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Convergence of Islamic and Conventional Interbank Rates

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Ravindran Ramasamy [α] & Mohammad Farhad Zangeneh [σ]

Abstract - Financial Institutions' (FI) and banks' earnings on the trading portfolio are significantly influenced by the changing market conditions such as price of an asset, interest rates, market volatility, and market liquidity. Researchers to measure the risk related uncertainty of the FI's earnings use few Market Risk Measurement Models (MRM). Historic Back Simulation Model is one of the approaches that consider the return on all assets, as non-normal, as against the RiskMetric Model that considers the returns on assets is symmetric. This paper investigates the risk and return associated with Islamic interbank offered rates (IIBOR) in Malaysia using Back Simulation model and the results are compared with the conventional interbank offered rates (CIBOR). On application of the Back Simulation approach over the two different data sets (Yield Rates of IIBOR and CIBOR), it was found that during the de-peg period, the value losses and gains for Islamic trading portfolios were found to be significantly higher at the tail end horizon de-peg period. We also conducted independent sample "t" test to compare the mean losses and mean gains reported during these three time periods. We found that the CIBOR was active during crisis and peg periods IIBOR was active after de-pegging with higher losses and gains. These higher losses and gains of IIBOR are due to the active participation of money market players and experience gained in the last decade in Islamic finance. The IIBOR now provides the much-needed liquidity for Islamic finance products and this will further push up the growth of Islamic finance.

Keywords : interbank offered rate, back simulation, islamic finance products, volatility, value at risk.

I. IIBOR and CIBOR

All economic activities revolve around money market and yield rates in a country. In Malaysia two money markets operate in parallel one in the traditional mode and the other on Islamic and Sharia principles. Both quote interbank overnight offered rates daily which form the basis for many other financial transactions. Islamic Interbank offered rate is confined to Islamic financial products and services, which are issued on Sharia principles. Mainly they avoid investing in financial instruments and projects which are involved in prohibited areas like Riba (interest), Gharar (uncertainty) and Maysir (gambling) (Sudin, 1997, Walid, 1994). Any rational investor, whether he is a Muslim or non-Muslim, would like to earn a reasonable return from an investment and this cannot be avoided. Taking this into consideration Malaysian Islamic financial instruments are designed and operating with profit rates (Grais, 2004; Mohammed, 2002) (avoids riba), of both fixed and floating types (http://iimm.bnm.gov.my/index.-php?ch=1&pg=42). Conventional financial instruments do not follow Sharia principles and they charge interest for monetary transactions. These two financial systems operate in the same economy, but follow different ideology and different techniques of proving income and charging income to their depositors and borrowers (Figlewski, 1994; Hendricks, 1996). Our aim is to compare and contrast these interbank offered rates (Koylouglyu, 1998) to gain more insight and understanding in terms of return, risk and value using historical interbank offered rates.

a) Value at Risk (VaR)

The banks and financial institutions operate as intermediaries between funds providers and fund seekers. Fund providers seek better return while fund seekers select least cost finance for their projects. The banks have to satisfy both these groups. These financial intermediaries are subjected not only to follow several rules and regulations but also instructed to earn a return for themselves for the long run survival and growth. As such, no idle fund could be kept in the bank even for one day. The interbank market through commercial papers, treasury bills and other financial instruments such as equity, foreign exchange and derivatives give ample opportunity for short-term investments (Abdul Rahman, 1995). These investments are bundled together as trading portfolios whose value depends on IBOR. These portfolio values are affected by the daily yield rate changes (Gourieroux, 2000) in both Islamic (Abdul Rashid, 1998; Volker, 1986) and conventional monetary systems. The increments in yield rates will cause reduction in value (vice versa) of trading portfolio of financial institutions (Frey, 2002, Bangia, 2002). This is the market risk or known as VaR and it is to be managed by banks through hedging techniques (Finger, 1999). Keeping this principle in mind yield rates of IIBOR and CIBOR were downloaded from Bank Negara website to estimate worst value loss and best value gain.

