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SAUDI ARABIAN COMMERCIAL BANKS' MARKET-RISK SENSITIVITY: A VIEW THROUGH ROLLING SUB- SAMPLES

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ABSTRACT

Using data collected from the Saudi Arabian TadawulStock Exchange, this paper analyses 11 publically listed bank risk-return relationships during 2008-2011. The contribution of this paper provides a more refined technique, a rolling beta, to accurately capture daily valuation swings caused by market-moving events over time. Alpha values are calculated using the CAPM enabling more dynamic risk-return valuations to emerge. These valuations identified three key phases of varying bank stock market activity and sector market valuations previously unrecognized when using the single linear beta value.These results suggest that in general, despite the relative instability within and between Saudi banks during the turbulent GFC, the contribution of SAMA strict regulations (and the banks themselves) ensured a less tempestuous performance within the Saudi banking sector overall, compared to the devastating impact that shook, and continues to shake, the banking sectors of the industrialized countries today. In addition, this analysis surprisingly reveals thatinvestment opportunities are presently re-emerging in the Saudi banks contrary to present global banking happenings and international contagion amongst other foreign countries' banking sectors.

Key Words: Alpha, Beta, CAPM,Rolling regression, Tadawul
JEL Classification Codes: G10, G12, G21

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INTRODUCTION

Despite the effects of the Global Financial Crisis (GFC) that shook the banking sectors of the industrialized countries, the Saudi commercial banks continued to maintain a strong financial position. Several factors seemed to have contributed to thisapparent robust position.Initially the combination of expansionary fiscal measures and the government's guarantee to safeguard depositors' money provided re-assurance in such a fragile economic climate of international contagion. Within the banking sector measures were also taken by Saudi Arabian Monetary Authorities (SAMA) to enhance banking liquidity and improve risk management systems at commercial banks. In addition theSaudi's banks' own efficient management of their financial resourcesmay have also contributed to avertingthe full adverse impacts of the GFC on the Saudi commercial banks.The purpose of this paper therefore is to explore this apparent robustness of the banking sector risk-return relationships via the Saudi Arabian Stock Market.Using a rolling regression econometric technique, a more accurate dynamic observation of the daily swings caused by market-moving events over time can be measured.This paper in particular, captures the listed banks'systematic risk during the crucial, turbulent, and now historical events from the 2008 global financial crisis, through the 2009 recovery period to the 2011 Arab Spring period.

A fundamental question in finance is how the risk of an investment should affect its expected return? Not all risks affect asset returns, some are diversified away. The remaining risk is market or systematic risk. This risk affects all firms and is unavoidable for investors. It can be caused by changes in long-term interest rates, inflation rates or other such macroeconomic shocks which can influence expected returns. It is therefore crucial for investors and financiers alike to understand the amount of unavoidable risk they are exposed to. One such indicator is the estimation of the coefficient beta, developed in the 1960s as a component of the Capital Asset Pricing Model (CAPM) by (Sharpe, 1964), (Lintner, 1965)and(Mossin, 1966). Beta provides a measurement of the risk-return sensitivity between a stock/sector and the overall market.The contribution of this research is to measure the sensitivity of banking market risk-returns by calculating the inter-temporal coefficients of beta and alpha based on the Saudi banks' stock prices, the Banks and Financial ServicesIndex (TBFSI), and the Tadawul All Shares Index (TASI)for the period June 3, 2008 to October 5, 2011.The beta measurement is one of the most recognized and frequently used tools in the field of finance. The measurement of beta enables the required return to be calculated by investors, the cost of capital to be estimated by firms seeking finance, and provides a guide for fund managers in the composition of an appropriately diversified portfolio. Beta also enables the calculation of alpha (excess returns over the market) which is a key financial measurement used to benchmark portfolio performance.

