in recovery rate uncertainty (volatility).
H2e: Expected loss decreases with an increase in recovery rate and Vice Versa.	
Research Question 3: Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?	
H3a: Operating margin, interest coverage and firm size are positive determinants of Islamic bonds' credit ratings, *ceteris paribus*.	**H3b:** Leverage ratios and standard errors are negative determinants of Islamic bonds' credit ratings, *ceteris paribus*.
H3c: Market model beta is an insignificant determinant of Islamic bonds' credit ratings, *ceteris paribus.*	**H3d:** Islamic bonds issued during 2008 have higher ratings, *ceteris paribus*.
H3e: Holding firm specific variables constant, credit ratings of newly issued Islamic bonds have not declined during the sub-prime financial crisis in 2009.	**H3f**: SARA bonds have higher ratings than IJV and debt bonds, *ceteris paribus*.
H3g: IJV bonds have lower ratings than debt bonds, *ceteris paribus.*	**H3h:** Islamic bonds approved by Shariah committees have higher ratings than those approved by individual advisors, *ceteris paribus.*
Research Question 4: Are the factors that affect an issuer's choice of Islamic bonds the same as for conventional bonds?	
H4a: Higher current debt, relative to targeted debt, results in firms preferring IJV over SARA and debt bonds and vice versa.	**H4b:**Holding other firm specific variables constant, firms with higher market to book value should prefer IJV over SARA and debt bonds and vice versa.
H4c: Firms with high leverage (total and long-term debt) prefer SARA over debt bonds and vice versa.	**H4d:** Firm having high profitability (operating margin and interest coverage ratio) prefer debt bond over SARA bonds and vice versa.
H4e: Firms having higher risk (market beta and standard error) prefer SARA over debt bonds and vice versa.	**H4f**: Issuer's aversion for IJV bonds increased in 2008.
H4g: SARA bonds, in contrast to debt and IJV bonds are more likely to be approved by Shariah committees than individual advisors.	

CHAPTER3: IJV IN ISLAMIC BANKS: METHODOLOGY AND RESULTS FOR RQ1

3.1 Introduction:

Chapter 2 explored the literature related to the four research questions discussed in Chapter 1 and developed their related hypotheses. This chapter discusses the methodology and results[89] for the 4 Hypotheses H1a to H1d associated with Research Question 1, *"Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?"* The chapter starts with a brief discussion of a firm focused model to infer the impact of firms' choice of debt financing on their profit in Section 3.2. This is then extended to IJV financing under perfect information (H1a) in Section 3.3. Section 3.4 then introduces information asymmetry into the IJV financing model (H2b). The model is extended in Section 3.5 to capture the banks' ability to neutralize moral hazards (H1c). Section 3.6 incorporates risk averse bank customers in the asymmetric information model (H1d). The chapter ends with Section 3.7 which summarises the discussion.

[89] The results are theoretical proofs of the models.

3.2 Firm Focused Model:

This section discusses the primary framework for a theoretical model based on the works of Leland & Pyle (1977), Diamond (1984) and Ueda (2004). The basic model developed here is later augmented with adverse selection, moral hazard and risk averse bank customers to test Hypotheses H1a to H1d. In line with Ueda (2004) the model is firm focused. It assumes that banks offer both debt and IJV financing as long as they provide them with a positive net present value (see Bester, 1985). Therefore, the possibility of whether an IJV would be utilized rests with the firms. The firms' decision to choose IJV or debt financing, however, depends on which will maximises the firms' profit. Section 3.2.1 below presents the model for debt financing firms. This model is later extended for the IJV case in Section 3.3.

3.2.1 Model for Debt Financing Firms:

The model for debt financing firms encapsulates the relationships between two parties: firms and banks. The role of each is discussed first along with an explanation of the model's variables (presented in Table 3.1). The firms' profit outcome under debt financing is then examined followed by analysis of banks' debt participatory constraints.

Table 3.1: List of Variables for RQ1

This table defines all the variables used in the Equation 3.1 to 3.75 related to RQ1, "Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?"

Variable	Description
F	Total cost of the project.
φ	Net revenue[90]
R	Rate of return charged on bank loan
f	$(1+R)F$
P	Probability that the project would make a profit
π	Total profit
r	proportion of the profit received by the bank in an IJV contract

3.2.1.1The Role of Firms and Banks:

This sub-section examines the role of the firms and the banks. The model assumes that the firms are of two types: One with a high success probability (Ph) and another with low a success probability (Pl) (Where $Ph > Pl$). If the firms succeed (with probability P), they generate revenue $'\varphi'$. The firms' total project funding requirement is 'F' and the banks' are the only available financing source. If the firms choose debt financing, bank charges them a rate of return 'R'. This implies that at maturity the firms repay $(1+R)\,F$ to the banks.

The model assumes, in line with the previous discussion in Chapter 2 Section 2.2.2, that banks can neutralize adverse selection for firms requiring debt financing (see Bester, 1985; Chan & Thakor, 1987; Diamond, 1984, 1989). They do so by thoroughly screening each firm to ensure that it can repay their principal and return [$(1+R)F$] and hence, would not default.[91] This is incorporated into the model by assuming that even if firms (with both high and low success probability) do not

[90] This is net revenue after deducting all the costs but before the servicing of debt. It is not called profit to distinguish it from the equilibrium profit π.

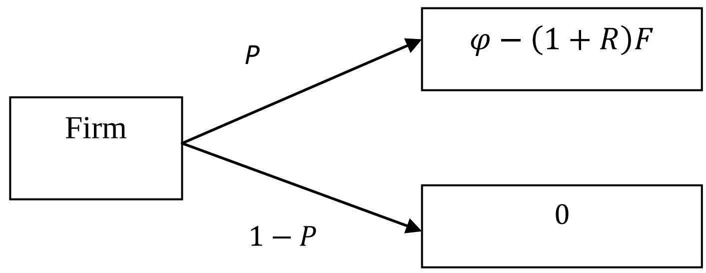
[91] This assumption regarding the banks' ability to perfectly neutralize adverse selection for debt financing is made for simplicity and it does not change the outcome of the results.

succeed with probability *(1-P)*, they still generate sufficient revenue to cover their borrowing cost.

3.2.1.2Firms' Profit Outcome Under Debt Financing:

Given the above assumptions, the firms' profit outcome is shown by Figure 3.1 below.

Figure 3.1: Firm's Profit in Debt Financing



Source: Prepared by the author.

A typical firm's expected profit when using debt financing (as shown in Figure 3.1) can be calculated by Equation 3.1 below.

Expected Profit = Success Probability x *Profit + (1-Success Probability)* x *Loss* (3.1)

Profit = $\varphi - (1 + R)F$ (3.2)

Loss[92] = *0* (3.3)

$$\pi = P(\varphi - (1 + R)F) + (1 - P)(0) = P\big(\varphi - (1 + R)F^{93}\big) = P_h(\varphi - f) \quad (3.4)$$

[92] This assumption is only made for simplicity and does not change the outcome of the model.
[93] f=$(1 + R)F$

Following Equation 3.4 above, the firms' profit functions with both high and low success probability are given by Equations 3.5 and 3.6 below

$$\pi_h^{debt} = P_h(\varphi - (1+R)F) = P_h(\varphi - f) \tag{3.5}$$

$$\pi_l^{debt} = P_l(\varphi - (1+R)F) = P_l(\varphi - f) \tag{3.6}$$

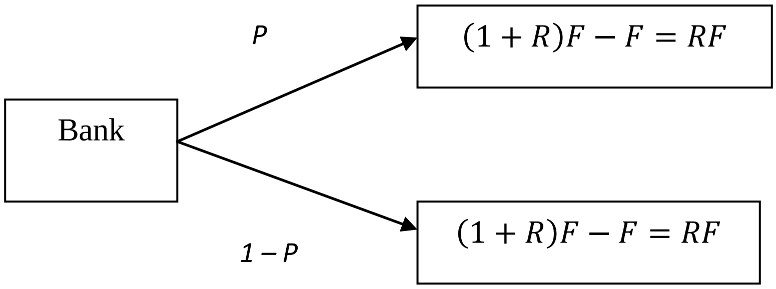
This sub-section focused on the firms' profit outcome. The banks' participation conditions are discussed next.

3.2.1.3 Bank's Debt Participatory Constraints:

In line with Bester (1985) and Ueda (2004), the model assumes a perfectly competitive banking sector. This implies that banks will finance all projects with a positive net present value (see Bester, 1985).[94] As discussed above banks are assumed to neutralize adverse selection for debt financing. The approved firms, therefore, will not default. Moreover, in either event of firms succeeding (with probability *P)* or not succeeding (with probability *1-P*), banks would still receive their principal and return.[95] The profit outcome for debt financing banks is show in Figure 3.2 below.

[94] In a firm focus model like the one used in this study this assumption only helps to simplify analysis and does not change the eventual outcome.
[95] This assumption is only made for simplicity and does not change the outcome of the model.

Figure 3.2: Bank’s Profit in Debt Financing



Source: Prepared by the author.

The banks’ expected profit outcome for debt financing is shown by Equation 3.7 below.

$$P(R)F \;+\; (1 - P)(R)F \qquad (3.7)$$

Following Bester (1985), banks would participate as long as the expected profit is non-negative. The banks’ participation constraint, therefore, is given by Equation 3.8 below.

$$P(R)F \;+\; (1 - P)(R)F \;\geq 0 \qquad (3.8)$$

$$RF \geq 0 \qquad (3.9)$$

Since the constraint has to be binding and $F > 0$ therefore,

$$R = 0 \qquad (3.10)$$

Equations 3.8 to 3.10 suggest that in a perfectly competitive banking sector, a risk less debt contract (with no default) should charge a zero rate of return. Equation 3.10 can be substituted in the firms’ profit Equations of 3.5 and 3.6 to generate their equilibrium profit as shown in Equation 3.11 and 3.12 below.

$$\pi_h^{debt} \;= P_h(\varphi - F) \qquad (3.11)$$

$$\pi_l^{debt} = P_l(\varphi - F) \tag{3.12}$$

The above model suggests that banks' debt financing return is independent of firms' success probability. As long as firms are non-defaulting,[96] their success probability in a debt contract is unimportant to the banks. This, however, is not the case for IJV financing where the banks' return is dependent on firms' performance. The next section analyses the firms' equilibrium IJV financing payoff under perfect information. This is then compared to the firms' debt financing profits given in Equation 3.11 and 3.12 to test Hypothesis H1a.

3.3 IJV with Perfect Information:

This section discusses the impact of IJV financing on the firms' and banks' equilibrium payoff in the presence of perfect information. This in turn enables testing of Hypothesis H1a, that is, *"In the absence of asymmetric information, firms will be indifferent between choosing IJV or debt"*. The section first analyses the firms' profit outcome under IJV financing. This is followed by banks' IJV participatory constraints.

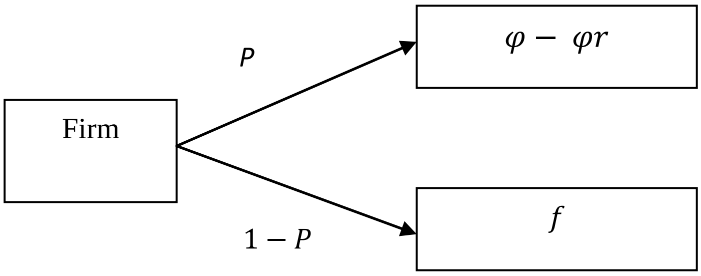
3.3.1 Firms' Profit Outcome Under IJV Financing:

The model developed here captures two distinguishing features of IJV financing discussed in Chapter 1 Section 1.2.2: the pre-agreed profit ratio and the investment

[96]The knowledge of only the firm's default probability is important for banks.

dependent loss ratio (see Usmani, 2006).[97] In an IJV, the firms have to pay a pre-agreed percentage *'r'* of their net revenue 'φ' to the banks (refer to Section 1.2). Therefore, if the firms succeed with probability *P*, the banks' revenue and the firms' cost would be $'\varphi r'$. The investment dependent loss ratio, however, implies that in the event of firms failing with probability *(1-P)*, the banks bear any loss according to their investment ratio.[98] In the model the banks provide full project funding and hence bears all the loss. It is similar to saying that upon failure the firms have the option to sell the project to the banks at a price of '*f*' (future value of the initial cost of investment *(1+R)F= f*) (see Ueda, 2004). The profit outcome for the firms is given in Figure 3.3 below.

Figure 3.3: Firms Profit in IJV Under Perfect Information



Source: Prepared by the author

The profit function of IJV financing firms with both high and low success probabilities is given in Equation 3.13 and 3.14 below.

[97] In an IJV the profit ratio can be pre-agreed but the loss has to be born according to the investment proportion (Usmani, 2006).
[98] For simplicity a Mudarabah contract is considered here, where the entire cost of the project is funded by the Islamic banks (see Usmani, 2006).

$$\pi_h^{IJV} = P_h(\varphi - \varphi r) + (1 - P_h)f \quad (3.13)$$

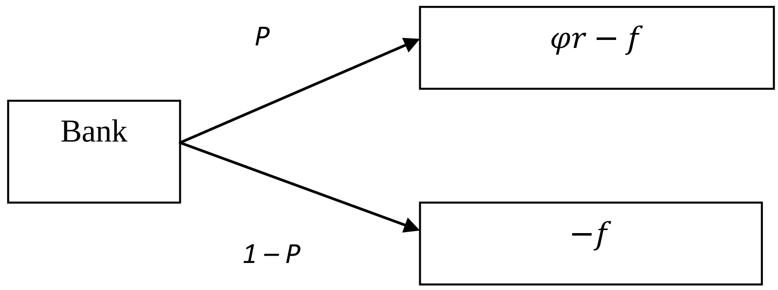
$$\pi_l^{IJV} = P_l(\varphi - \varphi r) + (1 - P_l)f \quad (3.14)$$

The banks' participatory constraints are discussed next.

3.3.2 Banks' IJV Participatory Constraint Under Perfect Information:

In an IJV the banks' expected profit depends on the firm's success probability (Iqbal et al., 1998; Usmani, 2006). It provides banks the incentive to gather additional information about the firms before negotiating the profit sharing ratio 'r'. To test Hypothesis H1a, this section assumes that banks possess perfect information about the firms' success probability. This implies that if two firms with success probability P_h and P_l, seek funding, the banks could differentiate between them. So the banks would offer each firm a profit rate 'r' that represents their underlying risk. The profit outcome for banks in an IJV contract is given by Figure 3.4 below.

Figure 3.4: Banks Profit in IJV Under Perfect Information



Source: Prepared by the author

The banks' participatory constraint for firms with high success probability would therefore be as follows.[99]

$$P_h(\varphi r - f) - (1 - P_h)f \geq 0 \tag{3.15}$$

From constraint (7), φr can be reduced to

$$\varphi r \geq \frac{f}{P_h} \tag{3.16}$$

Given that the banking industry is competitive, Equation 3.15 has to be binding; otherwise the payoff to the firms can be increased without violating the constraint. The constraint 3.16 can be plugged back in the firms' profit outcome given by Equation 3.13 to yield the following equilibrium results:

$$\pi_h^{IJV} \leq P_h(\varphi - f) \tag{3.17}$$

$$\pi_h^{IJV} = \min(\varphi, P_h(\varphi - f)) \tag{3.18}$$

Since$P_h(\varphi - f) < \varphi$ (3.19)

$$\pi_h^{IJV} = P_h(\varphi - f) \tag{3.20}$$

Equation 3.20 above gives the equilibrium profit of high success probability IJV financing firms. The results can be easily extended to show that the equilibrium

[99] The model here is solved for the firm with high success probability. The result, however, can be extended to a firm with low success probability.

profit for low success probability firms undertaking IJV is given by Equation 3.21 below.

$$\pi_l^{IJV} = P_l(\varphi - f) \tag{3.21}$$

The profit function of the IJV financing firms under perfect information given by Equations 3.20 and 3.21 can be compared with their debt financing profit given in Equation 3.5 and 3.6 to show that the payoffs are equal. Since there is no difference in IJV and debt financing profits for both firm types, they should be indifferent between choosing either of the financing modes. This supports the Hypothesis H1a below.

H1a: *In the presence of perfect information, firms will be indifferent between choosing IJV or debt.*

The next section introduces asymmetric information in the IJV financing model to test Hypothesis H1b.

3.4 Asymmetric Information Model:

The perfect information assumption is unrealistic as the real world is fraught with asymmetric information (Akerlof, 1970). The model in this section is updated to incorporate asymmetric information and is then used to compare the firms' equilibrium IJV and debt financing returns. The proof presented here enables the testing of the Hypothesis H1b that is "*In the presence of asymmetric information,* *firms with high (low) probability of success will prefer debt over IJV (IJV over debt)"*. This section first examines the impact of asymmetric information on the firms and the banks. This is followed by a discussion of how this asymmetric information in IJV financing can be captured in the model. Banks' participatory constraints are then analysed leading to the firms' equilibrium profit to test Hypothesis H1b.

3.4.1 The Impact of Asymmetric Information on the Firms and the Banks:

Asymmetric information is incorporated in the model by assuming that banks 'lack the knowledge regarding the firms' success probability (see Ueda, 2004). Moreover, the asymmetric information would not directly impact the firms as they would be aware of their own success probabilities.[100] Therefore, the firms' profit function will be similar to the perfect information case as given in Equation 3.13 and 3.14. The impact of asymmetric information on banks is discussed next.

Banks use different screening methods to neutralize asymmetric information (see Bester, 1985; Chan & Thakor, 1987; Diamond, 1984, 1989). However, as discussed in Chapter 2 Section 2.2.2, the banks' screening methods can neutralize asymmetric information for debt financing only and not IJV (see Gompers, 1995; Warde, 2000; Ueda, 2004). For simplicity it is assumed in the model that banks can perfectly neutralize asymmetric information for debt financing.[101] This implies that even in the presence of asymmetric information, the debt financing equilibrium profit for the banks and the firms would not be different from that of the perfect information case

[100] Note that there will be an indirect impact on the firm's equilibrium profit because of a change in the banks' participatory constraint.
[101] This assumption is for simplicity only and does not change the outcome of the model.

shown in Equation 3.5 and 3.6. For IJV financing, however, the banks' inability to neutralize asymmetric information would affect the banks' participatory constraint and, hence, the firms' equilibrium IJV financing payoff. The following section incorporates asymmetric information in the IJV financing model.

3.4.2 Asymmetric Information in IJV Financing:

Asymmetric information is captured in the IJV financing model by assuming that banks infer the success probabilities *Ph* and *Pl* of the approaching firms by observing performance and risk signals *'s'* during firm screening and negotiation (Ueda, 2004). The banks can perceive two types of signals: a signal s^h implying that the firms have a high success probability and a signal s^l implying a low success probability. The banks' ability to neutralize asymmetric information is captured by the probability of banks observing a 'perfect signal' in line with the firms' underlying success probability (Ueda, 2004). This implies that the banks observe a signal s^h for a high success probability firms and s^l for a low success probability firms. In contrast, the degree of asymmetric information in the model is reflected by the probability of banks observing a signal s^h (or s^l) when in reality the approaching firms have low success probability (or high success probability). These probabilities are shown in Equation 3.22 and 3.23 below.

$$Pr(s^h|P_h) = Pr(s^l|P_l) = \alpha \quad (3.22)$$

$$Pr(s^h|P_l) = Pr(s^l|P_h) = 1 - \alpha \text{where} \alpha \geq 0.5 \quad (3.23)$$

α reflects the extent to which the banks perceive the 'perfect signal' for the associated firms, while $1-\alpha$ represents the probability of the banks observing the 'imperfect signal'. In the presence of perfect information the value of α is 1. With complete information asymmetry, the value of $\alpha\ is$ 0.5. It is also assumed that prior to negotiations and screening, the banks do not possess any information about the firms and, hence, puts equal probabilities (0.5) of a high and low success probability (Ueda, 2004). Banks realise their inability to neutralize asymmetric information, and so calculate the conditional probabilities after observing signal 's' as shown by Equation 3.24 below.

$$Pr(P^h|s_h) = \frac{Pr(s^h|P_h)\Pr(P_h)}{Pr(s^h|P_h)\Pr(P_h) + Pr(s^h|P_l)\Pr(P_l)} = \frac{0.5\alpha}{0.5\alpha + 0.5(1-\alpha)} = \alpha \quad (3.24)$$

$$Pr(P^l|s_l) = \alpha, Pr(P^h|s_l) = Pr(P^l|s_h) = 1-\alpha \quad (3.25)$$

The information asymmetry captured by Equation 3.24 and 3.25 are incorporated next in the banks' participatory constraint.

3.4.2.1 Banks' IJV Participatory Constraint under Asymmetric Information:

The banks' participatory constraint changes in the presence of the asymmetric information as follows:

$$\alpha\,(P_h(\varphi r - f) - (1-P_h)f) + (1-\alpha)(\,P_l(\varphi r - f) - (1-P_l)f) \geq 0 \quad (3.26)$$

which reduces to

$$\varphi r \geq \frac{f}{\alpha P_h + (1-\alpha)\, P_l} \tag{3.27}$$

In a competitive market the Equation 3.27 has to be binding.[102] Putting the binding constraint back into the firms' payoff function yields the following:

$$\pi_h^{IJV} = P_h(\varphi - f) + f - \frac{P_h f}{\alpha P_h + (1-\alpha)\, P_l} \tag{3.28}$$

Since,

$$P_l \leq \alpha P_h + (1-\alpha)\, P_l \leq P_h \tag{3.29}$$

Hence,

$$\frac{P_h}{\alpha P_h + (1-\alpha)\, P_l} \geq 1^{103} \tag{3.30}$$

$$f - \frac{P_h f}{\alpha P_h + (1-\alpha)\, P_l} < 0 \tag{3.31}$$

Therefore,

$$P_h(\varphi - f) + f - \frac{P_h f}{\alpha P_h + (1-\alpha)\, P_l} < P_h(\varphi - f) \tag{3.32}$$

The right hand side in Equation 3.32 captures the debt financing profit for high success probability firms (given by Equation 3.5) while its left hand side shows the firms' IJV financing profit (given by Equation 3.28). Equation 3.32, therefore, implies that for firms with high success probability, their debt financing profit (given by Equation 3.5) will always be higher than the IJV payoff (given by Equation 3.28).

[102] Otherwise the payoff to the firm can be increased without violating the constraint.
[103] In the presence of asymmetric information $\alpha < 1$, therefore, the inequality will be strictly greater than one.

Similarly, the payoff for low success profitability firms can be shown to be as follows:

$$\pi_l^{IJV} = P_l(\varphi - f) + f - \frac{P_l f}{\alpha P_h + (1-\alpha)\, P_l} \tag{3.33}$$

$$f - \frac{P_l f}{\alpha P_h + (1-\alpha)\, P_l} > 0 \tag{3.34}$$

[104]

$$P_l(\varphi - f) + f - \frac{P_l f}{\alpha P_h + (1-\alpha)\, P_l} > P_l(\varphi - f) \tag{3.35}$$

The right hand side in Equation 3.35 captures the debt financing profit for low success probability firms (given by Equation 3.6) while its left hand side shows the firms' IJV financing profit (given by Equation 3.33). Equation 3.35, therefore, implies that the IJV financing profit for firms with low success probability will always be greater than their debt financing payoff (given by Equation 3.6). Since, the firms always prefer the financing mode that maximises their payoff. The proof above, therefore, shows that high success probability firms will always prefer debt over IJV while low success profitability firms will prefer IJV over debt. These results support the following Hypothesis H1b below.[105]

H1b: *In the presence of asymmetric information, firms with high (low) probability of success will prefer debt over IJV (IJV over debt).*

The impact of moral hazard on the firms' financing choice is discussed next.

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[104] Given $\alpha \geq 0.5$ the inequality will be strictly greater than zero.
[105] These results are consistent with Ross (1977) signaling hypothesis.

3.5 Moral Hazards in IJV:

The previous section investigated the impact of adverse selection in impeding the implementation of IJV financing in Islamic banks. This section focuses on the impact of moral hazard on the firms' choice of IJV financing. As argued in Section 2.2.5 in Chapter 2, banks use long-term relationships (Diamond, 1984, 1989; Boot, 2000; Bharath et al., 2009) and threat of punishment (see Merges, 1992; Landier, 2001; Ueda, 2004) to neutralize moral hazards. These two strategies are now incorporated into the model to test Hypothesis H1c that is: *"Where long-term relationships or threat of legal punishment exist, IJV banking can operate even in the presence of moral hazard"*. The section first provides an introduction to moral hazard in IJV financing. It then shows the impact of long term relationships followed by threat of legal punishment in Islamic banks' ability to neutralize moral hazard.

3.5.1 Introduction to Moral Hazard in IJV:

As argued in Section 2.2.7 in Chapter 2, moral hazard in IJV financing stems from ineffective monitoring resulting in excessive risk taking and misreporting profit (see Bacha, 1995, 1997; Khan, 1995; Iqbal et al., 1998; Warde, 2000). Excessive risk taking results from bank bearing part of the downward IJV risk. Profit misreporting, however, is an outcome of the banks' performance dependent return. If these risks are foreseen, banks can incorporate them in the negotiated profit ratio '*r*'. These moral hazard concerns, however, occur only after the financing contract has been negotiated. The following section incorporates firms' incentive to indulge in excessive risk taking behaviour in IJV and shows how Islamic banks' use of long-term relationships can neutralize it.

3.5.2 Long Term Relationships in IJV:

This section first explains excessive risk taking behaviour in the context of the above developed model and then introduces long-term relationships to test Islamic banks' ability to neutralize it.

3.5.2.1 Excessive Risk Taking:

The model captures excessive risk taking behaviour by assuming that banks do not monitor firms once their IJV financing is approved (see Gompers, 1995; Khan, 1995; Iqbal et al., 1998; Hellmann, 1998; Warde, 2000; Ahmed, 2001). This implies that firms with a high success probability (P_h), after negotiating a lower profit rate 'r' with the Islamic banks, can deviate from its strategy and implement a risky project with a low success probability (P_l).

For simplicity banks are assumed to have perfect information during the screening stage.[106] This means that banks can differentiate between firms with high and low success probability during negotiations for profit rate 'r'. If firms with a high success probability (P_h), negotiates an IJV contract and implements it truthfully, then their payoff would be given by Equation 3.36 below.

[106] This assumption is for simplicity only and does not change the outcome of the model.

$$\pi_h^{IJV} = P_h(\varphi - f) \tag{3.36}$$

If the firms instead decides to shirk after negotiating with the banks and undertake a risky project with low success probability (P_l), then the firms' payoff function would change to Equation 3.37 below. The banks' participatory constraint given by Equation 3.38, however, would not change.

$$\pi_l^{IJV} = P_l(\varphi - \varphi r) + (1 - P_l)f \tag{3.37}$$

The banks' participatory constraint: $P_h(\varphi r - f) - (1 - P_h)f \geq 0$ (3.38)

$$\varphi r \geq \frac{f}{P_h} \tag{3.39}$$

Putting the binding constraint given in Equation 3.39 into 3.37 gives the firms' equilibrium payoff given by Equation 3.40.

$$\pi_l^{IJV} = P_l(\varphi - f) + f - \frac{P_l f}{P_h} \tag{3.40}$$

The incentive to indulge in risk taking behaviour only occurs if the payoff from shirking (given by Equation 3.40) is higher than the payoff from the original less risky strategy as shown back in Equation 3.20. This is captured by Equation 3.41 below.

$$P_l(\varphi - f) + f - \frac{P_l f}{P_h} \geq P_h(\varphi - f) \tag{3.41}$$

$$P_l(\, P_h(\varphi - f) - f)] \geq \, P_h(\, P_h(\varphi - f) - f \tag{3.42}$$

Since $P_l < \, P_h$ Equation 3.42 above can only be true if Equation 3.43 below holds.

$$P_h(\varphi - f) - f \leq 0, \tag{3.43}$$

Equation 3.43 above can be simplified to Equation 3.44 and 3.45 below.

$$P_h \leq \frac{f}{(\varphi - f)} \tag{3.44}$$

$$\varphi \leq f(1 + \frac{1}{P_h}) \tag{3.45}$$

Equations 3.44 and 3.45 illustrate the conditions under which the firms with high success probability might implement the risky strategy. Equation 3.44 provides the success probability threshold while Equation 3.45 gives the revenue (φ) limit, below which firms will have an incentive to deviate and take excessive risk. The next section incorporates long-term relationships in the model to see if they can neutralize the excessive risk taking behaviour discussed in this section. This enables partial testing of Hypothesis H1c.

3.5.2.2 Long-term Relationships:

This section discusses the impact of long-term relationships in controlling unforseen risk taking behaviour by the firms. As discussed in Section 2.2.5Chapter 2, long-term IJV relationships may allow Islamic banks to address excessive risk taking behaviour in a particular period by terminating the contract in subsequent periods (see Diamond, 1984, 1989; Khan, 1995; Iqbal et al., 1998; Warde, 2000; Boot, 2000; Bharath et al., 2007). This assumption is incorporated into the perfect information IJV model discussed in Section 3.3 to test Hypothesis H1c.

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The perfect information model presented in Section 3.3 is a static one period model. To incorporate long-term relationships, the model first has to be modified into multi-periods. This is achieved by assuming that instead of providing all the funding at the start, the banks spread it over multiple periods. The model assumes that the banks will terminate subsequent funding if the firms shirk from the negotiated strategy or performs poorly in the previous period. Therefore, should the firms implement the low success probability (*Pl*) strategy rather than the high success probability (*Ph*) negotiated strategy, the contract will be terminated. Moreover, if the firms perform poorly and fail with probability (*1-Ph*) in the previous period, the banks refuse funding in subsequent periods.

From the firms' perspective, the decision to deviate from the original strategy in the multi-period model (other than depending on Equation 3.44 and Equation 3.45) depends on their loss from having to shut down because of no bank funding.[107] If the firms' profit incentive from shirking is lower than their expected multi-period profit then firms would lack the incentive to shirk. This would support Hypothesis H1c suggesting that in the presence of long-term relationships excessive risk taking behaviour can be neutralized.

[107] For simplicity it is assumed that banks are the only available source of financing for the firms. This is not an unrealistic assumption for if the firms cheat, their reputational loss might deter other financial institutions from lending to them.

If high success probability firms implements the negotiated strategy in each period, they earns the expected profit in Equation 3.46.

$$\pi_h^{IJV} = P_h(\varphi - f), \tag{3.46}$$

If the firms follow the negotiated high success probability strategy, their expected profit in 'n' periods is represented by Equation 3.47 below[108] (For simplicity the discount rate R is assumed to be zero).

$$\pi_h^{IJV} = P_h(\varphi - f) + {P_h}^2(\varphi - f) + {P_h}^3(\varphi - f) + \ldots\ldots\ldots\ldots + {P_h}^n(\varphi - f) \tag{3.47}$$

Assuming an infinite horizon, Equation 3.47 can be reduced to Equation 3.48 below.

$$\lim_{n\to\infty} \pi_h^{mm} = \frac{P_h(\varphi - f)}{1 - P_h} \tag{3.48}$$

In each period, firms face this choice of earning an expected perpetual profit[109] given by Equation 3.48 against the one time profit from deviating to the risky strategy given in Equation 3.40. For the firms to cheat, Equation 3.49 below has to hold true.

$$P_l(\varphi - f) + f - \frac{P_l f}{P_h} \geq \frac{P_h(\varphi - f)}{1 - P_h} \tag{3.49}$$

[108] The expected profit also incorporates the assumption that the banks would terminate finding if the firm fails with probability (1-P) in the previous period.
[109] The results can also be reduced to a finite period.

The above equation can be reduced to the following:

$$P_l < \frac{P_h}{1 - P_h} + \frac{{P_h}^2 f}{(1 - P_h)(P_h(\varphi - f) - f)} \tag{3.50}$$

Equation 3.50 above can be reduced to Equation 3.51 below.

$$P_l(P_h(\varphi - f) - f) > \frac{{P_h}^2(\varphi - f) - P_h f}{1 - P_h} + \frac{{P_h}^2 f}{1 - P_h} \tag{3.51}$$

Given $P_h(\varphi - f) - f < 0$ (3.52)

$$P_l < \frac{P_h(P_h(\varphi - f) - f}{(1 - P_h)(P_h(\varphi - f) - f)} + \frac{{P_h}^2 f}{(1 - P_h)} \tag{3.53}$$

Solving the above equation yields the following:

$$P_l < \frac{P_h}{1 - P_h}[1 - \frac{P_h f}{\left(f - P_h(\varphi - f)\right)}] \tag{3.54}$$

If it can be shown that $P_h f > f - P_h(\varphi - f)$, then there will be no value of $P_l > 0$ for which the above Equation 3.54 holds. The proof of it is given below.

$$P_h f > f - P_h(\varphi - f) \tag{3.55}$$

$$f - P_h \varphi < 0 \tag{3.56}$$

$$P_h \varphi > f \tag{3.57}$$

Equation 3.57 contradicts the conditions given in Equation 3.44 and 3.45, under which firms will have an incentive to implement the risky strategy. This proves that there will be no values of $P_l > 0$ for which the firms will have an incentive to cheat. These results support part of the Hypothesis H1c suggesting that in the presence of long-term relationships firms will have no incentive to indulge in excessive risk taking. To test Hypothesis H1c fully the impact of legal punishment in neutralizing the firms' incentive to misreports IJV profit will be analysed next.

3.5.3 Legal Punishment and Misreporting:

The previous section showed that the presence of long-term relationships enable to neutralize moral hazard concerns arising from excessive risk taking behaviour. This section analyses the impact of legal punishment in neutralizing other moral hazard concerns such as misreporting (see Merges, 1992; Khan, 1995; Iqbal et al., 1998; Warde, 2000; Landier, 2001).

3.5.3.1 Misreporting

The model assumes that after the initial profit rate has been negotiated, the firms can choose to report profit to the banks by factor θ. Misreporting (lower θ) would reduce the IJV profit that would have to be shared with the banks. For simplicity it is assumed that the adverse selection problem does not exist and the banks have perfect information about the nature of firms' success probability during initial negotiations. In such a setting the firms' profit function would change, while the banks' participatory constraint would not change.[110] Equation 3.58 below provides the

[110] The participatory constraint would have changed if this risk was foreseen by the banks.

firms' expected profit equation in the presence of misreporting factor θ. The banks' participatory constraint is given by Equation 3.59.

$$\pi_h^{IJV} = P_h(\varphi - \theta\varphi r) + (1 - P_h)f \tag{3.58}$$

Banks' participation constraint:

$$P_h(\varphi r - f) - (1 - P_h)f \geq 0 \tag{3.59}$$

Equations 3.58 and 3.59 above can be solved to yield the following:

$$\pi_h^{IJV} = P_h(\varphi - f) + f - \theta f \tag{3.60}$$

Equation 3.60 above suggests that the firms' expected equilibrium profit increases with the increase in the misreporting (a decrease in θ). Therefore, the firms will always have an incentive to misreport profit. The sub-section below shows how the threat of punishment can neutralize misreporting concerns.

3.5.3.2 Threat of Punishment:

The model assumes that the probability of firms' misreporting going unnoticed isP_s. Moreover, If the firms are caught, with probability (1- P_s), they will be fined a lump sum amount 'A'. In such a setting, the firms will have an incentive to cheat if the expected profit from cheating is greater than their profit otherwise. This is captured by Equation 3.61 below.

$$P_s(P_h(\varphi - f) + f - \theta f) - (1 - P_s)(A)) > P_h(\varphi - f) \quad (3.61)$$

$$P_s(P_h(\varphi - f) + f - \theta f) + A) > A + P_h(\varphi - f) \quad (3.62)$$

$$P_s > \frac{A + P_h(\varphi - f)}{(P_h(\varphi - f) + f - \theta f) + A)} \quad (3.63)$$

The inequality 3.63 above shows the firms' incentive to misreport profit is an outcome of their probability of not getting caught. Therefore, countries where the legal system is proficient in catching defrauding firms and punishing them severely, Equations 3.63 above would not hold true. This would neutralize moral hazard concern arising from misreporting. The proof completes the testing of the following Hypothesis H1c.

H1c: *Where long-term relationships or threat of punishment exist, IJV banking can operate even in the presence of moral hazard.*

3.6 Model with Risk Averse Utility:

The proofs for the Hypotheses H1a, H1b and H1c above suggest that adverse selection rather than moral hazard is the biggest impediment in the implementation of Islamic bank's IJV financing. However, as argued in Chapter 1 if profits are sufficiently large, Islamic banks can seek to specialize in VC type screening to offer IJV financing. This, however, does not appear to have happened. Chapter 2 Section 2.2.8 argued that the presence of risk averse bank customers on the Islamic banks' liability side could explain the banks' disincentive for using IJV screening methods. This section, therefore, augments the asymmetric information model with the risk averse utility function of Islamic bank customers to test H1d: *“In the presence of risk averse Islamic bank customers, firms would prefer debt over IJV”*.

The proof presented in this section explores the impact of bank customers’ risk averse utility function on the firms’ IJV and debt financing equilibrium profits. On the Islamic banks’ liability side if the bank customers invest in IJV financing accounts, their return will be uncertain with high risk of losing their principal (Bacha, 1995, 1997; Khan, 1995; Iqbal et al., 1998; Warde,2000). Hence, they will have to be paid a premium to be induced into investing in these accounts.

In line with Leland and Pyle (1973), the degree of risk aversion can be captured by assigning bank customers a Van-Newman type utility function with the following property:

$$EU(\varphi r) = U(E(\varphi r) - \frac{1}{2}\rho\sigma^2) \tag{3.64}$$

Where ρ is the degree of risk aversion. σ^2 is the variance in the depositor’s earnings. Assume for simplicity that the value of σ^2 is exogenous and is determined using historical data (see Leland and Pyle, 1973).

The model borrows all the assumptions from asymmetric information IJV model of Section 3.4. In such a setting, if the bank customers invest in an IJV financing account, their expected utility is given by Equation 3.65 below. In contrast, if the account holders invest in a debt financing account with certain returns their utility is given by Equation 3.66.

$$EU(\varphi r) = U(\ \alpha\ P_h \varphi r + (1-\alpha)\ P_l \varphi r - \frac{1}{2}\rho\sigma^2) \tag{3.65}$$

$$U\big((1+R)F\big) = U(f) \tag{3.66}$$

For the depositors to prefer the IJV financing account, the IJV financing utility given in Equation 3.65 should be greater than their debt financing utility given in Equation 3.66. This is captured by Equation 3.67 below.

$$U\left(\ \alpha\ P_h \varphi r + (1-\alpha)\ P_l \varphi r - \frac{1}{2}\rho\sigma^2\right) \geq U(\ f) \tag{3.67}$$

Assuming that standard utility function assumptions such as, “more is preferred to less” and transitivity hold, the above can be reduced to the following.

$$\alpha\ P_h \varphi r + (1-\alpha)\ P_l \varphi r - \frac{1}{2}\rho\sigma^2 \geq\ f \tag{3.68}$$

Since Equation 3.68 should be binding the following Equation 3.69 should hold.

$$\varphi r = \frac{f + \frac{1}{2}\rho\sigma^2}{\alpha P_h + (1-\alpha)\ P_l} \tag{3.69}$$

In the presence of Equation 3.68, the banks participatory constraint should automatically hold true. Substituting Equation 3.69 in the firms' profit function gives the following equilibrium payoffs.

$$\pi_h^{IJV} = P_h(\varphi - f) + f - \frac{P_h(f + \frac{1}{2}\rho\sigma^2)}{\alpha P_h + (1-\alpha)\, P_l} \tag{3.70}$$

$$\pi_l^{IJV} = P_l(\varphi - f) + f - \frac{P_l(f + \frac{1}{2}\rho\sigma^2)}{\alpha P_h + (1-\alpha)\, P_l} \tag{3.71}$$

It can be shown that in the presence of Equation 3.72 below, Equation 3.73 will hold true.

$$\frac{P_h}{\alpha P_h + (1-\alpha)\, P_l} \geq 1 \tag{3.72}$$

$$f - \frac{P_h(f + \frac{1}{2}\rho\sigma^2)}{\alpha P_h + (1-\alpha)\, P_l} < 0 \tag{3.73}$$

$$P_h(\varphi - f) + f - \frac{P_h(f + \frac{1}{2}\rho\sigma^2)}{\alpha P_h + (1-\alpha)\, P_l} < P_h(\varphi - f) \tag{3.74}$$

The right hand side in Equation 3.74 captures the debt financing profit for high success probability firms (given by Equation 3.5) while its left hand side shows the firms' IJV financing profit (given by Equation 3.70). Equation 3.74, therefore, suggests that the equilibrium payoff for a high success probability IJV financing firms in the presence of risk averse Islamic bank customers will always be less than that of their debt financing payoff. This implies that high success probability firms should always prefer debt to IJV financing. The outcome for firms with low success probability, however, given by Equation 3.71 is ambiguous. Analysing Equation 3.71 suggest that the profit incentive for low success probability IJV financing firms erodes with an increase in bank customers risk aversion ρ. This implies that in the presence of highly risk averse bank customers even firms with low success profitability should prefer debt to IJV financing. The proof, therefore, supports the following Hypothesis H1d.

H1d: *In the presence of risk averse Islamic bank customers, firms should prefer debt over IJV.*

3.7 Conclusion:

This section presents a summary of the results and discusses their implications for answering Research Question 1, that is, "*Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?*"

Chapter two developed four hypotheses to test if adverse selection, moral hazard and risk averse depositors could explain the lack of IJV financing by Islamic banks. This chapter presented a firm focused model to test these hypotheses. In the model developed here the role of the Islamic banks was to act as a financial intermediary offering both IJV and debt financing as long as its participation constraints are satisfied. This leaves the decision of financing choice with the firms. The firms, however, should choose the financing mode that maximizes their payoff. This implies that if firms' IJV financing profits are lower than their debt financing profits, they should have little incentive to adopt IJV resulting in domination of debt financing on the asset side of Islamic banks.

The first three Hypotheses H1a, H1b, H1c tested the difference between IJV and debt financing firms' profits under conditions of perfect information, adverse selection and moral hazard. Hypothesis H1a focused on the impact of firms' financing choice under conditions of perfect information. The presented results (proof) supported the hypothesis suggesting that under perfect information firms should be indifferent between IJV and debt financing. This implies that debt would not dominate IJV in Islamic banks under perfect information. The impact of adverse selection resulting from asymmetric information on the firms' payoff was tested by Hypotheses H2a. The results also supported the hypothesis implying that in the presence of adverse selection firms with high success probability would prefer debt to IJV while low success probability firms would prefer IJV to debt. This corroborates the assertion that Islamic banks' failure to neutralize adverse selection can severely deter the implementation of IJV financing. Hypotheses H1c captured the impact of moral hazard on firms' payoff. The results supported the Hypothesis H1c giving further weight to the view that adverse selection is the primary concern for the lack of IJV financing as moral hazards can be neutralized by long-term relationships and threat of punishment.

It was also argued in Chapter 1 that asymmetric information alone cannot explain the lack of IJV financing as it does not elucidate why Islamic banks do not specialize in VC type screening to neutralize adverse selection. It was suggested in Chapter 2, however, that the presence of risk averse bank customers (account holders) could explain this discrepancy. Hypothesis H1d, therefore, was developed to test the impact of risk averse bank customers on firms' financing payoffs. The proof presented in this chapter supported the Hypothesis H1d suggesting that the presence of risk averse bank customers further exhaust the financing firms' profit incentive. This in turn refrains Islamic banks from using VC type screening. The results also accentuate the importance of VCs raising funds from institutional investor with long term commitment in their ability to offer joint venture type products.

In summary, the answer to RQ1 is 'yes', the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks. Chapter 4 next presents the methodology and results for Research Question 2.

CHAPTER 4: CREDIT RISK IN ISLAMIC BONDS: METHODOLOGY AND RESULTS FOR RQ2 (IJV BONDS)

4.1 Introduction:

This chapter focuses on the credit risk modelling of IJV bonds, the methodology used for testing Hypotheses H2a and H2b and the results associated with Research Question 2, that is *"Can conventional credit risk models be used to assess the risk in Islamic bonds?"* The methodology for developing these IJV extensions of Merton (1974), first passage and CreditGrades models is discussed in Section 4.2. Section 4.3 then presents survival probability simulations results from these models and their IJV extensions to test Hypotheses H2a. Real data, as described in Section 4.4, is then employed in the same models to check the robustness of results for Hypothesis H2a as well as to test Hypothesis H2b. Section 4.5 discusses the methodology while the results are presented in Section 4.6. The chapter ends with Section 4.7 and a summary of the discussion.

4.2 Methodology for Developing IJV Extensions:

This section discusses the methodology for developing the IJV extension of the structural models.[111] The credit risk nature of IJV bonds is analysed first followed by an investigation of their market value. Their unique features are then incorporated in the Merton (1974), first passage and CreditGrades model respectively to develop the IJV extensions.

4.2.1 Credit Risk Nature of IJV Bonds:

Credit risk models are built to capture conventional bonds' probability of default (or survival). Typically, their default occurs when the issuer is unable to pay the principal or interest (see Duffie & Singleton, 2003). As discussed in Section 1.2.4, however, IJV bonds, like ordinary shares, represent ownership in the venture and do not guarantee the principal. Moreover, at maturity the bond holder receives the market value of IJV bonds which can be greater or less than the principal. A traditional default instigating event, therefore, does not exist in IJV bonds.