b) Normality and Fat Tails

While studying the market risks of trading portfolios the financial institutions and banks assume that the increments and decrements in yield rates are normally distributed with a mean of zero and variance of one ($\varepsilon \sim N(0,1)$) (Laycock, 1995).But these increments

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and decrements are not absolutely normal but they exhibit some what skewed and have fat tails, like "t" distributions. There are several reasons for non-normality. The modern financial institutions are not only dealing in traditional functions of banking but also engaged in derivatives writing and dealing. These derivatives include futures contracts, option contracts, swaps etc. The list is not confined to these items only it extends further in these directions whose returns are not symmetrical but skewed (Rockefeller, 2002). Therefore the overall yield rate in the money market is also skewed. Many research studies in the past have shown that these interbank rates are not absolutely normal and they have fat tails and skews (Artzner, 1999). Therefore the normality assumption of rates brings in considerable error in VaR estimations (Burgisser, 2001) and thereby increasing the cost of hedging and also leads to imperfect hedging. To avoid this, the past increments and decrements in historical interbank offered rate data are computed and through back simulation approach the VaR is estimated. The merits of this back simulation approach is its simplicity and it considers only historical data and does not assume normality in returns while computing VaR.

The remaining part of this paper is organized into five sections. The second section deals with methodology and data. Section three applies the back simulation approach to IIBOR and CIBOR to estimate worst losses and best gains and further highlights the differences between them. The fourth section compares the mean losses and mean gains of Islamic and Conventional hypothetical trading portfolio of a value of RM one million. The fifth section concludes the paper.

II. Methodology

The interbank rates of Islamic and conventional types normally vary between two percent and eight percent. The increments or decrements in them overnight are very meager and it would be around 10 to 50 basis points (Moshin, 1986). As the change in rate is very small it is difficult to observe and appreciate the behaviour. To avoid this, the following methodology is adopted to capture the magnitude and intensity of change in them. These changes in IIBORs and CIBORs will cause VaR and worst-case will occur when the rate increase is maximum and vice versa.

a) Back Simulation Approach

	Islamic Trading Portfolio	Conventional Trading Portfolio
Initial investment - RM one million (hypothetical value)	x	x
Present Yield Rate	iy_1	cy_1
Present Value of portfolio	$ix_1 = \frac{x}{(1+iy_1)}$	$cx_1 = \frac{x}{(1+cy_1)}$
If yield rate increases by 1%, the value falls & vice versa	$ix_2 = \frac{x}{(1+iy_2)}$	$cx_2 = \frac{x}{(1+cy_2)}$
Net Loss / Net Gain	$iL = (ix_2 - ix_1)$	$cL = (cx_2 - cx_1)$
Day_1	$iL_1 = iL * \Delta iy_1$	$cL_1 = cL * \Delta cy_1$
Day_2	$iL_2 = iL * \Delta iy_2$	$cL_2 = cL * \Delta cy_2$
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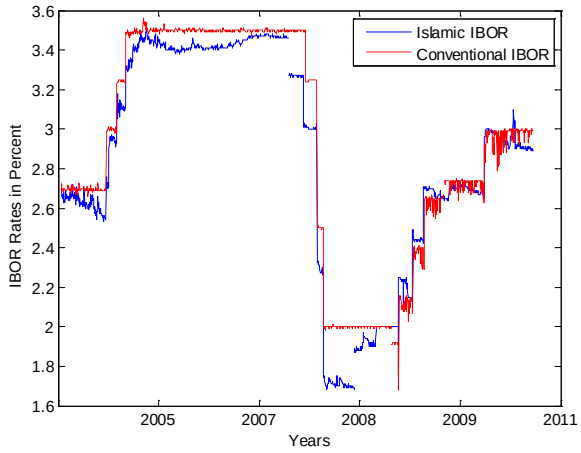
Day_n	$iL_n = iL * \Delta iy_n$	$cL_n = cL * \Delta cy_n$
Maximum Loss / Maximum Gain	Sort losses and gains (in descending order)	Sort losses and gains (in descending order)

b) Data

The interbank offered rate data from 12th Oct 1998 to 31st Dec 2011 were downloaded from Bank Negara website. We could get 4694 days interbank rate time series data. We classified these interbank rates into two segments. The period from 12th Oct 1998 to 21st July 2005 we consider as peg period.