The incentive behind this research is driven by the fact that in well-established financial markets, beta is calculated and commonly made use of by financial analysts and academics for portfolio management decision making and performance measurement. However in the relatively new

financial market of Saudi Arabia, the beta is not yet commonly used in financial reporting and analysis. The very nature and global importance of these new emerging markets necessitates the need for such calculations for greater transparency, improved efficient allocation of capital as well as establishing a benchmark for future equity analysis. It is against this background that a series of research questions emerge concerning the impact of systematic risk and the sensitivity of each banks' risk-return relationship to the broader TASI market over the period 2008 to 2011. Is the beta coefficient (market risk) stable within each bank and within the banking sector (TBFSI)over time? How plausible is the assumption that a single low beta estimate signals a low risk investment strategy? Are banks and the banking sector (TBFSI) returns over-valued or under-valued? Ultimately, did the GFC affect the Saudi banking sector?

The following section provides abrief background of the Saudi Arabian Capital and Money Markets. A Literature Review follows. **S**ection four describes the data and methodologies used in this study. Section five reports the analysis and results. Finally, section six provides discussion and concluding observations.

BACKGROUND

The Kingdom of Saudi Arabia (KSA) boasts a globally important economy, the twentieth biggest economy by GDP in the world. It ranks seventeenth in the World Economic Forum (WEF) Global Competitiveness Index. SAMA's net foreign assets of USD 555bn. are the third biggest in the world (Aserkoff, Kern, & Dixit, 2012). The Saudi stock market (Tadawul) is the only stock exchange in KSA. It is supervised by the Capital Market Authority. The Market is actively traded by domestic retail investors. Domestic institutions are a small part of the overall market. The Market has also been open to the Gulf Cooperation Council (GCC) nationals since 2007. Foreign investors, who are only permitted to invest in structured products, in volume terms, represent an extremely small percentage of trade. The Kingdom's oil wealth and ongoing current account surpluses mean that foreign investors are not necessary to finance investment. The accounting rules are still based on Saudi GAAP.

Petrochemical is the major sector that makes-up the TASI indexwhich composes of approximately 37% of the TASI's market capitalization. While this sector is fully exposed to the global economy, most of the remaining sectors are more domestically focused, including the larger sectors such as Banking 24%, Telecoms 9%, Cement 5%, Energy & Utilities 5% and Agriculture/Food 4%(Tadawul. , 2011). At the end of 2008, the TASI closed at 4,802.99 points compared to 11,038 points at the end of 2007, a decrease of 56%. As a result of the GFC, most of the world financial markets indices declined by more than 30% in 2008 and the Saudi stock marketwas no exception (Saudi Arabia Monetary Authority, 2010). TASI is composed of 15 sectors as listed in Table 1. This Saudi Stock Market is characterized by a high level of shareholder concentration with a considerable number of companies' shares being held by government, families, and just a few

owners. Table 1 lists the total issued shares and free-floating shares for each sector of the Saudi Stock Market at the end of 2011. Of the 40.7 billion issued shares, there were only 17 billion free-floating shares available for trade, or 42% of the issued shares. The banking sector has the highest number of issued shares and free floated shares. The percentage of free floated shares for the banking sector is 29 percent. This high percentage of free floated shares for the banking sector provided data resource to measure systematic risk for the banking sector in the Saudi Stock Market.

As of the third quarter of 2011, the Saudi stock market ranked first in the Arab world with capital of USD 324 billion or 37% of the total market capitalization of Arab stock markets and ranked fourth with respect to the number of listed companies (148 companies). It was also one of the most liquid markets in the Arab world with a daily average value traded of USD 872 million representing 65% of the total daily average value traded of Arab world(Arab Monetary Fund, 2011). The total number of listed companies in TASI jumped from 111 in 2007 to 150 in 2011, representing an addition of 39 new companies or a 35% increase in only four years.