In the absence of IJV default, the only way to develop the structural model's IJV extensions is to assume (rather inappropriately) that IJV bond holders are only concerned about the safe keeping of their principal. Moreover, they would dissolve the venture and receive the market value of their ownership on the fear of loss. The problem with this assumption, however, is that it ignores the high positive returns the IJV bonds may generate, hence, creating a bias. As discussed in Chapter 2 Section 2.3.3.1, a principal focused IJV extension, can be developed just by incorporating the

[111]"Structural Models" always refer to Merton (1974), First passage and CreditGrades models.

uncertainty in the IJV redemption (or market) value in the original structural model's default boundary. The determinants of an IJV bonds' market value are discussed next.

4.2.2 IJV Market Value:

IJV bonds have a number of features common with equity, particularly in the profit and loss sharing with the shareholders (see Section 1.2.4 in Chapter 1). Arbitrage should, therefore, ensure a relationship between the market value of IJV bond (M_t) and stock price (S_t). This is captured by Equation 4.1 below.

$$M_t = f(S_t) \tag{4.1}$$

This relationship between IJV market value and stock price could depend upon several factors including IJV bonds partial ownership, their lack of shareholder privileges and the bond's liquidity in the secondary markets (see Chapter 1 Section 1.2.4). The partial ownership implies that if used to finance individual projects, the IJV bond ownership would be limited to that project only. In contrast, ordinary shares represent full ownership of the firm. Their pricing relationship, therefore, would depend on the proportional IJV project value compared to the total value of the business. Lack of shareholders' privileges available to IJV bonds holders such as voting rights might also result in a price discount compared to the voting shares. Finally, IJV bond liquidity in the secondary market may also affect arbitrage opportunities between IJV and stock prices. A highly illiquid IJV bond market could result in a higher IJV discount compared to the firm's stock price. This illiquidity effect is a function of term to maturity and should dissipate completely at maturity when the issuer promises to redeem these bonds at their market value. The differences discussed here are captured in the IJV and stock price relationship shown in Equation 4.2 below.

$$M_t = \gamma e^{-a(T-t)} S_t \tag{4.2}$$

Here γ represents factors such as the partial ownership of IJV bond holders and the differences in share privileges, while 'a' measures factors such as the liquidity of the bond market. Bonds that are perfectly liquid 'a' will be assigned a value of zero, while higher values reflect increasing illiquidity. Equation 4.2 shows that illiquidity effect dissipates as the bond approaches maturity and is neutralised at maturity date 'T'. The next section incorporates the IJV credit risk and market value features into the Merton (1974) model to develop its IJV extension.

4.2.3 Merton Model and IJV Extension:

In the Merton (1974) model with certain recovery rate, default occurs should the outstanding debt exceed the firm's value at maturity. Equation 4.4 gives the probability of survival generated by the model[112] (refer to Section 2.3.2 Chapter 2 for more details).

$$P(V_T > D) \tag{4.3}$$

[112]A detailed discussion of the variables is given in Appendix B.

$$P(Z) > \left(\frac{\log\left(\frac{D}{V_T}\right) - \left(\alpha - \frac{1}{2}{\sigma_v}^2\right)(T-t)}{\sigma\sqrt{T-t}}\right) \tag{4.4}$$

$$\sigma_v = \sigma_s \frac{S}{S+D} \tag{4.5}$$

The IJV extension of Merton (1974) model incorporates the assumption that IJV bond holders would receive the market value of their bonds rather than the principal at maturity. The IJV extension, therefore, captures the probability of this IJV's market value at maturity being greater than its issuance value and is represented by Equation 4.6 below.

$$P(M_T > M_t) \tag{4.6}$$

Here M_t is the market value of IJV bonds at period't'. As discussed in Section 4.2.2 above, the no-arbitrage condition[113] ensure that the IJV bonds market value should be a function of the stock price as represented by Equation 4.2. Substituting Equation 4.2 in Equation 4.6 leads to Equation 4.7. This can be solved to generate the survival probability of Merton (1974) model's IJV extension as shown in Equation 4.8.

$$P\left(S_T > \frac{M_t}{\gamma}\right) \tag{4.7}$$

$$P(Z) > \left(\frac{\log\left(\frac{M_t}{\gamma S_t}\right) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}\right) \tag{4.8}$$

The next section develops the IJV extension of the first passage model.

[113] No arbitrage condition means that the all opportunities for arbitrage have been exhausted.

4.2.4 First Passage Model and IJV Extension:

In a first passage model, default can occur any time during bond maturity. Equation 4.9 below gives the survival probability for the first passage model (refer to Section 2.3.3 Chapter 2 for more details on the model).

$$P(Y_s > y, \forall s < t) = N\left(\frac{\left(\alpha - \frac{1}{2}{\sigma_v}^2\right)t - \log(\frac{LD}{V_t})}{\sigma_v\sqrt{t}}\right) - e^{\frac{2\left(\alpha-\frac{1}{2}{\sigma_v}^2\right)\log\left(\frac{LD}{V_t}\right)}{{\sigma_v}^2}} N\left(\frac{\left(\alpha - \frac{1}{2}{\sigma_v}^2\right)t + \log(\frac{LD}{V_t})}{\sigma_v\sqrt{t}}\right) \quad (4.9)$$

The IJV extension of the first passage model has the so called "default" occur when the IJV bond's market value falls below its issue value at any time during the life of the bond. This is captured by Equations (4.10) and (4.11) below.

$$P(M_t > M_0) \quad (4.10)$$

$$P\left(S_t > \frac{M_o}{\gamma e^{-a(T-t)}}\right) \quad (4.11)$$

For simplicity assume that $\theta = \frac{1}{\gamma e^{-a(T-t)}}$ (4.12)

It is also assumed that on default the illiquidity premium disappears, hence, T-t = 0 and $\theta = \frac{1}{\gamma}$.[114] Equation 4.11 above can be solved to generate the survival probability of the of the first passage IJV extension model as shown by Equation 4.13.

[114] It is for simplicity only and does not change the outcomes of the results.

$$P(Y_s > y, \forall s < t) \tag{4.13}$$
$$= N\left(\frac{\left(\alpha - \frac{1}{2}\sigma^2\right)t - \log\left(\frac{\theta M_0}{S_0}\right)}{\sigma\sqrt{t}}\right)$$
$$- e^{\frac{2\left(\alpha - \frac{1}{2}\sigma^2\right)\log\left(\frac{\theta M_0}{S_0}\right)}{\sigma^2}} N\left(\frac{\left(\alpha - \frac{1}{2}\sigma^2\right)t + \log\left(\frac{\theta M_0}{S_0}\right)}{\sigma\sqrt{t}}\right)$$

The IJV extension of the CreditGrades model is developed next.

4.2.5 CreditGrades Model and IJV Extension:

One of the distinguishing features of the CreditGrades model is how it captured the uncertainty in the recovery rate and hence the default boundary (Finger et al., 2002). Equation 4.17 below shows the CreditGrades survival probability (see Section 2.3.4 Chapter 2 for more details).

$$\bar{L} = \boldsymbol{E}L \tag{4.14}$$

$$\lambda^2 = Var\ log(L) \tag{4.15}$$

$$LD = \bar{L}De^{\lambda Z - \frac{\lambda^2}{2}} \tag{4.16}$$

$$P(t) = \phi\left(-\frac{A_t}{2} + \frac{log\ d}{A_t}\right) - d\ .\phi\left(-\frac{A_t}{2} - \frac{log\ d}{A_t}\right) \tag{4.17}$$

$$d = \frac{V_0 e^{\lambda^2}}{\bar{L}D} \tag{4.18}$$

$$A_t^2 = \sigma^2 t + \lambda^2 \tag{4.19}$$

Its related CreditGrades IJV extension incorporates the assumption of uncertainty in the recovery rate by assuming that the amount IJV bond holders receive upon default (when the venture gets dissolved) can differ from market price given by Equation

4.2. In the IJV framework this uncertainty could be due to financial distress cost such as litigation or price discounts during the sale of illiquid real assets. The Equations 4.20 and 4.25 below capture the survival probability of CreditGrades IJV extension.

$$P(M_t > LM_0) \tag{4.20}$$

$$\overline{L} = \boldsymbol{E}L \tag{4.21}$$

$$\lambda^2 = \mathrm{Var}\log(L) \tag{4.22}$$

$$LM_0 = \overline{L}M_0 e^{\lambda Z - \frac{\lambda^2}{2}} \tag{4.23}$$

$$P(S_t > \theta LM_o) \tag{4.24}$$

$$P(t) = \phi\left(-\frac{A_t}{2} + \frac{log\, d}{A_t}\right) - d\,.\phi\left(-\frac{A_t}{2} - \frac{log\, d}{A_t}\right) \tag{4.25}$$

$$d = \frac{V_o e^{\lambda^2}}{\overline{L}\theta M_o} \tag{4.26}$$

$$A_t^2 = \sigma^2 t + \lambda^2 \tag{4.27}$$

For all the simulated models, survival probabilities are generated against term to maturity and stock volatility. In the standard cases the firms are assumed to have low debt ratio while operating in a highly liquid IJV bond market (with a low value of a = 0.01). Robustness of survival probability results, however, to changes in debt ratio, equity ratio, *a,* are checked and presented in Appendix C. The simulation results are presented next.

4.3 Survival Probability Simulation Results:

This section reports on the survival probability simulation results for Merton (1974), first passage and CreditGrades models along with their IJV extension. These results enables testing of Hypothesis H2a*: "Structural models IJV extensions generate significantly lower survival probabilities than the original models"*.

4.3.1 Simulation Results for Merton Model and its IJV Extenstion:

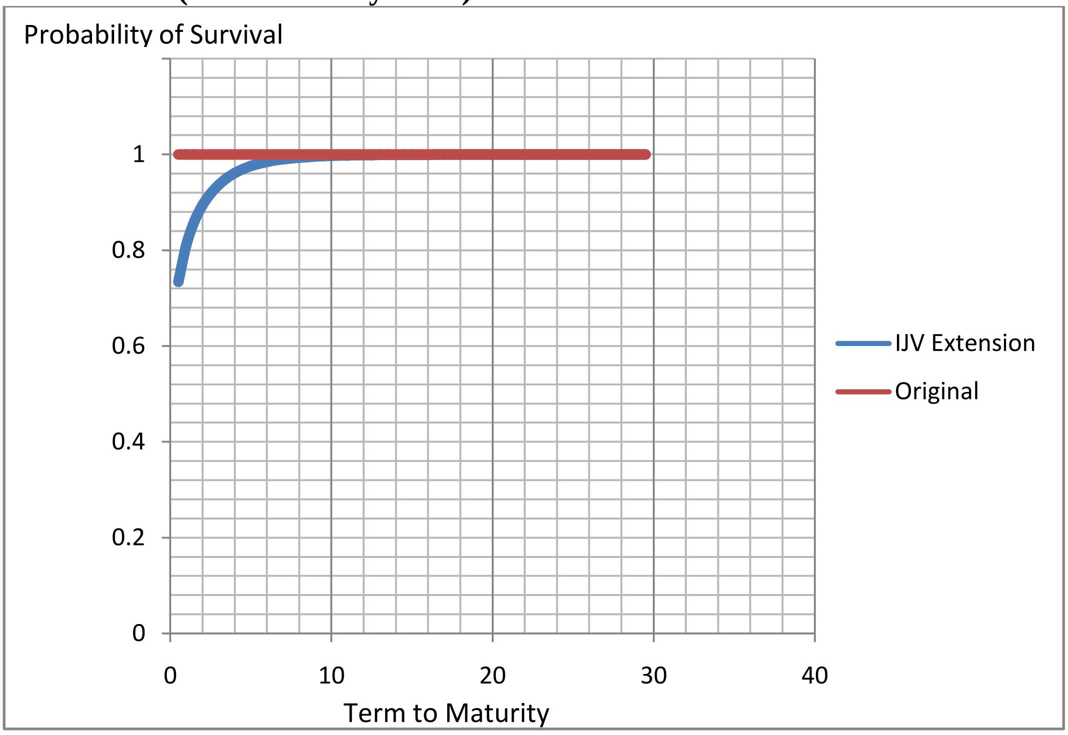
Survival probability results for Merton (1974) model and its IJV extension are presented hereand reflect changes in term to maturity followed by that of stock volatility.[115]

4.3.1.1 Term to Maturity(Merton Model):

The simulation results for the survival probability generated against term to maturity are presented in Figures 4.1 and 4.2. Figure 4.1 presents a standard case for a firm with low stock volatility $(\sigma = 0.3)$ and Figure 4.2 for a firm with high stock volatility $(\sigma = 0.5)$.

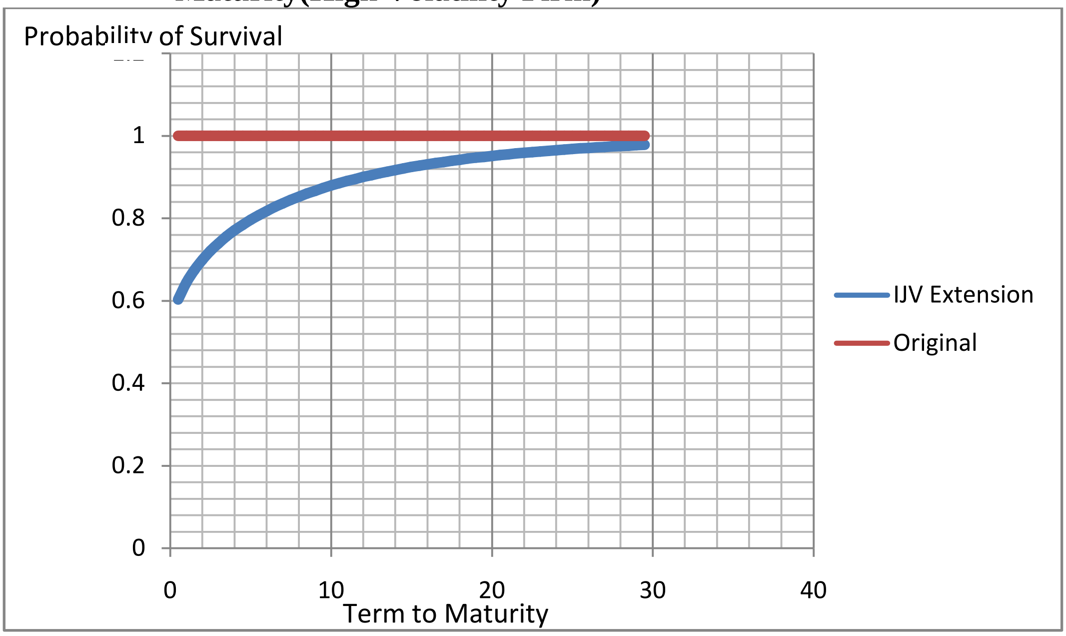
[115] Appendix C shows that results presented here are robust to changes in other variables in the model.

Figure 4.1: Merton Model: Survival Probability Against Term to Maturity (Low Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; \sigma = 0.3 \;\; \alpha = 0.3 \;\; \gamma = 1 \;\; a = 0.01$

Figure 4.2: Merton Model: Survival Probability Against Term to Maturity(High Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; \sigma = 0.5 \;\; \alpha = 0.3 \;\; \gamma = 1 \;\; a = 0.01$

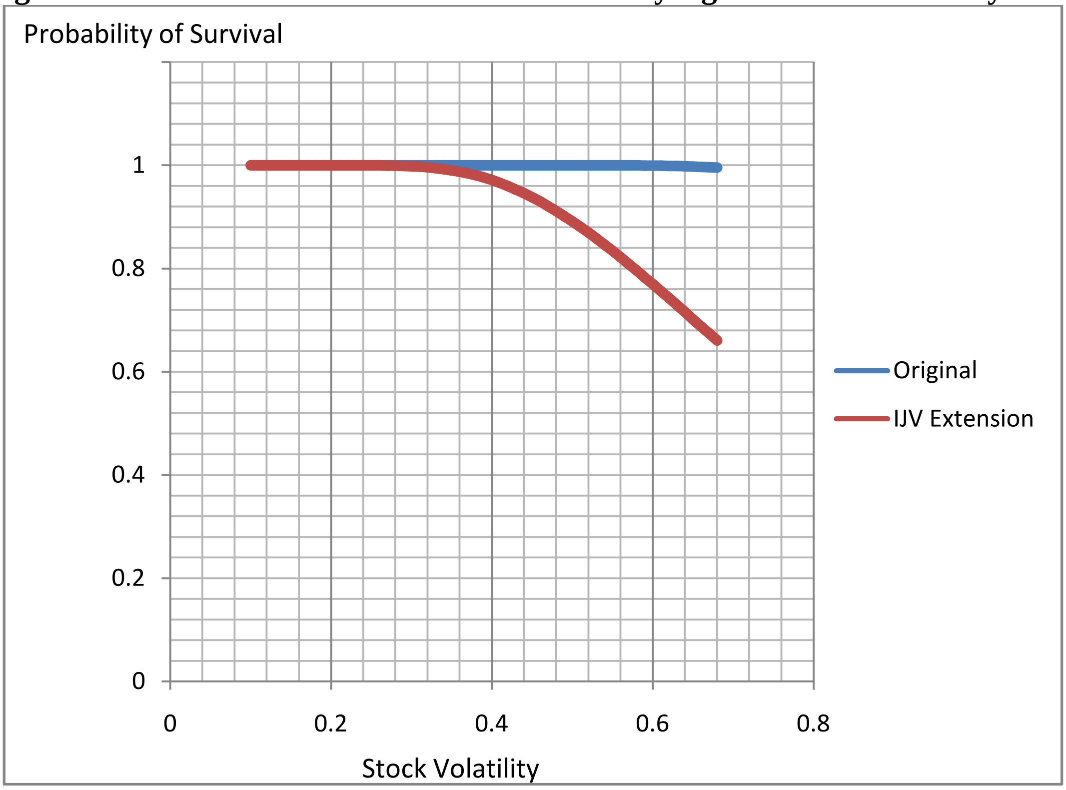
The results for the Merton (1974) model shown in Figures 4.1 and 4.2 above suggest that firms with low debt are likely to have almost perfect survival probability, irrespective of their term to maturity. The IJV extension results, however, indicate that if a firm with similar characteristics issues an IJV bond it will experience a relatively low survival probability.[116] This difference between the two models' survival probabilites disappear as the bond's term to maturity increases. For firms with low stock volatility the convergence is achieved at terms to maturity of around 10 years (see Figure 4.1). In contrast, for a firm with high stock volatility, the convergence is only acheived at bond maturities in excess of 30 years. As discussed in Chapter 2, this discrepency could be attributed to IJV bonds having a strong equity link. The stock volatility impact is greater in the short-term but smooths out with an increase in IJV bond maturity. The results suggest that low stock volatility accentuates the term to maturity impact on survival probability. The next section examines the impact of stock volatility on survival probability, holding terms to maturity constant.

[116] In the IJV case it is the probability of repayment of the principal.

4.3.1.2 Stock Volatility (Merton Model):

The survival probability results generated against changes in stock volatility for a ten year bond are shown in Figure 4.3 below.

Figure 4.3: Merton Model: Survival Probability Against Stock Volatility



$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \alpha = 0.3 \;\; \gamma = 1 \;\; a = 0.01$

This indicates that the survival probability generated by the original Merton (1974) model for a firm with low debt remains unchanged with increased stock volatility. In contrast, the IJV extension suggests that the survival probability for IJV bonds decreases considerably with an increase in stock volatility. The results presented in Figure 4.1, 4.2 and 4.3 above support the Hypothesis H2a for the Merton Model, suggesting that its IJV extension generates significantly lower survival probabilities than the original model. The next section analyses the results for the first passage model and its IJV extension.[117]

4.3.2 Simulations Results for First Passage Model and its IJV Extenstion:

The survival probability results for the first-passage model and its IJV extension generated against term to maturity and stock volatility are presented in this section.[118]

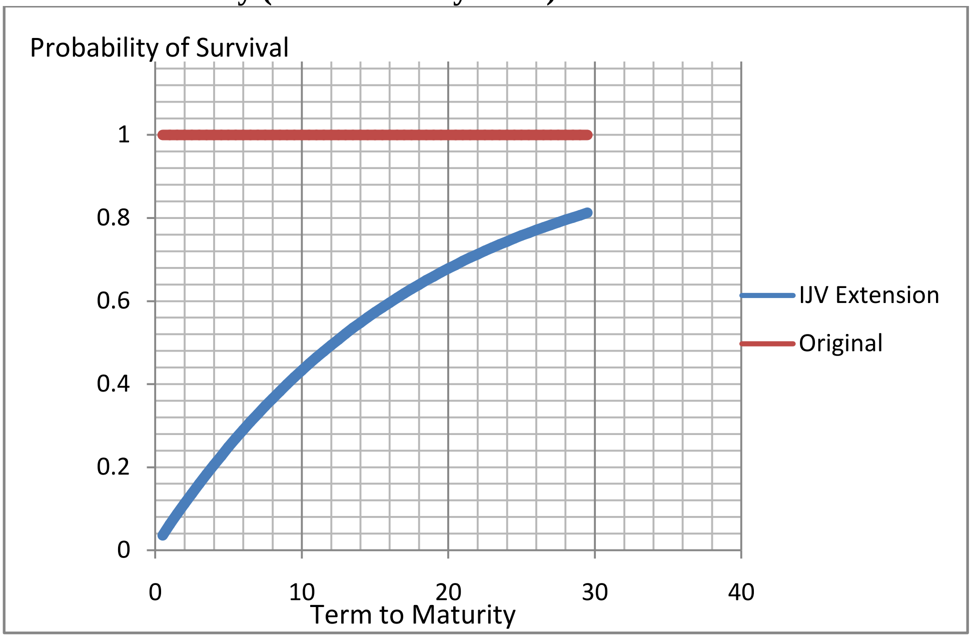
4.3.2.1 Term to Maturity (First Passage Model):

The results for a firm with low stock volatility ($\sigma = 0.3$) are given in Figure 4.4 below. Figure 4.5 provides the results for a firm with a high volatility stock.

[117] The results presented here are robust to changes in debt ratio, equity ratio and a as shown in Appendix C.

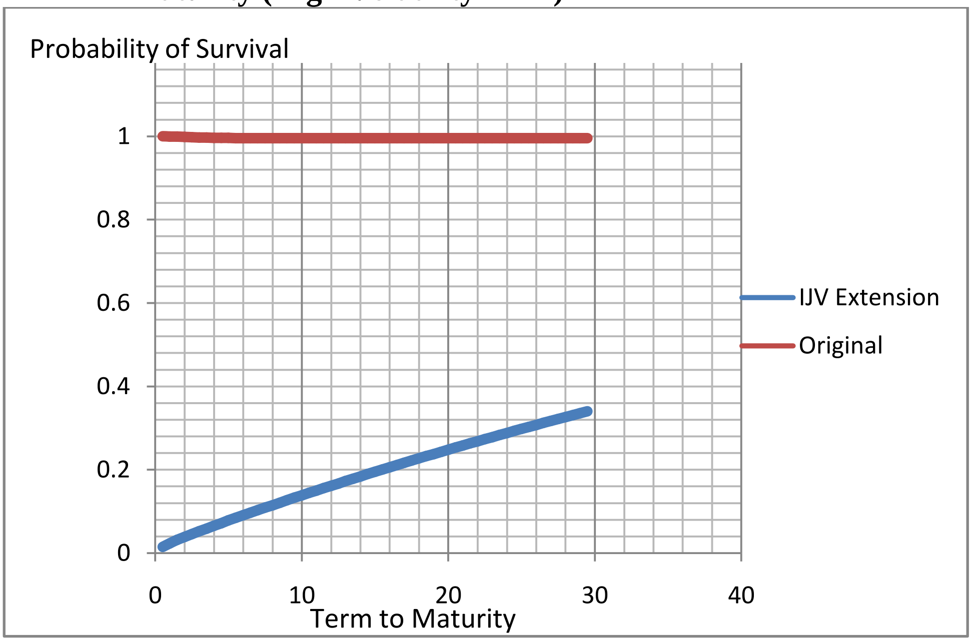
[118] Appendix C shows that results presented here are robust to changes in other variables in the model.

Figure 4.4: First Passage Model: Survival Probability Against Term to Maturity (Low Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; \sigma = 0.3 \;\; \alpha = 0.3 \;\; a = 0.01$

Figure 4.5: First Passage Model: Survival Probability Against Term to Maturity (High Volatility Firm)



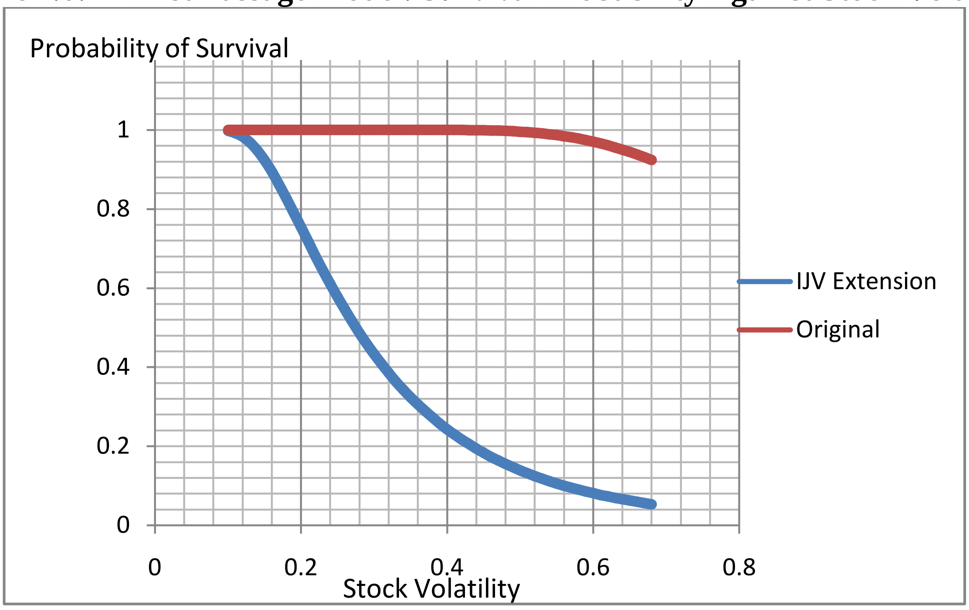
$S = 1 \;\; D = 0.75 \;\; \sigma = 0.5 \;\; \alpha = 0.3 \;\; a = 0.01$

The simulation results depicted in Figures 4.4 and 4.5 show that the original first passage model attributes high survival probability to firms with low debt, irrespective of the bond's term to maturity. In contrast, their IJV extension assigns significantly lower firm's survival probabilities. Unlike the Merton (1974) model, the difference between the survival probabilites of the original first passage model and its extension remains considerable even for bonds with maturity in excess of 30 years. This implies that the affect of stock-volatility in the model has not smoothed out overtime and so survival probabilities have not converged. The results for impact of stock volatility on survival probability is dicussed next.

4.3.2.2 Stock Volatility (First Passage Model):

Figure 4.6 below shows the results for bonds with a high stock drift ($\alpha = 0.3$)

Figure 4.6: First Passage Model: Survival Probability Against Stock Volatility



$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \alpha = 0.3 \;\; a = 0.01$

Figure 4.6 indicates that survival probability generated by the original first passage model decreases only slightly at very high levels of stock volatility. The result for their IJV extension, however, suggests that survival probability decreases considerably with increases in stock volatility. Figure 4.6 also indicates that convergence in survival probabilities between the original model and its extension is only achieved at very low levels (around 0.1) of stock volatility. Moreover, with increasing stock volatility their survival probability diverges. The results presented here support the Hypotheses H2a suggesting that there is a considerable difference in the survival probabilities of the original first passage model and its IJV extension. The results for the CreditGrades model are analysed next.

4.3.3 Simulations Results for CreditGrades Model and its IJV Extenstion:

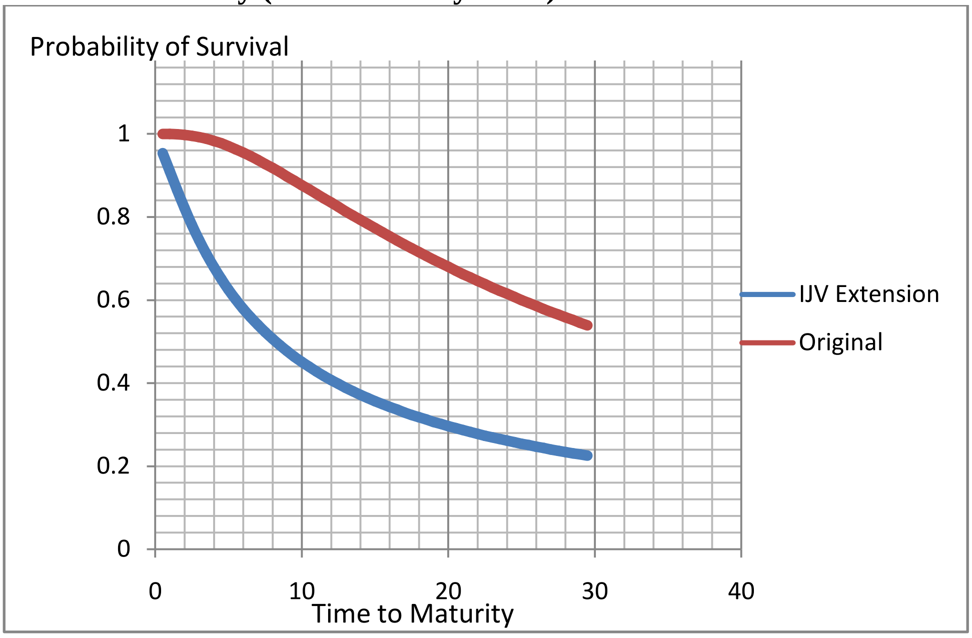
This section present survival probability results for CreditGrades Model and its IJV extension generated against term to maturity and stock volatility.[119]

4.3.3.1 Term to Maturity(CreditGrades Model):

The survival probability results for a firm with a low stock volatility ($\sigma = 0.3$) and high stock volatility ($\sigma = 0.5$) are shown in Figures 4.7 and Figure 4.8 respectively.

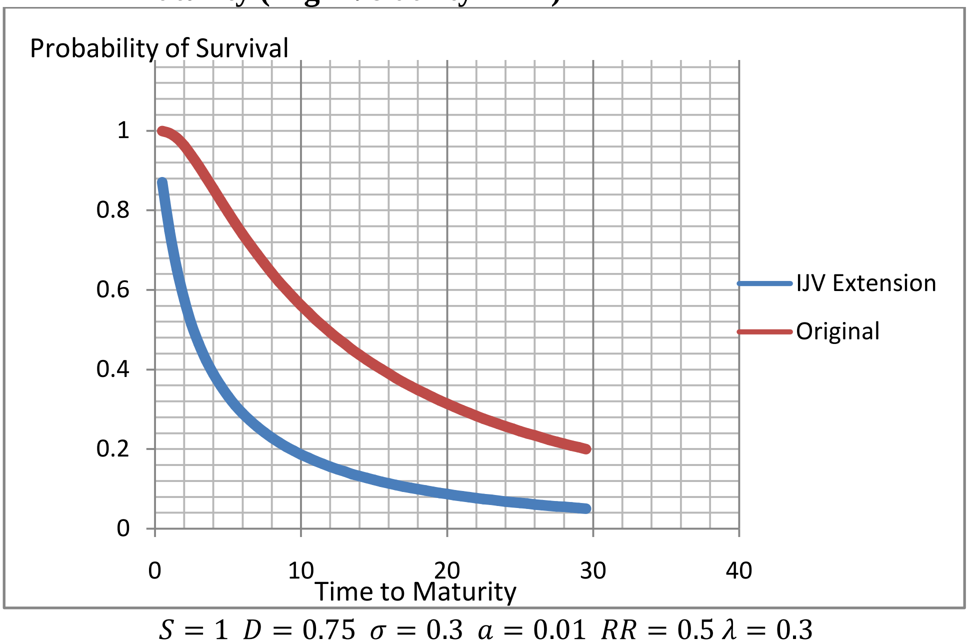
[119] Appendix C shows that results presented here are robust to changes in other variables in the model.

Figure 4.7: CreditGrades Model: Survival Probability Against Term to Maturity (Low Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; \sigma = 0.3 \;\; a = 0.01 \;\; RR = 0.5 \; \lambda = 0.3$

Figure 4.8: CreditGrades Model: Survival Probability Against Term to Maturity (High Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; \sigma = 0.3 \;\; a = 0.01 \;\; RR = 0.5 \; \lambda = 0.3$

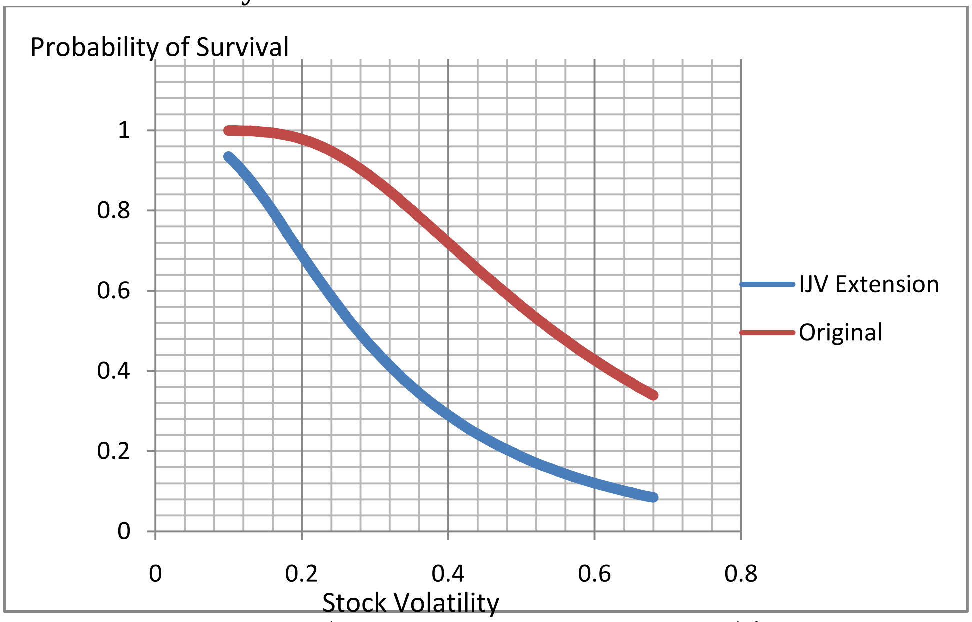
The results in Figures 4.7 and 4.8 above show that survival probabilities generated by the original CreditGrades model are higher than its IJV extension. These results, however, suggest that the bias against the IJV extension is less severe than that of the Merton (1974) and first passage models. The previous results in Section 4.3.1 and 4.3.2 also showed that a change in maturity had little or no impact on the original models' survival probability for a low debt firm. In contrast the Figures 4.7 and 4.8 above indicate that in the CreditGrades model, even for a low debt firm, longer maturity is accompanied by lower survival probability.

The results for CreditGrades IJV extension also suggest that an increase in bond maturity leads to lower IJV bonds' survival probability. This appears to be in slight contradiction to the Merton (1974) and first passage IJV extensions which suggested that higher maturity results in higher IJV survival probability. The rationale for this behaviour was that higher IJV bond maturities tend to smooth out the effect of the short-term stock volatility. A closer look at the Figures 4.7 and 4.8, however, suggests the slope of the IJV curve decreases with increasing levels of terms to maturity. The flattening of the slope for the IJV becomes considerable for maturities in excess of ten years. In contrast, the slope for original CreditGrades model's survival probability remains relatively constant and decreases only slightly at higher maturities. This suggests that in CreditGrades IJV extension the effect of the stock volatility takes longer to smooth out. The next section discusses the impact of stock volatility change on the models' survival probabilities.

4.3.3.2 Stock Volatility (CreditGrades Model):

The survival probability results generated against changes in stock volatility are shown in Figure 4.9 below.

Figure 4.9: CreditGrades Model: Survival Probability Against Stock Volatility



$S = 1$ $D = 0.75$ $T - t = 1\,0$ $a = 0.01$ $RR = 0.5$ $\lambda = 0.3$

Figure 4.9 above shows that as stock volatility increases the survival probability generated by both the original CreditGrades model and its IJV extension decreases. The decrease, however, is greater for the IJV extension. These results therefore support the Hypothesis H2a for the CreditGrades model.

All the results discussed in Section 4.3.1, 4.3.2 and 4.3.3 above show that the survival probability generated by the IJV extension of the Merton (1974), first passage and CreditGrades models are significantly lower than their original conventional counterparts. These results therefore fully support the Hypothesis H2a, that is *"Structural models IJV extensions generate significantly lower survival probabilities than the original models"*. In the next section, real data is used to check the robustness of these as well as to test Hypothesis H2b.

4.4 Data:

The previous Section 4.3, showed to good effect the significant difference in the survival probabilities of the original structural models and their IJV extensions. This section analyses real data for a sample of Islamic bonds to test Hypotheses H2a and H2b.

The data used here is for 52 corporate Malaysian Islamic bonds issuers for the period 2002 to 2010. The sample consists of 4 SARA bond issuers, 7 IJV bond issuers and 41 Islamic debt bond issuers. A closer look at the IJV bond structures, however, suggest that most of them are structured in a debt like manner instead, as discussed in Section 1.2.4 and 1.2.6 in Chapter 1. This is not surprising given the concern regarding the debt like structure of IJV bonds is voiced by a number of Shariah advisors and AAOIFI (see Ali, 2005, 2008; Usmani, 2007; AAOIF, 2008). Data for issuer's credit ratings and term to maturity is taken from the IFIS data base. Daily data for firm specific variables, such as share price and volatility, is taken from Datastream. Yearly data for debt per share is taken from the Compustat (refer to Section 6.2 in Chapter 6 for more details on the database). The sample contains only corporate bond issuers while data for banks and other financial institutions are excluded as some of their financial ratios are not comparable to corporate firms (see

Blume et al., 1998). The data sampling procedure is summarized in Table 4.1 below. The next section discusses the methodology and results.

Table 4.1: Sampling Procedure and Sample Size

This table outlines the sample selection criteria and total number of sample bond issuers considered for RQ2. The data is for Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base.

Description	**No**
Total corporate Islamic bond issuers obtained from the IFIS data base	244
Exclude issuers with missing data in the IFIS	81
Exclude non-Malaysian issuers.	33
Exclude issuers with missing daily data in the Datastream[120]	47
Exclude issuers with missing in Compustat	31
Final sample	**52**

Source: Prepared by the author using total IFIS data.

4.5 Methodology for Data Analysis:

This section presents the methodology to further check the robustness of results for Hypothesis H2a and test Hypothesis H2b, that is, *"There is a negative association between credit risk rankings generated by the structural models' IJV extensions and their original counterparts and credit ratings"*. The section first discusses how credit ratings and survival probabilities can be converted into a comparable credit scores (see Finger et al., 2002 of the use of credit scores). This is followed by an explanation of how average credit scores can be used to test Hypothesis H2a. The correlation coefficient and Kendall's tau techniques are then used to measure the association between credit score results to test Hypothesis H2b.

[120] A number of issuers were unlisted on KLSE.

4.5.1 Credit Scores:

The survival probability is a quantitative measure ranging from 0 to 1. Whereas the issuer's credit rating has a different classification ranging from AAA, AA, A, BBB, BB, B, and lower categories (Standard and Poor's, 2003). The assigning of a quantitative measure called a "credit score" to both credit ratings and survival probabilities would allow for a meaningful comparison (see Finger et al., 2002). This is based on a Standard and Poor's (2003) report which presents the default frequency[121] (or survival frequency) for bonds in different rating categories. Given their credit ratings and survival probability, each issuer is scored from one to four as follows.

$$\text{Credit Score} = \begin{bmatrix} \text{1 if issuer is rated AAA/AA} \\ \text{2 if issuer is rated A} \\ \text{3 if issuer is rated BBB} \\ \text{4 for all lower ratings} \end{bmatrix} \qquad (4.28)$$

$$\text{Credit Score} = \begin{bmatrix} 1 \text{ if PS}^{122} \geq 90 \\ 2 \text{ if } 80 \leq \text{PS} < 90 \\ 3 \text{ if } 70 \leq \text{PS} < 80 \\ 4 \text{ if PS} < 70 \end{bmatrix} \qquad (4.29)$$

4.5.2 Averages Credit Scores:

The credit scores, using the above method, can be generated for the original structural models, their IJV extensions and issuer's credit ratings. To test Hypothesis H2a, the average credit score can be calculated as follows.

[121] Default frequency = 1 – survival probability
[122] PS= Probability of Survival

$$Average\ Credit\ Score\ = \frac{\sum_{i=1}^{N} CreditScore_i}{N^{123}} \tag{4.30}$$

If the score generated by the IJV extensions are lower than those of the original models and the issuer's credit ratings, then this would support Hypothesis H2a. Correlations coefficients and Kendall's tau techniques are analysed next.

4.5.3 Correlation Coefficient and Kendall's Tau:

The association between the credit scores as measured by their correlation coefficients and Kendall's tau can test Hypothesis H2b. These two approaches will now be discussed in turn.

A correlation coefficient measures the degree of linear dependence between two variables and so captures the extent to which both move with respect to each other. For example, if the correlation between credit scores of model X and model Y is around 1, it suggest that firms assigned a high credit score by model X would have a high credit score from model Y and vice versa. Similarly, if the correlation between the models is nearing -1 then it implies that the firms that are assigned a high credit score by model X would have a low credit score from model Y and vice versa. A negative coefficient between the credit score of IJV extensions and the original models along with the credit ratings would be taken as a support for Hypothesis H2b. This is because it would suggest that firms given high credit scores by the original model or credit ratings are assigned a low score by their IJV extension. The correlation between two variables X and Y can be calculated as follows:

[123] 'N' is the number of firms in the sample.

$$corr\ (X, Y) = \frac{Cov(X, Y)}{\sigma_x \sigma_y} \tag{4.31}$$

$Cov(X, Y)$ is the covariance of variables X and Y, while σ_x and σ_y are their standard deviations, respectively. A problem, however, with using correlation coefficient is that outlier data and extreme observations can greatly influence this measure. To correct for this problem another measure of the association, Kendall's tau, will be used (see Finger et al., 2002).

Kendall's tau measures the similarity between the ranking order of two set of variables (see Finger et al., 2002; Eview's manual, 2010). For two random variables *X* and *Y* a Kendall's tau is defined by Equation 4.32 below:

$$\tau = \mathbf{P}\ \{(X2 - X1)(Y2 - Y1) \geq 0\} - \mathbf{P}\ \{(X2 - X1)(Y2 - Y1) < 0\} \tag{4.32}$$

Where $(X1,\ Y1)$ and $(X2,\ Y2)$ are two observations generated from the joint distribution of *X* and *Y*. For the purpose of this study, *X* is the original structural model credit score and Y is the IJV extension credit score. The first term in the Equation 4.32 above is the probability that original model and its IJV extension would rank a pair of firms in the same order. The second term can be interpreted as the probability of different rankings. A non-parametric estimation for Kendall's tau is given by Equation 4.33 below (see Finger et al., 2002).

$$\hat{\tau} = \frac{2}{k(k-1)} \sum_{i<j} sign\left[\left(X_i - X_j\right)\left(Y_i - Y_j\right)\right] \tag{4.33}$$

Equation 4.33 above calculates the excess number of concordant pairs of firms over discordant pairs. A concordant pair, which has the same relative ordering by both, *X* and *Y*, gets a score of 1. A discordant pair, where the ordering of firms ranking is different for X and Y is given a score of -1. A tie exists when there is neither concordance nor discordance and gets a score of zero. A problem, however, with the above version of Kendall's tau is that it reaches the extreme values of 1 and -1 only when all pairs are either concordant or discordant but with no tied ranks. In the presence of tied ranks the endpoint values of 1 and -1 are not reached. A slightly modified version of Kendall's tau as shown in Equation 4.34, therefore, is used (see Kendall's tau-b in Eview's manual). Hereafter any reference to Kendall's tau would be for Kendall's tau-b.

$$\tau_b(X,Y) = \frac{S(X,Y)}{\sqrt{\left[\frac{n(n-1)}{2} - \sum_s \frac{t_s(t_s-1)}{2}\right]\left[\frac{n(n-1)}{2} - \sum_v \frac{u_v(u_v-1)}{2}\right]}} \qquad (4.34)$$

Where t_s is the number of tied rank observations for *X* and u_v are the number of tied rank observations for *Y*. This rescaling ensures that $\tau_b\ (X,X) = 1$. Note that in the absence of ties, the modified version and the original version would yield similar results. A negative and statistically significant Kendall's tau would be considered as supporting Hypothesis H2b. The next section presents the credit score results.

4.6 Results:

This section starts by presenting the credit score results for issuer's credit ratings, Merton (1974), first passage, Credit Grades Models and their IJV extensions. Average credit scores results are then examined to test Hypothesis H2a. This is followed by analysis of their correlations coefficient and Kendaull's tau result to test Hypotheses H2b. The section ends with a discussion of the implications of these findings.