III. IIBOR and CIBOR Comparison

a) Results and Discussion

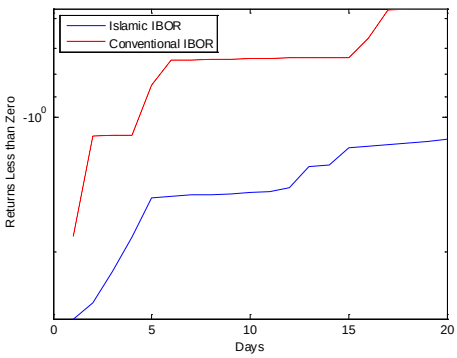


b) Before Global Meltdown

The peg period is approximately seven years which consist of 1657 days of data.

Table 1 : 20 Worst Losses and Best Gains During 2005 – 2007 Before Global Meltdown

	Worst Losses		Best Gains	
	IIBOR	CIBOR	IIBOR	CIBOR
1	-1.119	-0.571	1.190	0.575
2	-1.132	-0.571	1.208	0.576
3	-1.141	-0.573	1.208	0.578
4	-1.154	-0.575	1.286	0.741
5	-1.163	-0.664	1.462	0.741
6	-1.172	-0.735	1.533	0.741
7	-1.278	-0.735	1.533	0.743
8	-1.290	-0.735	1.575	0.743
9	-1.437	-0.735	1.634	0.743
10	-1.471	-0.738	1.639	0.746
11	-1.476	-0.738	1.792	0.746
12	-1.487	-0.741	1.824	0.749
13	-1.493	-0.741	1.825	0.855
14	-1.493	-0.743	1.916	1.111
15	-1.504	-0.743	2.113	1.124
16	-1.515	-0.847	2.581	1.128
17	-1.852	-1.099	3.053	1.425
18	-2.214	-1.099	5.424	7.430
19	-2.602	-1.103	6.070	8.054
20	-2.830	-1.845	8.235	10.409



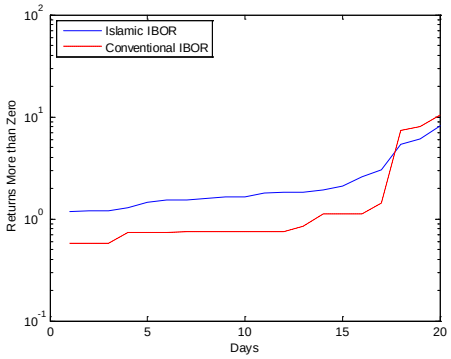


Figure 1 : 20 Worst Losses and Best Gains During 2005 – 2007 Before Global Meltdown

For at least 15 days during this peg period the CIBOR goes up and consequently the trading portfolio loses approximately RM 389,000 to RM 140,000. During this period the IIBOR has no matching increase in rates and no matching loss. The maximum loss for IIBOR is RM 115,000 which has occurred after some fifteen increments in CIBOR. The IIBOR has declined steeply from RM 115,000 to RM 68,000 and gradually decreases later and touches RM 8,551. The losses of RM 17,000, RM 13,000 and RM 8,500 repeat for 12, 15, and 41 times respectively. During the same period the CIBOR losses were greater and finally end with RM 25,000 approximately. Even the frequency of lower losses is greater. All these imply that the IIBOR is a better choice for participants and the portfolio managers as the losses are not severe during this period.

The decrease in CIBOR is greater than the IIBOR as decrease in rates result in gains in portfolios. The gains are more for CIBOR when compared to IIBOR. The gains start from RM 534,000 approximately for CIBOR and ends in RM 24831. There is no matching gain in IIBOR at these extreme rates. The IIBOR registers the first gain of RM 115,440 but on the same day the gain for CIBOR was RM 111,740. The gains of CIBOR were more when compared to IIBOR during the same period. The final gain for CIBOR was RM 24,831 but for IIBOR it was only RM 8,551.

As stated earlier the loss is to be avoided (downside risk) while profits are welcome. Basel II mandates the banks to maintain adequate capital to meet these market risks (Basel committee on bank supervision, 1995, 1996, 1999, 2001). The standardised method of Basel II prescribes a comprehensive capital requirement quantified through specific and general risk framework. It also stipulates adjustments of horizontal, vertical and residual disallowances. The comprehensive internal supervisory method prescribes more capital requirement at 1% level of significance. As such Islamic interbank transactions are less prone to loss attacks, as such the hedging cost and Basel II risk reserve capital requirements will be lower.

Table 2 : 20 Worst Losses and Best Gains During 2008 Global Meltdown

	Worst Losses		Best Gains	
	IIBOR	CIBOR	IIBOR	CIBOR
1	-0.288	-0.286	0.289	0.287
2	-0.288	-0.286	0.289	0.287
3	-0.288	-0.286	0.289	0.287
4	-0.288	-0.286	0.289	0.287
5	-0.288	-0.286	0.290	0.287
6	-0.289	-0.286	0.290	0.287
7	-0.289	-0.286	0.290	0.287
8	-0.289	-0.286	0.290	0.287
9	-0.289	-0.286	0.290	0.287
10	-0.289	-0.286	0.290	0.287
11	-0.289	-0.286	0.290	0.287
12	-0.289	-0.286	0.290	0.287
13	-0.289	-0.286	0.291	0.287
14	-0.292	-0.286	0.292	0.287
15	-0.312	-0.286	0.292	0.287
16	-0.312	-0.286	0.312	0.287
17	-0.312	-0.287	0.312	0.287
18	-0.313	-0.308	0.312	0.287
19	-0.621	-0.573	0.312	0.309
20	-6.957	-7.143	0.578	0.576

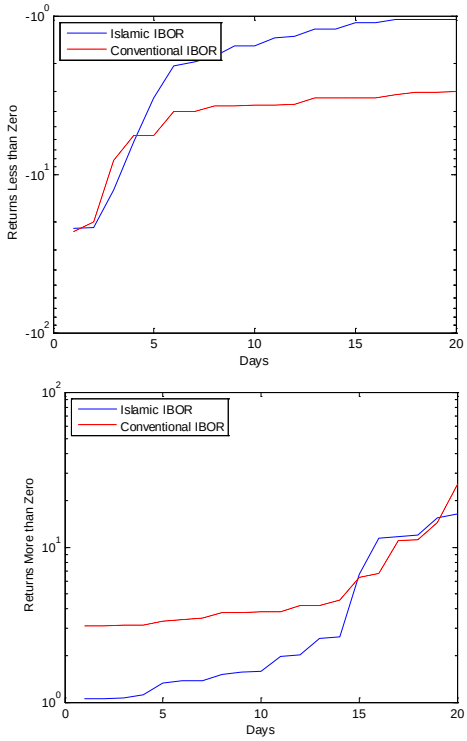


Figure 2 : 20 Worst Losses and Best Gains During 2008 Global Meltdown

The above graph clearly shows that IIBOR starts with lesser loss and quickly stabilizes and goes as a horizontal straight line. The CIBOR starts with a huge loss and slowly goes near the IIBOR but not touches it. The losses are lower in IIBOR and its cost of hedging and management is easy as it is lesser volatile than CIBOR.

Table 3 : 20 Worst Losses and Best Gains After 2008 Global Meltdown

	Worst Losses		Best Gains	
	IIBOR	CIBOR	IIBOR	CIBOR
1	-1.053	-3.000	1.053	3.093
2	-1.053	-3.041	1.053	3.125
3	-1.053	-3.041	1.070	3.136
4	-1.058	-3.153	1.111	3.136
5	-1.099	-3.285	1.333	3.333
6	-1.099	-3.297	1.370	3.409
7	-1.205	-3.297	1.370	3.484
8	-1.205	-3.309	1.509	3.766
9	-1.347	-3.629	1.563	3.791
10	-1.376	-3.650	1.579	3.819
11	-1.554	-3.663	1.974	3.819
12	-1.554	-3.679	2.013	4.181
13	-1.802	-3.679	2.591	4.183
14	-1.942	-4.013	2.646	4.577
15	-2.062	-4.013	6.667	6.406
16	-3.289	-5.686	11.429	6.810
17	-6.250	-5.705	11.698	11.027
18	-12.500	-8.122	11.983	11.163
19	-21.545	-20.000	15.385	14.346
20	-22.050	-23.077	16.355	25.568