4.6.1 Credit Score Results:

The credit scores generated using credit ratings and the original structural models are presented in Table 4.2. The results for their IJV extensions are presented in Table 4.3 below.

Table 4.2: Credit Scores from Original Models and Credit Ratings

This table presents credit scores generated using credit ratings, Merton (1974), first passage and CreditGrades model. The data used is for Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base.

Company	Type	Credit Ratings	Merton	First Passage	CreditGrades
ALAM MARITIM	SARA	1	2	3	3
ATLAN	Debt	2	1	2	1
BINA DARULAMAN	Debt	1	1	2	1
BOON KOON GROUP	Debt	2	1	2	1
CHEMICAL COMPANY	IJV	1	1	2	1
DELLOYD VENTURES	Debt	1	1	1	1
DRB-HICOM	Debt	1	1	1	1
EMAS KIARA IND	Debt	2	3	4	3
ESSO MALAYSIA	Debt	1	1	1	1
EVERMASTER GROUP	Debt	3	1	2	3
GAMUDA	IJV	1	2	2	2
GLOMAC	Debt	2	1	1	1
GOODWAY INTEGRATED	Debt	2	3	4	4
HONG LEONG INDUSTRIES	IJV	1	1	1	1
HUBLINE	Debt	1	2	3	2
HYTEX INTEGRATED	Debt	3	1	3	4
INGRESS CORPORATION	SARA	4	3	4	4
KINSTEEL	Debt	2	1	1	1
KNM GROUP	Debt	2	4	4	4
KWANTAS CORP	Debt	1	1	1	1
LAFARGE MALAYAN CEMENT	Debt	2	2	3	2
LEADER UNIVERSAL	Debt	2	3	4	4
LINGKARAN TRANS KOTA	IJV	1	1	1	1
MALAYSIAN AE MODELS	Debt	2	3	4	4
MALAYSIAN MER.MAR.	Debt	3	1	2	2
MATAHARI PUTRA PRIMA	SARA	2	2	4	3
MAXTRAL INDUSTRY	Debt	2	4	4	4
MIECO CHIPBOARD	Debt	1	1	1	1
MINETECH RESRCS	Debt	2	2	3	3
MISC	Debt	1	1	1	1
MUHIBBAH ENGINEERING	IJV	2	1	1	1
MULPHA INTERNATIONAL	Debt	1	1	1	1
NAM FATT CORP	Debt	3	1	1	3
NESTLE (MALAYSIA)	Debt	1	1	1	1
OILCORP	Debt	4	1	1	4
PHARMANIAGA	Debt	1	1	1	1
PLUS EXPRESSWAYS	IJV	1	1	1	1
POH KONG	Debt	1	1	2	1

Table 4.2: Credit Scores from Original Models and Credit Ratings Continued

Company	Type	Credit Ratings	Merton	First Passage	CreditGrades
PRICEWORTH WOOD PRDS.	Debt	2	4	4	4
PRINSIPTEK CORP	Debt	2	3	4	4
RANHILL	Debt	2	1	1	1
SAPURACREST PETROL	SARA	1	1	1	1
SCOMI GROUP	Debt	1	3	4	4
SUNRISE	Debt	2	1	1	1
SYMPHONY HOUSE	Debt	2	3	4	3
TENAGA NASIONAL	Debt	1	1	1	1
TOP GLOVE CORP	Debt	1	1	1	1
TRACOMA	Debt	4	2	3	3
TRADEWINDS CORP	Debt	1	1	2	2
UMW HOLDINGS	IJV	1	1	1	1
WEIDA (M)	Debt	1	1	1	1
ZECON	Debt	2	3	4	4

Source: Prepared by the author

Table 4.3: Credit Scores from IJV Extensions

This table presents credit scores generated using IJV extensions of Merton (1974), first passage and CreditGrades model. The data used is for 52 Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base.

Company	Type	Merton IJV	First Passage IJV	CreditGrades IJV
ALAM MARITIM	SARA	1	4	4
ATLAN	Debt	4	4	4
BINA DARULAMAN	Debt	4	4	4
BOON KOON GROUP	Debt	4	4	4
CHEMICAL COMPANY	IJV	4	4	4
DELLOYD VENTURES	Debt	4	4	4
DRB-HICOM	Debt	4	4	1
EMAS KIARA IND	Debt	4	4	4
ESSO MALAYSIA	Debt	4	4	2
EVERMASTER GROUP	Debt	4	4	4
GAMUDA	IJV	4	4	4
GLOMAC	Debt	4	4	4
GOODWAY INTEGRATED	Debt	4	4	4
HONG LEONG INDUSTRIES	IJV	4	4	4
HUBLINE	Debt	4	4	4
HYTEX INTEGRATED	Debt	4	4	4
INGRESS CORPORATION	SARA	4	4	4
KINSTEEL	Debt	4	4	1
KNM GROUP	Debt	4	4	4
KWANTAS CORP	Debt	4	4	1
LAFARGE MALAYAN CEMENT	Debt	4	4	4
LEADER UNIVERSAL	Debt	4	4	4
LINGKARAN TRANS KOTA	IJV	4	4	2
MALAYSIAN AE MODELS	Debt	4	4	4
MALAYSIAN MALAYSIAN MERCHANT MARINE.	Debt	4	4	4
MATAHARI PUTRA PRIMA	SARA	4	4	4
MAXTRAL INDUSTRY	Debt	4	4	4
MIECO CHIPBOARD	Debt	4	4	3
MINETECH RESRCS	Debt	4	4	4
MISC	Debt	4	4	1
MUHIBBAH ENGINEERING	IJV	4	4	3
MULPHA INTERNATIONAL	Debt	4	4	4
NAM FATT CORP	Debt	4	4	4
NESTLE (MALAYSIA)	Debt	4	4	1
OILCORP	Debt	4	4	4
PHARMANIAGA	Debt	4	4	1
PLUS EXPRESSWAYS	IJV	4	4	2
POH KONG HOLDINGS	Debt	4	4	4

Table 4.3: Credit Scores from IJV Extensions Continued

Company	Type	Merton IJV	First Passage IJV	CreditGrades IJV
PRICEWORTH WOOD PRDS.	Debt	4	4	4
PRINSIPTEK CORP	Debt	4	4	4
RANHILL	Debt	4	4	4
SAPURACREST PETROL	SARA	4	4	1
SCOMI GROUP	Debt	4	4	4
SUNRISE	Debt	4	4	4
SYMPHONY HOUSE	Debt	4	4	4
TENAGA NASIONAL	Debt	4	4	4
TOP GLOVE CORP	Debt	4	4	1
TRACOMA HOLDINGS	Debt	4	4	4
TRADEWINDS CORP	Debt	4	4	4
UMW HOLDINGS	IJV	4	4	1
WEIDA (M)	Debt	4	4	4
ZECON	Debt	4	4	4

Source: Prepared by the author

4.6.2 Average Credit Score Results:

The average credit scores results from Tables 4.2 and 4.3 are provided in Table 4.4 below.

Table 4.4: Average Credit Scores

This table presents the average credit scores results given in Table 4.2 and 4.3. The data used is for 52 Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base.

	Original	**IJV Extension**
Merton	1.6538	4
First Passage	2.1538	4
CreditGrades	2.0962	3.32692
Credit Ratings	1.7115	

They show that the average credit scores generated by the IJV extensions of the three structural models are significantly higher than their original counterparts. While Merton (1974) and the first passage IJV extension attributed the highest credit score of 4 to all the issuers, the bias shown by the CreditGrades IJV extension is comparatively less. However, its average credit score (3.42) compared with that of the original CreditGrades model (2.06) and credit ratings (1.83) is still considerably high. These results imply that if a bond is rated by the CreditGrades IJV extension rather than the original model, its rating would decline by at least one grade. Moreover, if rated by the Merton (1974) and the first passage models IJV extensions, the decline would be at least two grades. These results support the Hypothesis H2a suggesting that the IJV extensions of the structural models attribute significantly lower survival probability, credit ratings and credit score than the original models.

4.6.3 Correlation Coefficient and Kendall's Tau Results:

The correlation coefficients between the credit scores of the original models and credit ratings are provided in Table 4.5. Table 4.6, moreover, shows the correlation results for the CreditGrades IJV extension.[124] The Kendall's tau results are displayed in Table 4.7 and 4.8 below.

Table 4.5: Correlation Coefficients between Original Structural Model and Credit Ratings

This table presents the correlation coefficients between credit scores results given in Table 4.2. The data used is for 52 Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base.

	Credit Ratings	Merton	First Passage	CreditGrades
Credit Ratings	**1**			
Merton	0.2582	**1**		
First Passage	0.3548	0.8978	**1**	
CreditGrades	0.5897	0.8080	0.8480	**1**

Table 4.6: CreditGrades, IJV Extension and Credit Ratings Correlation

This table presents the correlation coefficients between credit scores results generated using credit ratings, CreditGrades model and its IJV extensions. The data used is for 52 Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base.

	CreditGrades IJV
Credit Ratings	0.4084
CreditGrades	0.4997

[124] Merton and first passage models IJV extensions assigned all the issuers the maximum score of 4. As there is no variation in their credit score series, their correlation coefficients and Kendall's tau with other models could not be calculated.

Table 4.7: Kendall's Tau between Original Structural Model and Credit Ratings

This table presents the Kendall's tau between credit scores results given in Table 4.2. The data used is for 52 Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base. The number in the parenthesis provides the probability for testing S = 0, implying that there is no association between the different credit scores.

	Credit Ratings	CreditGrades	First Passage	Merton
Credit Ratings	1.0000			
CreditGrades	0.5373	1.0000		
	(0.0000)			
First Passage	0.3793	0.7793	1.0000	
	(0.0022)	(0.0000)		
Merton	0.3149	0.7771	0.8297	1.0000
	(0.0131)	(0.0000)	(0.0000)	

Table 4.8: Kendall's Tau between CreditGrades, IJV Extension and Credit Ratings

This table presents the Kendall's tau between credit scores results generated using credit ratings, CreditGrades model and its IJV extensions. The data used is for 52 Malaysian Islamic bond issuers from the period 2002 to 2010 taken from IFIS data base. The number in the parenthesis provides the probability for testing S = 0, implying that there is no association between the different credit scores

	CreditGrades IJV
Credit Ratings	0.424849
	(0.001)
CreditGrades	0.491162
	(0.0001)

The results in Tables 4.5 show that all original structural models have positive correlation coefficients with the credit ratings. The Kendall's taus are also positive as shown in Table 4.7. This implies that there is a positive association between the survival probabilities of the original models and credit ratings. These results, therefore, corroborate the assertion in Chapter 1 that credit rating agencies are currently using conventional credit risk model to rate Islamic bonds. The results also show that the CreditGrades model has the highest correlation coefficient and the

Kendall's tau with credit ratings. This shows the superiority of the CreditGrades model over the Merton (1974) and first passage models.

The CreditGrades IJV extension's correlation coefficient (shown in Table 4.6) and Kendall's tau (shown in Table 4.8) with both credit ratings and the original CreditGrades model are positive, statistically significant and has a reasonably high magnitude.[125] This shows that they have a positive association. It further implies that bond issuers assigned a high credit score by the CreditGrades model will also receive a high score by its IJV extensions. These results, therefore, do not support the Hypothesis H2b. Had the correlation coefficient and the Kendall's tau been negative, it would have supported this hypothesis by suggesting that firms regarded as risky by the original model are viewed non-risky by its extension.

4.6.4 Implications of Hypotheses H2a and H2b:

When the test results for Hypotheses H2a and H2b are taken together, they offer a different perspective. The positive testing of Hypothesis H2a implies that when IJV bonds compete against debt bonds for credit ratings, these structural models and their extensions will hold a bias against them. This is because they attribute lower survival probabilities to IJV structures and so, assign them lower credit ratings than debt bonds. The negative testing of Hypothesis H2b, however, suggests a positive association between the CreditGrades model and its IJV extension. This implies that IJV extensions relative to the original model may differentiate the high risk issuers

[125] The correlation coefficient and Kendall-tau with the IJV extensions of Merton (1974) and the first passage cannot be calculated as the variance of their credit score series is zero.

from the low risk issuers.[126] Therefore, if IJV bonds are considered as distinct from debt bonds,[127] structural models' IJV extensions can be used as an adjunct tool for rating them. However, this has to be in addition to considering the high positive returns these IJV bonds may generate.

4.7 Conclusion:

This section summarizes the methodology and results for testing Hypotheses H2a and H2b discussed in this chapter. This in turn helps to partially answer Research Question 2 from the IJV bond perspective, that is, "*Can conventional credit risk models be used to assess the risk in Islamic bonds?*"

Chapter 2 developed two hypotheses to test whether structural credit risk models hold a bias against IJV bonds. To test these hypotheses this chapter first presented the methodology for developing the IJV extensions of the Merton, first passage and CreditGrades models. These were then used to run simulations. The results supported the Hypothesis H2a suggesting that IJV extensions generate lower survival probabilities than these original models. Real data was then introduced to check the robustness of previous results for Hypothesis H2a as well as to test Hypothesis H2b. The methodology for comparing credit rating and survival probabilities using credit scores was then discussed and followed by the averages, correlation coefficients and Kendall's tau methods to analyze credit scores were also discussed in detail. Finally, the results from employing real data were presented. They clearly supported the

[126] Note that this ability to differentiate is only in relative and not absolute terms as it has already been shown in testing H2a that in absolute terms the IJV extensions assign issuers lower survival probability and high risk.
[127] Probably as substitute for equity.

previous conclusion for Hypothesis H2a that the IJV extensions generate significantly lower survival probabilities than the original models. These results, however, did not support Hypothesis H2b.

It is evident from discussion presented in this chapter that conventional credit risk models focus only on the issuer' ability to return the principal and hence ignore the positive returns that IJV bonds may generate. This in turn creates a bias against them which cannot be removed by merely extending the models to capture some of IJVs unique features. The conclusion that is implied from these finding is that IJV bonds should be treated like equity rather than debt. Hence, tools used to measure equity risk should be applied to IJV bonds. In summary the answer to RQ2 for IJV bonds is no, conventional credit risk models cannot be used to assess the risk in Islamic bonds.

CHAPTER 5: CREDIT RISK IN ISLAMIC BONDS: METHODOLOGY AND RESULTS FOR RQ2 (SARA BONDS)

5.1 Introduction:

The previous chapter, Chapter 4 provided the methodology and results to test Hypotheses H2a and H2b relating to the IJV bond aspects of Research Question 2, *"Can conventional credit risk models be used to assess the risk in Islamic bonds"*. It also approached the second research question, i.e. RQ2, from an IJV bond perspective. This chapter also addresses the same question but presents the methodology and results to test Hypotheses H2c, H2d, and H2e from the view point of the SARA bonds. It starts with the methodology for measuring SARA bonds' credit risk in Section 5.2. This is followed by simulation results for survival probability and expected loss in Section 5.3. Section 5.4, finally ends the chapter with a summary of the discussion.

5.2 Methodology for Measuring SARA Bond Risk:

The structure of SARA bonds (as discussed in Chapter 1 has a number of features common with conventional debt including the bond aiming to provide a safe principle and a periodic return and so is quite different from IJV bonds. Therefore, in essence, a structural model should be capable of capturing its underlying risk. Nevertheless, SARA bonds have some unique features that imply these models might need adjusting to capture their true risk. The extent of modification needed can be deduced by testing Hypotheses H2c, H2d and H2e. The section first considers the nature of SARA bonds' recovery rate upon default and its uncertainty (volatility). This is followed by an examination of the CreditGrades model and an explanation as to why it is the most suitable choice for capturing SARA bond risk.[128] The section ends with a discussion of the simulation analysis to be used for generating results.

5.2.1 SARA Bonds' Recovery Rate:

SARA bonds have a number of unique features. The most important characteristic, however, that affects its credit risk is SARA bond's real ownership of the underlying asset (see Howladar, 2006; Dusuki & Mukhtar, 2010). It has an impact on SARA bond's recovery rate upon default and its uncertainty. As a secured conventional bond holder does not own the underlying asset, its holders have to undergo a lengthy bankruptcy exercise before they can claim the proceeds from its sale. They also have to bear the related financial distress cost which reduces their recovery rate. In contrast, the SARA bonds' ownership of the underlying asset makes claiming the asset and its sale less tedious and costly. So SARA bonds should experience a higher

[128] For reasons mentioned later Section 5.2.1 and 5.2.2 the focus would only be on the CreditGrades model.

recovery rate than their equivalent conventional bonds. Real asset ownership also implies that its recovery rate has a strong link with the underlying asset's market value. Moreover, volatility in this price causes uncertainty in the recovery rate. These unique features of SARA bonds' recovery rate are incorporated next in the CreditGrades model.

5.2.2 CreditGrades Model and SARA Bonds:

As discussed in Section 2.3.4 Chapter 2, the distinguishing feature of the CreditGrades model is its incorporation of an uncertain recovery rate in the default boundary. This is in contrast to the Merton (1974) model that does not capture the recovery rate and the simple first passage model that ignores any recovery rate uncertainty. This makes the CreditGrades model an ideal choice to capture the unique aspects of SARA bonds recovery rate and its uncertainty as discussed above. Therefore, Hypothesis H2c, H2d and H2e will be tested by using the CreditGrades model. The CreditGrades model (as discussed in Section 2.3.4 in Chapter 2) is represented by the following system of equations.

$$\bar{L} = \boldsymbol{E}L \tag{5.1}$$

$$\lambda^2 = \mathrm{Var}\log(L) \tag{5.2}$$

$$\mathrm{LD} = \bar{L}De^{\lambda Z - \frac{\lambda^2}{2}} \tag{5.3}$$

Here, L is the recovery rate and λ *is* uncertainty in the recovery rate. D is borrowed amount of debt while Z is a standard normal random variable. In a simplistic sense, the recovery rate for secured conventional bonds, can be modelled as shown in Equation 5.4 below.

$$L = \frac{EP_a - C}{D} \tag{5.4}$$

Here, EP_a is the expected price of the underlying asset on default, while C is the cost of financial distress. Since SARA bonds have relatively lower financial distress cost, Equation 5.4 above can be modified in Equation 5.5 below.[129]

$$L = \frac{EP_a}{D} \tag{5.5}$$

A comparison of Equations 5.4 and 5.5, suggest that SARA bonds should have a higher recovery rate than secured conventional bonds. Based on empirical evidence recovery rate ($\bar{L}$) and uncertainty λ for conventional bonds are estimated to be 0.5 and 0.3 respectively (Finger et al., 2002; Hu and Lawrence, 2000). These are the average estimates for all debt types. Therefore, unsecured debt can be expected to have recovery rate of less than 0.5, while secured debt should have a recovery rate of more than 0.5 (Finger et al., 2002). As SARA bonds are more secured, they should have much higher recovery rate than 0.5. Moreover, the CreditGrades model gives much importance to the recovery as shown in Equations 5.1 to 5.3 above. Therefore, if the adjustment for the SARA bonds higher recovery rate is not made, it might cause the model to generate biased survival probability results. This is tested by Hypotheses H2c and H2d. As discussed in Section 2.3.5.2 Chapter 2, the recovery

[129] For simplicity it is assumed that SARA bonds have zero financial distress cost.

rate also has an impact on bonds expected Loss (EL). Therefore, a recovery rate that does not capture the true nature of SARA bonds might give a biased estimate of expected loss. Hypothesis H2e tests this. The next section discusses the simulation analysis used to test these hypotheses.

5.2.3 Simulation Analysis:

The impact of the recovery rate and its uncertainty is ascertained by running simulations for survival probability and expected loss (EL) using the CreditGrades model. These results are first generated for a standard case with low debt (D=0.75), low firm volatility ($\sigma = 0.3$) and medium term to maturity (T=10). However, robustness to changes in these variables is also checked. Empirical studies have shown that the average recovery rate for secured and unsecured bonds is 0.5 (Finger et al., 2002; Hu and Lawrence, 2000). This implies that secured bonds should have a recovery rate higher than 0.5 and unsecured bond a rate lower than 0.5. In the simulation models, for the purpose of comparison it is assumed that conventional unsecured bonds have a recovery rate of 0.4 while secured conventional bonds have a recovery rate of the 0.6. The recovery rate for SARA bonds is assumed to be 0.75.[130] The simulation results are presented next.

5.3 Simulation Results:

This section presents the results for the Hypotheses H2c, H2d and H2e simulations. The section first covers the impact of the SARA bonds' high recovery rate on the CreditGrades survival probability to test Hypothesis H2a. The effect of recovery rate

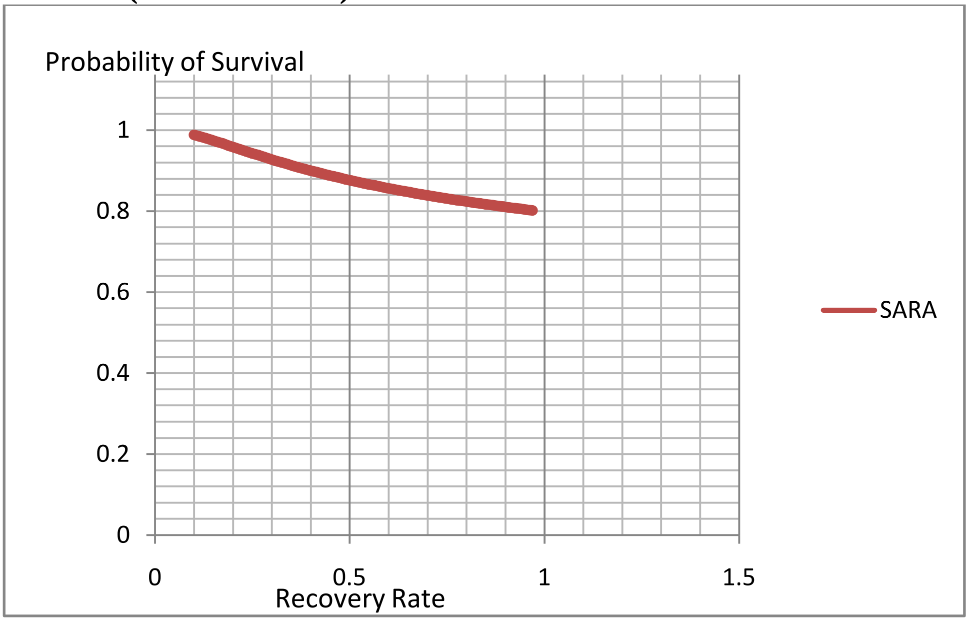
[130] This assumption is made just for simplicity of comparison and does not change the outcome of the results.

uncertainty on survival probability is then produced to test Hypothesis H2d. This is followed by the expected loss (EL) sensitivity to changes in recovery rate used to test Hypothesis H2e. The robustness of the results to changes in firm's stock volatility, term to maturity and debt ratios are also analysed here.

5.3.1 SARA Bonds Recovery Rate:

The simulation results for the survival probability against changes in recovery rate are presented in this section. The standard case is presented in Figure 5.1. Robustness of these results to changes in firm volatility, term to maturity and debt ratios are presented in Figures 5.2, to 5.6.

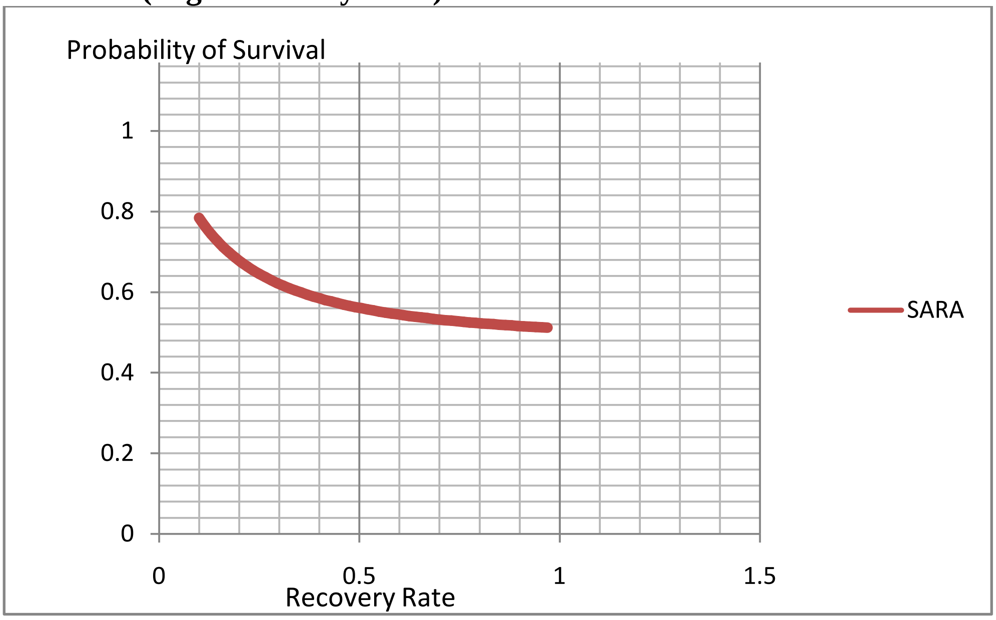
Figure 5.1: Probability of Survival Against Recovery Rate (Standard Case)



$S = 1\ D = 0.75\ \ T - t = 10\ \ \sigma = 0.3\ \ \lambda = 0.3$

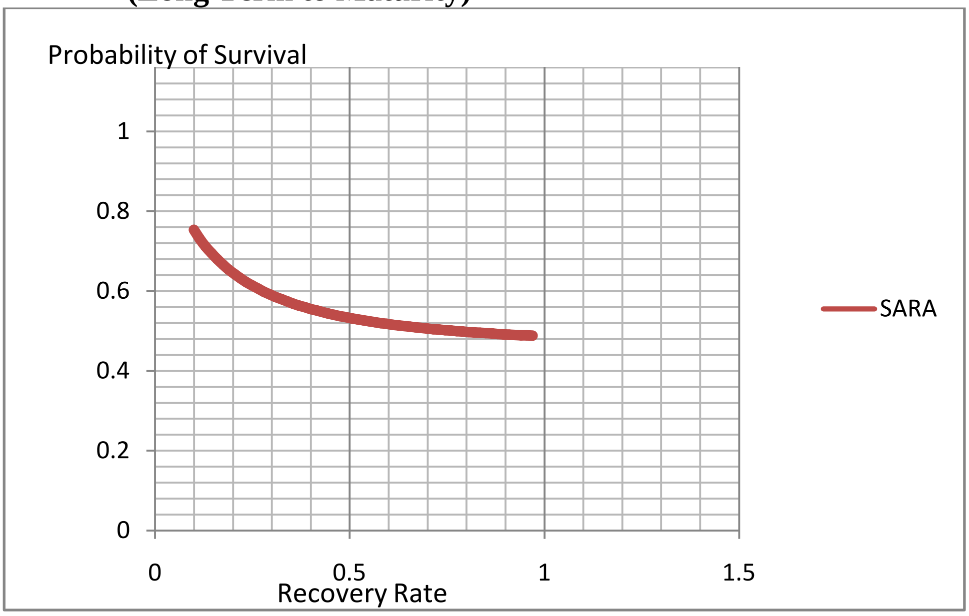
Figure 5.1 suggests that a higher recovery rate results in a slight decrease in the survival probability. This decrease is much greater when comparing conventional unsecured bonds (with around 0.4 recovery rate) and secured bonds (with around recover rate of 0.6).In contrast, the change between the secured conventional bonds and SARA bonds (with 0.75 recovery rate) is not considerable. Figures 5.2, 5.3, 5.4, 5.5 and 5.6 below further suggest that these results are reasonably robust to changes in stock volatility, term to maturity and debt to equity ratios. They, therefore, reject the Hypothesis H2c for SARA bonds suggesting that their higher recovery rate would not cause the survival probability to change considerably over that of secured conventional bond. The impact of recovery rate uncertainty is analysed next.

Figure 5.2: Probability of Survival Against Recovery Rate (High Volatility Firm)



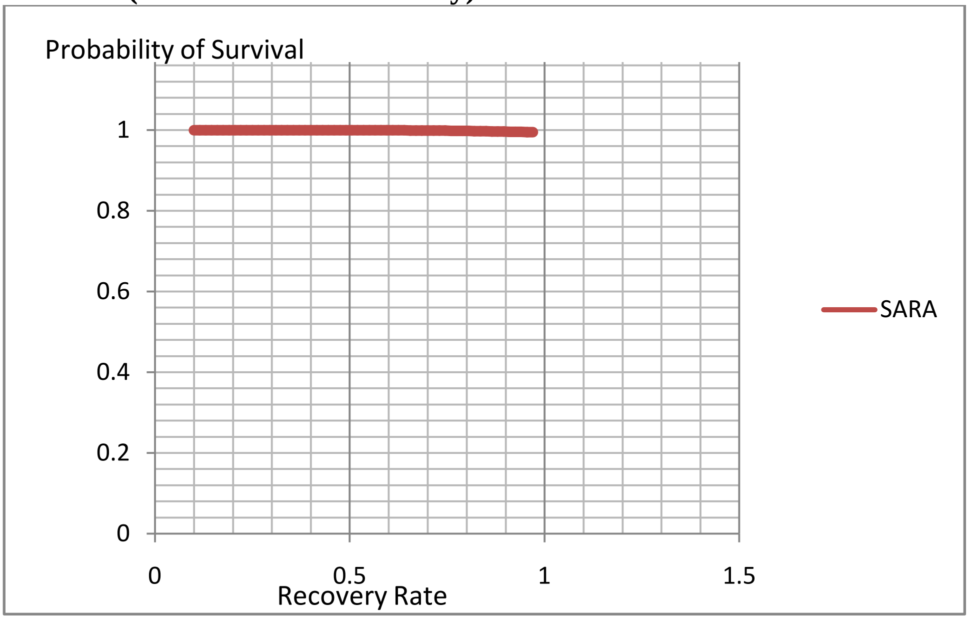
$S = 1\ D = 0.75\ \ T - t = 10\ \ \sigma = 0.5\ \ \lambda = 0.3$

Figure 5.3: Probability of Survival Against Recovery Rate (Long Term to Maturity)



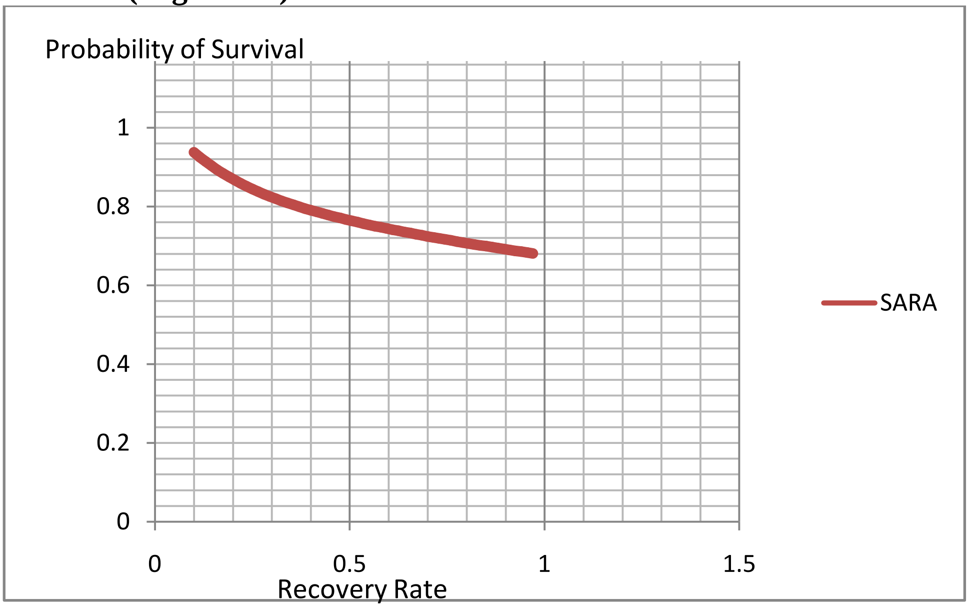
$S = 1\ D = 0.75\ \ T - t = 30\ \ \sigma = 0.3\ \ \lambda = 0.3$

Figure 5.4: Probability of Survival Against Recovery Rate (Short Term to Maturity)



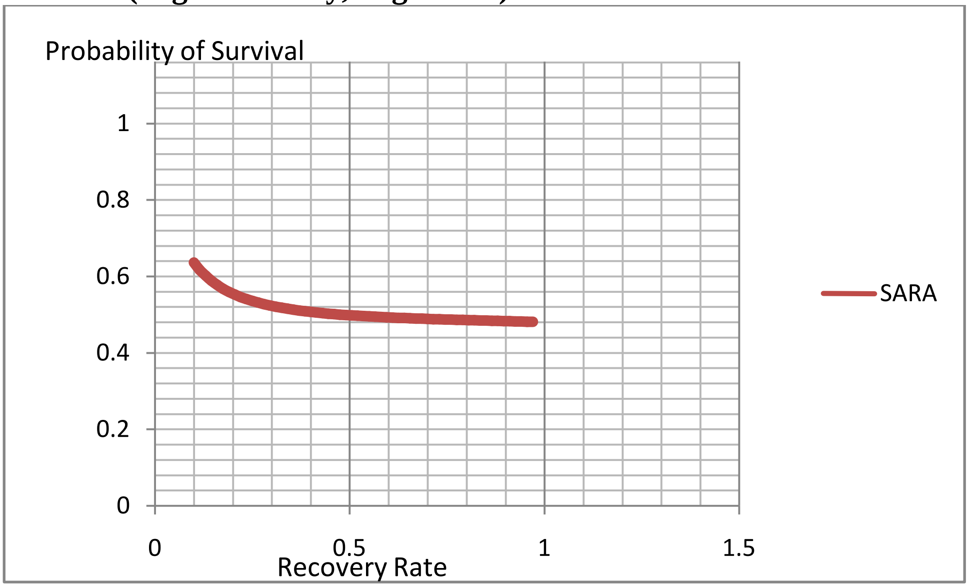
$S = 1 \; D = 0.75 \;\; T - t = 0.5 \;\; \sigma = 0.3 \;\; \lambda = 0.3$

Figure 5.5: Probability of Survival Against Recovery Rate (High Debt)



$S = 1 \; D = 2 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; \lambda = 0.3$

Figure 5.6: Probability of Survival Against Recovery Rate (High Volatility, High Debt)

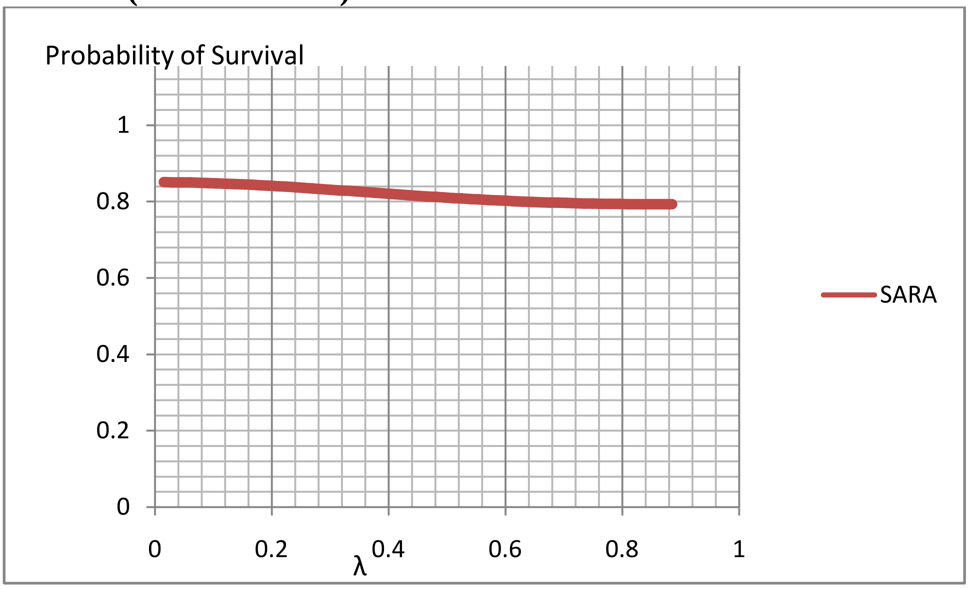


$S = 1 \; D = 2 \; T - t = 10 \;\; \sigma = 0.5 \;\; \lambda = 0.3$

5.3.2 SARA Bonds and Uncertainty in Recovery Rate:

This section provides the simulation results for the survival probability generated against the uncertainty in the recovery rate. The results for the standard model are presented in Figure 5.7. Their robustness to changes in stock volatility, term to maturity and debt ratio are provided in Figures 5.8, 5.9, 5.10, 5.11 and 5.12.

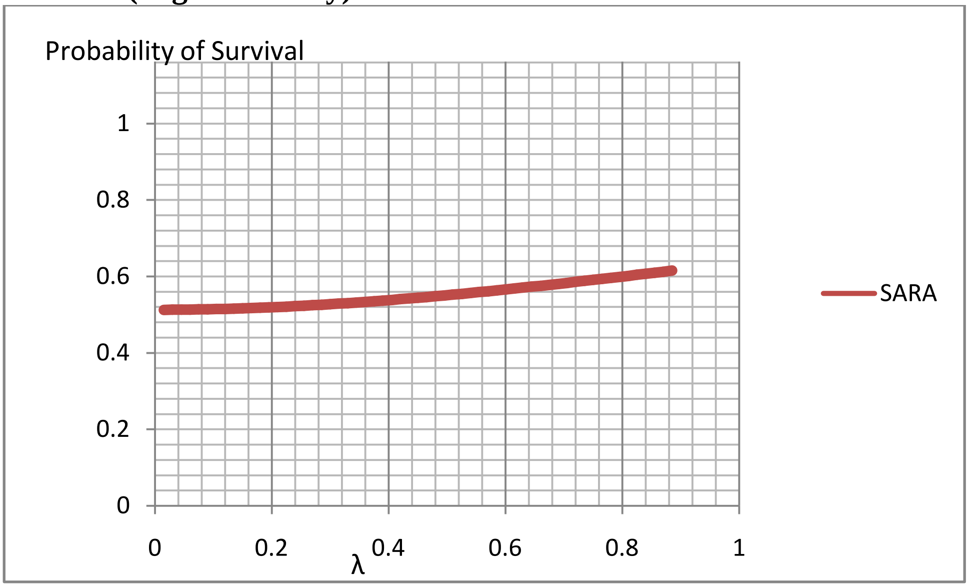
Figure 5.7: Probability of Survival Against Recovery Rate Uncertainty (Standard Case)



$S = 1 \; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; RR = 0.75$

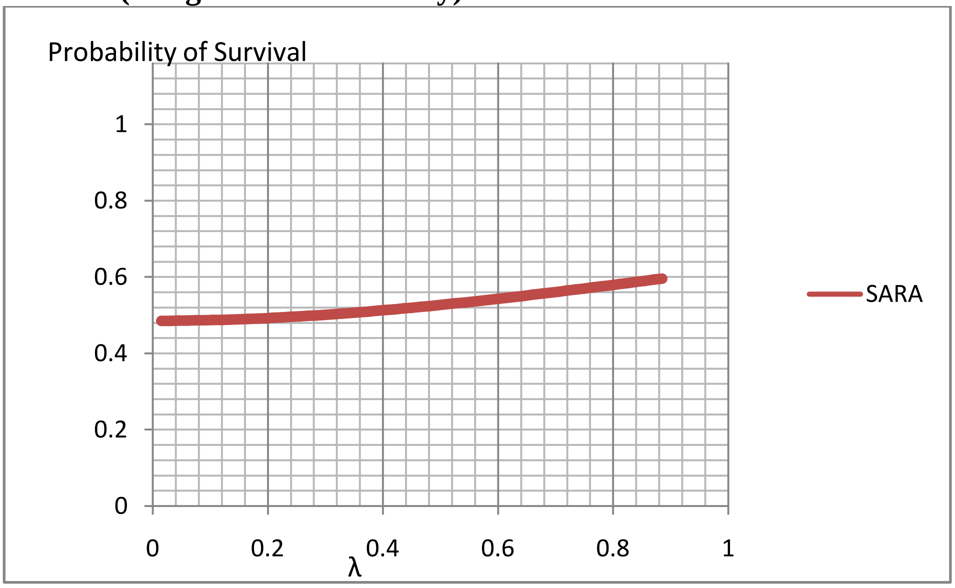
Figure 5.7 suggests that recovery rate uncertainty causes only a slight change in survival probability. The empirical estimate for the average recovery rate uncertainty for secured and unsecured bonds is 0.3 (see Finger et al., 2002). Figure 5.7 above shows that even if SARA bonds experience recovery rate uncertainty of less than 0.3 there would not be a considerable decrease in their survival probability. Moreover, if the uncertainty is extremely high it would only result in a slight decrease in their survival probability. The robustness test (Figures 5.8, 5.9, 5.10, 5.11 and 5.12) however, indicate that the direction of this small change, occurring at very high level of recovery rate uncertainty, is not consistent. Figures 5.8 and 5.9 show a slight increase while 5.10 and 5.11 show a decrease. Figure 5.12, however, presents a considerable change. It suggests that for the very special case of high debt, high stock volatility and low term to maturity, the survival probability experiences a considerable decrease with an increase in recovery rate uncertainty. The situation presented in Figure 5.12, however, is a rare case and cannot be used alone to support Hypothesis H2d. Therefore, Hypothesis H2d is rejected suggesting that an increase in recovery rate uncertainty has no meaningful impact on survival probability. The simulation results for expected loss are presented next.