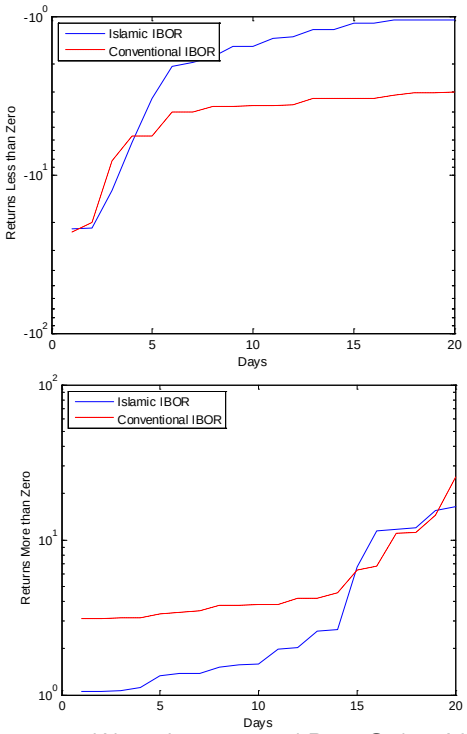


Figure 3 : 20 Worst Losses and Best Gains After 2008 Global Meltdown

The above figure shows the pattern of the gains of IIBOR and CIBOR for 80 decrements in interbank rates. The volatility of the CIBOR gains is more than the IIBOR gains. Initially there are more gains for CIBOR than IIBOR. At the beginning there is a wide gap between these two gains but gradually the gap narrows down. The IIBOR gains, though low, stable and it is looking like a horizontal straight line, while the CIBOR display a very few higher gains and gradually declining and coming closer to IIBOR. The CIBOR shows greater losses and greater gains than IIBOR, which implies the greater volatility and thus greater risk than IIBOR.

c) Post De-Peg

After de-pegging the interbank rates produce 526 days data which are analysed as earlier for a trading portfolio value of RM one million and the results are presented below.

The IIBOR registers the highest loss at RM 34,339 whereas the CIBOR shows highest loss as RM 45,479. It is interesting to note that the conventional losses decrease rapidly while IIBOR losses slowly decline. The frequencies of lower losses are more for CIBOR whereas IIBOR shows lesser frequency of lower losses. This pattern is quite opposite to the earlier results of crisis and peg periods.

In gain also similar pattern is observed. The largest gain for IIBOR is RM 14,717 while the CIBOR displays only RM 4,873 as its greatest gain, but this occurs on three days. The second gain of IIBOR RM 8,176 and third gain of RM 6,541 do not have a match in conventional counterpart. The gain of RM 4,906 occurs on 15 occasions in IIBOR but the highest gain is less than this figure in CIBOR. These results show now the IIBOR is experiencing greater acceptance and there by causing more volatility and produces greater losses and greater gains. It implies that Islamic interbank market is very brisk and active than the conventional interbank market.

The CIBOR losses are more for the first three days and later it declines rapidly and afterwards shows a steady trend. The IIBOR losses are less initially and later they are more than the CIBOR and closely follow the same trend as in CIBOR. During crisis and peg periods the pattern was different, CIBOR showed more losses and gains than the IIBOR.

The CIBOR gains were greater in crisis and peg periods but in this graph the pattern is different. The IIBOR shows higher gains and rapidly declines and stays well above the CIBOR gains. The highest CIBOR gain stands at RM 5,000 approximately and declines gradually and reaches roughly RM 2,000 level and then it is stable. IIBOR is also show similar pattern but the gains are at a higher level. The IIBOR gains start at RM 14,500 approximately and steeply declines to RM 5,000 and stabilizes at RM 4,000.