Figure 5.8: Probability of Survival Against Recovery Rate Uncertainty (High Volatility)



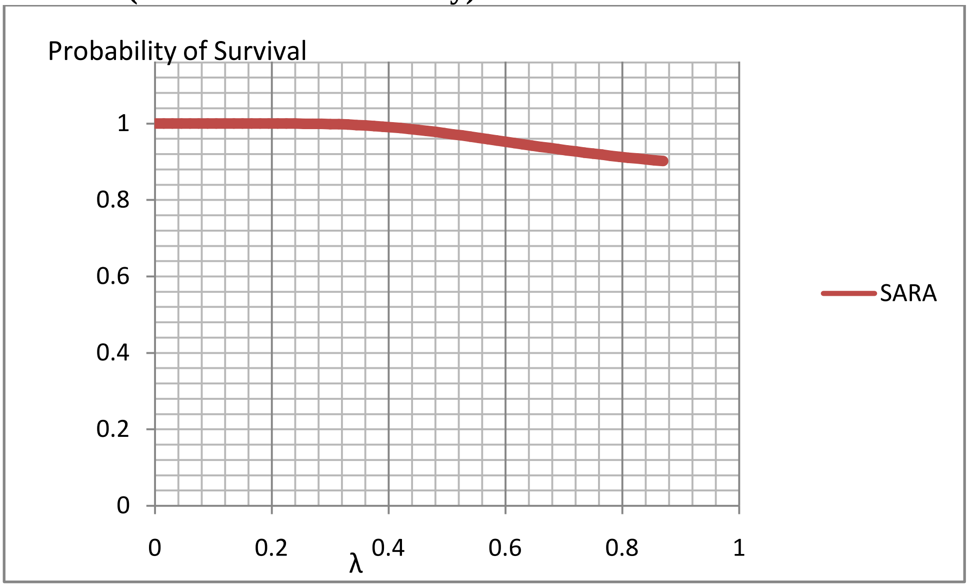
$S = 1\ D = 0.75\ \ T - t = 10\ \ \sigma = 0.5\ \ RR = 0.75$

Figure 5.9: Probability of Survival Against Recovery Rate Uncertainty (Long Term to Maturity)



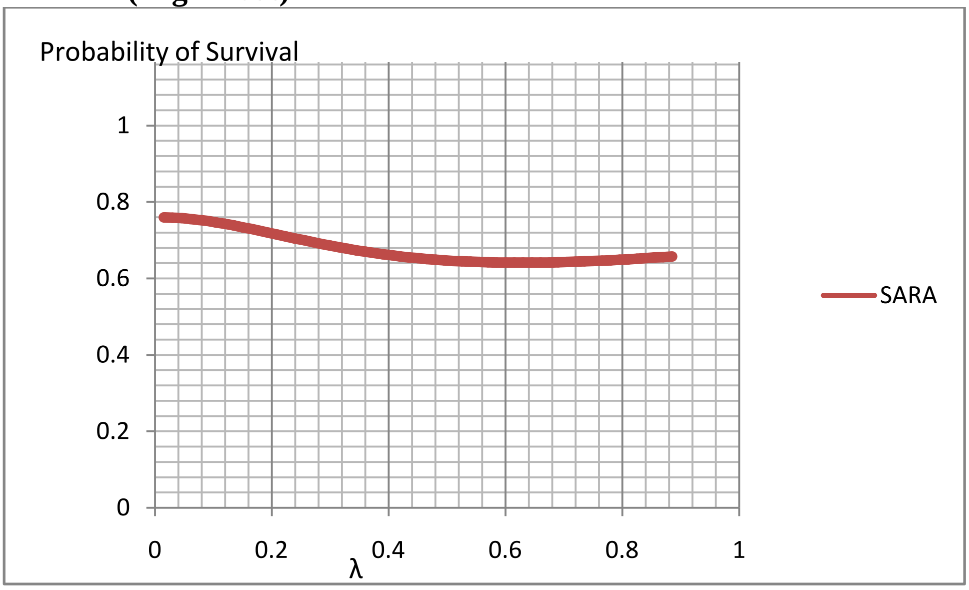
$S = 1\ D = 0.75\ \ T - t = 30\ \ \sigma = 0.3\ \ RR = 0.75$

Figure 5.10: Probability of Survival Against Recovery Rate Uncertainty (Short Term to Maturity)



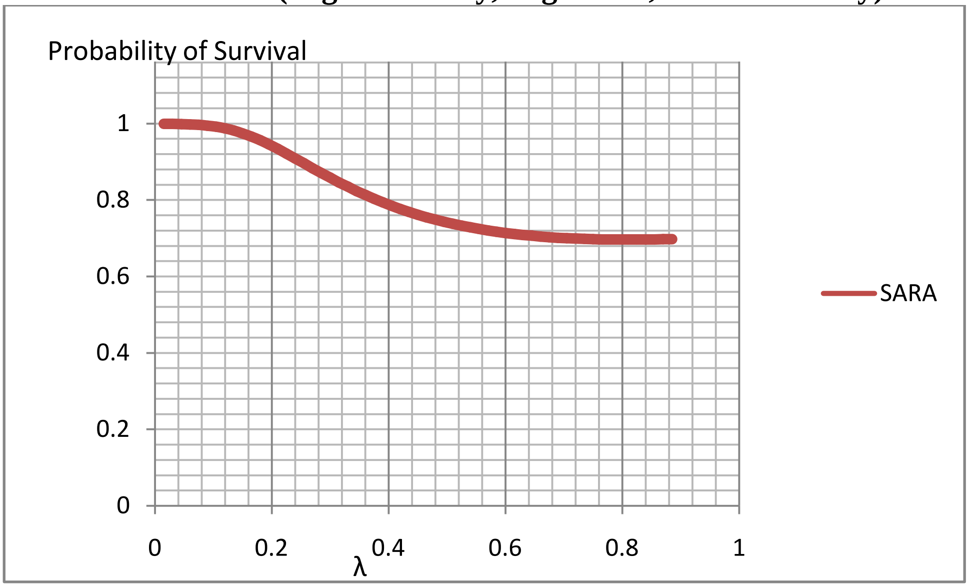
$S = 1\ D = 0.75\ \ T - t = 0.5\ \ \sigma = 0.3\ \ RR = 0.75$

Figure 5.11: Probability of Survival Against Recovery Rate Uncertainty (High Debt)



$S = 1\ D = 2.5\ \ T - t = 10\ \sigma = 0.3\ \ RR = 0.75$

Figure 5.12: Probability of Survival Against Recovery Rate Uncertainty (High Volatility, High Debt, Short Maturity)

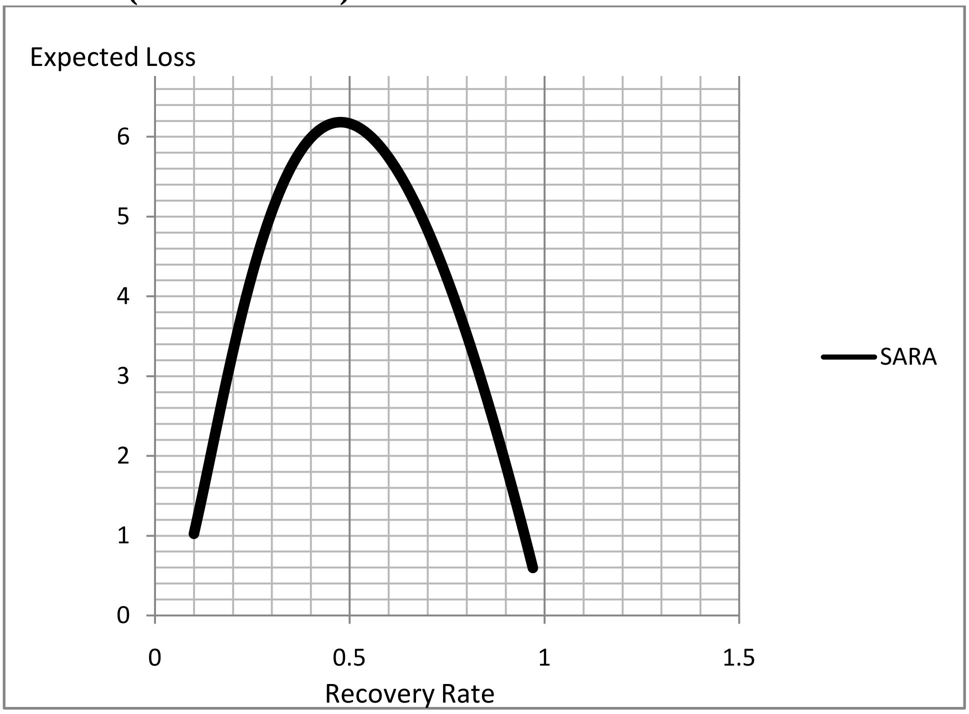


$S = 1\ D = 2.5\ \ T - t = 0.5\ \sigma = 0.5\ \ RR = 0.75$

5.3.3 SARA Bonds and Expected Loss:

This section provides the simulation results for the expected loss (EL) generated against changes in recovery rate. The results for the standard model are presented in Figure 5.13. Their robustness to changes in stock volatility, term to maturity and debt-equity ratio are provided in Figure 5.14, 5.15, 5.16, 5.17 and 5.18 respectively.

Figure 5.13: Expected Loss Against Recovery Rate (Standard Case)



$S = 1\ D = 0.75\ \ T - t = 10\ \ \sigma = 0.3\ \ \lambda = 0.3$

Figure 5.13 above shows that expected loss (EL) increases for recovery rates below 0.5 and falls for recovery rate in excess of 0.5. Moreover, the change in expected loss is quite considerable. The results indicate that for unsecured bonds (with recovery rates of around 0.4) an increase causes the expected loss to rise.[131] However, for secured bonds (with recovery rates of around 0.6) their higher recovery rates cause

[131] As long as this increase does not cause the recovery rate to cross the 0.5 threshold.

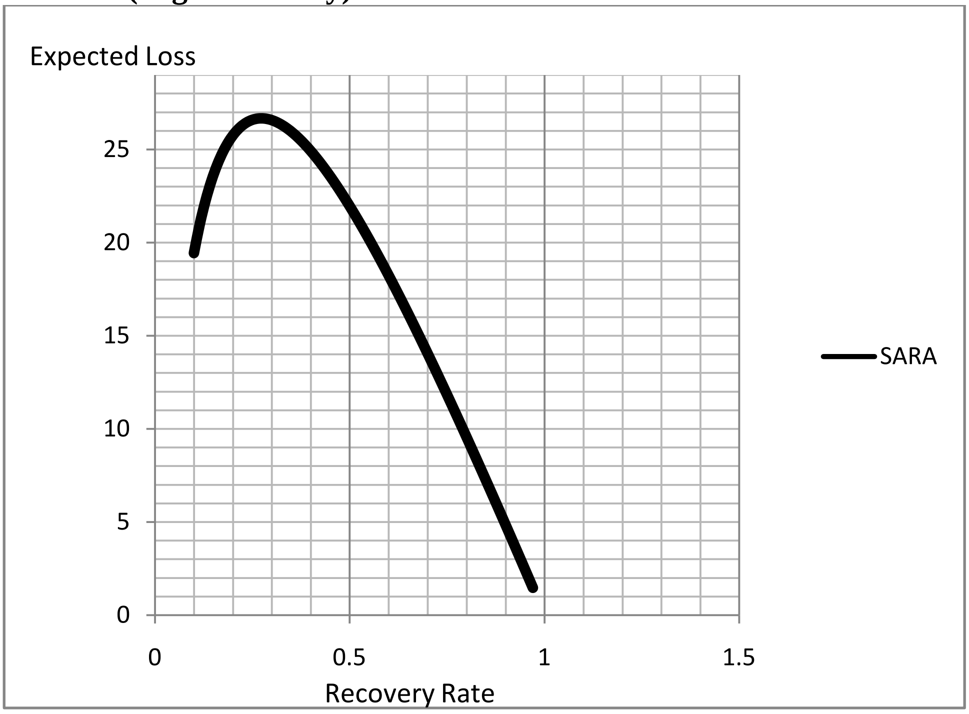
the expected loss to fall. This implies that SARA bonds, with higher recovery rates (around 0.75) than secured conventional bonds, would experience considerably lower expected loss. A possible explanation for the shape of Figure 5.13 above is that for recovery rates of less than 0.5, the decline in the survival probability as shown in Figure 5.1[132] dominates, causing the expected loss (EL) to rise. In contrast, for recovery rates in excess of 0.5, the positive effect of recovery rates dominates resulting in a fall in expected loss (EL).[133] The robustness test presented in Figures 5.14, 5.15, 5.16, 5.17 and 5.18 below corroborate the result shown in Figure 5.13 above with only slight changes in recovery rate threshold after which the expected loss (EL) falls. These results, therefore, support the Hypothesis H2e suggesting that SARA bond's higher recovery rate would cause expected loss (EL) to decrease considerably.

[132] Figure 5.1 shows the change in survival probability with a change in recovery rate.

[133] Holding survival probability constant, recovery rate has an inverse relation with expected loss.

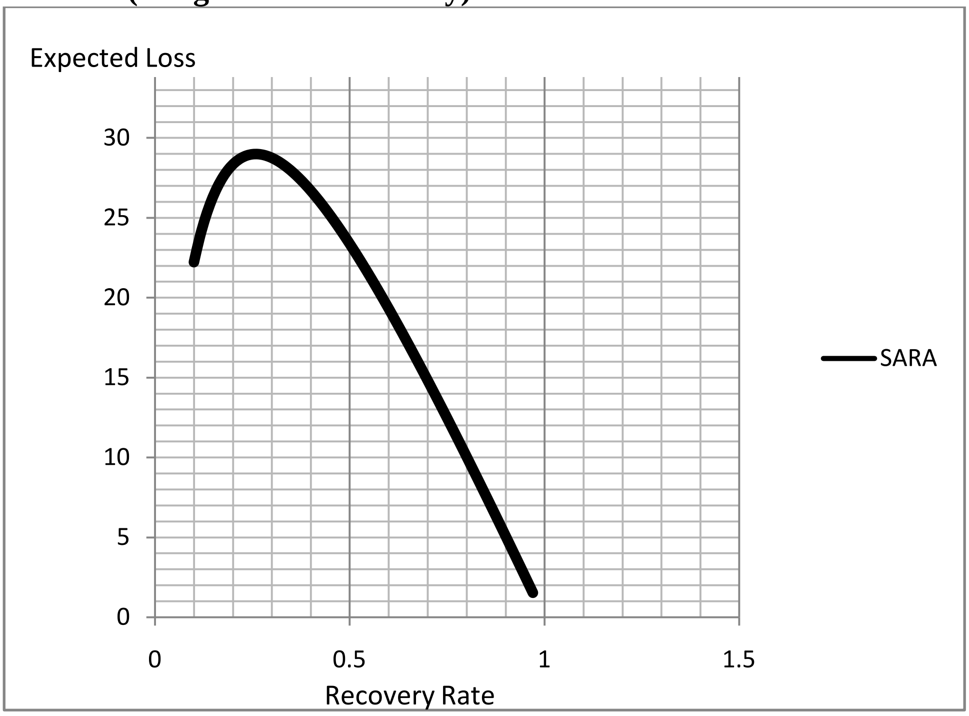
$$EL = (1 - Survival\ Probability)(1 - Recovery\ Rate)$$

Figure 5.14: Expected Loss Against Recovery Rate (High Volatility)



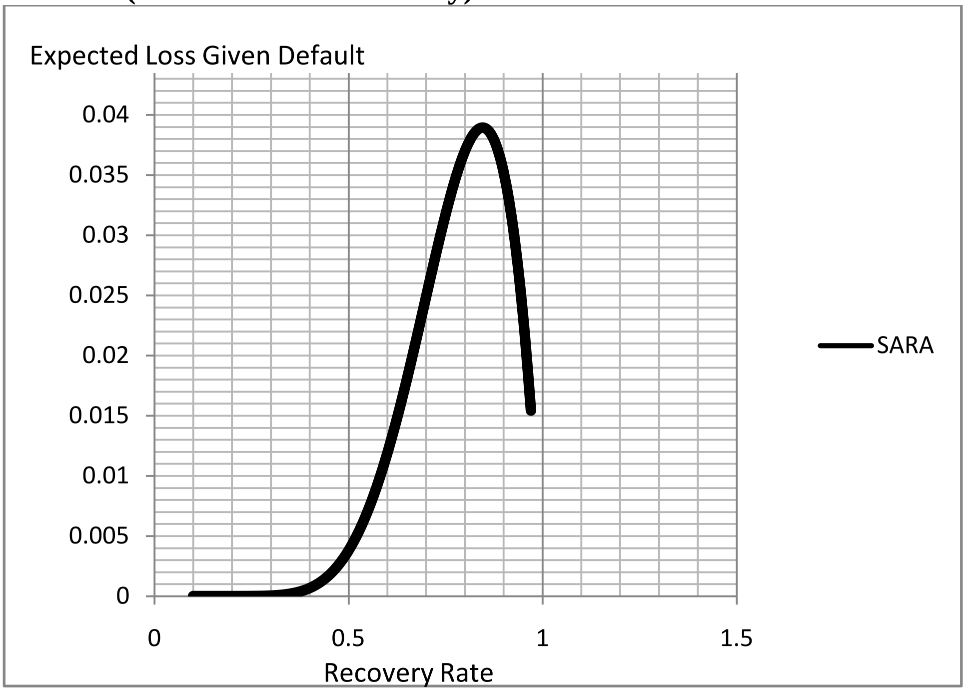
$S = 1\ D = 0.75\ \ T - t = 10\ \ \sigma = 0.5\ \ \lambda = 0.3$

Figure 5.15: Expected Loss Against Recovery Rate (Long Term to Maturity)



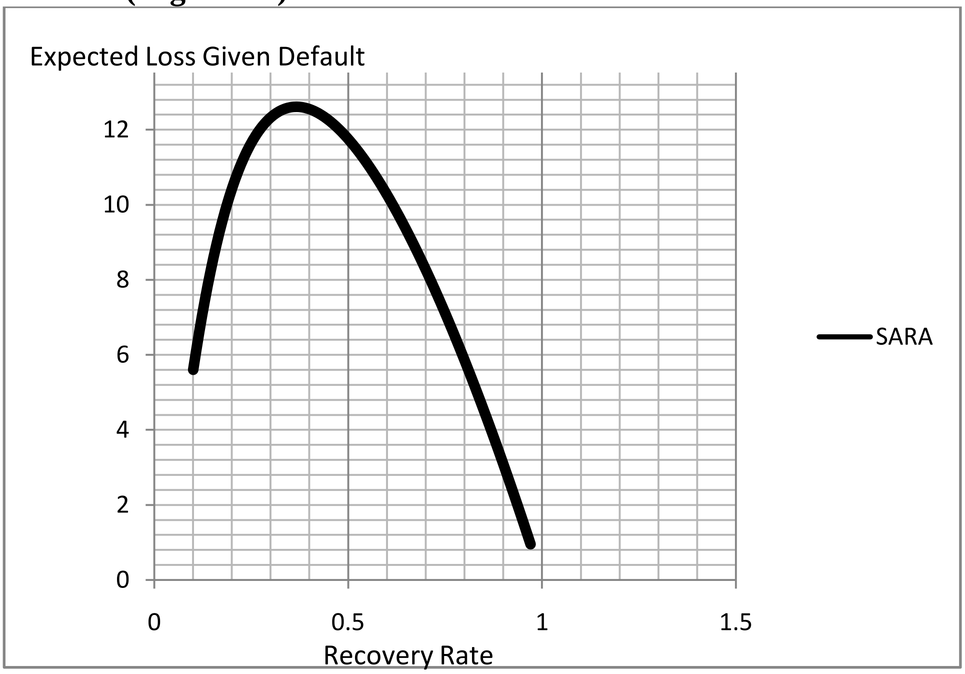
$S = 1\ D = 0.75\ \ T - t = 30\ \ \sigma = 0.3\ \ \lambda = 0.3$

Figure 5.16: Expected Loss Against Recovery Rate (Short Term to Maturity)



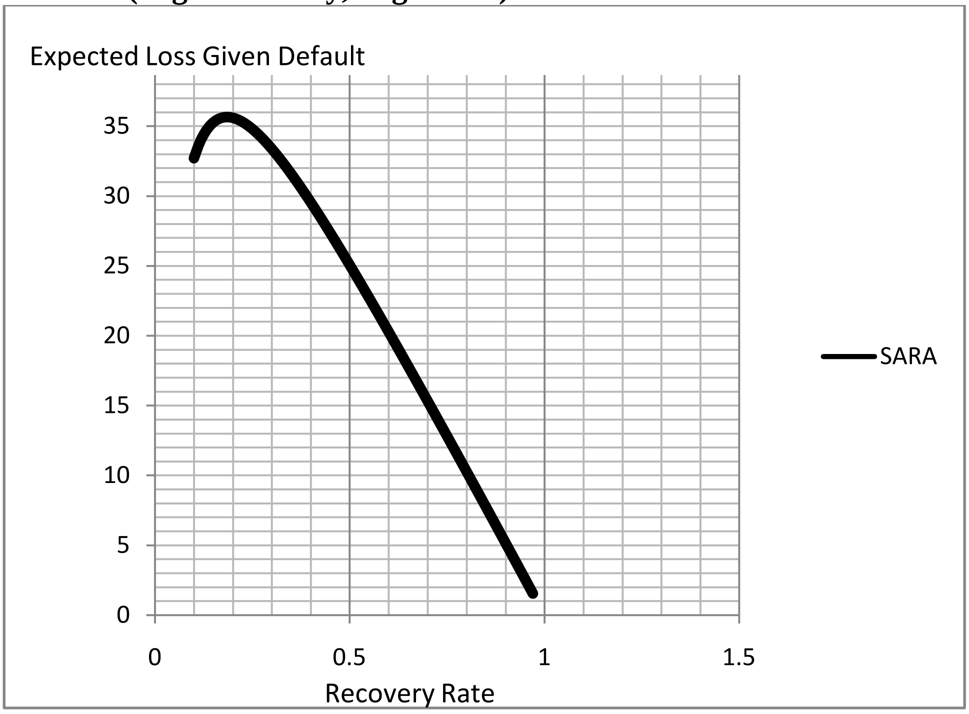
$S = 1\ D = 0.75\ \ T - t = 0.5\ \ \sigma = 0.3\ \ \lambda = 0.3$

Figure 5.17: Expected Loss Against Recovery Rate (High Debt)



$S = 1\ D = 2\ \ T - t = 10\ \ \sigma = 0.3\ \ \lambda = 0.$

Figure 5.18: Expected Loss Against Recovery Rate (High Volatility, High Debt)



$S = 1\ D = 2\ \ T - t = 10\ \ \sigma = 0.5\ \ \lambda = 0.3$

5.4 Conclusion:

This chapter provided the methodology and results for testing Hypotheses H2c, H2d and H2e and to answer Research Question 2 from the SARA bond perspective, that is, "*Can conventional credit risk models be used to assess the risk in Islamic bonds?*"

The chapter first presented the methodology used to test the hypotheses. It then discussed the importance of the SARA bonds recovery rate and its uncertainty as well as the ability of the CreditGrades model to incorporate these findings. Simulations were then run using the CreditGrades model. The simulations rejected Hypotheses H2c and H2d. This suggests that the SARA bond's recovery rate and its uncertainty are not likely to impact survival probability sufficiently to cause it to differ from that of a secured bond. Their support to Hypothesis H2e, however, implies that the SARA bond's higher recovery rate is likely to decrease its expected loss (EL) compared to a conventional secured bond.

When taken together, Hypotheses H2c, H2d and H2e suggest that for the purpose of calculating survival probability, SARA bonds can be considered the same as conventional secured bonds. Therefore, conventional credit risk models like CreditGrades can be used to capture their default risk. However, the lower expected loss (EL) that accompanies SARA bonds' higher recovery rate should cause its credit risk to be lower and ratings to be higher than secured conventional bonds. This implies that SARA bonds' unique features should be considered in order to capture their true underlying risk. In summary the answer to RQ2 for SARA bonds is yes, conventional credit risk models cannot be used to assess the risk in Islamic bonds.

CHAPTER 6: DETERMINANTS OF CREDIT RATINGS AND ISSUER CHOICE OF BOND TYPE: DATA, METHODOLOGY AND RESULTS FOR RQ3 AND RQ4

6.1 Introduction:

This chapter presents the methodology and results of testing the eight hypotheses associated with Research Question 3 (RQ3), *"Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?"* and the seven hypotheses related to Research Question 4 (RQ4), *"Are the factors that affect an issuer's choice of Islamic bonds the same as for conventional bonds?"* The testing of Hypotheses H3a to H3h uses ordered probit analysis while Hypotheses H4a to H4g of RQ4 are examined through multivariate probit analysis. The remaining of this chapter is structured as follows. The data is described first in Section 6.2 and is followed by a discussion of methodology for RQ3 in Section 6.3 and for RQ4 in Section 6.4. The testing for RQ3 is reported in Section 6.5 and that of RQ4 in Section 6.6. The chapter ends with Section 6.7 which summarizes the discussion.

6.2 Data:

This section discusses the data used to test the hypotheses associated with RQ3 and RQ4. Data for RQ3 is covered first followed by that of RQ4.

6.2.1 Data for RQ3:

This sub-section analyses the data to test Hypotheses H3a to H3h for RQ3. It describes the sample units, data sources and sampling procedure, composition and coverage.

6.2.1.1 Sample Units:

The data consists of a sample of 458 Malaysian corporate Islamic bonds. The study has been restricted to Malaysia[134] for it is by far the largest issuer of Islamic bonds.[135] The sample period is from 2002 to 2010. Islamic bonds issued prior to 2002 have been excluded as there was data for only one issuer for that period.[136] The data for sovereign government bonds have also been omitted as the focus is only on corporate issuers (See Blume et al., 1998; Mirkovic & Ragunathan, 2006). Banks and other financial institutions are similarly excluded as their financial ratios are not always comparable to other corporate firms (See Blume et al., 1998). Given some of the variables used for RQ3 (for example beta), only companies listed on the Kuala Lumpur Stock Exchange (KLSE) are considered.

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[134] For the use of censored and truncated data to avoid sample bias see Wooldrige (2009) and Greene (2008).

[135] In the IFIS database (as shown in Table 6.1) more than 90% of the data is for Malaysian Bonds. This is due to unparalleled measures taken by the Malaysian government to establish their world leadership in Islamic finance.

[136] For removing of outliers to avoid sample bias see Wooldrige (2009) and Greene (2008).

6.2.1.2 Data Sources:

The data has been obtained from IFIS (Islamic Finance Information Service), Datastream and Compustat. IFIS provides the data for the name of Islamic bond issuer, issue date, issuer's credit rating, Islamic bond type and Shariah advisor.[137] Datastream is used to extract daily data for the issuing firm's stock prices[138] and the Dow Jones Total Market Index for Malaysia. Compustat is employed for other firm specific variables (see Section 6.3). A brief introduction of each of these databases is provided next.

IFIS is managed by ISI Emerging Markets, which is part of the Euromoney Institutional Investor Company. IFIS offers comprehensive data on Islamic capital markets with particularly detailed coverage of specific Islamic bond issues, their credit ratings and Shariah advisors. Datastram is managed by Thomson Reuters and is the source of historical financial time series data. Compustat is administered by Capital IQ and offers a comprehensive coverage on historical fundamental firm data. The sample procedure, composition and data coverage is explained next.

6.2.1.3 Sample Procedure, Composition and Coverage:

A data sample of 1166 Islamic bonds from a cross section of countries was initially obtained using the IFIS database. Given the focus of RQ3 is on corporate Islamic bonds, 206 sovereign Islamic bonds were excluded from the sample (see Blume, Lim& MacKinlay, 1998). However, as more than 90% of remaining sample of

[137] It is believed to be the most comprehensive global Islamic finance database available. It is managed by ISI Emerging Markets, which is part of the Euromoney Institutional Investor Company.
[138] These are used to calculate market value beta and its standard errors.

corporate Islamic bonds consisted of Malaysian Islamic bonds, the study was restricted to Malaysia.[139] Data for financial institutions was also excluded from the sample (see Blume et al., 1998). Finally, a search was then conducted in Datastream and Compustat to extract firm specific data for the issuers. Due to missing data, however, a number of bond issues had to be eliminated as complete data was only retrieved for 458 Islamic bonds from 83 issuers. Table 6.1 below summarizes the sampling procedure.

Table 6.1: Sampling Procedure and Sample Size for RQ3

This table outlines the sample selection criteria and total number of sample bond considered for RQ3. The data is for Malaysian Islamic bonds from the period 2002 to 2010.

Description	**No**
Total corporate and sovereign Islamic bonds obtained from the IFIS data base	1166
Exclude sovereign Islamic bonds	206
Total corporate bonds	960
Exclude non Malaysian Islamic bonds	75
Exclude bonds issued by financial institutions and those with missing data from Datastream and Compustat	427
Final sample	**458**

Source: Prepared by the author using total IFIS data.

A summary of the Islamic bond rating and type (see Table 6.2) shows that debt bonds[140] dominate the final sample. This is due to the ease with which they can be structured given their similarity with conventional bonds (Howladar, 2006; Dusuki & Mukhtar, 2010). The sample composition by the issuers' industry is provided in Table 6.3.

[139] As suggested earlier (see FN1).

[140] As discussed in Section 1.2.4.3, these are Murabaha bonds.

Table 6.2: Selected Islamic Credit Ratings and Bond Type for RQ3

The table shows a summary of credit ratings data for debt, IJV and SARA bonds. The data is for corporate Malaysian Islamic bond issues from the period 2002 to 2010

Rating	Debt Bonds	IJV Bonds	SARA Bonds	Total
AAA/AA	203	47	12	262
A	156	1	2	159
BBB	20	0	0	20
Other	14	0	3	17
Total	**393**	**48**	**17**	**458**

Source: Prepared by the author using IFIS data.

Table 6.3: Selected Credit Ratings and Industry Effect for RQ3

The table shows a summary of sample composition according to the issuer's industry. The data is for corporate Malaysian Islamic bond issues from the period 2002 to 2010.

Industry	AAA/AA	A	BBB	lower	Total
Manufacturing	28	96	17	4	**145**
Property and Infrastructure Development	75	26	1	0	**102**
Energy (Electricity, Gas and Oil)	36	6	0	13	**55**
Agriculture, Food and Palm Oil	76	11	0	0	**87**
Shipping and Transportation Services	28	0	1	0	**29**
Other	19	20	1	0	**40**
Total	**262**	**159**	**20**	**17**	**458**

Source: Prepared by the author using IFIS data.

6.2.2 Data for RQ4:

This sub-section considers the data used to test Hypotheses H4a to H4g for RQ4. It describes the sample units, data sources and sampling procedure, composition and coverage.

6.2.2.1 Sample Units:

The data consists of 456 Malaysian corporate Islamic bond issues. As with RQ3, the sample period is from 2002 to 2010 with prior to 2002 data excluded due to availability problem.[141] Data for banks and other financial institutions are also excluded (Julio et al., 2008; Blume et al., 1998).

6.2.2.2 Data Sources:

Like with RQ3, the issuing firm's name, issue data, bond type and Shariah advisor has been obtained from IFIS (Islamic Finance Information Service). Datastream is used to extract daily data for stock prices, market to book value ratio of the issuer and Dow Jones Total Market Index. Compustat, moreover, is employed for other firm specific financial variables (see Section 6.4).

6.2.2.3 Sample Procedure, Composition and Coverage:

A sample of 458 Islamic bond issues obtained for RQ3 was initially employed as was shown in Table 6.2. A search was then conducted in Datastream to extract data for any additional variable not present in the model for RQ3. A few observations were

[141] For removing of outliers to avoid sample bias see Wooldrige (2009) and Greene (2008).

lost as data was retrieved for 456 Islamic bond issues.[142] The sampling procedure is summarised in Table 6.4 below. A summary of the sample's composition on type of bond is provided in Table 6.5 below. The issuers' industry composition is provided in Table 6.6.

Table 6.4: Selected Sampling Procedure and Sample Size for RQ4

This table outlines the sample selection criteria and total number of sample bond considered for RQ3. The data is for Malaysian Islamic bonds from the period 2002 to 2010.

Description	**No**
Sample for RQ3	458
Exclude bonds with missing data from Datastream	2
Final Sample for RQ4	**456**

Source: Prepared by the author using IFIS data

[142] A few observations were lost because the model for RQ4 contains one additional variable (Market to book value) not present in the model for RQ3 (see Section 6.3 and 6.4).

Table 6.5: Selected Islamic Bond Type for RQ4

The table shows composition of the data sample according to the bond type. The data consists of debt, IJV and SARA bonds. The sample is of corporate Malaysian Islamic bond issues from the period 2002 to 2010.

Debt Bonds	IJV Bonds	SARA Bonds	Total
391	48	17	456

Source: Prepared by the author using IFIS data.

Table 6.6: Selected Issues According to Industry for RQ4

The table shows a summary of sample's composition according to the issuer's industry. The data is for corporate Malaysian Islamic bond issues from the period 2002 to 2010.

Industry	Total
Manufacturing	144
Property and Infrastructure Development	102
Energy (Electricity, Gas and Oil)	55
Agriculture, Food and Palm Oil	86
Others[143]	69
Total	**456**

Source: Prepared by the author using IFIS data.

[143] These include shipping, transportation and technical services (IFIS data base).

6.3 Methodology for RQ3:

This section discusses the ordered probit analysis used to test Hypotheses H3a to H3h. It starts with an overview of econometric methods used for credit rating determination. This helps to establish their shortcomings and shows the superiority of the ordered probit. This ordered probit analysis is then extended to develop an Islamic bond rating model. This is followed by measurements of the model's variables. The section ends with robustness test used to identify the presence of any industry effect.

6.3.1 Overview of Econometric Methods Used for Credit Rating Determination:

Researchers have used several econometric methods to infer the determinants of corporate bond ratings including Z-scores, regression analysis and ordered probit. Z-scores use weighted average of financial ratios to differentiate a group of bankrupt and non-bankrupt firms (See Altman, 1968). Given the simplistic nature of Z scores, however, researchers have employed econometric techniques such as regression analysis (see Pogue & Soldofsky, 1969; Packer, 2000). These involve assigning numerical values to credit ratings (such as AAA = 16, AA+ = 15, AA = 14, B = 2, and B- =1) and then regressing against a set of explanatory variables using OLS (Packer, 2000). The linear regressions have certain limitations that have made them unpopular. Firstly, the regression assumes continuity of dependent variables but credit ratings are discrete and not continuous. Secondly, linear regression requires the differences between the rating categories be evenly spaced, that is, the difference between AAA and AA is the same as that of the BB and B but this again is not true in practice (see Kaplan & Urwitz, 1979; Blume et al., 1998). As a result of these limitations, ordered probit analysis is the most widely used approach for corporate and sovereign credit ratings (Blume et al., 1998; Gray, Mirkovic & Ragunathan, 2006). The following section discusses the ordered probit analysis.

6.3.2 Ordered Probit:

Order probit analysis considers the discreet and the ordinal nature of the dependent variable. This enables it to evaluate variables such as credit ratings which are non-continuous and have an economic meaning to their ranking order (Kaplan & Urwitz, 1979). The ordered probit analysis establishes the relationship between the discreet variable and a set of independent explanatory variables by using an unobserved latent variable. This latent variable is a function of the observed independent explanatory variables. The ordered probit analysis maps the discreet variable into a subset of the latent variable's range and in turn infers the relationship between the discreet and the explanatory variables (see Greene, 2008). The example below illustrates the ordered probit analysis.

Suppose that there is an ordered variable 'y' that takes on 'j' different values. Ordered probit assumes that 'y' is generated by a latent unobservable variable$'y^{*\prime}$ which is determined by a set of independent observed variables (X). Equation 6.1 below captures the determinants of $'y^{*\prime}$. Equation 6.3 shows how $'y^{*\prime}$ can be used to map the variable 'y' into a subset of the range of $'y^{*\prime}$.

$$y^* = x^{'}\beta + \epsilon \qquad (6.1)$$

$$\varepsilon \sim N(0,1) \qquad (6.2)$$

$$
\begin{aligned}
y &= 0 \text{ if } y^* \leq 0 \\
&= 1 \text{ if } 0 < y^* \leq \mu_1 \\
&= 2 \text{ if } \mu_1 < y^* \leq \mu_2) \\
&\quad .. \\
&\quad .. \\
&= J \text{ if } \mu_{J-1} \leq y^*
\end{aligned}
\tag{6.3}
$$

From the above Equation 6.3 the probabilities of each of the j occurrence happening can be calculated as shown in Equation 6.4 below.

$$
\begin{gathered}
\Pr(y = 0|\, x) = \Phi(-x'\beta), \\
\Pr(y = 1|\, x) = \Phi(\mu 1 - x'\beta) - \Phi(-x'\beta), \\
\Pr(y = 2|\, x) = \Phi(\mu_2 - x'\beta) - \Phi(\mu_1 - x'\beta), \\
.. \\
.. \\
\Pr(y = J|\, x) = 1 - \Phi\left(\mu_{J-1} - x'\beta\right).
\end{gathered}
\tag{6.4}
$$

$$
0 < \mu_1 < \mu_2 < \cdots < \mu_{J-1} \tag{6.5}
$$

The value of the μ and β above can be estimated using a likelihood function. This is a product of the probabilities associated with each discreet outcome as shown in Equation 6.6 below.

$$L\ (\beta,\mu) = \prod_{i=1}^{n} \Pr(y_i = j |\, x_i\ ) \tag{6.6}$$

$$L\ (\beta,\mu) = \prod_{i=1}^{n} \varphi\left(\mu_{y_{i+1}} - x_i\beta\right) - \varphi\left(\mu_{y_i} - x_i\beta\right) \tag{6.7}$$

The log of Equation 6.7 above is taken first. Then for simplicity an indicator function Z is introduced which takes on the value 1 when y_i equals 'j' and zero otherwise. When used in Equation 6.7 the likelihood function can be reduced to Equation 6.8 below.

$$Z_{ij} = I(y_i = j) \tag{6.8}$$

$$L\ (\beta,\mu) = \sum_{i=1}^{n}\sum_{j=1}^{J} Z_{ij} \log\left[\varphi\left(\mu_{y_{i+1}} - x_i\beta\right) - \varphi\left(\mu_{y_i} - x_i\beta\right)\right] \tag{6.9}$$

Using first order conditions for the above Equation 6.9, the values for μ and βcan be estimated.The Islamic bond rating model is discussed next.

6.3.3 Islamic Bond Rating Model:

This sub-section section uses ordered probit analysis to develop an Islamic bond rating model. Following Equations 6.1 and 6.3 above, credit ratings are first converted into a discrete credit score variable, Y_i as shown in Equation 6.10.

$$Y_i = \begin{cases} 1 \text{ if company is rated AAA/AA} \\ 2 \text{ if company is rated A} \\ 3 \text{ if compnay is rated BBB} \\ 4 \text{ for all lower ratings} \end{cases} \tag{6.10}$$

As discussed previously in Section 2.4 Chapter 2, the Islamic bond ratings are determined by firm and Islamic instruments specific variables. These are captured by the latent variable Y_i^* in Equation 6.11.

$$\begin{aligned} Y_i^* = \alpha + \beta_1 OIS + \tau_1 IC1 + \tau_2 IC2 + \tau_3 IC3 + \tau_4 IC4 + \beta_2 LA \\ + \beta_3 LTDA + \beta_4 DTA + \beta_5 SE + \beta_6 BETA + \gamma_1 2008 \\ + \gamma_2 GFC + \gamma_3 \mathrm{IJV} + \gamma_4 \mathrm{SARA} + \gamma_5 SB + \varepsilon \end{aligned} \tag{6.11}$$

Y_i^* then maps these variables on the credit ratings as reflected in Equation 6.12.

$$Y_i^* = \begin{cases} 1 \text{ if } Y_i^* \leq \alpha_1 \\ 2 \text{ if } \alpha_1 < Y_i^* \leq \alpha_2 \\ 3 \text{ if } \alpha_2 < Y_i^* \leq \alpha_3 \\ 4 \text{ if } Y_i^* > \alpha_4 \end{cases} \tag{6.12}$$

The model in Equation 6.11 and 6.12 is developed so that those variables expected to result in a credit rating increase should have negative coefficients while those causing a decline in ratings should be positive. These variables are depicted in Table 6.7 and are discussed next.

Table 6.7: Variables Used in the Islamic Bond Rating Model for RQ3

This table provide details of the variables used to estimate Equations 6.11 related to RQ3. These include their effect, measurement, expected impact, hypothesized coefficient sign and the associated hypotheses. The information provided here is consistent with previous studies as explained in the text.

Effect	Variable	Measurement	Expected Impact	Hypothesized Coefficient Sign	Hypotheses
Operating Margin	OIS	$\frac{\text{operating income before depreciation}}{\text{sales}}$	+	-	**H3a:** Operating margin, interest coverage and firm size are positive determinants of Islamic bonds' credit ratings, *ceteris paribus*.
Interest Coverage	IC	$\frac{\text{operating income after depreciation} + \text{interest exp}}{\text{interest expense}}$	+	-	
Firm Size	LA	Log of total assets	+	-	
Leverage Ratio I	LTDA	$\frac{\text{long term debt}}{\text{total assets}}$	-	+	**H3b:** Leverage ratios and standard errors are negative determinants of Islamic bonds' credit ratings, *ceteris paribus.*
Leverage Ratio II	DTA	$\frac{\text{long term debt} + \text{debt in current liabilities}}{\text{total assets}}$	-	+	
Standard Error	SE		-	+	
Beta	Beta	Market beta	(insignificant)		**H3c:** Market model beta is an insignificant determinant of Islamic bonds' credit ratings, *ceteris paribus*.

Table 6.7: Variables Used in the Islamic Bond Rating Model for RQ3 Continued

Shariah Standards	2008	Dummy variable that takes the value 1 for bonds issued in 2008	+	-	**H3d**: Islamic bonds issued during 2008 have higher ratings, *ceteris paribus*.
Sub-prime Crisis	GFC	Dummy variable that the value 1 for bonds issued in 2009 and 2010	(non negative)	+ (or insignificant)	**H3e**: Holding firm specific variables constant, credit ratings of newly issued Islamic bonds have not declined during the sub-prime financial crisis in 2009.
SARA Bond	SARA	Dummy variable that takes the value of 1 for SARA bond type	+	-	**H3f:** SARA bonds have higher ratings than IJV and debt bonds, *ceteris paribus*.
IJV Bond	IJV	Dummy variable that takes the value of 1 for IJV bond type	-	+	**H3g:** IJV bonds have lower ratings than debt bonds, *ceteris paribus*.
Shariah Committee	SB	Dummy variable that takes the value of 1 for Shariah Committees	+	-	**H3h:** Islamic bonds approved by Shariah committees have higher credit ratings than those approved by individual advisors, *ceteris paribus*.

6.3.4 Measurements of the Variables:

This section discusses the measurements and modifications of the model's variables (Equation 6.11). The firm specific variables are covered first followed by those capturing specific events and Islamic instrument specific effects. The section ends with a statically summary of the variables.

6.3.4.1 Measures of Firms Specific Variables (H3a to H3c):

As discussed previously in Section 2.4 of Chapter 2, the firm specific determinants of Islamic bonds' credit risk are captured by operating margin, long-term debt, total debt, interest coverage, Firm size, market beta, standard error and event specific effect. These help to test Hypotheses H3a to H3e.

Measure of Operating Margin, Interest Coverage and Firm Size (H3a):

Operating margin is represented by the operating income (before depreciation) to sales ratio (OIS). It measures profitability and reflects the company's return on each dollar of sales (Blume et al., 1998). As a high ratio is likely to have a positive impact on Islamic bond ratings, their coefficient in the model should be negative.

Interest coverage (IC) is the sum of operating income (after depreciation) and interest expense calculated as multiple of interest expense. The IC variable, however, must be modified before it can be used in the model (see Blume et al., 1998). This is because ordered probit analysis as given in Equation 6.11 assumes a linear relationship between the latent variable Y_i^* and the independent variables. This assumption, however, is implausible for the interest coverage ratio, since the data sample has a skewed distribution with a coefficient equal to 20.98. The mean value of interest coverage is 11.01 and the median is 4.IC also ranges from a maximum value of 2239 to a minimum value of -29.21 with 3 values of more than 100. Given the linearity assumption of ordered probit analysis, a change in IC from 3 to 6 should have a similar effect on credit ratings as a change from 100 to 103 (see Blume et al., 1998). This seems counter intuitive for a change in IC from 3 to 6 (100% increase) should result in an upgrade in credit ratings while relatively small change from 100 to 103 might have no effect. IC also has 8 values of less than zero. A negative ratio seems meaningless as earnings of less than zero are responsible for the negative sign. This creates an ambiguity in interpreting IC's coefficient because a large negative IC could either be due to a small interest expense or large negative earning (see Blume et al. 1998).

The above problems have been remedied by adjusting IC following Blume et al. (1998) in two ways. Firstly, all the negative values for IC are set to zero and values greater than 100 are set reduced to 100. Secondly, its non-linearity is countered by replacing the single IC variable with the four variables (IC1, IC2, IC3 and IC4) to reflect different levels of interest coverage as shown in Table 6.8 below.

Table 6.8: Modification of Interest Coverage in Islamic Bond Rating Model for RQ3

This table presents the modification of the IC variable in the ordered probit model given in Equation 6.11.The table suggests that impact of interest coverage (IC) ratio ranging from 0 to 5 is captured by 1C1, from 5 to 10 by IC2, from 10 to 20 by IC3 and from 20 to 100 by IC4.

	$IC1_i$	$IC2_i$	$IC3_i$	$IC4_i$
$\boldsymbol{IC_i} \in [\mathbf{0},\mathbf{5})$	IC_i	0	0	0
$\boldsymbol{IC_i} \in [\mathbf{5},\mathbf{10})$	5	$IC_i - 5$	0	0
$\boldsymbol{IC_i} \in [\mathbf{10},\mathbf{20})$	5	5	$IC_i - 10$	0
$\boldsymbol{IC_i} \in [\mathbf{20},\mathbf{100}]$	5	5	10	$IC_i - 20$

Source: Adapted from Blume et al. (1998, p. 1398)

Table 6.8 above suggests that impact of interest coverage (IC) ratio ranging from 0 to 5 is captured by 1C1, from 5 to 10 by IC2, from 10 to 20 by IC3 and from 20 to 100 by IC4. The above methodology employed by Blume et al. (1998) allows for different weights for each increment of the interest coverage ratio. This captures the fact that different increments of IC affect the credit ratings differently. Moreover, it can test the assertion that additional increments of the IC at higher values provide no information regarding the firm's credit risk. If the assertion is true for the sample, one would expect the coefficient of IC4 to be statistically insignificant. This has been shown to be true by Blume et al. (1998). They found the coefficient of IC1to be positive, large and significantly different from zero. The coefficients of IC2 and IC3 and were found to be small, positive and significant while τ_4 was found to be statistically insignificant.

Firm size is captured by taking a log of the total assets (LA) (see Kaplan & Urwitz, 1979; Blume et al., 1998). As bigger firms tend to have more experienced, better product lines and more diverse sources of revenue, they are less likely to fail (Blume et al., 1998). Therefore, firm size should also have a positive effect on Islamic bond ratings. Their coefficient in the model should be negative.

Measure of Firm Leverage (H3b):

The long term debt to total asset ratio (LTDA) and total debt[144] to total asset ratio (DTA) reflect the impact of firm leverage on its credit ratings (see Blume et al., 1998). As it measures risk it should have a negative impact on Islamic bond ratings and a negative coefficient in the model.

Market Model Beta (H3c) and Standard Error (H3b):

Market model beta is a measure of issuing firm's market risk while the model's standard error captures its unique risk ratings (see Blume et al., 1998). The following equation is used to calculate the beta and standard error for each firm.

$$R_{it} = \alpha + \beta R_{Mt} + \varepsilon \qquad (6.14)$$

Where R_{it} is the daily return of the issuing firm, and the R_{Mt} is the daily return of the market portfolio.[145] ε is the disturbance term. BETA is represented by coefficient β. The Equation 6.14 above has been regressed using OLS to estimate BETA. The impact of beta on Islamic bond ratings depends upon how insulated the Islamic financial industry is from systematic shocks in the conventional system.[146] As argued previously in Section 2.4 Chapter 2, the Islamic financial industry in general and Islamic bond markets in particular are in a class of their own with Islamic bonds

[144] Total debt is represented by the sum of long-term debt and debt in current liabilities (Blume et al., 1998).
[145] As discussed in Section 6.2 DowJones Total Market Index for Malaysia is taken as the proxy for the market portfolio. The daily return is taken for the period 2002 to 2010.
[146] There is hardly any literature on how a systematic shock in conventional finance industry would affect the Islamic finance industry and vice versa.

having distinct structures and stronger fundamentals[147] compared to conventional bonds (Wibier & Salah, 2011). Therefore, they may not be affected directly by systematic shocks in the conventional financial system. BETA therefore is hypothesized to be insignificant (H3c).

Standard error represents that part of the variation in the stock return not explained by the market beta (Blume et al., 1998). It can be calculated as follows:

$$\hat{\sigma} = \sqrt{\frac{SSR}{n-2}} \qquad (6.15)$$

Where SSR is the sum of squared residuals from the OLS regression of Equation 6.14 above. Since high unique risk results in low credit ratings (Blume et al., 1998), for it should have a positive coefficient in the model.

[147] SARA bonds represent ownership in the underlying asset, hence, are more secured than secured conventional bonds (Usmani, 2007; Dusuki & Mukhtar, 2010).

6.3.4.2 Measure of Event Specific Effect (H3d and H3e):

As discussed previously in Section 2.4 Chapter 2, the Islamic bond ratings are likely to be affected by two specific events: Changes in Shariah standards (H3d) and the sub-prime financial crisis (H3e).

Measure of Changes in Shariah Standards (H3d):

A change in Shariah standards was formally announced by AAOIFI at the start of 2008 (see Usmani, 2007; AAOIFI, 2008). This effect is captured by 2008 year dummy that takes the value 1 for the year 2008 and 0 for all other years. As discussed previously in Section 2.4.3 Chapter 2, these better standards should have a positive impact on Islamic bond ratings.[148] Their estimated coefficient, therefore, should be negative.

Measure of Sub-prime Financial Crisis (H3f):

The sub-prime financial crisis that exacerbated in the US during the middle of 2008 starting effecting emerging markets like Malaysia at the end of 2008 and start of 2009 (see Hutchison & Dooley, 2009). Therefore, GFC (Global Financial Crisis) dummy variable that takes on the value 1 for bonds issued in 2009 and 2010 has been included to capture the crisis effect. As discussed previously in Section 2.4.3, the crisis should have limited impact on Islamic bond rating (Wibier & Salah, 2011). The coefficient of the GFC dummy therefore, should not be positive. Measurements of Islamic instrument specific effect are discussed next.

[148] See Usmani (2007), Howladar (2009) and Dusuki & Mukhtar (2010) for more on the impact of the 2008 AAOIFI standards on Islamic bond structures.

6.3.4.3 Measurements of Islamic Instrument Specific Effect:

As discussed previously in Section 2.4 of Chapter 2, Islamic instrument specific effect is captured by bond type effect (H3f) and Shariah advisor effect (H3g).

Measure of Bond Type Effect (H3f):

In the model shown in Equation 6.11, Islamic bond is used as the base case with dummy variables for IJV and SARA bonds. IJV dummy takes the value one for IJV bonds and zero otherwise. Similarly, SARA dummy takes the value one for the SARA bonds and zero otherwise. As discussed previously in Section 2.4.4, holding other things constant, IJV bonds should have lower ratings while SARA bond should have higher ratings (see Usmani, 2006; Howladar, 2006; Dusuki & Mukhtar, 2010). So the coefficient of IJV dummy in the model should be positive and negative for the SARA dummy.

Measure of Shariah Advisor Effect (H3g):

The Shariah advisor effect is captured by whether a bond is approved by an individual Shariah advisor or a committee. A Shariah committee (SB) dummy variable in the model takes a value of one for bonds certified by a Shariah committee and zero for those approved by an individual advisor. As discussed in Section 2.4.4 in Chapter 2, bonds approved by Shariah committees should have better structures owing to the stringent standards used by them to comply with the opinion of all the committee members (Karim, 1990; Grais & Pellegrini, 2006; Karim & Archer, 2007; Dusuki & Mukhtar, 2010). The Shariah committee dummy (SB) should, therefore, have a positive impact on Islamic bond ratings and hence a negative coefficient in the model.

6.3.4.4 Statistical Summary of the Variables:

The statistical summary of the variables is provided in Table 6.9 below, while the correlation matrix is given in Table 6.10.

Table 6.9: Statistical Summary of Variables Used in the Islamic Bond Rating Model for RQ3

This table provides the statistical summary of the variables used in Equation 6.11 related to RQ3 for the period 2002 to 2010. The descriptive statistics include mean, median, maximum, minimum, standard deviation, skewness and kurtosis.

	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis
OIS	0.147195	0.122289	0.878234	-0.07161	0.142581	2.957502	12.75795
IC1	3.583009	3.996298	5	0	1.327025	-0.45137	2.087414
IC2	1.056725	0	5	0	1.812847	1.416692	3.275959
IC3	0.701297	0	10	0	2.354386	3.213222	11.58833
IC4	0.875764	0	80	0	7.216551	9.675578	101.0827
LA	6.547014	6.150878	10.90375	4.371555	1.233679	1.123018	4.014705
LTDA	0.163674	0.129258	0.712726	0	0.127327	1.822369	6.276678
DTA	0.359023	0.3609	0.722745	0	0.133256	0.017592	2.50106
SE	0.030757	0.031131	0.107641	0.009301	0.013453	1.25908	6.969681
BETA	0.834916	0.800746	2.376969	-0.13352	0.355899	0.723274	3.288885

Table 6.10: Correlation Matrix of Variables Used in the Islamic Bond Rating Model for RQ3

The table shows the correlation matrix for variables used in Equation 6.11 related to RQ3 for the period 2002 to 2010. Refer to Table 6.7 for the definitions of these variables.

	OIS	**IC1**	**IC2**	**IC3**	**IC4**	**LA**	**LTDA**	**DTA**	**SE**	**BETA**
OIS	1	0.337219	0.138731	0.081555	0.061284	0.528131	0.529167	0.223423	-0.33085	0.009365
IC1	0.337219	1	0.623796	0.318762	0.129867	0.339431	-0.02512	-0.32749	-0.26961	0.128035
IC2	0.138731	0.623796	1	0.649342	0.264549	0.029526	-0.14873	-0.382	-0.01584	0.109016
IC3	0.081555	0.318762	0.649342	1	0.480348	0.146843	-0.19965	-0.32569	-0.05286	0.244338
IC4	0.061284	0.129867	0.264549	0.480348	1	-0.01824	-0.09245	-0.2302	-0.09293	0.035845
LA	0.528131	0.339431	0.029526	0.146843	-0.01824	1	0.37013	0.050839	-0.4634	0.233827
LTDA	0.529167	-0.02512	-0.14873	-0.19965	-0.09245	0.37013	1	0.510622	-0.25849	0.135366
DTA	0.223423	-0.32749	-0.382	-0.32569	-0.2302	0.050839	0.510622	1	0.051549	-0.28002
SE	-0.33085	-0.26961	-0.01584	-0.05286	-0.09293	-0.4634	-0.25849	0.051549	1	-0.10595
BETA	0.009365	0.128035	0.109016	0.244338	0.035845	0.233827	0.135366	-0.28002	-0.10595	1

6.3.5 Robustness of the Model and Industry Effect:

When comparing financial ratios from different industries, caution is advised as the relative importance of each ratio across industries might differ (Iskandar & Emery, 1994; Gray et al., 2006). Standard and Poor's (2003) found stark difference in some of the financial ratios of different industries. This section presents an alternative model that tests the robustness of the ordered probit model presented in Equation 6.11 by including variables that capture the industry effect.

The sample contains firms from different industries including manufacturing, energy, agriculture, property development, shipping, transportation and other services. To counter for any industry effect, dummy variables for manufacturing, energy, property and agriculture industries have been included in a second regression. The model is given by Equation 6.16 below and the industry variables are discussed in Table 6.11.

$$\begin{aligned} Y_i^* = \beta_1 OIS + \tau_1 IC1 + \tau_2 IC2 + \tau_3 IC3 + \tau_4 IC4 + \beta_2 LA + \beta_3 LTDA \\ + \beta_4 DTA + \beta_5 SE + \beta_6 BETA + \gamma_1 2008 + \gamma_2 GFC \\ + \gamma_3 IJV + \gamma_4 SARA + \gamma_5 SB + \theta_1 Property + \theta_2 Energy \\ + \theta_3 Agriculture + \theta_4 Manufacture + \varepsilon \end{aligned} \tag{6.16}$$

Table 6.11: Variables Capturing Industry Effect in the Islamic Bond Rating Model for RQ3

This table provide details of the variables that are used in Equations 6.16 to capture the industry effect for the period 2002 to 2010. These variables help to test the robustness of the results for Equation 6.11

Industry	Variable	Measurement
Manufacturing	Manufacture	Dummy variable that takes the value 1 for manufacturing industry
Energy Sector	Energy	Dummy variable that takes the value 1 for energy sector
Property and Infrastructure Development	Property	Dummy variable that takes the value 1 for property and infrastructure development industry
Agriculture, Plantation and Food	Agriculture	Dummy variable that takes the value 1 for agriculture, plantation and food industry

6.4 Methodology for RQ4:

This section presents the methodology to test Hypotheses H4a to H4g associated with RQ4. It starts with the multinomial probit analysis used to develop the estimating model by capturing the determinants of Islamic bond type. The model's variables are then covered. The section ends with the robustness test of the model for any industry caused effects.

6.4.1 Multinomial Probit:

Multinomial probit model is a generalization of the probit model for comparing multiple choices (more than two) for an unordered data (see Greene, 2008; Kumar, Chava & Warga, 2010). Like the ordered probit model, it uses a latent variable to establish a link between the discrete variable and its determinants. This latent variable can be likened to a utility function as shown in Equation 6.17 below.

$$U_{ij} = x'_{ij}\beta + \epsilon_{ij} \tag{6.17}$$

where the joint distribution of $(\varepsilon_{i1}, \varepsilon_{i2}, \cdots, \varepsilon_{iJ})$ is multivariate normal with the following properties.

$$\begin{bmatrix} \varepsilon_{i1} \\ \varepsilon_{i2} \\ \vdots \\ \vdots \\ \varepsilon_{iJ} \end{bmatrix} \sim N(0, \Sigma) \tag{6.18}$$

$$\Sigma = [\sigma_{jk}]_{j,k=1,\dots,J} \tag{6.19}$$

Assume that Equation 6.17 above provides the utility for all the multiple outcomes of a discrete variable Y.

$$Y = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ . \\ . \\ j \end{bmatrix} \qquad (6.20)$$

The model assumes that the *j*th alternative is chosen if and only if the utility derived from the *j*th outcome is higher (or at least equal) than the utility from other outcomes as shown in Equation 6.21 below.

$$U_{ij} \geq U_{ik} \ for \ all \ k \neq j \qquad (6.21)$$

Here the probability of the *j*th outcome is equal to the probability of Equation 6.21 being true. It can be reduced to Equation 6.22.

$$P(y_i = j) = P_{ij} = P\left[\varepsilon_{i1} - \varepsilon_{ij} < \left(x_{ij} - x_{i1}\right)^{'} \beta, \dots, \varepsilon_{iJ} - \varepsilon_{ij} < \left(x_{ij} - x_{iJ}\right)^{'} \beta\right] \qquad (6.22)$$

The multinomial probit equation can be estimated using the log-likelihood function as follows:

$$\mathcal{L} = \sum_{i=1}^{N} \sum_{j=1}^{J} d_{ij} \ \ln P(y_i = j) \qquad (6.23)$$

Where

$$d_{ij} = \begin{cases} 1 & if\ individual\ i\ chooses\ alternative\ j \\ 0 & otherwise \end{cases} \qquad (6.24)$$

The next section presents a multi-nomial probit model for the determinants of Islamic bond type.

6.4.2 Determinants of Islamic Bond Type Model:

This section develops the multinomial probit model for the determinants of Islamic bond type.

The data described in Section 6.2 is composed of three types of Islamic bonds IJV, SARA and debt bonds. Equation 6.25 below shows the discrete variable, Y, that represents each of three Islamic bonds.

$$Y_{i=} \begin{bmatrix} 1\ \text{IJV bonds} \\ 2\ \text{SARA bonds} \\ 3\ \text{for debt bonds} \end{bmatrix} \qquad (6.25)$$

As discussed previously in Section 2.5 Chapter 2, the type of Islamic bond a firm issues is determined by firm specific, event specific and Islamic instrument specific variables. These are captured by the latent utility shown in Equation 6.26 below (see Table 6.12 for the explanation of the variables).

$$U_i^{*} = \alpha + \beta_1 DTA + \beta_2 LTDA + \beta_3 BETA + \beta_4 SE + \beta_5 IC + \beta_6 OIS + \beta_7 LA + \beta_8 MtB + \beta_9 2008 + \beta_{10} GFC + \gamma_1 SB + \varepsilon \quad (6.26)$$

When estimating the model, Islamic debt bond (with $Y_i = 3$) is used as the base case against which both the issuers' choice of IJV bonds (with $Y_i = 1$) and SARA bonds (with $Y_i = 2$) are compared. The multinomial probit model (as shown in Section 6.6) in this case generates two panels (Panel A and Panel B) of results. Panel A compares the issuer's choice of IJV and Islamic debt bonds. A positive coefficient for the variables in the IJV and Islamic debt bond comparison suggest that higher values of the variable make the issuer prefer debt over IJV bonds. A negative coefficient, however, would imply that the variable is causing the issuer to prefer IJV over debt bonds. Panel B compares SARA and Islamic debt bonds. A positive coefficient in the results Panel B again reflects the fact that higher values of the variable makes the issuer prefer Islamic debt bonds over SARA bonds. In contrast a negative value makes them prefer SARA over debt bonds. The variables used in Equation 6.26 above are shown in Table 6.12 below and discussed next.

Table 6.12: Variables Used in the Issuer's Choice of Islamic Bond Type Model for RQ4

This table provide details of the effect and measurement of the variables used to estimate Equations 6.26 related to RQ4 for the period 2002 to 2010. The information provided here is consistent with previous studies as explained in the text.

Effect	Variable	Measurement
Leverage Ratio I	LTDA	$\frac{\text{longtermdebt}}{\text{total assets}}$
Leverage Ratio II	DTA	$\frac{\text{longtermdebt} + \text{debt in current liabilities}}{\text{total assets}}$
Beta	BETA	Market beta
Standard Error	SE	
Interest Coverage	IC	$\frac{\text{operating income after depreciation} + \text{interest expense}}{\text{interest expense}}$
Operating Margin	OIS	$\frac{\text{operating income before depreciation}}{\text{sales}}$
Firm Size	LA	Log of total assets
Stock Valuation	MtB	$\frac{\text{market value}}{\text{net total assets}}$
Shariah Standards	2008	Dummy variable that takes the value 1 for bonds issued in 2008
Global Financial Crisis	GFC	Dummy variable that takes the value 1 for bonds issued in 2009 and 2010
Shariah Committee	SB	Dummy variable that takes the value of 1 for Shariah Committees

Table 6.13: Impact of Variables Used in the Issuer's Choice of IJV Bond Type Model for RQ4

This table provide the effect, expected impact, hypothesized coefficient and associated hypotheses related to variables affecting issuer's choice of IJV bonds. These variables are used to estimate Equations 6.26 related to RQ4 for the period 2002 to 2010. The information provided here is consistent with previous studies as explained in the text.[149]

Effect	Variable	Expected Impact for IJV	Hypothesized Coefficient Sign for IJV	Hypotheses
Leverage Ratio I	LTDA	+	-	**H4a:** Higher current debt, relative to targeted debt, results in firms preferring IJV over SARA and debt bonds and vice versa.
Leverage Ratio II	DTA	+	-	
Beta	BETA	+	-	
Standard Error	SE	+	-	
Interest Coverage	IC	-	+	
Operating Margin	OIS	-	+	
Firm Size	LA	-	+	
Stock Valuation	MtB	+	-	**H4b:** Holding other firm specific variables constant, firms with higher market to book value should prefer IJV over SARA and debt bonds and vice versa.
Shariah Standards	2008	-	+	**H4f:** Issuer's aversion for IJV bonds increased in 2008.
Shariah Committee	SB	-	+	**H4g**: SARA bonds, in contrast to debt and IJV bonds are more likely to be approved by Shariah committees than individual advisors.

[149]GFC dummy variable included in Equation 6.13 is not discussed here in Table 6.13. This is because it is not related to any of the hypothesis and is used as a control variable to capture the effect of global financial crisis.

Table 6.14: Impact of Variables Used in the Issuer's Choice of SARA Bond Type Model for RQ4

This table provide the effect, expected impact, hypothesized coefficient and associated hypotheses related to variables affecting issuer's choice of SARA bonds. These variables are used to estimate Equations 6.26 related to RQ4 for the period 2002 to 2010. The information provided here is consistent with previous studies as explained in the text.

Effect	Variable	Expected Impact for SARA	Hypothesized Coefficient Sign for IJV	Hypotheses
Leverage Ratio I	LTDA	+	-	**H4c:** Firms with high leverage (total and long-term debt) prefer SARA over debt bonds and vice versa.
Leverage Ratio II	DTA	+	-	
Beta	BETA	+	-	**H4e:** Firms having higher risk (market beta and standard error) prefer SARA over debt bonds and vice versa.
Standard Error	SE	+	-	
Interest Coverage	IC	-	+	**H4d:** Firm having high profitability (operating margin and interest coverage ratio) prefer debt over SARA bonds and vice versa.
Operating Margin	OIS	-	+	
Firm Size	LA	-	+	
Stock Valuation	MtB			
Shariah Standards	2008	+	-	
Shariah Committee	SB	+	-	**H4f**: SARA bonds, in contrast to debt and IJV bonds are more likely to be approved by Shariah committees than individual advisors.

6.4.3 Measurement of the Variables:

This section focuses on how firm specific, event specific and Islamic instrument specific effects are measured in the determinants of Islamic bond type model (Equation 6.26). These variables are calculated similarly to those in the Islamic bond rating model (Equation 6.11) and are shown in Table 6.12. This section, therefore only discusses the impact and hypothesized sign of the variables in Equation 6.26. The section starts with analysing firm specific variables (H4a to H4e) followed by the event specific variables (H4f) and Shariah advisor effect variables (H4g).

6.4.3.1 Firm Specific Variables (H4a to H4e):

As discussed in Chapter 2, Section 2.5, the issuer's between the three Islamic bond types can be analysed at two stages. The first is when the issuer decides between issuing equity against debt. If certain issuer's characteristics favour equity, then IJV bonds are the preferred choice. If the issuer chooses debt instead, a second stage decision is required to issue SARA bonds or Islamic debt bonds (Dusuki & Mokhtar, 2010). These different measures of IJV, SARA and debt bond determinants are captured in Equation 6.26 and are discussed in turn below.

Measure of IJV Bond Determinants (H4a and H4b):

The impact of IJV bond determinants is tested by Hypotheses H4a and H4b. As discussed previously in Chapter 2 Section 2.5.2, the decision to issue IJV bonds might be affected by issuer's current position relative to its target debt to equity ratio (H4a) and those factors that cause the deviation from this target (H4b).

The firm's current debt position is captured by long term debt to assets (LTDA) and total debt to assets (DTA). A high LTDA and DTA compared to the target suggest that the firm would issue less debt and more of equity type IJV bonds (see Marsh, 1982; Hovakimian et al., 2001). Their coefficient in the model, therefore, should be negative. As discussed previously in Section 2.5.2 Chapter 2, the target debt to equity ratio is determined by bankruptcy risk, firm performance and firm size (see Marsh, 1982; Hovakimian et al., 2001). Bankruptcy risk is captured in the model by the standard error (SE) and market beta (Beta). Higher SE and Beta increases bankruptcy risk and so reduces the firm's debt target level. They both should, therefore, have a positive impact on issuing IJV bonds and hence a negative coefficient in the model. Firm performance is captured by interest coverage (IC) and operating income to sales ratios (OIS). Higher IC and OIS ratios reflect the firm's ability to service its existing debt and its propensity to issue more debt (see Marsh, 1982; Hovakimian et al., 2001). Higher IC and OIS ratios, therefore, should decrease the probability of issuing IJV bonds. Hence, their coefficient in the model should be positive. Firm size is captured by LA (log of assets). Since larger firms issue more debt, higher levels of LA should result in greater issuance of debt and lower issuance of IJV bonds. Their coefficients in the mode, therefore, should be positive. Variables capturing any deviations from the target ratio (H4b) are analysed next.

As discussed previously in Section 2.5.2 Chapter 2, over or undervalued stock is an important determinant in the issuer deviating from the target ratio (see Hovakimian et al., 2001). This view is captured by the market to book value ratio (MtB). Holding other variables constant, a low MtB suggests stock is undervalued and would discourage equity raising including IJV bonds (see Ross, 1977; Myers & Majluf, 1984; Hovakimian et al., 2001). MtB, therefore, should have a negative coefficient in the model. Measures of SARA and Islamic debt bond determinants are discussed next.

Measures of SARA and Islamic Debt Bond Determinants (H4c, H4d and H4e):

As argued previously in Section 2.5.3 Chapter 2, highly levered (H4c), poor performing firms (H4d) with high bankruptcy risk (H4e) would be expected to issue secured bonds (Berger & Udell, 1990; Julio et al., 2008). Therefore, a SARA bond issuer should have high level of long term debt (LTDA) and total debt (DTA) ratios. These variables in the model should be negative (H4c). Firm performance is captured by operating margin (OIS) and interest coverage (IC) ratio. SARA bonds should have low level of operating margin (OIS) and interest coverage (IC). These ratios should have a positive coefficient in the model (H4d). Risk is captured by beta (BETA) and standard errors (SE). SARA bonds should have high level of SE and BETA and hence a negative coefficient in the model (H4e).

6.4.3.2 Measure of Event Specific Effect (H4f):

The impact of the 2008 AAOIFI recommendations is captured by 2008 year dummy. These recommendations were particularly critical of prevalent IJV structures and suggested much more stringent alternatives (see Usmani, 2007). This suggests that the number of IJV bond issues should decline in 2008, implying a positive coefficient for their dummy variables. The impact of Shariah advisor effect is discussed next.

6.4.3.3 Measure of Shariah Advisor Effect (H4g):

Similar to RQ3, the Shariah advisor effect is captured by a Shariah committee dummy variable. As argued in Section 2.5.4 Chapter 2, Shariah advisors have preference for certain type of bonds (Karim, 1990; Grais & Pallegrini, 2006; Karim & Archer, 2007; Dusuki & Mukhtar, 2010). Shariah committees with multiples members, however, may smooth out any individual preferences in reaching a final decision. SARA bonds which are unanimously agreed upon by scholars as Shariah compliant, therefore, have a higher probability of being issued by Shariah committees. In contrast, debt bonds and some structure of IJV bonds are less likely to be approved by Shariah committees as some scholars consider these issues to be non-Shariah compliant (see AAOIFI, 2008; Dusuki & Mukhtar, 2010). Hence, the coefficient of the Shariah committee dummy variables should be positive for IJV bonds and negative for SARA bonds.

6.4.4 Robustness of the Model and Industry Effect:

A robustness test of the results is conducted by running a second regression shown in Equation 6.27 below that includes dummies for three industries: manufacturing, property and agriculture.[150] Given the nature of SARA bonds, they are used frequently in the property industry as real property can serve as the underlying asset. Therefore, the sign of the property dummy variable should be negative for SARA bonds.

$$U_i^* = \alpha + \beta_1 DTA + \beta_2 LTDA + \beta_3 BETA + \beta_4 SE + \beta_5 IC + \beta_6 OIS + \beta_7 LA + \beta_8 MtB + \beta_9 2008 + \beta_{10} GFC + \gamma_1 SB + \theta_1 Manufacture + \theta_2 Property + \theta_3 Agriculture + \varepsilon \quad (6.27)$$

[150] The numbers of observations for SARA bonds issuers belonging to the energy sector are not large enough for it to be included in the model. This is in contrast to Equation 6.11 for RQ3 where it was included.

6.5 Results for Islamic Bond Rating Determinants (RQ3):

This section reports the regression results for the testing of eight Hypotheses, H3a to H3h, to help answer RQ3. In this regard, Equations 6.11 (as in Section 6.3.3) was estimated using ordered probit model with Huber (1964) and White (1980) robust variance-covariance matrix. The results are reported in Table 6.15. More specifically, it shows the impact of firm specific variables (H3a, H3b and H3c), event specific effect (H3d and H3e) and Islamic instrument specific characteristics (H3f, H3g and H3h) on the credit ratings of Islamic bonds. The robustness of these results is tested by estimating Equation 6.16 which accounts for any industry effect and is reported in Table 6.16.

Table 6.15: Results for the Determinants of Islamic Bond Rating Model for RQ3

This table presents the estimation of the ordered Probit model shown in Equation 6.11:

$$\mathbf{Y}_i = \begin{cases} \textbf{1 if company is rated AAA/AA} \\ \textbf{2 if company is rated A} \\ \textbf{3 if compnay is rated BBB} \\ \textbf{4 for all lower ratings} \end{cases}$$

$$\mathbf{Y}_i^* = \alpha + \beta_1 OIS + \tau_1 IC1 + \tau_2 IC2 + \tau_3 IC3 + \tau_4 IC4 + \beta_2 LA + \beta_3 LTDA + \beta_4 DTA + \beta_5 SE + \beta_6 BETA + \gamma_1 2008 + \gamma_2 GFC + \gamma_3 \mathrm{IJV} + \gamma_4 \mathrm{SARA} + \gamma_5 SB + \varepsilon$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i^*$is the latent variable that links the dependent variable with $\mathbf{Y}_i$. OIS is operating income to sales ratio. IC1 represents interest coverage ratio from 0 to 5, IC2 from 0 to 10, IC3 from 10 to 20 and IC4 from 20 to 100. LA is log of assets. LTDA is long term debt to asset ratio. DTA is total debt to asset ratio. SE is standard errors. BETA is the market model beta. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. IJV is a dummy variable that equal 1 for IJV bond issues. SARA is a dummy variable that equal 1 for SARA bond issues. In the result shown in the table debt bonds is used as the base case. Adjusted P-values using Huber-White test are also provided in the table.

Variable	Coefficient	Std. Error	Z-Statistic	Prob.	Prob (Adjusted)
OIS	2.431738	0.945525	2.571838	0.0101	0.0047
IC1	0.022165	0.077306	0.286721	0.7743	0.7349
IC2	-0.30338	0.081246	-3.73409	0.0002	0.0004
IC3	0.076612	0.058455	1.310618	0.19	0.1915
IC4	0.00437	0.011918	0.366667	0.7139	0.6234
LA	-0.17441	0.087822	-1.98597	0.047	0.0556
LTDA	-2.83449	0.813996	-3.4822	0.0005	0
DTA	4.367884	0.737062	5.926072	0	0
SE	64.67387	6.381098	10.13523	0	0
BETA	0.087167	0.228099	0.382147	0.7024	0.7137
2008	-0.82121	0.44558	-1.84302	0.0653	0.0376
GFC	-1.55225	0.188553	-8.23244	0	0
IJV	-1.57238	0.587665	-2.67563	0.0075	0.0314
SARA	-0.02627	0.377933	-0.06951	0.9446	0.963
SB	-0.69105	0.258742	-2.67079	0.0076	0.0085

Table 6.16: Robustness Results Testing Industry Effect for RQ3

This table presents the estimation of the ordered probit model shown in Equation 6.11:

$$\mathbf{Y}_{i} = \begin{cases} \textbf{1 if company is rated AAA/AA} \\ \textbf{2 if company is rated A} \\ \textbf{3 if compnay is rated BBB} \\ \textbf{4 for all lower ratings} \end{cases}$$

$$\begin{aligned} \boldsymbol{Y_i}^* = {} & \boldsymbol{\beta_1 OIS + \tau_1 IC1 + \tau_2 IC2 + \tau_3 IC3 + \tau_4 IC4 + \beta_2 LA + \beta_3 LTDA + \beta_4 DTA} \\ & \boldsymbol{+ \beta_5 SE + \beta_6 BETA + \gamma_1 2008 + \gamma_2 GFC + \gamma_3 IJV + \gamma_4 SARA + \gamma_5 SB} \\ & \boldsymbol{+ \theta_1 Property + \theta_2 Energy + \theta_3 Agriculture + \theta_4 Manufacture} \\ & \boldsymbol{+ \varepsilon} \end{aligned}$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i^*$is the latent variable that links the dependent variable with$\mathbf{Y}_i$. OIS is operating income to sales ratio. IC1 represents interest coverage ratio from 0 to 5, IC2 from 0 to 10, IC3 from 10 to 20 and IC4 from 20 to 100. LA is log of assets. LTDA is long term debt to asset ratio. DTA is total debt to asset ratio. SE is standard errors. BETA is the market model beta. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. IJV is a dummy variable that equal 1 for IJV bond issues. SARA is a dummy variable that equal 1 for SARA bond issues. Property is a dummy variable that equals 1 if the issuer belongs to the property industry. Energy is a dummy variable that equals 1 if the issuer belongs to the energy industry. Agriculture is a dummy variable that equal 1 if the issuer belongs to the agriculture industry. Manufacture is a dummy variable that equals 1 if the issuer belongs to the manufacturing industry. In the result shown in the table debt bonds is used as the base case. Adjusted P-values using Huber-White test are also provided in the table.

Variable	Coefficient	Std. Error	Z-Statistic	Prob.	Prob (Adjusted)
OIS	-0.27496	1.298059	-0.21182	0.8322	0.8476
IC1	0.190142	0.097283	1.95453	0.0506	0.0852
IC2	-0.53193	0.101146	-5.25908	0	0.0002
IC3	0.083147	0.064477	1.289567	0.1972	0.3348
IC4	0.00541	0.011289	0.479248	0.6318	0.6803
LA	-0.22079	0.103386	-2.13554	0.0327	0.0735
LTDA	-3.51635	1.02879	-3.41794	0.0006	0.0003
DTA	1.864679	0.921244	2.024087	0.043	0.0487
SE	72.66635	8.436802	8.61302	0	0
BETA	0.263804	0.26057	1.012411	0.3113	0.3378
2008	-1.25611	0.506855	-2.47825	0.0132	0.0286
GFC	-1.86671	0.21598	-8.64297	0	0
IJV	-1.6355	0.607314	-2.693	0.0071	0.0606
SARA	0.817399	0.432714	1.889004	0.0589	0.1816
SB	-1.42944	0.304684	-4.69154	0	0
Property	-1.29918	0.296445	-4.38255	0	0.001
Energy	1.254016	0.334052	3.753952	0.0002	0.0011
Agriculture	-2.15503	0.376477	-5.72422	0	0
Manufacture	0.701262	0.276275	2.538278	0.0111	0.0106

6.5.1. Results for Firm Specific Variables (H3a, H3b and H3c):

Table 6.15 above reports on the hypothesis testing of H3a,H3band H3cfor firm specific Islamic bond rating determinants (as developed earlier in Section 6.3) using ordered probit analysis. These hypotheses test if operating margin (OIS), interest coverage (IC1, IC2, IC3, IC4), and firm size (LS) are positive determinants of Islamic bond ratings (H3a). They should further reflect whether leverage ratios (LTDA and DTA) and standard errors (SE) are negative determinants (H3b) and market beta (BETA) is an insignificant determinant of Islamic bond ratings (H3c). Their robustness is checked in Table 6.16 by accounting for the industry effect in the model. Results for each of the Hypotheses H3a, H3b and H3c are discussed in turn.

Results for Interest Coverage, Operating Margin and Firm Size (H3a):

Hypothesis H3a tests for the positive firm specific determinants of Islamic bond credit rating. These include interest coverage (IC1, IC2, IC3, IC4), operating margin (OIS) and firm size (LA). Given the way the model is developed, however, the positive determinants should have negative coefficients in the model (see Section 6.3.3).

As discussed previously in Section 6.3.4, the interest coverage ratio has been modified into four subclasses. The interest coverage from 0 to 5 is captured by 1C1, from 5 to 10 by IC2, from 10 to 20 by IC3 and from 20 to 100 by IC4 (see Blume et al., 1998). The coefficients of IC1, IC3 and IC4 in the Table 6.15 above are insignificant suggesting that very low and high interest coverage ratios do not influence credit ratings for Islamic bonds. In contrast, IC2is significantly negative at the 1% level, supporting the Hypothesis H3a that the interest coverage ratio ranging from 5 to 10 is a positive determinant of Islamic bond rating. Table 6.16 shows that the results for IC2 are robust to the industry effect. However, once industry effect is addressed, the IC1 results also become significant at 10% with a positive sign. This is not as expected and instead suggests that very low interest coverage ratios have a negative effect on credit ratings. Similar inconsistencies on the interest coverage ratio, however, have also been reported by Blume, Lim and MacKinlay (1998).[151] They found IC4 to be a negative determinant of credit ratings.

Table 6.15 shows, that the operating margin (OIS) coefficient is positive. After accounting for the industry effect, however, Table 6.16 shows that it becomes insignificant. This implies that the issuer's industry has a strong impact on how OIS affects credit rating. To further test the industry impact, OIS slope dummies[152] are include in Equation 6.16 (the result are reported in Appendix D). The results indicate that the OIS variable has a strong positive coefficient for manufacturing industry and a negative coefficient for the energy sector. This could reflect the manufacturing sector's high operating expenses as compared to other industries as they might diminish its net operating income and, hence, its operating margin ratio (OIS) (see Iskandar & Emery, 1994; Gray et al., 2006). The results therefore, suggest that the impact of OIS on Islamic bond rating is not generic but rather more industry specific. These results do not lend unconditional support to Hypothesis H3a for OIS.

[151] Blume et al. (1998) found IC4 to be a negative determinant of credit ratings for US conventional bonds issued during 1978 to 1995. .
[152] The dummy variables for individual industries are multiplied with the OIS variable to create slope dummies (see Appendix D).

The coefficient for log of asset (LA) variable capturing firm size is statistically significant at the 5% level[153] (as shown in Table 6.15) and has the expected negative sign. The result is also robust to the industry effect (see Table 6.16). This suggests that larger Islamic issuers are likely to have higher credit ratings. This is in line with prior literature which suggests that larger firms with their established product line and diverse sources are less risky and hence have higher ratings (Blume et al., 1998).

The interest coverage (IC2 in particular) and firm size (LA) result render support for Hypothesis H3a suggesting that they are positive determinants of Islamic bond ratings. The results for operating margin (OIS), however, do not unconditionally support to Hypothesis H3a. Instead they suggest that Islamic bond rating may be more industry driven. Therefore, Hypothesis H3a is only partially supported. The results for Hypothesis H3b are discussed next.

Results for Leverage Ratios and Standard Errors (H3b):

Hypothesis H3b tests for the negative firms specific determinants of Islamic bond rating. These include leverage ratios (LTDA and DTA) and standard errors (SE) terms.

Table 6.15 shows that the results for the total debt to asset (DTA) ratio are significant at the 1% level and positive. In contrast, those for long-term debt to asset (LTDA) are significant at 1% level but negative. This suggests that long-term debt has a positive impact on credit rating while that of total debt is negative. This inconsistency has also been reported in prior literature which attributes it to the

[153] The results are significant at the 10% level after adjusting for Huber-White robustness test.

differences in bond maturities (see Blume et al., 1998). Given the sample is dominated by Islamic debt bonds, which generally have shorter maturities, the coefficient for DTA is positive and LTDA is negative (see Section 2.4.2, Chapter 2). Therefore, the results for only total debt to asset ratio (DTA) ratio support the Hypothesis H3b suggesting that it is a negative determinant of Islamic bond ratings.

The standard error (SE) in the model captures the unique risk of Islamic bond issuers (Blume et al., 1998). Table 6.15 shows that the coefficient for SE is positive and highly significant at the 1% level. They are also robust to the industry effect as shown in Table 6.16. These results support Hypotheses H3b suggesting that standard error (SE) is a negative determinant of Islamic bond ratings.

The above analysis partially supports the Hypothesis H3b suggesting that total debt to asset ratio (DTA) and standard error (SE) are negative determinants of Islamic bond ratings. The results for Hypothesis H3c are discussed next.

Results for Beta (H3c):

Hypothesis H3c tests whether the impact of beta (BETA) is insignificant in Equation 6.11. Both Tables 6.15 and 6.16 show that the coefficient for BETA is insignificant lending support to Hypothesis H3c. These results support the argument that Islamic bonds are not directly affected by systematic shocks in the conventional financial system (Wibier & Salah, 2011). Results for Hypotheses H3d and H3e testing for event specific effect are presented next.

6.5.2 Event Specific Effect (H3d and H3e):

The results for the testing of Hypotheses, H3d andH3e show whether the 2008 changes in AAOIFI Shariah standards (H3d) and sub-prime financial crisis (H3e) had an impact on Islamic bond ratings. These are discussed in turn.

Results for changes in AAOIFI Shariah Standards (H3d)

Changes in AAOIFI standards are captured by 2008 year dummy. The results in Tables 6.15 and 6.16 suggest that its coefficient is negative and statistically significant at the 5% level. This suggests that holding other things constant, new issues in 2008 had higher credit ratings. As discussed previously in Section 2.4.3 Chapter 2, stringent Shariah standards issued by AAOIFI might have resulted in better Islamic bond structures and hence improved ratings (Usmani, 2007; Howladar, 2009). The results fully support the Hypothesis H3d. The next section discusses the results for Hypothesis H3e.

Results for Sub-Prime Financial Crisis Effect (H3e):

The impact of sub-prime financial crisis on Islamic bond ratings is captured by GFC dummy variable. The results in Tables 6.15 and 6.16 show that its coefficient is negative and highly significant at the 1% level. This implies that rating for new Islamic bond issues increased during the sub-prime financial crisis. The result, therefore, corroborates the evidence that Islamic bond industry has remained insulated from any direct effects of the sub-prime financial crisis (Wibier & Salah, 2011). The results render full support the Hypothesis H3e.

6.5.3 The Impact of Islamic Instrument Specific Characteristics (H3f, H3g and H3h):

The effect of Islamic instrument specific characteristics is tested by Hypotheses H3f, H3g and H3h. These include the impact of Islamic bond type effect (H3f and H3g) and Shariah advisor effect (SB) (H3h). The results for each are discussed below.

Results for the Impact of Islamic Bond Type (H3f and H3g):

Islamic bond type effect is captured in the model by including dummy variables for the IJV and SARA bonds. The coefficient for the IJV variable is negative at the 5% level (Table 6.15) suggesting that IJV variables have higher ratings than debt bonds. The results, therefore, reject the Hypothesis H3f. These results can be attributed to the nature of IJV bond structures. In theory, they have equity type characteristics implying a lower rating. However, the results suggest that many of the IJV bonds in the sample were in fact structured like conventional debt which enabled them to generate higher ratings.[154]

The coefficient for the SARA variable is insignificant at the 10% level (Table 6.15) implying there is no significant difference between the credit ratings of SARA and debt bonds. These results also reject the Hypothesis H3g. In theory, as SARA bonds represent real ownership of the underlying asset, they should be more secured and hence have higher ratings than debt bonds (Usmani, 2002; Howladar, 2006; Dusuki & Mukhtar, 2010). However, these results imply that those SARA bonds in the

[154] These results also support the conclusion for RQ2 presented in Chapter 4 which suggests that IJV bonds may not be issued in equity like manner to avoid lower ratings.

sample might not represent real ownership of the underlying asset and hence are not more secured than Islamic debt bonds.

These rejections of Hypotheses H3f and H3g support the AAOIFI's concern that most Islamic bonds are structured like conventional debt bonds (see Usmani, 2007). The impact of Shariah advisor effect is discussed next.

Results for Shariah Advisor Effect (H3h):

Shariah advisor effect captures the difference in bond structures originating from the lack of Shariah harmonization in the Islamic finance. As discussed previously in Section 2.4.4.2 Chapter 2, some scholars adopt stringent criteria when approving SARA and Islamic debt bonds and require them to have a strong link with the underlying asset (Karim, 1990; Grais & Pellegrini, 2006; Karim & Archer, 2007; Dusuki & Mukhtar, 2010).[155] Therefore, the bonds approved by the Shariah committees are likely to have higher ratings.[156] Shariah advisor effect is captured by a dummy variable for Shariah committees (SB). The coefficient has the expected negative sign and is highly significant at the 1% level. The results support the Hypothesis H3h that Islamic bonds approved by Shariah committees have higher ratings than those approved by individual advisors.

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[155] Some scholars require SARA bonds to have ownership of the underlying asset and debt bonds to have some security from the underlying asset. Therefore, debt bonds would be like conventional secured bonds while SARA bonds would be even more secured than them (Howladar, 2006; Usmani, 2007; Dusuki & Mukhtar, 2010).

[156] Extending this argument to IJV bonds approved by Shariah committees suggest that their IJV structures should be more equity type and hence should have lower ratings. However, those IJV bonds with equity structures are insufficient in number to have a meaningful influence.

6.5.4 Summary of the Hypotheses H3a to H3h:

Hypotheses H3a to H3c focused on firm specific determinants of credit ratings. With regards to Hypotheses H3a, interest coverage (IC2) and firm size (LA) are found to be positive determinants of Islamic bond ratings while operating margin (OIS) is found significant only for some industries (H3a is partially-supported). For Hypothesis H3b, total debt to asset ratio (DTA) and standard error are shown to be negatively and long term debt to asset (LTDA) positively related to credit ratings (H3b is partially supported). When testing Hypothesis H3c, the impact of beta (BETA) is found to be insignificant (H3c is fully supported). Hypotheses H3d and H3e tested the impact of specific events. For Hypothesis H3d, changes in AAOIFI Shariah standard in 2008 (captured by 2008 year dummy) are found to affect credit ratings positively (Hypothesis H3d is fully supported). Moreover, testing of Hypothesis H3e showed that the Islamic bond rating increased during the sub-prime financial crisis (captured by GFC year dummy) (H3e is fully supported). Hypotheses H3f and H3g capture the impact of Islamic bond type on credit ratings. For H3f IJV bonds are shown to have higher ratings than debt bonds (so H3f is rejected). In contrast, SARA bonds are found to have an insignificant impact on Islamic bonds' credit ratings (so H3g is rejected). Shariah advisor effect (captured by Shariah committee) tested by Hypotheses H3h, however, shows a positive impact on credit ratings (Hypothesis H3h is well supported).

6.5.5 Answering RQ3:

For RQ3, Hypotheses H3a to H3h were tested in this chapter. Hypotheses H3a to H3c focused on the firm specific determinants of credit ratings. The result partially supported H3a and H3b and fully supported H3c suggesting that firm specific variables are a vital component of credit risk for Islamic bonds. Specifically, the results for H3a and H3b suggested that interest coverage, firm size and long-term debt to asset ratio are positive determinants of Islamic bond ratings. In contrast, both the total debt to asset ratio and standard error are negative determinants of bond ratings. With regards to H3c Islamic bond ratings were found to be not affected by market beta. This supports the assertion that Islamic bond industry is insulated from shocks in the conventional financial markets. Hypotheses H3d and H3e tested the impact of changes in AAOIFI Shariah standards and the effect of sub-prime financial crisis. The results implied that the tightening of Shariah standards had a positive impact on Islamic bond ratings. This reflects the importance of the Shariah standards for the various Islamic bond structures and their credit ratings. The results further showed that the sub-prime financial crisis did not cause the Islamic bond rating for new issuers to decline. In contrast, the Islamic bond rating experienced an increase after the year 2009, marked by the sub-prime financial crisis. This further corroborates the assertion that Islamic finance industry is insulated from external shocks in the conventional industry. The impact of Islamic bond type effect on credit ratings is captured by Hypotheses H3f and H3g. The results rejected both the hypotheses and reflected that IJV bonds have higher ratings than debt bonds while SARA bonds were not much different from debt bonds, ceteris paribus. These results imply that IJV bonds may not be structured in equity like manner, while many of SARA bond may not represent ownership of the underlying asset. These results along with those for beta (H3c) and the sub-prime financial crisis (H3e) imply that the insulation of Islamic finance industry to external shocks is not due to its fundamentally strong products but rather their limited interaction with the conventional finance industry. Shariah advisor effect (captured by Shariah committee) is tested by Hypotheses H3h and is shown to have a positive impact on credit ratings. This reflects that Shariah committee approved products have better structures and have been able to achieve higher ratings. The results signify the problem of Shariah harmonization and lack of standardized structures within the Islamic finance industry.

In summary, the answer to RQ3 is no, the determinants of credit rating for Islamic bonds are not the same as for conventional bonds.

6.6 Results for Islamic Bond Type Determinant (RQ4):

This section reports the regression results for the testing of seven Hypotheses, H4a to H4g, to answer RQ4. In this regard, Equations 6.26 (as in Section 6.4.2) is estimated using multinomial probit analysis with Huber (1964) and White (1980) robust variance-covariance matrix. The results are generated for IJV and SARA bonds using Islamic debt bonds as the base case (see Section 6.4.2) and are reported in Table 6.17: Panel A for IJV bonds and Panel B for the SARA bonds. Table 6.17 also shows the impact of firm specific variables affecting issuer’s choice of IJV (H4a and H4b), SARA and debt bonds (H4c, H4d and H4e). The impact of changes in Shariah standards (H4f) and Shariah advisor effect affecting issuer’s choice of Islamic bond type (H4g) are similarly reported in Table 6.17. Finally, the robustness results after accounting for industry effect by estimating Equation 6.27 are presented in Table 6.18.