These results are interesting. In crisis and peg periods the CIBOR results were high in terms of losses and gains, the volatilities were also higher. In the recent de-peg period the IIBOR is more active and volatile than CIBOR. This could be attributed to two main causes. Firstly the Islamic money market is active now than ever before and in this active market the demand and supply of funds on Islamic principles are greater. Secondly the experience gained in the crisis and peg periods in the interbank money market gives IIBOR the much-needed impetus to operate vigorously.

IV. IIBOR and CIBOR

a) Mean Rate Differences and Volatilities

Finally we tried to compare the mean losses and mean gains of both IIBOR and CIBOR through independent sample "t" test to find whether there is any significant difference exist during the three sample periods. The losses and gains of each period for IIBOR and CIBOR were analysed and the following results obtained.

Table 4 : Mean losses and gains of Islamic Conventional trading portfolios

	Before Crisis		During Crisis		After Crisis	
	IIBOR	CIBOR	IIBOR	CIBOR	IIBOR	CIBOR
Mean	3.162	3.244	3.428	3.471	2.448	2.486
Variance	0.121	0.123	0.008	0.006	0.177	0.166
Observations	900	900	366	366	1096	1096
Pooled Variance	0.122		0.007		0.171	
Hypothesized Mean Difference	0.000		0.000		0.000	
df	1798		730		2190	
t Stat	-4.971		-7.104		-2.170	
P(T<=t) one-tail	0.000		0.000		0.015	
t Critical one-tail	1.646		1.647		1.646	
P(T<=t) two-tail	0.000		0.000		0.030	
t Critical two-tail	1.961		1.963		1.961	

During the peg period, IIBOR showed 281 rate increases, while the CIBOR reported 509 rate increases. The mean loss for IIBOR was RM 7,775 while the CIBOR showed a mean loss of RM 18,985. The mean loss difference is more than 100% between these interbank rates. Their standard deviations also differ very widely. The IIBOR shows RM 11,300 as standard deviation while CIBOR registered RM 37,764 as its standard deviation, which implies more variability in CIBOR. The mean difference in losses is RM 11,210 with a "t" value of 4.856. This mean difference is highly significant at 1% level of significance. Similarly during this period the mean gain is higher for CIBOR than IIBOR which has recorded a mean gain of RM 18,744, which results in a mean difference of RM 10,900. The standard deviation is very high for CIBOR during this period. The "t" value is significant at 1% level this indicates the major difference in gains.

After de-peg the IIBOR shows altogether a different pattern. The losses are greater for IIBOR and the frequency also greater when compared with CIBOR. The mean loss difference is RM 375, which is more for IIBOR. Interestingly the standard deviation for IIBOR is less showing lesser variability when compared to CIBOR. The "t" value is less and insignificant, which implies that these is no major difference in the losses of both IIBOR and CIBOR. The gains in case of IIBOR are for 148 days in case CIBOR it is only for 90 days. IIBOR shows greater average gain of RM 693. The standard deviation is greater for IIBOR in contrast to other periods. The standard deviation of gains also is very high when compared to CIBOR. The "t" value is 3.5 and significant at 1% level. This implies that the gains generated by IIBOR during this period are much higher than CIBOR. The after de-peg period results show a different pattern for IIBOR. This may be due to the experience gained by the Islamic interbank market.

V. Conclusion

The interbank offered rates decide the yield rate on day-to-day basis which is considered as a benchmark for many other financial transactions. We analyzed both IIBOR and CIBOR under two different periods. The IIBOR shows more variation in losses and gains than CIBOR in this de-peg period. The volatility in terms of standard deviation is also higher for IIBOR in the recent past. The differences in the mean losses and gains of IIBOR were lower during peg periods but in the recent past the IIBOR has exhibited higher losses and gains when compared to CIBOR. The Malaysian Government's encouragement and the attitude of the Malaysian participants in interbank market in general and the Malaysian corporate world in particular all focused towards Islamic finance. The participants involved in the interbank market seem to have gained experience and understood the benefits of Islamic finance and thus attracted towards it. As such, the IIBOR becomes active than CIBOR in the recent past providing the much-needed liquidity in interbank market for Islamic financial instruments and financial services. Of late the Islamic interbank market is more active and vibrant than conventional interbank market.

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