Table 6.17: Results for the Issuer's Choice of Islamic Bond Type Model for RQ4

This table presents the estimation of the multinomial probit model show in Equation 6.13.

$$\mathbf{Y}_i = \begin{bmatrix} \textbf{1 IJV bonds} \\ \textbf{2 SARA bonds} \\ \textbf{3 for debt bonds} \end{bmatrix}$$

$$\boldsymbol{U_i^* = \alpha + \beta_1 DTA + \beta_2 LTDA + \beta_3 BETA + \beta_4 SE + \beta_5 IC + \beta_6 OIS + \beta_7 LA + \beta_8 MtB + \beta_9 2008 + \beta_{10} GFC + \gamma_1 SB + \varepsilon}$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i$ captures bond type. $\mathbf{U}_i^*$is the latent variable that links the dependent variable with$\mathbf{Y}_i$. DTA is total debt to asset ratio. LTDA is long term debt to asset ratio. BETA is the market model beta. SE is standard errors. IC is interest coverage ratio. OIS is operating income to sales ratio. LA is log of assets. MtB is market to book value ratio. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. In the result shown in this table debt bonds is used as the base case. PANEL A provides the results for IJV bonds. Panel B provides the results for SARA bonds. Adjusted P-values using Huber-White test are also provided in the table.

Issue	**Coef.**	**Std. Err.**	**Z-Stat**	**Prob**	**Prob (Adjusted)**
PANEL A (IJV Bonds)					
DTA	-8.27915	2.751596	-3.01	0.003	0
LTDA	6.113098	2.813355	2.17	0.03	0.035
BETA	-1.09855	0.655874	-1.67	0.094	0.095
SE	-33.8354	25.12348	-1.35	0.178	0.42
IC	-0.12308	0.055935	-2.2	0.028	0.026
OIS	2.78282	1.577453	1.76	0.078	0.085
LA	0.069683	0.173934	0.4	0.689	0.758
MtB	0.273912	0.150924	1.81	0.07	0.099
2008	2.566097	0.629726	4.07	0	0
GFC	0.099917	0.43109	0.23	0.817	0.835
SB	2.10014	0.541412	3.88	0	0
_cons	-0.43129	1.743708	-0.25	0.805	0.839

Table 6.17: Results for the Issuer's Choice of Islamic Bond Type Model for RQ4 Continued

Issue	Coef.	Std. Err.	Z-Stat	Prob	Prob (Adjusted)
PANEL B (SARA BONDS)					
DTA	-2.68262	3.510771	-0.76	0.445	0.297
LTDA	3.743863	3.315118	1.13	0.259	0.125
BETA	0.841531	0.823889	1.02	0.307	0.15
SE	-125.358	48.61427	-2.58	0.01	0.001
IC	0.005254	0.014146	0.37	0.71	0.641
OIS	2.987766	1.782678	1.68	0.094	0.031
LA	-0.2187	0.205182	-1.07	0.286	0.301
MtB	0.165214	0.180923	0.91	0.361	0.304
2008	0.270215	0.887627	0.3	0.761	0.722
GFC	-0.98672	0.545146	-1.81	0.07	0.034
SB	-0.49824	0.561417	-0.89	0.375	0.379
_cons	1.229856	2.097052	0.59	0.558	0.582

Table 6.18: Results Testing Industry Effect for RQ4

This table presents the estimation of the multinomial probit model shown in Equation 6.14

$$\mathbf{Y}_i = \left[\begin{array}{c} \mathbf{1\ IJV\ bonds} \\ \mathbf{2\ SARA\ bonds} \\ \mathbf{3\ for\ debt\ bonds} \end{array}\right.$$

$$\mathbf{U}_i^* = \boldsymbol{\alpha} + \boldsymbol{\beta_1 DTA} + \boldsymbol{\beta_2 LTDA} + \boldsymbol{\beta_3 BETA} + \boldsymbol{\beta_4 SE} + \boldsymbol{\beta_5 IC} + \boldsymbol{\beta_6 OIS} + \boldsymbol{\beta_7 LA} + \boldsymbol{\beta_8 MtB} + \boldsymbol{\beta_9 2008} + \boldsymbol{\beta_{10} GFC} + \boldsymbol{\gamma_1 SB} + \boldsymbol{\theta_1 Manufacture} + \boldsymbol{\theta_2 Property} + \boldsymbol{\theta_3 Agriculture} + \varepsilon$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i$ captures bond type. $\mathbf{U}_i^*$ is the latent variable that links the dependent variable with $\mathbf{Y}_i$. DTA is total debt to asset ratio. LTDA is long term debt to asset ratio. BETA is the market model beta. SE is standard errors. IC is interest coverage ratio. OIS is operating income to sales ratio. LA is log of assets. MtB is market to book value ratio. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. Property is a dummy variable that equals 1 if the issuer belongs to the property industry. Manufacture is a dummy variable that equals 1 if the issuer belongs to the manufacturing industry. In the result shown in the table debt bonds is used as the base case. PANEL A provides the results for IJV bonds. Panel B provides the results for SARA bonds. Adjusted P-values using Huber-White test are also provided in the table.

	Coef.	**Std. Err.**	**Z-Stat**	**Prob**	**Prob (Adjusted)**
PANEL A (IJV BONDS)					
DTA	-15.7001	4.173263	-3.76	0	0
LTDA	9.992165	3.727618	2.68	0.007	0.029
BETA	-1.45586	0.764833	-1.9	0.057	0.012
SE	37.99625	22.47332	1.69	0.091	0.04
IC	-0.14879	0.054958	-2.71	0.007	0
OIS	3.555497	1.800129	1.98	0.048	0.079
LA	0.529083	0.216547	2.44	0.015	0
MtB	0.329576	0.171572	1.92	0.055	0.053
2008	2.860449	0.759338	3.77	0	0
GFC	-0.45045	0.48809	-0.92	0.356	0.292
SB	3.166288	0.684501	4.63	0	0
Manufacture	2.738119	0.823975	3.32	0.001	0
Property	1.905076	0.665876	2.86	0.004	0.012
Agriculture	3.961999	1.018763	3.89	0	0
_cons	-5.99666	2.242103	-2.67	0.007	0

Table 6.18: Result Testing Industry Effect for RQ4 Continued

	Coef.	Std. Err.	Z-Stat	Prob	Prob (Adjusted)
PANEL B (SARA BONDS)					
DTA	-3.09623	4.194972	-0.74	0.46	0.359
LTDA	4.191526	3.909983	1.07	0.284	0.14
BETA	0.824404	0.875921	0.94	0.347	0.245
SE	-83.043	46.79482	-1.77	0.076	0.007
IC	0.004852	0.015165	0.32	0.749	0.661
OIS	5.655009	2.259231	2.5	0.012	0.002
LA	-0.08901	0.224404	-0.4	0.692	0.649
MtB	0.276328	0.191515	1.44	0.149	0.104
2008	0.289479	1.052435	0.28	0.783	0.772
GFC	-1.193	0.638267	-1.87	0.062	0.041
SB	-0.51802	0.686602	-0.75	0.451	0.412
Manufacture	0.063251	0.840112	0.08	0.94	0.918
Property	-1.58731	1.178701	-1.35	0.178	0.114
Agriculture	1.253038	0.812069	1.54	0.123	0.089
_cons	-1.42471	2.718931	-0.52	0.6	0.549

6.6.1 Impact of Firm Specific Variables Affecting Issuer's Choice of IJV (H4a and H4b):

As discussed previously in Section 2.5.2 in Chapter 2, two types of firm specific variables affect the IJV choice, those that capture the firm's current position relative to the target debt to equity ratio (H4a) and those that cause deviations from the target (H4b). The results for each are reported in Panel A of Table 6.17 and their robustness tests after accounting for industry effect in Panel A of Table 6.18.

Results for Firm's Current Position Relative to the Target (H4a):

Hypothesis H4a tests the impact of firm's current debt level relative to its target debt to equity ratio. As discussed previously in Section 6.4, the current's position is captured by the total debt to asset ratio (DTA) and long term debt to asset ratios (LTDA). Holding the target ratio constant, these variables should have a positive impact (negative coefficient) on issuer's choice of IJV bonds. However, only the coefficient for DTA shown in Table 6.17 is negative and significant at the 1% level. In contrast, the coefficient of LTDA is positive and significant also at the 5% level. This suggests that the long term debt as a proportion of total assets negatively affects issuer's choice of IJV while short term debt has a positive impact.[157] Therefore, only the results for DTA support the Hypothesis H4a, while LTDA rejects it. A possible explanation for this is that Islamic debt bonds have shorter maturities than IJV and SARA bonds. Therefore, holding target debt to equity ratio constant, higher long term debt ratio (LTDA) should increase the issuer's propensity to issue Islamic debt bonds.

[157] In the presence of long-term debt variable in the regression model, the coefficient of total debt represents the affect of issuer's choice assuming long-term debt is constant. Therefore, the total debt coefficient would only capture the impact of short-term debt (see Blume et al., 1998).

The target debt to equity ratio is determined by bankruptcy risk, firm performance and firm size (see Marsh, 1982; Hovakimian et al., 2001). Bankruptcy risk in the model (Equation 6.26) is captured by standard error (SE) and market beta (BETA) (expected impact on IJV bonds: positive, coefficient in the model: negative). Firm performance is reflected in interest coverage (IC) and operating income to sales ratios (OIS) (expected impact on IJV bonds: negative, coefficient in the model: positive). Firm size addressed by LA (log of assets) (expected impact on IJV bonds negative, coefficient in the model positive). Table 6.17 shows that BETA is significant at the 10% level and has the expected negative coefficient. In contrast, standard error (SE), which also measures bankruptcy risk, is insignificant. However, once industry effect is accounted, Table 6.18 shows that SE becomes significant but with the unexpected positive coefficient. The results further indicate that log asset (LA) variable capturing firm size variable is insignificant in the original model in Table 6.17 becomes significant at the 1% level with the expected positive sign once industry effect is accounted for. Table 6.17 also reflects that the result for IC is contrary to expectation and the wrong sign (negative). The result for OIS is significant at the 10% with the expected positive coefficient. Panel A of Table 6.18 shows that results for IC and OIS are robust to any industry effect. Therefore, it can be concluded that only the results for DTA, Beta, LA and OIS have the expected sign and hence they partially support the Hypothesis H4a. In contrast, LTDA, IC and SE reject the hypothesis. The results for H4b are discussed next.

Results for Deviation from the Target Ratio (H4b):

The deviation from the target ratio is captured by market to book value ratio (MtB). Holding other firm specific variables constant, low market to book value reflects that a stock is undervalued. Since undervalued stocks are most costly to issue (see Ross, 1977; Myers & Majluf, 1984), firm with lower market to book value are expected to issue less IJV and more debt. This is tested by Hypothesis H4b. The results presented in Panel A of Table 6.17 and 6.18 suggest that the MtB is significant at the 10% level but with the incorrect positive sign. Hence, Hypothesis H4b gets rejected. This implies that over or undervalued stocks do not affect the issuer's preference for IJV.

The results for both the Hypotheses H4a and H4b corroborate the assertion that IJV bonds have little in common with equity and should be treated more like conventional debt bonds (see Usmani, 2007; Ali, 2008). The results for firm specific determinants of SARA bonds are discussed next.

6.6.2 Firm Specific Variables Affecting Issuer's Choice of SARA Bonds (H4c, H4d, and H4e):

The issuer's choice of SARA and debt bonds is determined by variables capturing leverage (H4c), firm performance (H4d) and risk (H4e). The results for each are reported in Panel B of Table 6.17 and their robustness results after accounting for industry effect are reported in Panel B of Table 6.18.

Results for Firm Leverage Ratios (H4c):

Hypothesis H4c tests for the impact of leverage ratios including long term debt to asset ratio (LTDA) and total debt to asset ratio (DTA) on issuer's choice of SARA bonds. Both were expected to have a positive impact (negative coefficients) on issuer's choice of SARA bonds. Panel B of Table 6.17 and 6.18, however, show that LTDA and DTA are statistically insignificant. Therefore, the Hypothesis H4b is rejected.

Results for Firm Performance Ratios (H4d):

Hypothesis H4c tests for the impact of firm performance captured by operating income to sales ratio (OIS) and interest coverage ratio (IC). They were expected to have a negative impact (positive coefficients) on SARA bond issues. The results in Panel B of Table 6.17 show that IC is statistically insignificant. In contrast, OIS is significantly positive at the 5% level. Panel B of Table 6.18 suggests that these results are robust to changes in industry effect. IC remains statistically insignificant while OIS become positively significant at the 1% level. This partially supports the Hypothesis H4d suggesting that firms with higher operating margin prefer debt bonds over SARA bonds.[158]

Results for Risk Ratios (H4e):

Hypothesis H4e tests for the impact of issuer's risk as captured by BETA and standard error (SE). They were expected to have positive impact on issuer's choice for SARA bond. The results in Panel B of Table 6.17, however, show that BETA is

[158] The results are consistent with the signalling hypothesis (Ross, 1977).

statistically insignificant. In contrast, SE is significantly negative at the 1% level. The results partially support the Hypothesis H4e suggesting that issuers with higher standard errors (SE) prefer SARA over debt bonds. These results imply that firms with high bankruptcy risk have a preference for SARA bonds which are secured.

6.6.3 Results for Changes in AAOIFI Shariah Standards (H4f):

Hypothesis H4f tests for the changes in AAOIFI Shariah standards (H4f) on the issuer's choice of IJV bonds. The effect is captured by 2008 year dummy. In line with expectations, PANEL A of Table 6.17 and 6.18 shows its coefficient is positive and statistically significant at the 1% level. This suggests that holding other things constant, the issuer's preference for IJV bonds declined in the year 2008. As discussed previously in Section 2.5.4 in Chapter 2, this can be attributed to tougher Shariah standards issued by AAOIFI which require IJV bonds to be structured in equity like manner (Usmani, 2007). The results support the Hypothesis H4f.

6.6.4 Results for Shariah Advisor Effect (H4g):

Hypothesis H4g tests for the impact of Shariah advisor effect on the issuer's choice of Islamic bond type. It reflects differences in Islamic bond types due to a lack of Shariah harmonization in Islamic finance industry (Karim, 1990; Grais & Pellegrini, 2006; Karim & Archer, 2007; Dusuki & Mukhtar, 2010). The effect is captured by the Shariah committee (SB) variable, which takes on the value 1 for bond approved by Shariah committees and 0 for those approved by individual advisors. Panel A of Table 6.17 shows that the coefficient for SB is significantly positive at the 1% level suggesting that Shariah committees have an aversion for IJV bonds. This is in line with expectations as some Shariah scholars have been very critical of the prevalent structures of IJV bonds (see Usmani, 2007). The SB variable for the SARA bonds as shown in Panel B of Table 6.17, however, is insignificant. The results partially support the Hypothesis H4g suggesting that issuer choice of IJV bonds is determined by preferences of Shariah advisors.

6.6.5 Summary of the Hypotheses H4a to H4g:

Hypotheses H4a and H4b focused on firms specific determinants of issuer's choice of IJV bonds. With regards to Hypotheses H4a, the results for DTA and BETA have the expected negative coefficient while OIS and LA have the expected positive coefficient. Contrary to expectations, LTDA is found to be positive and IC to be negative (H4a is partially-supported). For Hypothesis H4b, the coefficient for MtB has the wrong positive sign (H4b is rejected). Hypotheses H4c, H4d and H4e tested the impact of firm specific determinants on issuer's choice of SARA bonds. For Hypothesis H4c, the leverage ratios (LTDA and DTA) are insignificant (H4c is rejected).With regards to Hypotheses H4d, OIS is significantly positive while IC is insignificant (H4d is partially supported). When testing Hypothesis H4e, SE is found to be significantly negative. In contrast, BETA is found to be insignificant (H4e partially supported). Hypotheses H4f tested the impact of changes in AAOIFI Shariah standard on IJV bonds. The coefficients are significantly positive (H4f is well-supported). Shariah advisor effect (SB) is tested by Hypotheses H4g. Its coefficient is found to be significantly positive for IJV bonds. For SARA bonds the coefficient is insignificant (Hypothesis H4g is partially supported).

6.6.6 Answering RQ4:

For answering RQ4, Hypotheses H4a to H4g were tested in this chapter. Hypotheses H4a and H4b focused on the firm specific determinants of issuer choice of IJV bonds. Both these hypotheses were developed considering that in theory issuer should view IJVs as equity instruments (Usmani, 2006). The results, however, supported Hypotheses H4a only partially and rejected Hypothesis H4b. This suggests that issuers do not view IJV instruments as equity replacement as their choice is not being affected by the normal firm specific determinants of equity. Hypotheses H4c, H4d and H4e tested the impact of firm specific determinants of issuer's choice of SARA bonds. These hypotheses were developed in Chapter 2 assuming that SARA bonds represent ownership of the underlying asset and hence should be more secured than conventional secured bonds. The results rejected Hypothesis H4c and only partially supported Hypotheses H4d and H4e. This suggests that not all SARA bonds in the sample represent an ownership of the underlying asset and so are no different from secured conventional bonds. Hypotheses H4f captured the impact of changes in AAOIFI Shariah standard on IJV bonds. The results supported the hypothesis suggesting that in the aftermath of AAOIFI recommendations, issuer's aversion for IJV bonds increased. Shariah Hypotheses H4g focused on the Shariah advisor effect. The hypothesis was supported for IJV bonds suggesting that Shariah committees do not prefer to issue the controversial IJV structures. Moreover, this preference of Shariah committees is eventually reflected in the issuer's choice.

In summary, the answer to RQ4 is 'no', *the factors that affect an issuer's choice of Islamic bonds are not the same as for conventional bonds.*

6.7 Conclusion:

This section summarizes the methodology and results for Hypotheses H3a to H3h associated with Research Question 3, "*Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?*" and Hypotheses H4a to H4g associated with Research Question 4, *"Are the factors that affect an issuer's choice of Islamic bonds the same as for conventional bonds?"*The chapter started with discussing the methodology for RQ3 and developed the ordered probit model to test Hypotheses H3a to H3h. The focus then shifted to the methodology for RQ4 where multinomial probit model was developed to test Hypotheses H4a to H4g. The chapter then provided the results for each estimated model and it implications for the associated hypotheses. These help to answer RQ3 and RQ4 both in the negative.

CHAPTER 7: CONCLUSION

7.1 Introduction:

This concluding chapter summarizes the thesis' main findings. Specifically, Section 7.2 reviews the four research questions, their associated hypotheses and findings. Section 7.3 then identifies the main contributions. This is followed by a discussion on their policy implications in Section 7.4. Section 7.5 notes some of limitations of this work while Section 7.6 concludes the chapter with some suggestions for future research.

7.2 Review of the Research Questions, Hypotheses and Findings:

This thesis' objective has been to assess whether traditional finance theories related to asymmetric information, credit risk modelling, credit ratings and instrument type determinants can explain the different characteristics of Islamic financial instruments'. It also sought to investigate the role that these Islamic instrument's unique characteristics may play in their usage, credit risk and ratings. To achieve this, four research questions guided by the existing research gaps were developed and are listed in Table 7.1 below:

Table 7.1: Research Questions

This table presents the thesis' four research question developed in Chapter 1.

RQ1:	Can the presence of asymmetric information and risk averse Islamic bank depositors jointly explain the lack of IJV financing by Islamic banks?
RQ2:	Can conventional credit risk models be used to assess the risk in Islamic bonds?
RQ3:	Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?
RQ4:	Are the factors that affect an issuer's choice of Islamic bonds the same as for conventional bonds?

The following four sub-sections (7.2.1, 7.2.2, 7.2.3 and 7.24) summarize the hypotheses, methodology, and major findings relating to each of these research questions.

7.2.1. RQ1: Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?

RQ1 was addressed by testing Hypotheses H1a to H1d using theoretical models to capture the effects of asymmetric information; risk averse bank depositors, long term contracts and legal punishments (Chapter 3). The objective was to show that firms in the presence of asymmetric information and risk averse bank customers could maximise their profit through debt financing rather than IJV. This minimises the firm's demand for IJV and hence explains the lack of IJV financing by Islamic banks. The results for individual Hypotheses H1a to H1d shown in Table 7.2 are discussed in turn below.

Table 7.2: Summary for Research Question 1

This table summarizes Research Question 1, associated hypotheses (H1a to H1d), methodology and results

RQ1: Can the presence of asymmetric information and risk averse Islamic bank customers jointly explain the lack of IJV financing by Islamic banks?

Hypotheses	Methodology	Results
H1a: In the absence of asymmetric information, firms will be indifferent between choosing IJV or debt.	Mathematical proof using a firm focused perfect information model.	The proof showed that the firm's profit both from IJV and debt financing is equal. This makes them indifferent between choosing IJV or debt. The results support the hypothesis.
H1b: In the presence of asymmetric information, firms with high (low) probability of success will prefer debt over IJV (IJV over debt).	Mathematical proof using an asymmetric information model.	The proof showed that in the presence of asymmetric information the firm's profit from debt financing is higher than IJV financing. This makes firm prefer debt to IJV. The results support the hypothesis.
H1c: Where long-term relationships or threat of punishment exist, IJV banking can operate even in the presence of moral hazard.	Mathematical proof using a model with long term contracts and threat of legal punishment.	The proof showed that in the presence of long term contracts and threat of legal punishment the loss from excessive risk taking behaviour and misreporting is higher than the gain. Firms, therefore, should have no incentive to indulge in moral hazard behaviour. The result supported the hypothesis.
H1d: In the presence of risk averse Islamic bank customers, firms would prefer debt over IJV.	Mathematical proof using an asymmetric information model augmented with risk averse utility function of bank customers.	The proof showed that the firm's IJV profit further diminishes in the presence of risk averse customers. They should, therefore, prefer debt to IJV. The results supported the hypothesis.

Hypotheses H1a and H1b captured the impact of adverse selection on firm's choice of IJV financing. Hypothesis H1a was tested by developing a firm focused model in a perfectly competitive banking sector. Perfect information was also assumed in the model. The presented proof in Section 3.3 in Chapter 3 supported the hypothesis suggesting that under perfect information firms should be indifferent between IJV and debt financing. Asymmetric information, as shown in Section 3.4 in Chapter 3, was then introduced into the model to test Hypothesis H1b. The proof supported the hypothesis and showed that joint venture contracts, which are more prone to asymmetric information than debt, reduce firm profitability. The results for Hypothesis H1a and H1b, therefore, imply that the presence of asymmetric information makes debt rather than IJV the firm's preferred financing choice.

Hypotheses H1c tested the impact of long-term relationships and legal punishment in neutralizing moral hazard concerns such as excessive risk taking behaviour and misreporting. For long-term relationships, the model was extended from a single to multiple periods. It also assumed that if the firm deviated from their contractual strategy and indulged in excessive risk taking behaviour in any particular period, the bank would terminate the firm's contract in the subsequent period (see Section 3.5 in Chapter 3). The proof showed that the firm's loss as a result of contract termination was much higher than its gains from excessive risk taking. Legal punishment was then introduced in the model. The proof showed that in countries where property rights are well protected, moral hazard concerns (such as misreporting) are not severe. The results for both long-term relationships and threat of punishment supported Hypothesis H1c by showing that long-term relationships and legal punishment can neutralize IJV moral hazard concerns.

The results for Hypotheses H1a, H1b and H1c together showed that adverse selection deters IJV financing more than moral hazards. The concern regarding Islamic banks' failure to implement VC type screening to neutralise adverse selection was then tested by Hypothesis H1d.

For Hypothesis H1d the model incorporated the impact of risk averse bank customers. The proof showed that in the presence of risk averse bank customers, any gains from an Islamic bank specializing in the VC type screening are lost by the firm and the bank (see Section 3.6 in Chapter 3). This is because any gains are absorbed in the form of an additional risk premium passed to bank customers to persuade them to invest with Islamic bank implementing IJV financing.

The hypotheses testing (H1a to H1d) above implies that that adverse selection rather than moral hazard, resulting from asymmetric information, deters the implementation of IJV banking. However, the results also show that the presence of asymmetric information alone cannot fully explain the absence of IJV financing. The models should be augmented to reflect risk averse Islamic bank customer, in order to offer a comprehensive explanation.

In summary, the answer to RQ1 is yes, the presence of asymmetric information and risk averse Islamic bank customers can jointly explain the lack of IJV financing by Islamic banks.

7.2.2. RQ2: Can conventional credit risk models be used to assess the risk in Islamic bonds?

RQ2 was addressed by testing Hypotheses H2a to H2e: Hypotheses H2a and H2b on IJV bonds (see Chapter 4) and Hypotheses H2c to H2e on SARA bonds (see Chapter 5). This contributed to the understanding that current credit risk models focus on principal's repayment abilities. Therefore, they hold a bias against IJV bonds whose return can be greater (or lower) than the principal. In contrast, as SARA bonds aim to return the principal, conventional credit risk model like CreditGrades can be used to capture their risk. Individual Hypotheses from H2a to H2e as shown in Table 7.3 are discussed below.

Table 7.3: Summary for Research Question 2

This table summarizes Research Question 2, associated hypotheses (H2a to H2e), methodology and results

RQ2: Can conventional credit risk models be used to assess the risk in Islamic bonds?

Hypotheses	**Methodology**	**Results**
H2a: Structural models IJV extensions generate significantly lower survival probabilities than the original models. .	Two methods: Simulation analysis and Comparing Average Credit Scores	The simulation analysis showed that IJV extension generated significantly lower survival probability. The average credit scores for the IJV extension were also significantly low. The result supported the hypothesis.
H2b: There is a negative association between credit risk rankings generated by the structural models' IJV extensions and their original counterparts and credit ratings.	Testing if the correlation coefficients and Kendall's tau between the credit scores of IJV extensions, original models and credit ratings are significantly negative.	The correlation coefficients and Kendall's tau were found to be significantly positive. The results rejected the hypothesis.
H2c: Structural models' survival probabilities change significantly with an increase in recovery rate.	Simulation analysis testing the impact of recovery rate on survival probability.	The simulation results showed that compared to secured conventional bonds the change in recovery rate for SARA does not cause its survival probability to change significantly. The results rejected the hypothesis.
H2d: Structural models' survival probabilities change significantly with an increase in recovery rate uncertainty (volatility). .	Simulation analysis testing the impact of recovery rate uncertainty (volatility) on survival probability.	The simulation results showed that compared to secured conventional bonds the change in recovery rate uncertainty (volatility) for SARA bonds do not cause their survival probability to change significantly. The results rejected the hypothesis.
H2e: Expected loss decreases with an increase in recovery rate and Vice Versa.	Simulation analysis testing the impact of recovery rate on expected loss.	The simulation results showed that compared to secured conventional bonds the change in recovery rate for SARA bonds cause their expected loss to decrease significantly. The results supported the hypothesis.

Hypothesis H2a captured whether the structural models including Merton (1974), first passage and CreditGrades models assigned lower survival probabilities to IJV bonds. This was tested by developing IJV extensions of structural models and comparing their survival probability and credit scores with those of the original models and credit ratings. The results supported the Hypothesis H2a suggesting that IJV extension models generate significantly lower survival probabilities and credit scores.

Hypothesis H2b focused on another aspect of the structural models' bias against IJV. It compared the issuer's credit risk ranking by IJV extensions against those of the original models and credit ratings. The purpose was to see if a negative association existed between them. This reflects that IJV extensions assign low ranking (low ratings) to firms ranked higher by original models and credit ratings and vice versa. The results, however, rejected the Hypothesis H2b suggesting instead a positive association. When the results for the Hypotheses H2a and H2b are taken together, it suggests that an IJV extension causes an absolute decline in credit ratings and ranking. In contrast, their relative credit risk ratings and raking do not change much.

Hypotheses H2c and H2d tested the impact of recovery rate and its volatility (uncertainty) on the SARA bonds' survival probability. As discussed previously in Chapter 1, SARA bonds represent ownership of the underlying asset so their recovery rate should be higher than secured conventional bonds. This is because ownership of the underlying asset should reduce their financial distress cost (see Chapter 5). Moreover, the volatility (uncertainty) in this recovery rate depends on the underlying asset's price. Hypotheses H2c and H2d when tested using simulation analysis, were rejected. This suggests that the SARA bond's higher recovery rates and asset dependent uncertainty are unlikely to impact much on their survival probability and so not cause it to differ from that of a secured conventional bond.

Hypothesis H2e tested the impact of higher recovery rate on SARA bond's expected loss given default. Its support implies that the SARA bond's higher recovery rate is likely to decrease expected loss considerably.

The results for Hypotheses H2c, H2d and H2e, when taken together, suggest that when calculating survival probabilities SARA bonds can be considered as conventional secured bonds. Therefore, conventional credit risk models like CreditGrades can be used to capture their risk. These results, however, also imply the lower expected loss (EL) that accompanied SARA bonds' higher recovery rate should cause its credit risk to be lower and ratings to be higher than secured conventional bonds. This implies that SARA bonds' unique features should be considered to capture their true underlying risk.

Thus, from the above hypotheses testing the answer to RQ2 for IJV bonds is no, conventional credit risk models cannot be used to assess the risk in IJV bonds. The answer to RQ2 for SARA bonds, however, is yes, conventional credit risk models can be used to capture the risk in SARA bonds.

7.2.3. RQ3: Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?

RQ3 was addressed by testing Hypotheses H3a to H3h (shown in Table 7.4). They explore the impact of firm specific variables (H3a, H3b and H3c), event specific effects (H3d and H3e) and Islamic instrument specific characteristics (H3f, H3g and H3h) on Islamic bonds' credit ratings (see Chapter 6). Each of these hypotheses are discussed in turn below.

Table 7.4: Summary for Research Question 3

This table summarizes Research Question 3, associated hypotheses (H3a to H3h), methodology and results

RQ3: Are the determinants of credit rating for Islamic bonds the same as for conventional bonds?

Hypothesis	Methodology	Results
H3a: Operating margin, interest coverage and firm size are positive determinants of Islamic bonds' credit ratings, *ceteris paribus.*	Individual t-statistic of the estimated coefficients of OIS, IC1, IC2, IC3, IC4 and LA in Equation 6.11 are statistically significant and negative.	Interest Coverage (IC2) and firm size (LA) were positive determinants of Islamic bond ratings. OIS was a positive determinant only for some industries. The results supported the Hypothesis H3a.
H3b: Leverage ratios and standard errors are negative determinants of Islamic bonds' credit ratings, *ceteris paribus*.	Individual t-statistic of the estimated coefficients of DTA, LTDA and SE in Equation 6.11 are statistically significant and positive.	Total debt to asset ratio (DTA) and standard error were shown to negatively affect Islamic bond ratings while long term debt to asset (LTDA) was found to affect them positively H3b. The results partially supported the Hypothesis H3b.
H3c: Market model beta is an insignificant determinant of Islamic bonds' credit ratings, *ceteris paribus*.	Individual t-statistic of the estimated coefficient of BETA in Equation 6.11 is statistically insignificant.	BETA was shown to be an insignificant determinant of Islamic bond ratings. The results supported the Hypothesis H3c.
H3d: Islamic bonds issued during 2008 have higher ratings, *ceteris paribus.*	Individual t-statistic of the estimated coefficient of 2008 in Equation 6.11 is statistically significant and negative.	Credit ratings for newly issued Islamic bonds were higher in 2008. The results supported the Hypothesis H3d.
H3e: Holding firm specific variables constant, credit ratings of newly issued Islamic bonds have not declined during the sub-prime financial crisis in 2009.	Individual t-statistic of the estimated coefficient of GFC in Equation 6.11 is not significantly positive.	Credit ratings for newly issued Islamic bonds were higher 2009 and 2010. The results supported the Hypothesis H3e.
H3f: SARA bonds have higher ratings than IJV and debt bonds, *ceteris paribus*.	Individual t-statistic of the estimated coefficient of SARA in Equation 6.11 is statistically significant and negative.	There was no significant difference between the credit ratings of SARA and debt bonds. The results rejected the Hypothesis H3f.
H3g: IJV bonds have lower ratings than debt bonds, *ceteris paribus.*	Individual t-statistic of the estimated coefficient of IJV in Equation 6.11 is statistically significant and positive.	IJV bonds were shown to have higher ratings than debt bonds. The results rejected the Hypothesis H3g.
H3h: Islamic bonds approved by Shariah committees have higher credit ratings than those approved by individual advisors, *ceteris paribus.*	Individual t-statistic of the estimated coefficient of SB in Equation 6.11 is statistically significant and negative.	The bonds approved by Shariah committees had higher ratings. The results supported the Hypothesis H3h.

Hypotheses H3a to H3c focused on firm specific determinants of credit ratings. Specifically Hypothesis H3a tested whether operating margin, interest coverage and firm size were positive determinants of Islamic bond ratings. The findings were supportive in respect to interest coverage (IC2) and firm size (LA) being positive determinants of Islamic bond ratings but operating margin (OIS) was significantly positive only for some industries. Hypothesis H3b tested whether leverage ratios (total debt and long term debt to asset ratios) and standard errors were negative determinants of Islamic bond ratings. The negative impact of total debt to asset ratio (DTA) and standard error (SE) were supported but the long term debt to asset (LTDA) instead was found to affect them positively H3b. Hypothesis H3c attempted to show whether Islamic financial industry is insulated from systematic shocks in the conventional system by testing the impact of beta and was supported as beta proved insignificant. These overall results for Hypotheses H3a to H3c suggest that firm specific variables are a vital component of credit risk for Islamic bonds.

Hypotheses H3d and H3e tested the impact of specific events including changes in AAOIFI Shariah standard in 2008 (H3d) and the sub-prime financial crisis in 2009 (H3e). Hypothesis H3d was supported with the credit ratings for newly issued Islamic bonds found higher in 2008. This reflects the importance of Shariah standards to the various structures of Islamic bonds and their credit ratings. Hypothesis H3e was also supported as the Islamic bond rating increased during the sub-prime financial crisis. This further corroborates the assertion that Islamic finance industry is insulated from external shocks in the conventional industry.

Hypotheses H3f, H3g and H3h captured the impact of Islamic instrument specific characteristics. Specifically, Hypotheses H3f and H3g tested the impact of Islamic bond type on credit ratings and H3h tested the Shariah advisor effect. With regards to Hypothesis H3f, IJV bonds were shown to have higher ratings than debt bonds (H3f rejected). For Hypothesis H3g, SARA bonds were found to have an insignificant impact on Islamic bonds' credit ratings (H3g rejected). These results imply that IJV bonds are not in fact structured in equity like manner while many of SARA bonds do not represent ownership of the underlying asset. The results support the concern of AAOIFI (2008) and other Islamic scholars regarding the prevalent structures of some Islamic bonds being non-Shariah compliant (see Usmani, 2007; Ali, 2008). Shariah advisor effect (captured by Shariah committee) was tested by Hypotheses H3h and was shown to have a positive impact on credit ratings (Hypothesis H3h well supported). This reflects that products approved by Shariah committees have better structures and should receive higher ratings. The results signify the problem of Shariah harmonization and lack of standardized structures in the Islamic finance industry (see Usmani, 2007; AAOIFI, 2008).

In summary, the answer to RQ3 is no, the determinants of credit rating for Islamic bonds are not the same as for conventional bonds.

7.2.4. RQ4: Are the factors that affect an issuer's choice of Islamic bonds the same as for conventional bonds?

RQ4 was addressed by testing Hypotheses H4a to H4g (shown in Table 7.5). The objective was to infer the impact of firm specific variables (H4a to H4e), changes in

Shariah standards (H4f) and Shariah advisor effect (H4g) on issuer's choice of Islamic bond type (see Chapter 6). Each of these hypotheses are discussed below.

Table 7.5: Summary for Research Question 4

This table summarizes Research Question 4, associated hypotheses (H4a to H4g), methodology and results

RQ4: Are the factors that affect an issuer's choice of Islamic bonds the same as for conventional bonds?

Hypothesis	**Methodology**	**Results**
H4a: Higher current debt, relative to targeted debt, results in firms preferring IJV over SARA and debt bonds and vice versa.	Individual t-statistic of the estimated coefficients of DTA, LTDA, BETA and SE, in Equation 6.13 for IJV bonds are statistically significant and negative. In contrast, IC, OIS and LA are statistically significant and positive.	Higher DTA, IC and BETA resulted in firm preferring IJV bonds while higher LTDA, OIS and LA increased the firm's aversion for IJV bonds. The results partially supported the Hypothesis H4a
H4b: Holding other firm specific variables constant, firms with higher market to book value should prefer IJV over SARA and debt bonds and vice versa.	Individual t-statistic of the estimated coefficient of MtB in Equation 6.13 is statistically significant and negative.	Market to book value ratio was shown to have a positive impact on issuer's choice of IJV bonds. The results rejected the Hypothesis H4b.
H4c: Firms with high leverage (total and long-term debt) prefer SARA over debt bonds and vice versa	Individual t-statistic of the estimated coefficients of DTA and LTDA in Equation 6.13 for SARA bonds are statistically significant and negative.	Firm leverage was shown to have an insignificant impact on issuer's preference for SARA bond. The results rejected the Hypothesis H4c.
H4d: Firm having high profitability (operating margin and interest coverage ratio) prefer debt bond over SARA bonds and vice versa.	Individual t-statistic of the estimated coefficient of OIS and IC, in Equation 6.13 for SARA bonds are statistically significant and positive	Firms with higher operating margin (OIS) were shown to prefer SARA bonds while interest coverage was shown to have an insignificant impact on SARA bond choice. The results rejected the Hypothesis H4d.
H4e: Firms having higher risk (market beta and standard error) prefer SARA over debt bonds and vice versa.	Individual t-statistic of the estimated coefficients of BETA and SE in Equation 6.13 are statistically significant and negative.	Firms with high standard error (SE) were shown to prefer SARA bonds while BETA was shown to have an insignificant impact. The results partially supported the Hypothesis H4e.
H4f: Issuer's aversion for IJV bonds increased in 2008.	Individual t-statistic of the estimated coefficient of 2008 in Equation 6.13 for IJV bonds is statistically significant and positive.	The results showed that the issuer's aversion for IJV bonds increased after 2008. The results supported the Hypothesis H4f.
H4g: SARA bonds, in contrast to debt and IJV bonds are more likely to be approved by Shariah committees than individual advisors.	Individual t-statistic of the estimated coefficients of SB in Equation 6.13 is statistically positive for IJV bond and negative for SARA bonds.	The results showed that Shariah committees had an aversion for IJV. The results partially supported the Hypothesis H4g.

Hypotheses H4a and H4b focused on the firm specific determinants of issuer choice of IJV bonds while Hypotheses H4c, H4d and H4e did so for SARA bonds. Hypotheses H4a and H4b considered that in theory an issuer should view an IJV as an equity instrument. Therefore, the choice of IJV would be affected by the issuer's target debt to equity ratio (H4a). Moreover, it would be affected by those variables that cause the issuer to deviate from the target. As discussed previously in Section 2.5.2 Chapter 2, the target debt to equity ratio is determined by bankruptcy risk (captured by beta (BETA) and standard error (SE)), firm performance (measured by operating margin (OIS), interest coverage (IC)) and firm size (LA). The firm's current position relative to the target was captured by long term debt to asset ratio (LTDA) and total debt to asset ratios (DTA). The findings showed the total debt to asset ratio (DTA) and BETA with the expected significantly negative coefficient and operating margin (OIS) and firm size variables (LA) with the expected significantly positive coefficient. Contrary to expectations, the long term debt to asset ratio (LTDA) was found to be significantly positive and interest coverage (IC) to be significantly negative. Thus Hypotheses H4a was only partially supported. The deviation from the target debt to equity ratio was captured by market to book value ratio (MtB). The results found that MtB was significant but had the unexpected positive sign. Therefore, Hypothesis H4b was rejected. These results for Hypotheses H4a and H4b suggest that issuers' IJV choice was not affected by firm specific determinants. This implies that issuers do not view IJV bonds as equity instruments. This further corroborates the assertion that IJV bonds are structured in a debt rather than equity like manner (see Usmani, 2007; AAOIFI, 2008).

Hypotheses H4c, H4d and H4e tested the impact of firm specific determinants of issuer's choice of SARA bonds. These hypotheses, developed in Chapter 2 assumed that SARA bonds represent ownership of the underlying asset and hence should be more secured than conventional secured bonds (Ali, 2005, 2008; Howladar, 2006; Dusuki & Mukhtar, 2010).The prior conventional finance literature might imply that highly levered (H4c), poor performing (H4d) and high risk (H4e) firms might prefer SARA over Islamic debt bonds. In contrast, firm with lower leverage, high profitability and low risk may prefer debt bonds over SARA bonds. High leverage was captured by total and long-term debt ratios (LTDA and DTA). Profitability was represented by operating margin (OIS) and interest coverage ratios (IC) and risk was measured by market beta (BETA) and standard errors (SE). For Hypothesis H4c, the impact of leverage ratios (LTDA and DTA) was found to be insignificant (H4c was rejected).With regards to Hypotheses H4d, OIS was significantly positive while IC was insignificant (H4d was rejected). When testing Hypothesis H4e, SE proved significantly negative. In contrast, BETA was found to be insignificant (H4e partially supported). These results suggest that not all SARA bonds in the sample represent the ownership of the underlying asset and, hence, are no different from secured conventional bonds (see Usmani, 2007; AAOIFI, 2008).

Hypotheses H4f captured the impact of event specific effect particularly changes in AAOIFI Shariah standard on IJV bonds in 2008. The results supported the hypothesis suggesting that in the aftermath of AAOIFI recommendations, issuer's aversion for IJV bonds increased.

Hypotheses H4g focused on the Shariah advisor effect. The hypothesis was supported for IJV bonds suggesting that Shariah committees prefer to avoid the controversial IJV structures. This preference of Shariah committees was reflected in the issuer’s aversion for IJV bonds.

In summary, the answer to RQ4 is no, the factors that affect an issuer's choice of Islamic bonds are not the same as for conventional bonds.

7.3 Contribution:

The thesis extends the current literature in several ways and contributes in areas of Islamic banking and capital markets. The contributions made by each of the four research questions are discussed in turn.

In terms of answering Research Question 1, as far as it could be ascertained, it is the first study to augment asymmetric information models with risk averse utility function of bank customers to offer a comprehensive explanation of the lack of IJV financing by Islamic banks. While only cursory references on the impact of asymmetric information on the IJV puzzle are found in the literature (see Chapter 1), the asymmetric information model developed here shows that it alone cannot explain the lack of IJV financing phenomenon. Only when augmented with the risk averse behaviour of bank depositors does the new model offers a complete explanation.

With regards to Research Question 2, this is believed to be the first academic contribution to provide evidence that conventional credit risk models are incapable of capturing the risk of IJV bonds.[159] Moreover, it is also the first to show that for credit risk purposes, SARA bonds can be treated like secured conventional bonds. It suggests that conventional credit risk models like CreditGrades which consider the bond's underlying recovery rate can be used for capturing SARA bonds' credit risk.

For Research Question 3, this appears to be the first investigation of whether firm specific determinants of conventional bond ratings have a similar effect on Islamic bond ratings. It shows that some variables such as market beta (BETA), which have a strong impact on conventional bond ratings, have an insignificant impact on Islamic bonds. It also is the first to show that event specific and Islamic instrument specific effects (unique to Islamic bonds) are also important determinants of their credit ratings.

In terms of Research Question 4, as far as it could be ascertained, this is the first examination of the determinants of issuer's choice of Islamic bond type. It extends the literature related to the firm choice of debt to equity ratio to provide evidence that IJV bonds are not viewed by issuer as equity instrument. Furthermore, it also the first to employ the literature on issuer's preference for secured versus unsecured bonds to show that SARA bonds are not different from secured conventional bonds.

7.4 Policy Implications:

This thesis has several implications for Islamic banks, policy makers/regulators, credit rating agencies and Islamic bond issuers.

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[159] Here the study is referring to AAOIFI compliant IJV bonds with equity type structure.

For Islamic banks trying to facilitate the IJV mode of financing, this study suggests that their use of affiliated venture capital and private equity type institutions might prove more successful. This is because the findings for RQ1 imply that while asymmetric information and risk averse depositors are responsible for the lack of IJV financing in Islamic banks, these problems can be neutralised effectively by venture capitalists and VC type financing structures. As discussed in Chapter 2, this is because of their more stringent screening and monitoring techniques to overcome asymmetric information and their funding from less risk averse and more long-term institutional investors.

For the policy maker/regulators, the findings for RQ2 suggest that conventional credit risk models have a bias against IJV type structures which results in their lower credit ratings and helps explain issuer's aversion for IJV bonds. So policy makers/regulators might instead encourage credit rating agencies to develop better models for IJV bonds. Finally, the results for RQ3 and RQ4 suggest that policy makers/regulators such as AAOIFI and Shariah advisors have a major impact on Islamic bond ratings and issuer's choice. The results also magnify the lack of Shariah harmonization in the Islamic finance industry and suggest that for the Islamic finance to prosper policy makers/regulators must support Shariah harmonization.

For the credit rating agencies, the results related to RQ2 suggest that conventional credit risk models have a bias against equity type IJV bonds which cannot be removed by merely extending them. So perhaps credit rating agencies should treat IJV bonds simple as equity and measure their risk using equity risk tools. In contrast, conventional credit risk models can capture the underlying risk of SARA bonds.RQ3 also has important implications for the credit rating agencies. As a number of positive and negative firm specific determinants of Islamic bond ratings were identified. Also other variables such as market beta (BETA), which have a strong impact on conventional bond ratings, proved insignificant for Islamic bonds. The findings also suggest that the sub-prime financial crisis did not cause the bond ratings for new issues to decline. This implies that Islamic finance is much more insulated from external shocks in the conventional financial system. Another important implication for Credit Rating agencies is the relevance of firm specific factors to Islamic bonds' Credit Ratings. The results for RQ3 suggest that though unique characteristics of Islamic bonds are having an impact on its credit ratings, many firm specific variables such as leverage and profitability are also key determinants of conventional bonds. Therefore, conventional credit risk models that incorporate these firm specific variables can be remodelled to capture Islamic bonds' credit risk. These finding on the determinants of Islamic bond ratings should enable credit rating agencies to develop a specialized rating methodology for Islamic bonds.

From an issuer's view point RQ4 suggests that firm specific variables should affect their choice of Islamic bond type not unlike that of conventional debt. This implies that they should be more concerned about the bond's security and seniority rather than simply their IJV or SARA like structure. They should nevertheless prefer Shariah compliant structures to protect themselves from changes in Shariah standards and to avoid conflict with their Shariah committees.

7.5 Limitations of the Thesis:

This thesis has several limitations particularly in terms of its data and methodology that deserve specific mention. The limitation for each research question would be discussed in turn.

For Research Question 1, data for banks employing IJV financing was not available. This is because the number of cases where Islamic banks have employed IJV financing are quite rare and so made data difficult to obtain. Therefore, sufficient observations could not be collected from which to make any meaning generalization. Hence, the study had to resort to theoretical modelling and mathematical proofs to test the hypotheses.

With regard to Research Question 2, data collection was again the biggest challenge. Particularly for the analysis in Chapter 5, data for SARA bond recovery rates was not available. This is because the Islamic corporate bonds have not yet experienced sufficient defaults for their recovery rates to be estimated. Therefore, in Chapter 5 the thesis again had to resort to simulation analysis with no data estimations.

With regards to Research Questions 3 and 4, the initial plan entailed a cross country study of the Islamic corporate bonds. However, insufficient non-Malaysian corporate bonds were available to conduct a meaningful analysis. The research also suggests that there may be some inconsistencies even with the Malaysian issues that were collected. Some IJV bonds in the sample, for example, were not really structured like equity while some SARA bonds lacked ownership of the underlying asset. Efforts to control for this in the sample were in vain due to the lack of data. Only a handful of Islamic bond prospectuses were obtained from which one might discern their structure. Even then some prospectuses remained ambiguous with no clear indications of status of bond holders upon default. This explains the recent controversy whereby some SARA bond holders, who thought themselves as real owners of the underlying asset, upon default were declared as having no asset ownership right.

7.6 Areas for Future Research:

As suggested in Section 7.5 above, data availability was a major limitation of this work. This will not always be the case, however, and so some specific research projects can be suggested to implement in due course. These include more research on the Islamic banks use of IJV financing, the recovery rates of SARA bonds, any country specific differences between Malaysia and Islamic bond issues made in other countries and a detailed investigation as to the structural differences between various IJV and SARA bond issues.

In respect to Islamic banks and their IJV finance, while relatively few examples exist of it, this may change in time. Bodies such as AAOIFI, Bank Negara Malaysia and Islamic Development Bank may facilitate more use of this style of financing as well as its better reporting and so make a future study on this specific topic more conducive.

SARA bonds also offer an intriguing area for research. Their supposed ownership of the underlying asset should place their position in default much better than that of a conventional secured debt. Fortunately, for their providers, the default experience with these instruments remains quite modest. With the 2009 property crisis in Dubai, a number of SARA bonds have since defaulted, but most are still in litigation. Their end experience and that of others will eventually provide the basis for calculating an appropriate recovery rate for SARA bonds. This can then allow the simulation analysis in Chapter 5 to be extended with real data.

It is obvious that country specific differences might be important in examining Islamic bond issues. Indeed, the initial plan for this thesis was for a cross country study. The actual numbers found available in the data collection stage forced the work to instead concentrate on Malaysia. As more data for other countries becomes available, there is merit to extend Research Questions 3 and 4 into a cross country study.

Finally, while SARA bonds are supposed to entail the ownership of the underlying asset and IJVs to represent equity positions, this work suggests that these titles are inconsistently applied. It is hoped that the continued work of AAOIFI and national regulators might result in a more uniform standard being applied and might allow future researchers to identify any of these remaining differences and so determine their effect.

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APPENDIX A: ARABIC ISLAMIC FINANCE TERMINOLOGY

A.1 Introduction:

Conventional finance terminology was employed for some of the Arabic Islamic finance terms to make the work more accessible to non-Arabic speaking audience. These are discussed below.

A.2 Conventional Versus Arabic Islamic Finance Terminology:

The conventional finance terminology and its Arabic Islamic finance counterpart are presented in Table A.1 below (see Usmani, 2002 for more details).

Table A.1: Conventional Versus Arabic Terminology

Conventional Terminology	Arabic Terminology
Bonds	Sukuk
Islamic joint venture (IJV)	Musharakah/Mudarabah
Trade based financing	Murabaha
Lease based financing	Ijarah
Islamic joint venture (IJV) bonds	Musharakah/Mudarabah Sukuk
Secured Against Real Asset (SARA) bonds	Ijarah Sukuk
Islamic debt bonds	Murabaha Sukuk

APPENDIX B: STRUCTURAL MODELS VARIABLES AND PROOFS

B.1 Introduction:

This appendix explains the variables used in the structural models related to RQ2. It then presents the mathematical proofs of Merton (1974), first passage and Credit Grades model and their IJV extensions.

B.2 Variables Used in the Structural Models:

The variables used in the Merton (1974), first passage and CreditGrades models and their IJV extensions are defined in Table B.1 below.

Table B.1: Structural Models' Variables.

Variables	Description
St	Stock price at time't'.
Mt	Price of IJV bond at time't'.
$\boldsymbol{\sigma}$	Standard deviation.
D	Debt per share.
L	Recovery rate.
$\boldsymbol{\lambda}$	Recovery rate volatility.
V	Value of the company per share.
$\boldsymbol{\gamma}$	Captures the partial ownership of IJV bond holders and differences in share privileges.
A	It measures the liquidity of the bond market.
Wt	Random variable that follows a Weiner process.

B.2.1 Debt Per Share:

Following Finger et al. (2002) debt per share (*D*) for corporate firms is calculated using the following algorithm.

$$\text{Financial Debt} = \text{Short Term Borrowing} + \text{Long Term Borrowing} + 0.5 * (\text{Other Short Term Liabilities} + \text{Other Long Term Liabilities}) + 0 * (\text{Account Payable}) \tag{B.1}$$

Short term borrowing and long term borrowing are defined by the short-term and long-term interest-bearing financial obligations including bank overdrafts, bonds, loans, etc. Other short term borrowing and long term borrowing represent current and long-term obligations that do not bear explicit interest, such as tax liabilities and pension liabilities. 50 percent weight is used by Finger et al. (2002) as some of these are similar to financial liabilities (such as pension liabilities, leases, etc.) while some of them are not (such as, provisions). A 0 percent weight for accounts payable and deferred taxes is used as they do not participate in the firm's financial leverage (see Finger et al., 2002). The liabilities of subsidiaries are consolidated at 100 percent even if the parent company may not own 100 percent of the subsidiary. To adjust for this, Finger et al. (2002) assume that the subsidiary has a debt-to-equity ratio of *k*.

$$\text{Minority Debt} = k * \text{Minority Interest} \tag{B.2}$$

Where Minority Interest represents that portion which the parent company does not own in the subsidiary.

The total debt is calculated as follows:

$$\text{Debt} = \text{Financial Debt} - k * \text{Minority Interest} \tag{B.3}$$

In the calculation, Finger et al. (2002) assume that k = 1 and limit Minority Debt to no more than half of Financial Debt.

$$\text{Number of Shares} = \text{Common Shares} + \text{Preferred Shares} \tag{B.4}$$

$$\text{Debt per Share} = \text{Debt}/\text{Number of Shares} \tag{B.5}$$

B.3 Merton Model:

$$P(V_T > D) \tag{B.6}$$

$$P\left(V_t e^{\sigma(W_T - W_t) + \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)} > D\right) \tag{B.7}$$

$$P(\sigma(W_T - W_t) + \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)) > \log(\frac{D}{V_t}) \tag{B.8}$$

$$P(W_T - W_t) > (\frac{\log(\frac{D}{V_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma}) \tag{B.9}$$

$$P\left(\frac{W_T - W_t}{\sqrt{T-t}}\right) > (\frac{\log(\frac{D}{V_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}) \tag{B.10}$$

$$P(Z) > (\frac{\log(\frac{D}{V_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}) \tag{B.11}$$

$$\frac{W_T - W_t}{\sqrt{T-t}} = Z \sim N(0,1) \tag{B.12}$$

Note:σ in this model is standard deviation of the value of the firm.

$$\sigma_v = \sigma_s \frac{S}{S + LD} \tag{B.13}$$

B.4 Merton Model IJV Extension:

$$M_t = \gamma e^{-\alpha(T-t)} S_t \tag{B.14}$$

$$P(M_T > M_t) \tag{B.15}$$

$$P(S_T > M_t) \tag{B.16}$$

$$P\left(S_T > \frac{M_t}{\gamma}\right) \tag{B.17}$$

$$P\left(S_t e^{\sigma(W_T - W_t) + \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)} > \frac{M_t}{\gamma}\right) \tag{B.18}$$

$$P(\sigma(W_T - W_t) + \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)) > \log(\frac{M_t}{\gamma S_t}) \tag{B.19}$$

$$P(W_T - W_t) > \frac{\log(\frac{M_t}{\gamma S_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma}) \tag{B.20}$$

$$P\left(\frac{W_T - W_t}{\sqrt{T-t}}\right) > (\frac{\log(\frac{M_t}{\gamma S_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}) \tag{B.21}$$

$$P(Z) > (\frac{\log(\frac{M_t}{\gamma S_t}) - \left(\alpha - \frac{1}{2}\sigma^2\right)(T-t)}{\sigma\sqrt{T-t}}) \tag{B.22}$$

$$\frac{W_T - W_t}{\sqrt{T-t}} = Z \sim N(0, 1) \tag{B.23}$$

B.5 First Passage Model:

$$P(V_t > D) \tag{B.24}$$

$$P\left(V_t e^{\sigma(W_t)+\left(\alpha-\frac{1}{2}\sigma^2\right)(T-t)} > D\right) \tag{B.25}$$

$$P\left(\sigma(W_t) + \left(\alpha - \frac{1}{2}\sigma^2\right)(t) > \log(\frac{D}{V_t})\right) \tag{B.26}$$

$$Y_t = at + bW_t \tag{B.27}$$

$$b = \sigma \tag{B.28}$$

$$a = (\alpha - \frac{1}{2}\sigma^2) \tag{B.29}$$

$$y = \log\left(\frac{D}{V_t}\right) \tag{B.30}$$

$$\begin{aligned} P(Y_s > y, \forall s < t) \\ &= N\left(\frac{\left(\alpha - \frac{1}{2}\sigma^2\right)t - \log(\frac{LD}{V_t})}{\sigma\sqrt{t}}\right) \\ &- e^{\frac{2\left(\alpha-\frac{1}{2}\sigma^2\right)\log\,(\frac{LD}{V_t})}{\sigma^2}} N\left(\frac{\left(\alpha - \frac{1}{2}\sigma^2\right)t + \log(\frac{LD}{V_t})}{\sigma\sqrt{t}}\right) \end{aligned} \tag{B.31}$$

B.6 First Passage IJV Extension:

$$M_t = \gamma e^{-a(T-t)} S_t \quad \text{(B.32)}$$

$$P(M_t > M_0) \quad \text{(B.33)}$$

$$P\left(S_t > \frac{M_o}{\gamma e^{-a(T-t)}}\right) \quad \text{(B.34)}$$

For simplicity assume that$\theta = \frac{1}{\gamma e^{-a(T-t)}}$ (B.35)

$$P(S_t > \theta M_o) \quad \text{(B.36)}$$

$$P\left(S_0 e^{\sigma(W_t)+\left(\alpha-\frac{1}{2}\sigma^2\right)(t)} > \theta M_0\right) \quad \text{(B.37)}$$

$$P(\sigma(W_t) + \left(\alpha - \frac{1}{2}\sigma^2\right)(t)) > \log(\frac{\theta M_0}{S_0}) \quad \text{(B.38)}$$

$$Y_t = \ at + bW_t \quad \text{(B.39)}$$

$$b = \ \sigma \quad \text{(B.40)}$$

$$a = (\alpha - \frac{1}{2}\sigma^2) \quad \text{(B.41)}$$

$$y = \log\left(\frac{\theta M_0}{S_0}\right) \quad \text{(B.42)}$$

$$P(Y_s > y, \forall s < t)$$

$$= N\left(\frac{\left(\alpha - \frac{1}{2}\sigma^2\right)t - \log\left(\frac{\theta M_0}{S_0}\right)}{\sigma\sqrt{t}}\right) \quad \text{(B.43)}$$

$$- e^{\frac{2\left(\alpha-\frac{1}{2}\sigma^2\right)\log\left(\frac{\theta M_0}{S_0}\right)}{\sigma^2}} N\left(\frac{\left(\alpha - \frac{1}{2}\sigma^2\right)t + \log\left(\frac{\theta M_0}{S_0}\right)}{\sigma\sqrt{t}}\right)$$

B.7 CreditGrades Model:

$$\frac{dVt}{Vt} = \sigma dW_t + \mu D dt \tag{B.44}$$

$$\overline{L} = \boldsymbol{E}L \tag{B.45}$$

$$\lambda^2 = \operatorname{Var}\log(L) \tag{B.46}$$

$$\mathrm{LD} = \overline{L}De^{\lambda Z - \frac{\lambda^2}{2}} \tag{B.47}$$

The recovery rate L follows a lognormal distribution with mean $\overline{L}$and percentage standard deviation λ. Z is a standard normal random variable. The random variable Z is independent of the Brownian motion W. Z is unknown at t = 0 and is only revealed at the time of default.

$$V_0 e^{\sigma W_t - \frac{\sigma^2 t}{2}} > \overline{L}De^{\lambda Z - \frac{\lambda^2}{2}} \tag{B.48}$$

$$X_t = \sigma W_t - \lambda Z - \frac{\lambda^2}{2} - \frac{\sigma^2 t}{2} \tag{B.49}$$

$$X_t > log(\frac{\overline{L}D}{V_0}) - \lambda^2 \tag{B.50}$$

$$EX_t = -\frac{\sigma^2}{2}(t + \frac{\lambda^2}{\sigma^2}) \tag{B.51}$$

$$VarX_t = \sigma^2\left(t + \frac{\lambda^2}{\sigma^2}\right) \tag{B.52}$$

$$P\{Y_s > y, \forall\, s < t\} = \phi\left(\frac{at - y}{b\sqrt{t}}\right) - e^{\frac{2ay}{b^2}}\phi\left(\frac{at + y}{b\sqrt{t}}\right) \tag{B.53}$$

$$P(t) = \phi\left(-\frac{A_t}{2} + \frac{log\, d}{A_t}\right) - d\,.\phi\left(-\frac{A_t}{2} - \frac{log\, d}{A_t}\right) \tag{B.54}$$

$$d = \frac{V_0 e^{\lambda^2}}{\bar{L}D} \quad \text{(B.55)}$$

$$A_t^2 = \sigma^2 t + \lambda^2 \quad \text{(B.56)}$$

B.8 CreditGrades IJV Extension:

$$P(M_t > LM_0) \quad \text{(B.57)}$$

$$\bar{L} = \boldsymbol{E}L \quad \text{(B.58)}$$

$$\lambda^2 = \operatorname{Var}\log(L) \quad \text{(B.59)}$$

$$LM_0 = \bar{L}M_0 e^{\lambda Z - \frac{\lambda^2}{2}} \quad \text{(B.60)}$$

$$P(S_t > \theta LM_o) \quad \text{(B.61)}$$

$$P(t) = \phi\left(-\frac{A_t}{2} + \frac{\log d}{A_t}\right) - d\,.\,\phi\left(-\frac{A_t}{2} - \frac{\log d}{A_t}\right) \quad \text{(B.62)}$$

$$d = \frac{V_o e^{\lambda^2}}{\bar{L}\theta M_o} \quad \text{(B.63)}$$

$$A_t^2 = \sigma^2 t + \lambda^2 \quad \text{(B.64)}$$

APPENDIX C: ROBUSTNESS RESULTS OF IJV EXTENSIONS

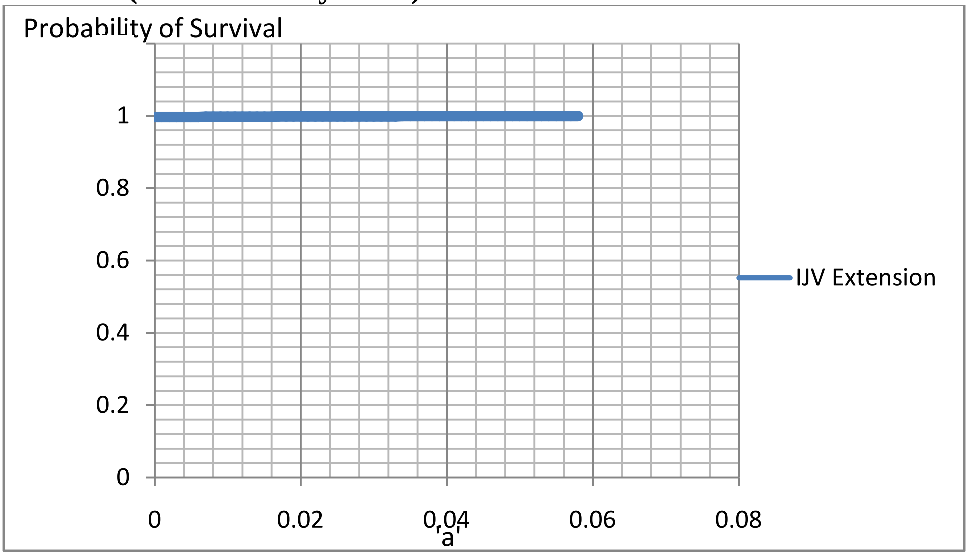
C.1 Introduction:

This appendix presents the robustness result of the simulation analysis used in Chapter 4. The results are provided for Merton (1974), first passage, Credit Grades model and their IJV extensions.

C.2 Robustness Results of Merton Model and IJV Extension:

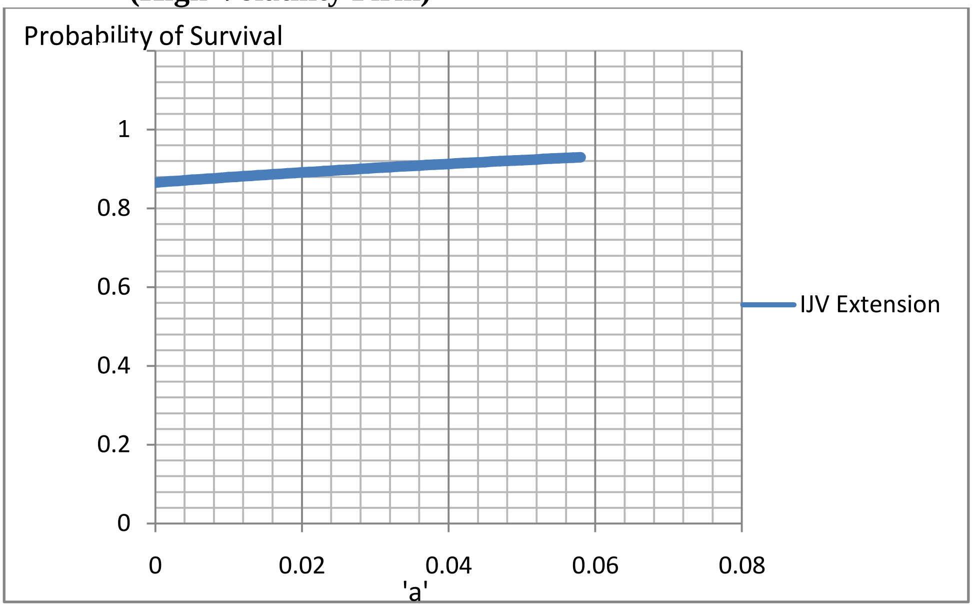
The robustness results for the survival probability of Merton (1974) model and its IJV extension are presented here. These results reflect the survival probability sensitivity to changes in 'a' (Figure C.1 and C.2), equity per share (Figure C.3 and C.4) and debt per share (Figure C.5 and C.6).

Figure C.1: Merton Model: Survival Probability Against 'a' (Low Volatility Firm)



$S_t = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; \alpha = 0.3 \;\; \gamma = 1$

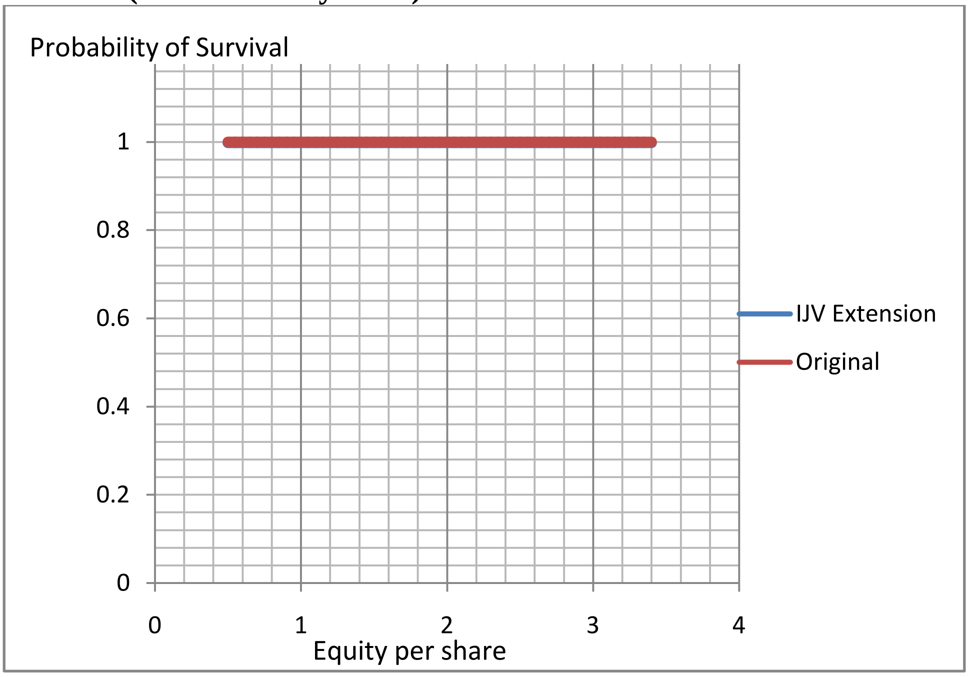
Figure C.2: Merton Model:Survival Probability Against 'a' (High Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.5 \;\; \alpha = 0.3 \;\; \gamma = 1 \;\; a = 0.01$

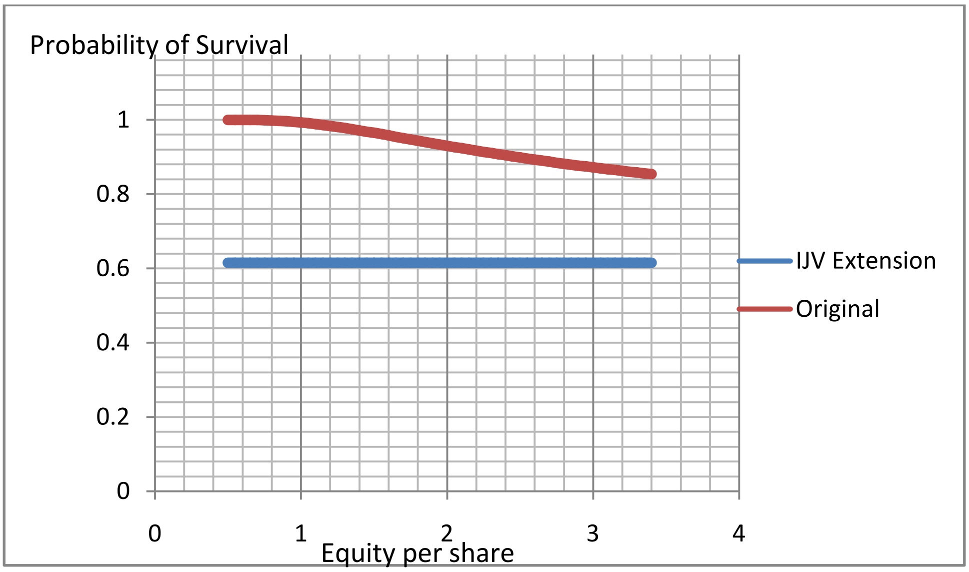
FiguresC.1 and C.2 above indicate that for Merton (1974) model's IJV extension the survival probabilities are robust to changes in 'a'.

Figure C.3: Merton Model: Survival Probability Against Equity Per Share (Low Volatility Firm)



$D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; \alpha = 0.3 \;\; a = 0.01 \;\; \gamma = 1$

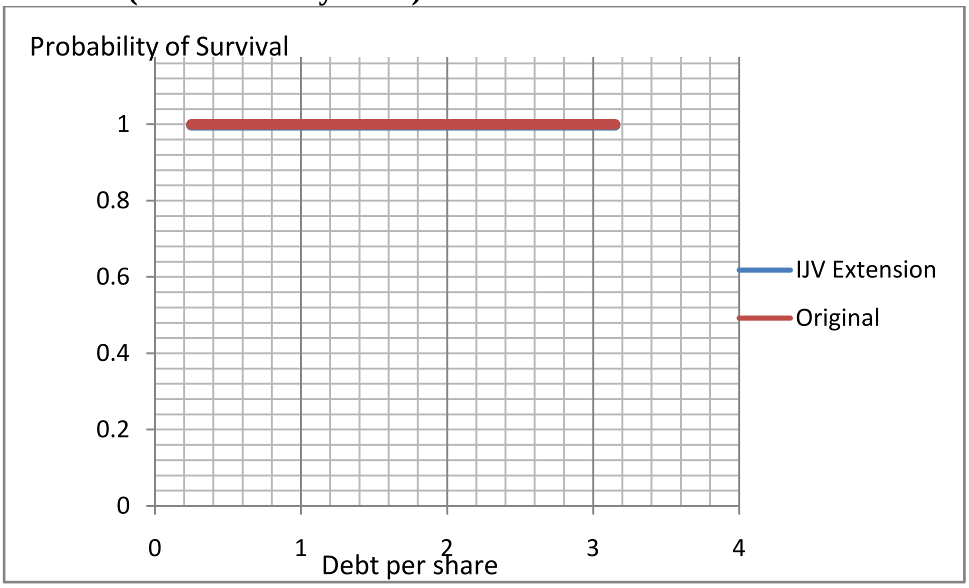
Figure C.4: Merton Model: Survival Probability Against Equity Per Share (High Volatility Firm)



$D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.7 \;\; \alpha = 0.3 \;\; a = 0.01 \;\; \gamma = 1$

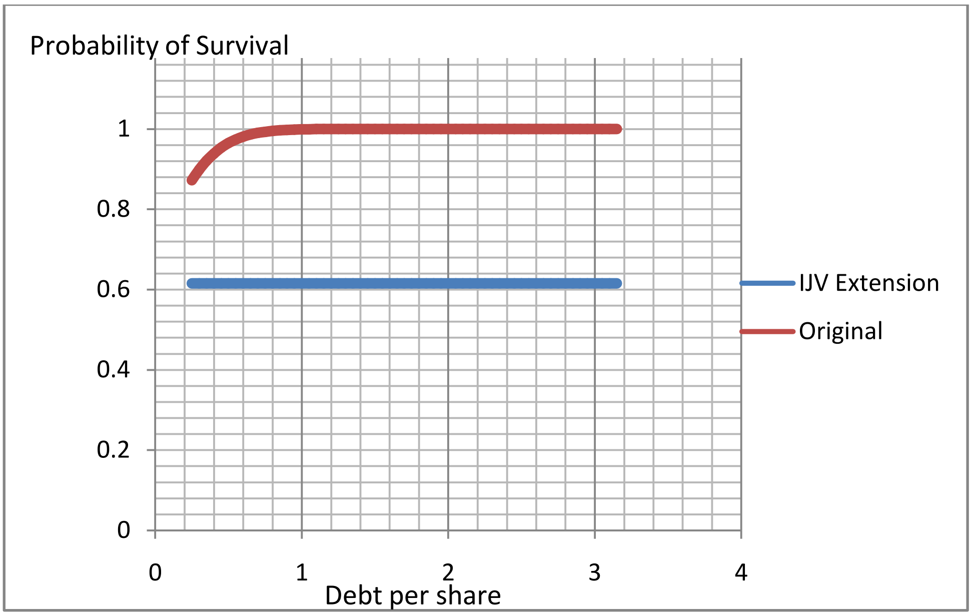
Figures C.3 and C.4 above indicate that for Merton (1974) model and its IJV extension the survival probabilities are robust to changes in equity per share.

Figure C.5: Merton Model: Survival Probability Against Debt Per Share (Low Volatility Firm)



$S_t = 1 \quad T - t = 10 \quad \sigma = 0.3 \; \alpha = 0.3 \quad a = 0.01 \; \gamma = 1$

Figure C.6: Merton Model: Survival Probability Against Debt Per Share (High Volatility Firm)



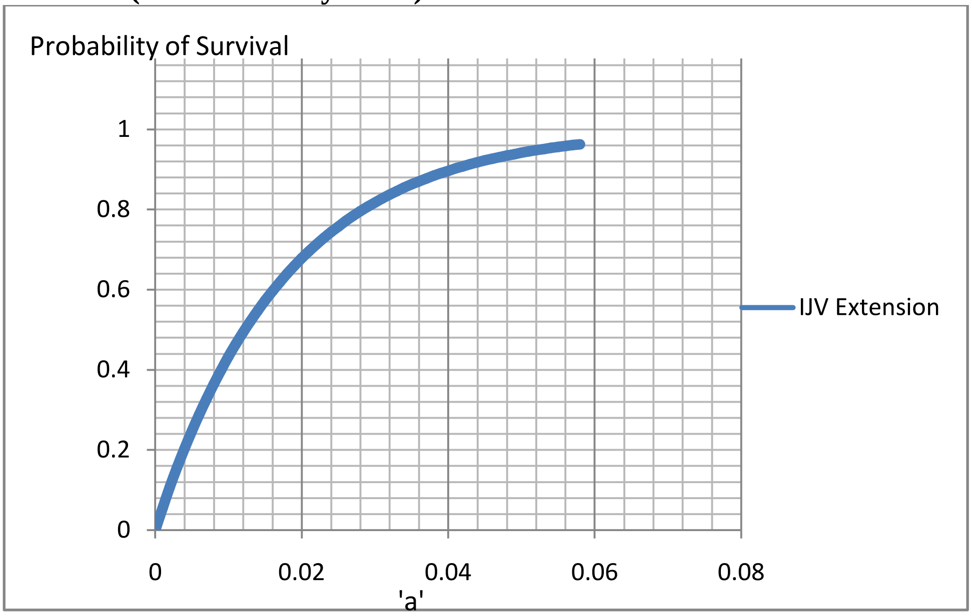
$S_t = 1 \quad T - t = 10 \quad \sigma = 0.7 \; \alpha = 0.3 \quad a = 0.01 \; \gamma = 1$

Figures C.5 and C.6 above indicate that for Merton (1974) model and its IJV extension the survival probabilities are robust to changes in debt per share.

C.3 Robustness Results of First Passage Model and IJV Extension:

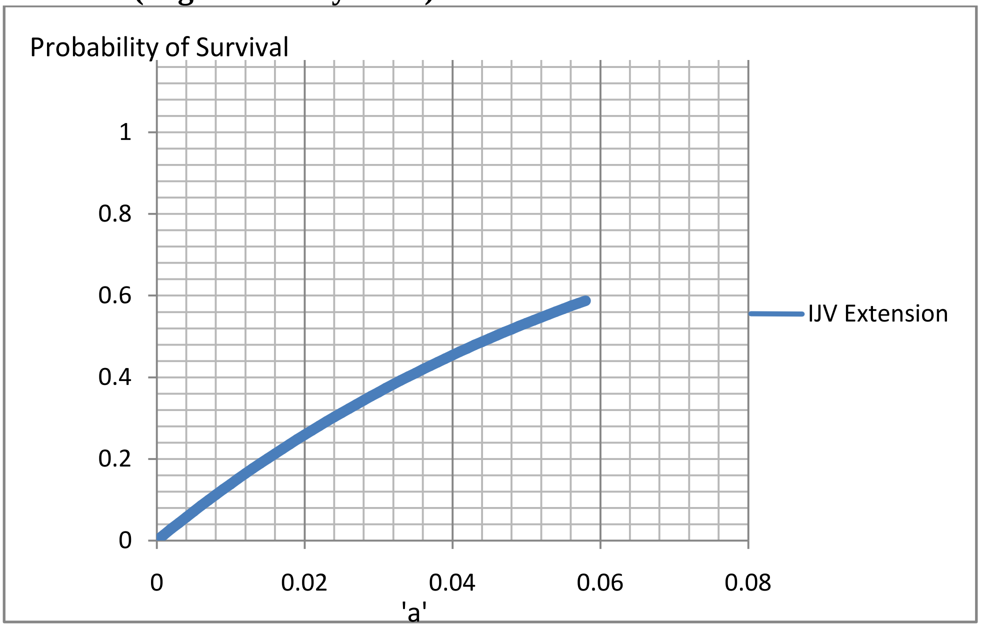
The robustness results for the survival probability of first passage model and its IJV extension are presented here. These results reflect the survival probability sensitivity to changes in ‘a’ (Figure C.7 and C.8), equity per share (Figure C.9 and C.10) and debt per share (Figure C.11and C.12).

Figure C.7: First Passage Model: Survival Probability Against '*a*' (Low Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; \alpha = 0.3$

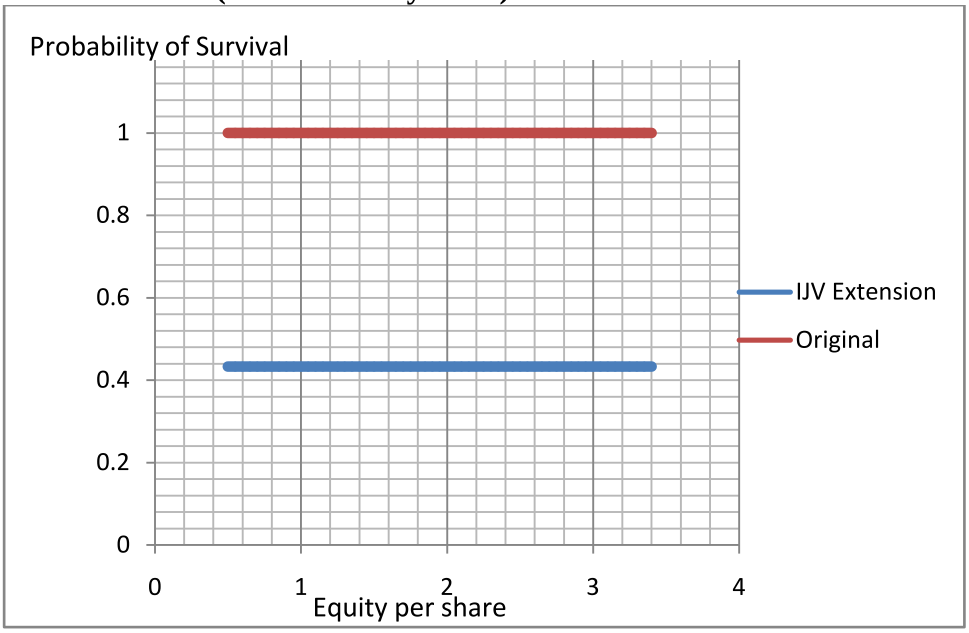
Figure C.8: First Passage Model: Survival Probability Against '*a*' (High Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.5 \;\; \alpha = 0.3$

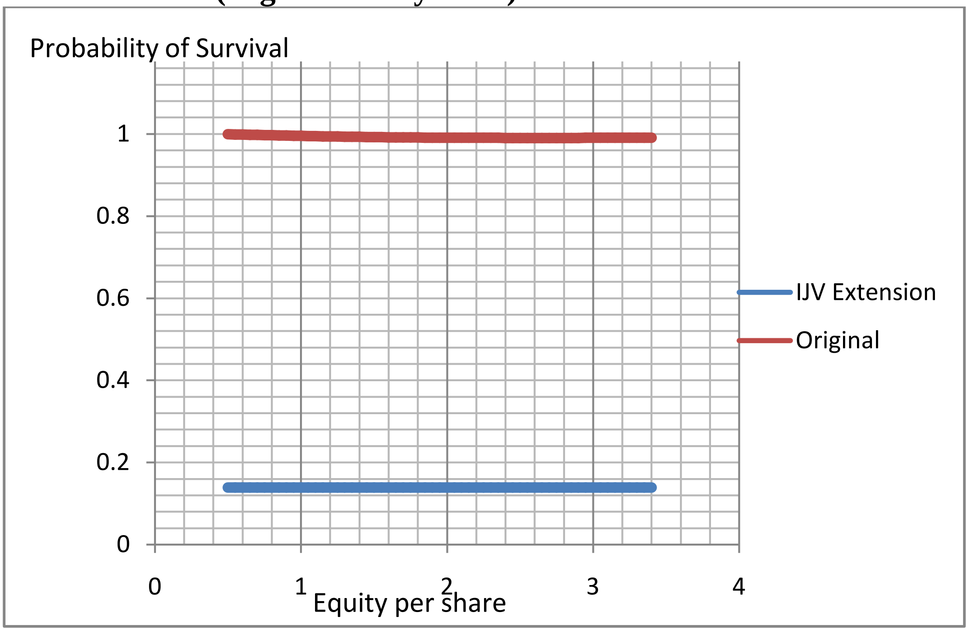
Figures C.7 and C.8 suggest that for the first passage model's IJV extension, an increase in '*a*' is accompanied by higher survival probability. The results indicate that the bias the first passage model has against IJV bonds would be less if their secondary market is highly liquid.

Figure C.9: First Passage Model: Survival Probability Against Equity Per Share (Low Volatility Firm)



$D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \; \alpha = 0.3 \;\;\; a = 0.01 \;\; \gamma = 1$

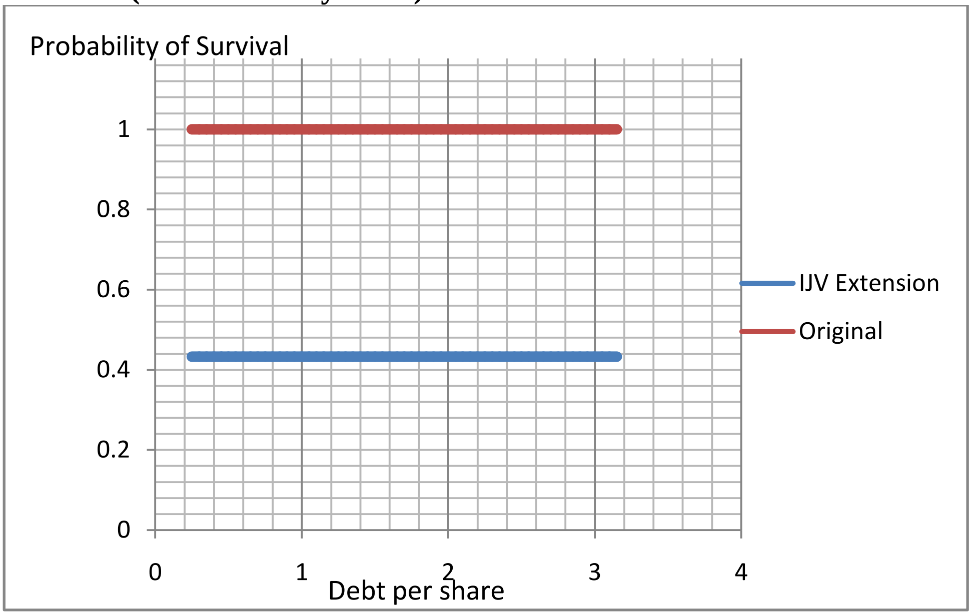
Figure C.10: First Passage Model: Survival Probability Against Equity Per Share (High Volatility Firm)



$D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.5 \; \alpha = 0.3 \;\;\; a = 0.01 \;\; \gamma = 1$

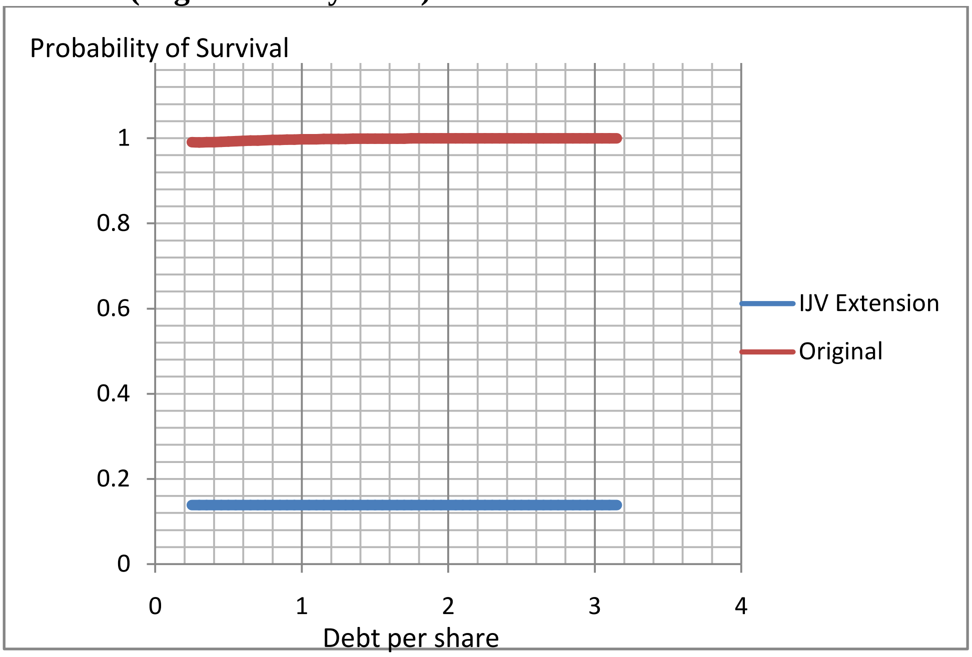
Figures C.9 and C.10 above indicate that for the first passage model and its IJV extension the survival probabilities are robust to changes in equity per share.

Figure C.11: First Passage Model: Survival Probability Against Debt Per Share (Low Volatility Firm)



$S_t = 1 \quad T - t = 10 \quad \sigma = 0.3 \; \alpha = 0.3 \quad a = 0.01 \quad \gamma = 1$

Figure C.12: First Passage Model: Survival Probability Against Debt Per Share (High Volatility Firm)



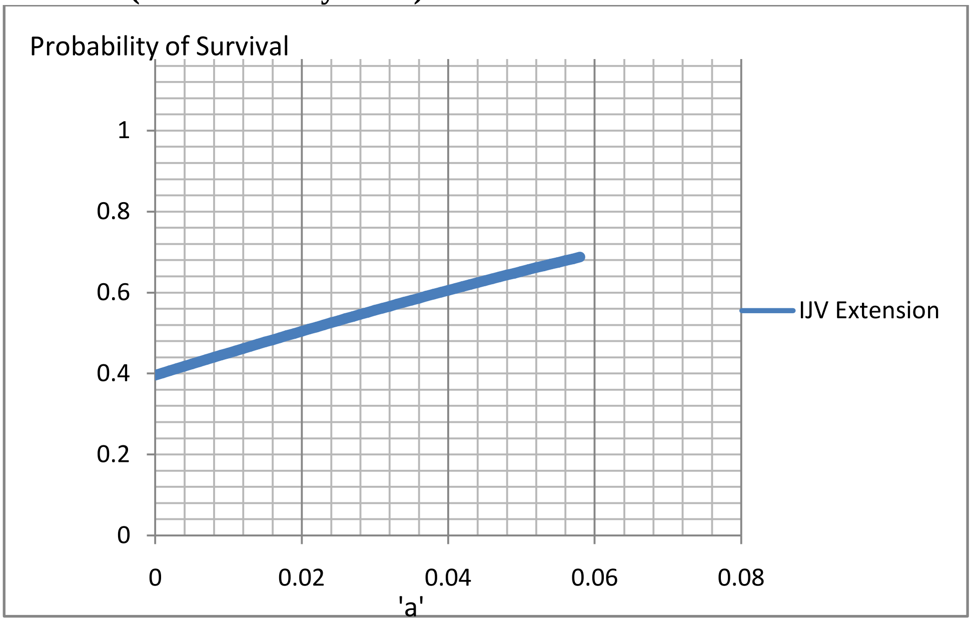
$S_t = 1 \quad T - t = 10 \quad \sigma = 0.5 \; \alpha = 0.3 \quad a = 0.01 \quad \gamma = 1$

Figures C.11 and C.12 above indicate that for the first passage model and its IJV extension the survival probabilities are robust to changes in equity per share.

C.4 Robustness Results of CreditGrades Model and IJV Extension:

The robustness results for the survival probability of CreditGrades model and its IJV extension are presented here. These results reflect the survival probability sensitivity to changes in 'a' (Figure C.13 and C.14), equity per share (Figure C.15 and C.16), debt per share (Figure C.17and C.18), recovery rate (Figure C.19 and C.20) and recovery rate volatility (C.21 and C.22).

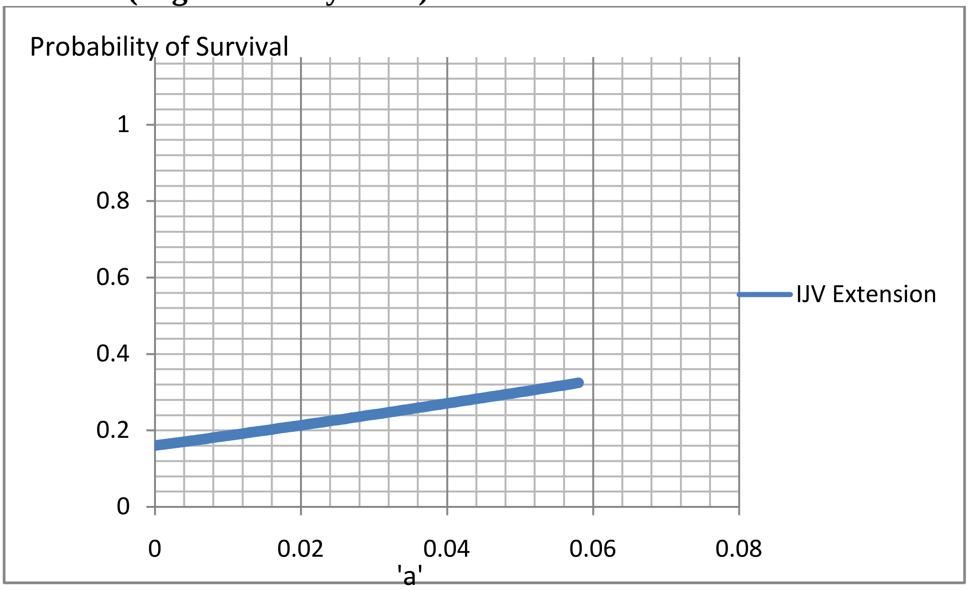
Figure C.13: CreditGrades Model: Survival Probability Against '*a*' (Low Volatility Firm)



$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \;\;\; RR = 0.5 \; \lambda = 0.3$

Figure X

Figure C.14: CreditGrades Model: Survival Probability Against '*a*' (High Volatility Firm)

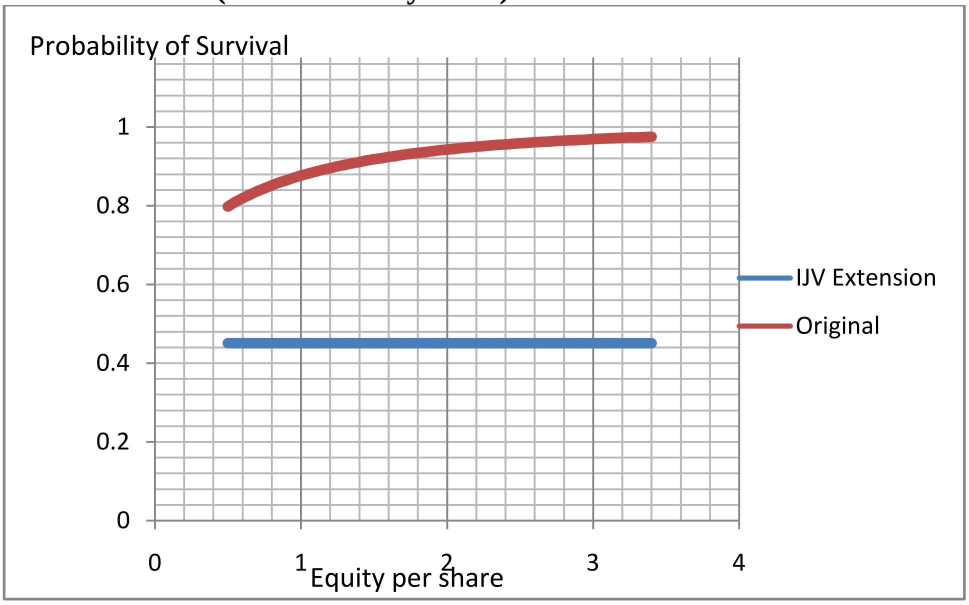


$S = 1 \;\; D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.5 \;\;\; RR = 0.5 \; \lambda = 0.3$

Figures C.13 and C.14 suggest that for the CreditGrades IJV extension, an increase in 'a' is accompanied by higher survival probability. The results imply that the bias

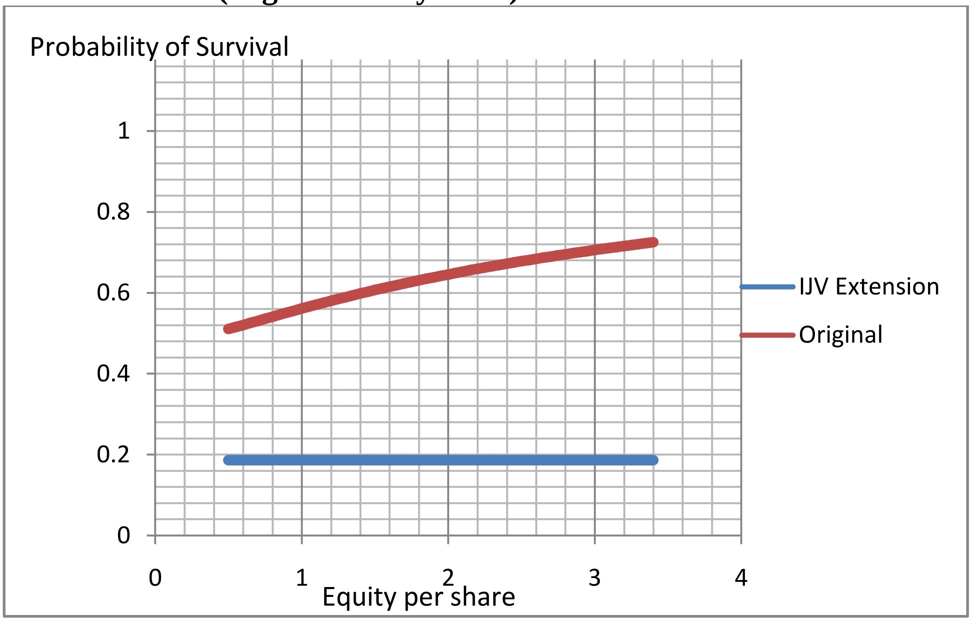
CreditGrades model has against IJV bonds would be less if their secondary market is highly liquid.

Figure C.15: CreditGrades Model: Survival Probability Against Equity Per Share (Low Volatility Firm)



$D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; a = 0.01 \;\; RR = 0.5 \; \lambda = 0.3$

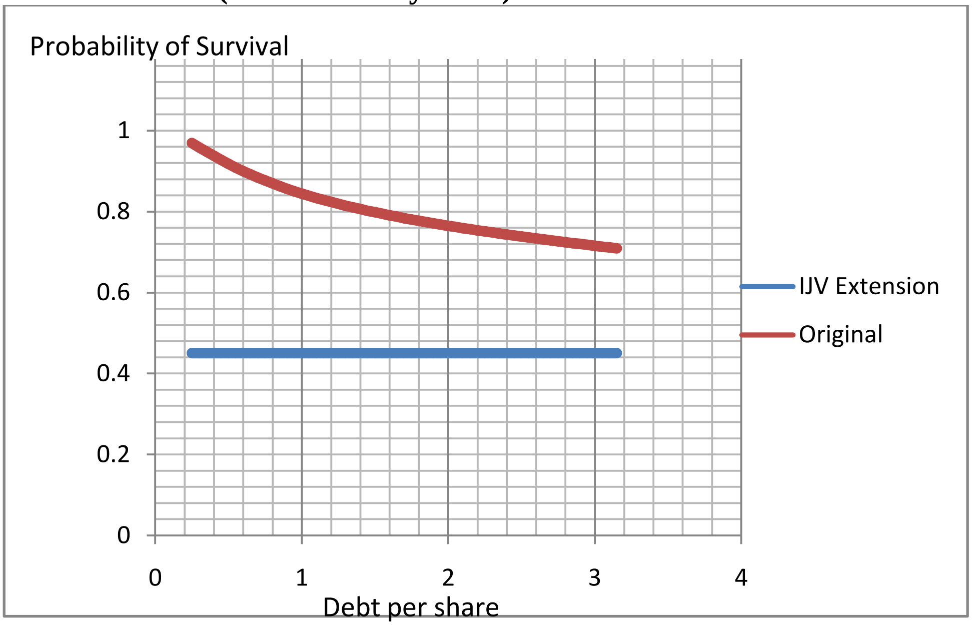
Figure C.16: CreditGrades Model: Survival Probability Against Equity Per Share (High Volatility Firm)



$D = 0.75 \;\; T - t = 10 \;\; \sigma = 0.5 \;\; a = 0.01 \;\; RR = 0.5 \; \lambda = 0.3$

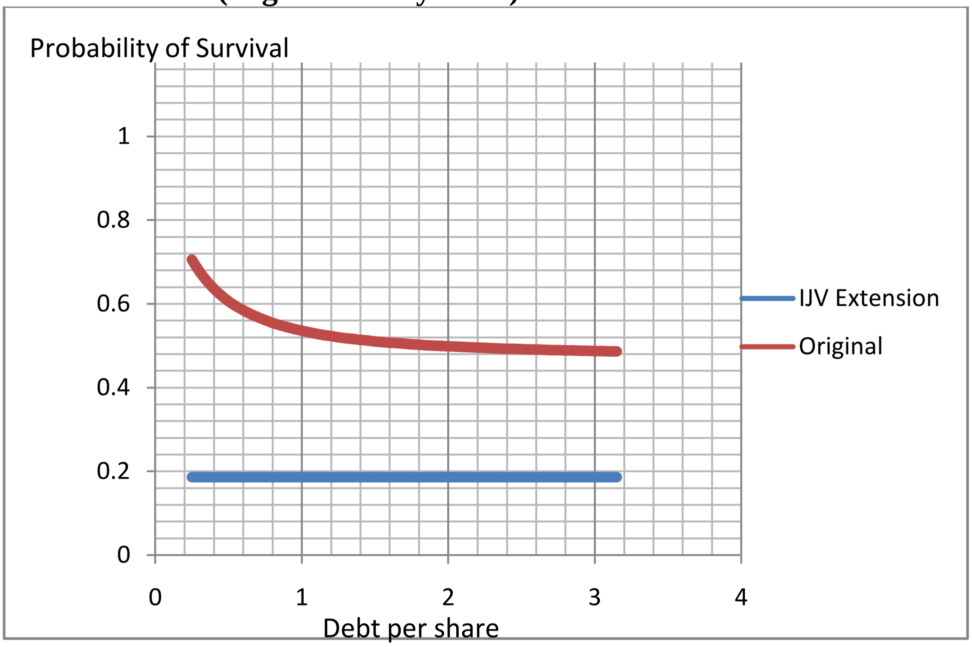
Figures C.15 and C.16 above indicate that for the CreditGrades model and its IJV extension the survival probabilities are robust to changes in equity per share.

Figure C.17: CreditGrades Model: Survival Probability Against Debt Per Share (Low Volatility Firm)



$S = 1 \;\; T - t = 10 \;\; \sigma = 0.3 \;\; a = 0.01 \; RR = 0.5 \; \lambda = 0.3$

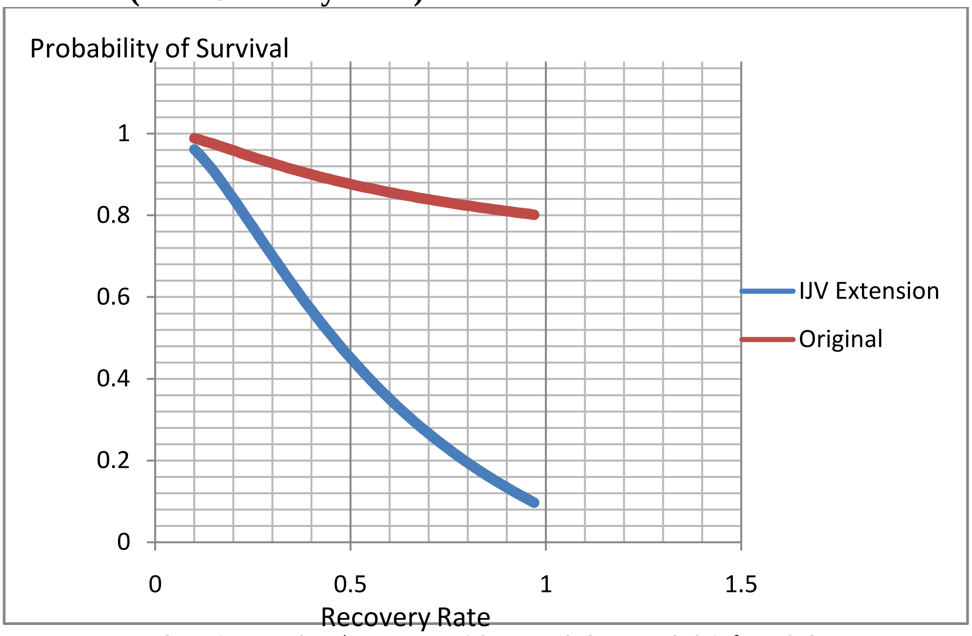
Figure C.18: CreditGrades Model: Survival Probability Against Debt Per Share (High Volatility Firm)



$S = 1 \;\; T - t = 10 \;\; \sigma = 0.5 \;\; a = 0.01 \;\; RR = 0.5 \; \lambda = 0.3$

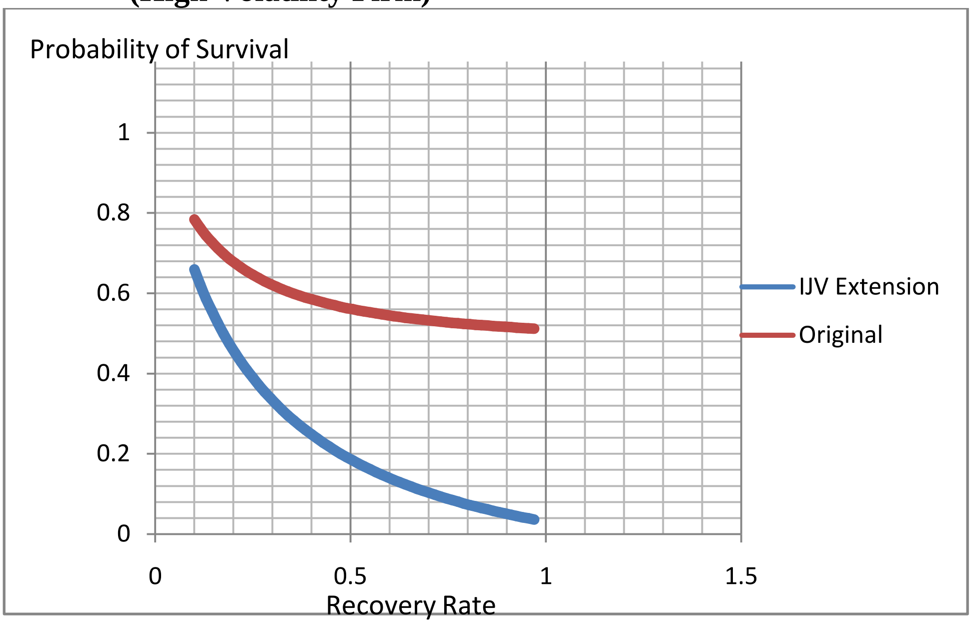
Figures C.17 and C.18 suggest that for the CreditGrades model, an increase in debt per share is accompanied by higher survival probability while its IJV extension is robust to changes in debt per share.

Figure C.19: CreditGrades Model: Survival Probability Against Recovery Rate (Low Volatility Firm)



$S = 1\ D = 0.75\ T - t = 10\ \ \sigma = 0.3\ \ a = 0.01\ \lambda = 0.3$

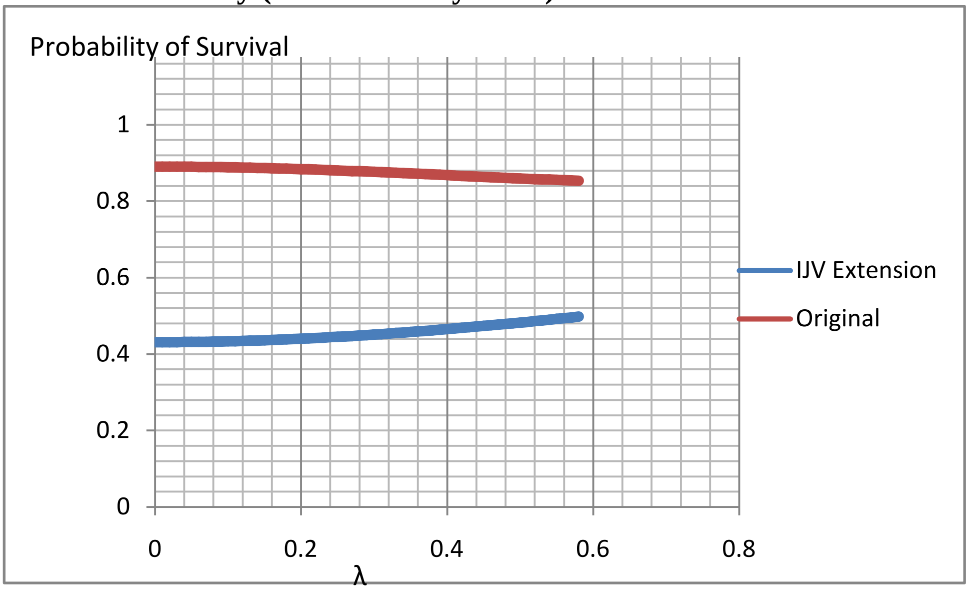
Figure C.20: CreditGrades Model: Survival Probability Against Recovery Rate (High Volatility Firm)



$S = 1\ D = 0.75\ T - t = 10\ \ \sigma = 0.5\ \ a = 0.01\ RR = 0.5\ \lambda = 0.3$

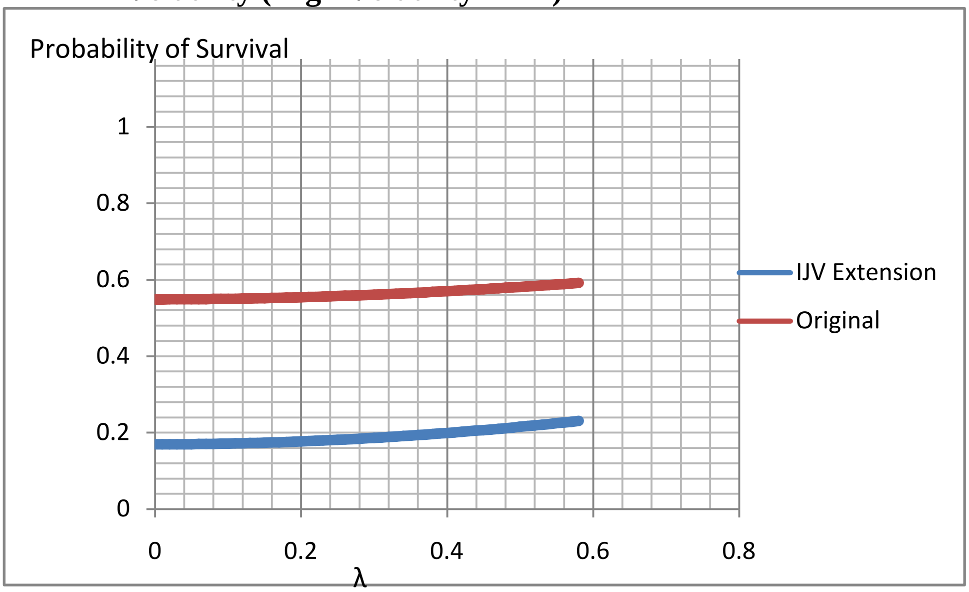
Figures C.19 and C.20 suggest that CreditGrades IJV extension is more sensitive to recovery rate change than the original model. These results support the assertion that the CreditGrades model has a bias against IJV bonds.

Figure C.21: CreditGrades Model: Survival Probability Against Recovery Rate Volatility (Low Volatility Firm)



$S = 1\ D = 0.75\ T - t = 10\ \ \sigma = 0.3\ \ a = 0.01\ \ RR = 0.5$

Figure C.22: CreditGrades Model: Survival Probability Against Recovery Rate Volatility (High Volatility Firm)



$S = 1\ D = 0.75\ T - t = 10\ \ \sigma = 0.5\ \ a = 0.01\ \ RR = 0.5$

Figures C.21 and C.22 above indicate that for the CreditGrades model and its IJV extension the survival probabilities are robust to changes in recovery rate volatility (uncertainty).

APPENDIX D: ROBUSTNESS RESULTS FOR: ISLAMIC BOND RATING MODEL

D.1 Introduction:

This appendix presents the robustness result of the Islamic bond rating model related to RQ3.

D.2Issuer’s Industry Impact on Operating Margin Ratio:

As discussed previously in Section 6.5.1 the impact of issuer’s industry on the operating margin ratio is captured by including slope dummies for OIS in the Islamic bond rating model given by Equation 6.12. The slope dummies are created as shown in Equation D.1 to D.4. The results for the revised model are presented in Table D.1.

$$OISProperty = OIS \text{ x } Property \tag{D.1}$$

$$OISEnergy = OIS \text{ x } Energy \tag{D.2}$$

$$OISAgriculture = OIS \text{ x } Agricultre \tag{D.3}$$

$$OISManufacture = OIS \text{ x } Manufacture \tag{D.4}$$

Table D.1: Robustness Results for the Determinants of Islamic Bond Rating Model for RQ3

This table presents the estimation of the ordered Probit model:

$$\mathbf{Y}_i = \begin{cases} \textbf{1 if company is rated AAA/AA} \\ \textbf{2 if company is rated A} \\ \textbf{3 if compnay is rated BBB} \\ \textbf{4 for all lower ratings} \end{cases}$$

$$\begin{aligned} Y_i^* = {} & \beta_1 OIS + \beta_{2a} OISProperty + \beta_{2b} OISPower + \beta_{2c} OISAgriculture \\ & + \beta_{2d} OISManufacture + \tau_1 IC1 + \tau_2 IC2 + \tau_3 IC3 \\ & + \tau_4 IC4 + \beta_2 LA + \beta_3 LTDA + \beta_4 DTA \\ & + \beta_5 SE + \beta_6 BETA + \gamma_1 2008 + \gamma_2 GFC + \gamma_3 IJV + \gamma_4 SARA \\ & + \gamma_5 SB + \theta_1 Property + \theta_2 Energy + \theta_3 Agriculture \\ & + \theta_4 Manufacture + \varepsilon \end{aligned}$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i^*$is the latent variable that links the dependent variable with $\mathbf{Y}_i$. OIS is operating income to sales ratio. **OISProperty**, **OISEnergy**, OISAgriculture, OISManufacture are slope dummy variables capturing industry effect. IC1 represents interest coverage ratio from 0 to 5, IC2 from 0 to 10, IC3 from 10 to 20 and IC4 from 20 to 100. LA is log of assets. LTDA is long term debt to asset ratio. DTA is total debt to asset ratio. SE is standard errors. BETA is the market model beta. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. IJV is a dummy variable that equal 1 for IJV bond issues. SARA is a dummy variable that equal 1 for SARA bond issues. Property is a dummy variable that equals 1 if the issuer belongs to the property industry. Energy is a dummy variable that equals 1 if the issuer belongs to the energy industry. Agriculture is a dummy variable that equal 1 if the issuer belongs to the agriculture industry. Manufacture is a dummy variable that equals 1 if the issuer belongs to the manufacturing industry. In the result shown in the table debt bonds is used as the base case. Adjusted P-values using Huber-White test are also provided in the table.

Variable	Coefficient	Std. Error	Z-Statistic	Prob.	Prob (Adjusted)
OIS	-0.92762	2.165412	-0.42838	0.6684	0.741
OISProperty	-2.61381	6.646968	-0.39323	0.6941	0.7334
OISEnergy	-14.2047	7.600497	-1.86892	0.0616	0.1982
OISAgriculture	4.86423	4.635885	1.049256	0.2941	0.3069
OISManufacture	10.22198	2.997268	3.410434	0.0006	0.0036
IC1	0.045624	0.116302	0.392285	0.6948	0.7309
IC2	-0.52775	0.110902	-4.75869	0	0.0008
IC3	0.132622	0.072781	1.822219	0.0684	0.1396
IC4	-0.00525	0.012125	-0.43271	0.6652	0.7379
LA	-0.09548	0.111172	-0.8588	0.3905	0.4594
LTDA	-2.9626	1.0736	-2.7595	0.0058	0.0114
DTA	2.017376	0.996369	2.024729	0.0429	0.0316
SE	74.47677	9.154338	8.13568	0	0
BETA	0.047076	0.279928	0.168171	0.8664	0.8629

2008	-0.88015	0.321384	-2.73863	0.0062	0.0212

Table D.1: Robustness Results for the Determinants of Islamic Bond Rating Model for RQ3 Continued

Variable	Coefficient	Std. Error	Z-Statistic	Prob.	Prob (Adjusted)
GFC	-1.06159	0.507229	-2.09292	0.0364	0.0449
IJV	-1.81736	0.228854	-7.94112	0	0
SARA	-1.88783	0.716429	-2.63506	0.0084	0.1306
SB	0.201535	0.481095	0.41891	0.6753	0.7316
Property	-1.17496	0.625155	-1.87947	0.0602	0.0673
Energy	3.028242	1.005542	3.011553	0.0026	0.0555
Agriculture	-2.43024	0.613556	-3.9609	0.0001	0
Manufacture	-0.71194	0.509573	-1.39713	0.1624	0.1457

D.2.1 Discussion of the Results:

The results in Table D.1 above indicate that the OIS variable has a strong positive coefficient for manufacturing industry, but a negative coefficient for the energy sector (see Section 6.5.1 for more details).

APPENDIX E: ROBUSTNESS RESULTS FOR ISSUER CHOICE OF ISLAMIC BOND TYPE MODEL

E.1 Introduction:

This appendix presents the robustness result of the issuer's choice of Islamic bond type model related to RQ4. The data shown in Table 6.4 had a high dominance of debt bonds.[160] To ensure that there is no bias in the results for Equations 6.13 and 6.16 presented in Tables 6.17 and 6.18, the robustness of results with a truncated data sample are provided here.

E.2 Truncated Data Sample:

A sample of 456 Islamic bond issues obtained for RQ4 was initially employed as was shown in Table 6.5.To reduce the domination of debt bonds in the sample and without losing observations of economic importance[161] multiple debt bond issues from a single issuer in any particular year were eliminated. The final sample consists of 156 Islamic bond issues. The sampling procedure is summarised in Table E.1 below. A summary of the sample's composition on type of bond is provided in Table E.2 below. The issuers' industry composition is provided in Table E.3.

[160] This problem is a concern for RQ4 but not so much for RQ3. This is because the bond type is the dependent variable for RQ4 while in the RQ3modelit is used as the independent variable (see Section 6.3 and 6.4).

[161] See Wooldrige (2009) and Greene (2008) for the use of truncated and censored data to avoid sample bias.

Table E.1: Selected Sampling Procedure and Sample Size for RQ4

This table outlines the sample selection criteria and total number of sample bond considered for RQ3. The data is for Malaysian Islamic bonds from the period 2002 to 2010 taken from IFIS data base.

Description	**No**
Sample for RQ4	456
Exclude multiple debt bonds from a single issuer in a particular year	300
Final Sample for RQ4	**156**

Source: Prepared by the author using IFIS data.

Table E.2: Selected Islamic Bond Type for RQ4

The table shows composition of the data sample according to the bond type. The data consists of debt, IJV and SARA bonds. The sample is of corporate Malaysian Islamic bond issues from the period 2002 to 2010.

Debt Bonds	**IJV Bonds**	**SARA Bonds**	**Total**
91	48	17	**156**

Source: Prepared by the author using IFIS data.

Table: E.3: Selected Issues According to Industry for RQ4

The table shows a summary of sample's composition according to the issuer's industry. The data is for corporate Malaysian Islamic bond issues from the period 2002 to 2010.

Industry	**Total**
Manufacturing	47
Property and Infrastructure Development	43
Energy (Electricity, Gas and Oil)	23
Agriculture, Food and Palm Oil	22
Others[162]	21
Total	**156**

Source: Prepared by the author using IFIS data.

[162] These include shipping, transportation and technical services (IFIS data base).

E.3 Results:

The results for Equations 6.13 and 6.14 using the truncated data sample (as shown in Table E.2) are presented in the Table E.4 and E.5 below.

Table E.4: Results for the Issuer's Choice of Islamic Bond Type Model for RQ4

This table presents the estimation of the multinomial probit model show in Equation 6.13.

$$\mathbf{Y}_i = \begin{cases} \mathbf{1\ IJV\ bonds} \\ \mathbf{2\ SARA\ bonds} \\ \mathbf{3\ for\ debt\ bonds} \end{cases}$$

$$\boldsymbol{U_i^* = \alpha + \beta_1 DTA + \beta_2 LTDA + \beta_3 BETA + \beta_4 SE + \beta_5 IC + \beta_6 OIS + \beta_7 LA + \beta_8 MtB + \beta_9 2008 + \beta_{10} GFC + \gamma_1 SB + \varepsilon}$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i$ captures bond type. $\mathbf{U}_i^*$ is the latent variable that links the dependent variable with $\mathbf{Y}_i$. DTA is total debt to asset ratio. LTDA is long term debt to asset ratio. BETA is the market model beta. SE is standard errors. IC is interest coverage ratio. OIS is operating income to sales ratio. LA is log of assets. MtB is market to book value ratio. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. In the result shown in this table debt bonds is used as the base case. PANEL A provides the results for IJV bonds. Panel B provides the results for SARA bonds. Adjusted P-values using Huber-White test are also provided in the table.

Issue	Coef.	Std. Err.	Z-Stat	Prob	Prob (Adjusted)
PANEL A (IJV Bonds)					
DTA	-11.3227	3.815273	-2.97	0.003	0.001
LTDA	8.419915	3.74672	2.25	0.025	0.025
BETA	-2.01996	0.844096	-2.39	0.017	0.019
SE	-24.026	27.36823	-0.88	0.38	0.532
IC	-0.12053	0.065088	-1.85	0.064	0.004
OIS	1.470448	1.904117	0.77	0.44	0.431
LA	0.389979	0.217783	1.79	0.073	0.181
MtB	0.195041	0.182145	1.07	0.284	0.219
2008	2.838451	0.725102	3.91	0	0
GFC	1.190813	0.548625	2.17	0.03	0.035
SB	1.880596	0.638853	2.94	0.003	0.001
_cons	-1.08964	2.126865	-0.51	0.608	0.616

Table E.4: Results for the Issuer's Choice of Islamic Bond Type Model for RQ4 Continued

Issue	Coef.	Std. Err.	Z-Stat	Prob	Prob (Adjusted)
PANEL B (SARA BONDS)					
DTA	-2.23756	3.84569	-0.58	0.561	0.426
LTDA	3.171824	3.658853	0.87	0.386	0.273
BETA	0.56917	0.89103	0.64	0.523	0.368
SE	-123.497	53.44814	-2.31	0.021	0.003
IC	0.005425	0.014881	0.36	0.715	0.636
OIS	2.423202	1.893547	1.28	0.201	0.097
LA	-0.12051	0.208858	-0.58	0.564	0.554
MtB	0.088183	0.194306	0.45	0.65	0.579
2008	0.433959	0.906455	0.48	0.632	0.561
GFC	0.054257	0.662534	0.08	0.935	0.924
SB	-0.6891	0.602486	-1.14	0.253	0.189
_cons	1.163915	2.164703	0.54	0.591	0.588

Table E.5: Result Testing Industry Effect for RQ4

This table presents the estimation of the multinomial probit model shown in Equation 6.14

$$\mathbf{Y}_i = \begin{cases} \mathbf{1\ IJV\ bonds} \\ \mathbf{2\ SARA\ bonds} \\ \mathbf{3\ for\ debt\ bonds} \end{cases}$$

$$\mathbf{U}_i^* = \boldsymbol{\alpha} + \boldsymbol{\beta_1 DTA} + \boldsymbol{\beta_2 LTDA} + \boldsymbol{\beta_3 BETA} + \boldsymbol{\beta_4 SE} + \boldsymbol{\beta_5 IC} + \boldsymbol{\beta_6 OIS} + \boldsymbol{\beta_7 LA} + \boldsymbol{\beta_8 MtB} + \boldsymbol{\beta_9 2008} + \boldsymbol{\beta_{10} GFC} + \boldsymbol{\gamma_1 SB} + \boldsymbol{\theta_1 Manufacture} + \boldsymbol{\theta_2 Property} + \boldsymbol{\theta_3 Agriculture} + \varepsilon$$

where, subscripts *i* denote individual bond issues. $\mathbf{Y}_i$ captures bond type. $\mathbf{U}_i^*$ is the latent variable that links the dependent variable with $\mathbf{Y}_i$. DTA is total debt to asset ratio. LTDA is long term debt to asset ratio. BETA is the market model beta. SE is standard errors. IC is interest coverage ratio. OIS is operating income to sales ratio. LA is log of assets. MtB is market to book value ratio. 2008 is a dummy that equals 1 for bonds issued in 2008. GFC is a dummy variable that equals 1 for bonds approved in 2009 and 2010. SB is a dummy variable that equals 1 for bonds approved by Shariah committees. Property is a dummy variable that equals 1 if the issuer belongs to the property industry. Manufacture is a dummy variable that equals 1 if the issuer belongs to the manufacturing industry. In the result shown in the table debt bonds is used as the base case. PANEL A provides the results for IJV bonds. Panel B provides the results for SARA bonds. Adjusted P-values using Huber-White test are also provided in the table.

	Coef.	Std. Err.	Z-Stat	Prob	Prob (Adjusted)
PANEL A (IJV BONDS)					
DTA	-15.1184	4.673678	-3.23	0.001	0
LTDA	9.375938	4.316547	2.17	0.03	0.076
BETA	-2.09022	0.906592	-2.31	0.021	0.015
SE	27.97216	24.3205	1.15	0.25	0.129
IC	-0.15466	0.062067	-2.49	0.013	0
OIS	2.234432	2.102107	1.06	0.288	0.313
LA	0.72519	0.263579	2.75	0.006	0.005
MtB	0.259077	0.196668	1.32	0.188	0.101
2008	3.208969	0.854211	3.76	0	0
GFC	0.723329	0.594261	1.22	0.224	0.162
SB	2.619521	0.763998	3.43	0.001	0
Manufacture	1.406308	0.867408	1.62	0.105	0.08
Property	1.018613	0.725816	1.4	0.16	0.179
Agriculture	3.124065	1.043084	3	0.003	0.002
_CONS	-5.23471	2.544562	-2.06	0.04	0.001

Table E.5: Result Testing Industry Effect for RQ4 Continued

	Coef.	Std. Err.	Z-Stat	Prob	Prob (Adjusted)
PANEL B (SARA BONDS)					
DTA	-1.73448	4.351692	-0.4	0.69	0.603
LTDA	2.536005	4.259689	0.6	0.552	0.439
BETA	0.534251	0.970168	0.55	0.582	0.445
SE	-86.4689	55.69725	-1.55	0.121	0.017
IC	0.006017	0.015901	0.38	0.705	0.587
OIS	4.962545	2.449588	2.03	0.043	0.008
LA	-0.01959	0.232033	-0.08	0.933	0.921
MtB	0.1745	0.205734	0.85	0.396	0.252
2008	0.607184	1.052376	0.58	0.564	0.503
GFC	-0.13308	0.747459	-0.18	0.859	0.839
SB	-0.72912	0.709794	-1.03	0.304	0.201
Manufacture	-0.30819	0.850358	-0.36	0.717	0.621
Property	-1.72258	1.182439	-1.46	0.145	0.077
Agriculture	1.090575	0.914875	1.19	0.233	0.196
_cons	-1.01455	2.899362	-0.35	0.726	0.659

E.4 Discussion of the Results:

Tables E.4 and E.5 suggest that the findings for RQ4 (as shown in Tables 6.17 and 6.18) are robust with only slight differences in results for operating margin (OIS) and market to book value (MtB). OIS was reported to be significant with the wrong positive sign in Panel A of Tables 6.17 and 6.18. In contrast, Panel A of Tables E.4 and E.5 show that OIS is insignificant. Similarly MtB was found to be significantly positive in the previous results. However, the results in Panel A of TablesE.4 and E.5 suggest that MtB becomes significant at the 10% level only after controlling for industry effect. None of these changes, however, have any impact on the associated hypotheses and the overall findings for RQ4. Therefore, it can be concluded that the high dominance of debt bonds is not causing a bias in the results.

APPENDIX F: AAOIFI STANDARDS (2008)

F.1 Introduction:

This appendix presents the AAOIFI (2008) recommendations on Islamic bond structures.

Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI)

In the name of Allah, the Beneficent, the Merciful

Praise be to Allah, and peace and blessings on His Noble Prophet and on his family and Companions

As to what follows**:**

The Shari'ah Board of the Accounting and Auditing Organization for Islamic Financial Institutions (AAOIFI), in view of the increased use of Sukuk worldwide, the public interest in them, and the observations and questions raised about them, studied the subject of the issuance of Sukuk in three sessions; first, in al-Madinah al-Munawwarah, on 12 Jumada al-Akhirah 1428 AH (27 June, 2007), second, in Makkah al-Mukarramah, on 26 Sh'aban 1428 AH (8 September, 2007), and third in the Kingdom of Bahrain on 7 and 8 Safar 1429AH (13 and 14 February, 2008).

Following the meeting of the working group, appointed by the Board, which met in Bahrain, on 6 Muharram 1429AH (15 January, 2007), which was also attended by a significant number of representatives from various Islamic banks and financial institutions, the working group presented its report to the Shari'ah Board.

After taking into consideration the deliberations in these meetings and reviewing the papers and studies presented therein, the Shari'ah Board - while re-affirming the rules provided in the AAOIFI Shari'ah Standards concerning Sukuk - advises Islamic financial institutions and Shari'ah Supervisory Boards to adhere to the following matters when issuing Sukuk:

First: Sukuk, to be tradable, must be owned by Sukuk holders, with all rights and obligations of ownership, in real assets, whether tangible, usufructs or services, capable of being owned and sold legally as well as in accordance with the rules of Shari'ah, in accordance with Articles
(2)[1] and (5/1/2)[2] of the AAOIFI Shari'ah Standard (17) on Investment

[1] Definition of Sukuk: Investment Sukuk are certificates of equal value representing undivided shares in ownership of tangible assets, usufruct and services or (in the ownership of) the assets of particular projects

Sukuk. The Manager issuing Sukuk must certify the transfer of ownership of such assets in its (Sukuk) books, and must not keep them as his own assets.

Second: Sukuk, to be tradable, must not represent receivables or debts, except in the case of a trading or financial entity selling all its assets, or a portfolio with a standing financial obligation, in which some debts, incidental to physical assets or usufruct, were included unintentionally, in accordance with the guidelines mentioned in AAOIFI Shari'ah Standard (21) on Financial Papers.

Third: It is not permissible for the Manager of Sukuk, whether the manager acts as Mudarib (investment manager), or Sharik (partner), or Wakil (agent) for investment, to undertake to offer loans to Sukuk holders, when actual earnings fall short of expected earnings. It is permissible, however, to establish a reserve account for the purpose of covering such shortfalls to the extent possible, provided the same is mentioned in the prospectus. It is not objectionable to distribute expected earnings, on account, in accordance with Article (8/8) [3] of the AAOIFI Shari'ah Standard (13) on Mudaraba, or to obtaining project financing on account of the Sukuk holders.

Fourth: It is not permissible for the Mudarib (investment manager), sharik (partner), or wakil (agent) to undertake {now} to re-purchase the assets from Sukuk holders or from one who holds them, for its nominal

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or special investment activity, however, this is true after the receipt of the value of the Sukuk, the closing of the subscription and employment of funds received for the purpose for which the Sukuk were issued.

[2] 5/1/2 It is permissible to issue certificates for (to securitize) assets that are tangible assets, usufruct andservices by dividing them into equal shares and issuing certificates for their value. As for debts owed as a liability, it is not permissible to securitize them for the purpose of trading.

[3] 8/8 The Mudarib is entitled to a share of profit as soon as it is clear that the operations of the Mudaraba have led to the realization of a profit. However, this entitlement is not absolute, as it is subject to the retention of interim profits for the protection of the capital. It will be an absolute right only after distribution, i.e. when actual or constructive valuations take place. It is permissible to distribute the realized profit among the parties on account, in which case the distribution will be revised when actual or constructive valuation takes place. The final distribution of profit should be made based on the selling price of the Mudaraba assets, which is known as actual valuation. It is also permissible that the profit be distributed on the basis of constructive valuation, which is valuation of the assets on the basis of fair value. Receivables shall be measured at the cash equivalent, or net realizable, value, i.e. after the deduction of a provision for doubtful debts. In measuring receivables, neither time value (interest rate) nor discount on current value for extension of period of payment shall be taken into consideration.

value, when the Sukuk are extinguished, at the end of its maturity. It is, however, permissible to undertake the purchase on the basis of the net value of assets, its market value, fair value or a price to be agreed, at the time of their actual purchase, in accordance with Article (3/1/6/2)[4] of AAOIFI Shari'ah Standard (12) on Sharikah (Musharaka) and Modern Corporations, and Articles (2/2/1)[5] and (2/2/2)[6] of the AAOIFI Shari'ah Standard (5) on Guarantees. It is known that a Sukuk manager is a guarantor of the capital, at its nominal value, in case of his negligent acts or omissions or his non-compliance with the investor's conditions, whether the manager is a Mudarib (investment manager), Sharik (partner) or Wakil (agent) for investments.

In case the assets of Sukuk of al-Musharaka, Mudarabah, or Wakalah for investment are of lesser value than the leased assets of "Lease to Own" contracts (Ijarah Muntahia Bittamleek), then it is permissible for the Sukuk manager to undertake to purchase those assets - at the time the Sukuk are extinguished - for the remaining rental value of the remaining assets; since it actually represents its net value.

Fifth: It is permissible for a lessee in a Sukuk al-Ijarah to undertake to

[4] 3/1/6/2 It is permissible for a partner to issue a binding promise to buy, either within the period of operation or at the time of liquidation, all the assets of the Sharika as per their market value or as per agreement at the date of buying. It is not permissible, however, to promise to buy the assets of the Sharika on the basis of face value.

[5] 2/2Guarantees in trust (fiduciary) contracts

2/2/1 It is not permissible to stipulate in trust (fiduciary) contracts, e.g. agency contracts or contracts of deposits, that a personal guarantee or pledge of security be produced, because such a stipulation is against the nature of trust (fiduciary) contracts, unless such a stipulation is intended to cover cases of misconduct, negligence or breach of contract. The prohibition against seeking a guarantee in trust contracts is more stringent in Musharaka and Mudaraba contracts, since it is not permitted to require from a manager in the Mudaraba or the Musharaka contract or an investment agent or one of the partners in these contracts to guarantee the capital, or to promise a guaranteed profit. Moreover, it is not permissible for these contracts to be marketed or operated as a guaranteed investment.

[6] 2/2/2 It is not permissible to combine agency and personal guarantees in one contract at the same time (i.e. the same party acting in the capacity of an agent on one hand and acting as a guarantor on the other), because such a combination conflicts with the nature of these contracts. In addition, a guarantee given by a party acting a an agent in respect of an investment turns the transaction into an interest-based loan, since the capital of the investment is guaranteed in addition to the proceeds of the investment, (i.e. as though the investment agent had taken a loan and repaid it with an additional sum which is tantamount to riba). But if a guarantee is not stipulated in the agency contract and the agent voluntarily provides a guarantee to his clients independently of the agency contract, the agent becomes a guarantor in a different capacity from that of agent. In this case, such an agent will remain liable as guarantor even if he is discharged from acting as agent.

purchase the leased assets when the Sukuk are extinguished for its nominal value, provided he {lessee} is not also a partner, Mudarib, or investment agent.

Sixth: Shari'ah Supervisory Boards should not limit their role to the issuance of fatwa on the permissibility of the structure of Sukuk. All relevant contracts and documents related to the actual transaction must be carefully reviewed {by them}, and then they should oversee the actual means of implementation, and then make sure that the operation complies, at every stage, with Shari'ah guidelines and requirements as specified in the Shari'ah Standards. The investment of Sukuk proceeds and the conversion of the proceeds into assets, using one of the Shari'ah compliant methods of investments, must conform to Article (5/1/8/5)[7] of the AAOIFI Shari'ah Standard (17).

Furthermore, the Shari'ah Board advises Islamic Financial Institutions to decrease their involvements in debt -related operations and to increase true partnerships based on profit and loss sharing in order to achieve the objectives of the Shari'ah.

In the end, all praise is due to Allah, Lord of all the Worlds!

[7] 5/1/8/5 The prospectus must state that the investment of the realized funds and the assets into which the funds are converted will be undertaken through Shari'ah-compliant modes of investment.