Table-1. The TASI, by sector, 2011

Sector	Number of Companies	Issued Shares	Free Floated Shares	Percentage of Issued shares
Banks & Financial Services	11	9,203.96	4,890.62	53
Petrochemical Industries	14	8,941.09	3,815.80	43
Real Estate Development	8	3,733.52	1,869.14	50
Telecommunication & Information Technology	5	4,240.00	1,413.36	33
Cement	10	1,106.90	831.44	75
Energy & Utilities	2	4,241.59	766.40	18
Agriculture & Food Industries	15	1,123.01	744.01	66
Industrial Investment	13	1,422.40	612.09	43
Building & Construction	15	758.30	511.45	67
Multi-Investment	7	4,022.47	419.19	10
Insurance	31	833.17	375.19	45
Transport	4	476.30	338.85	71
Retail	10	351.50	249.64	71
Media and Publishing	3	155.00	88.96	57
Hotel & Tourism	2	79.16	45.90	58
TOTAL	150	40,688.36	16,972.04	42

Source: *Tadawul Quarterly Report January, 2012*

The Saudi banking sector consists primarily of 12 domestic participants, 11 of which, except National Commercial Bank, are listed on the stock exchange. Saudi banks command a conservative balance sheet structure with around 10% of balance sheet in form of ready liquid assets, around 55% of the assets in private sector claims, primarily private sector loans, around 15% of assets in public sector claims, majority of which consist of government and quasi

government debt. Public Sector debt forms only a small 2% of the total assets. The banks have a conservative funding profile compared to their GCC members with 70% of total assets funded be deposits, 14% of total assets funded by equity and no significant reliance on wholesale funding (Aserkoff, Kern, & Dixit, 2012).

Currently there are four Islamic banks listed on the TASI. The remaining banks are conventional banks whichalso offer Islamic products. Islamic banks are not only the major source of Islamic banking products, but also offer a variety of banking services such as foreign exchange, business, money transfers, documentary trade finance, portfolio management and underwriting of capital market issues.Islamic banks listed on the TASI represent 42% of the banking sector, Al-Rajhi Bank 34%, Alinma 4%, Bank AL-Jazira and Bank Al-Bilad 2% each. Conventional banks represent 58% of the banking sector, Samba Financial Group 13%, Riyad Bank 11%, Saudi British Bank 10%, Banque Saudi Fransi 10%, Arab National Bank 8%, Saudi Hollandi Bank and Saudi Investment Bank 3% each. Collectively the Saudi banking sector represents a very strong reservoir of liquidity within a world of financial drought, economic stagnation and political instability.

Table-2. Banking sector shares, prices, and weight in TASI

Bank Name	No. of Shares	Close Price	% weight in index as of Dec. 2011
Alinma Bank	1,500,000,000	9.35	1.10
Al-Rajhi Bank	1,500,000,000	69.5	8.20
Samba Financial Group	900,000,000	46.6	3.30
The Saudi British Bank	750,000,000	40.7	2.40
Riyad Bank	1,500,000,000	23.3	2.75
Banque Saudi Fransi	723,214,300	42.1	2.40
Arab National Bank	850,000,000	27.5	1.84
The Saudi Investment Bank	550,000,000	16.15	0.70
Saudi Hollandi Bank	330,750,000	29.8	0.78
Bank Al-Jazira	300,000,000	16.95	0.40
Bank Al-Bilad	300,000,000	19.85	0.47

Source: *TADAWUL annual report (31st December 2011)*

LITERATURE REVIEW

In 1990, William Sharpe won a Nobel Prize in Economics for his work in developing the CAPM. Traditionally the CAPM has been the basis for calculating the required return to the shareholder. In turn this figure has been used to calculate the economic value of the stock and the Weighted Average Cost of Capital (WACC) for capital budgeting. Black, Jensen, & Scholes (1972)reported the first notable test of the CAPM. Their methodology was mainly a time series regression

framework. The CAPMstates that the expected return of any capital asset is proportional to its systematic risk measured by the beta. Fama & Macbeth (1973)further tested the cross section relationship implied by the CAPM. They found the risk premium for beta is positive and the average return on the asset uncorrelated with the market is equal to the risk free rate of interest. In the first step of their two pass procedure the risk variables are estimated via a time series regression of the excess asset return on the excess markets return. The subsequent monthly returns on the asset are then cross-sectionally regressed on the risk variables estimated from previous data which provide the estimates of the risk premium. The empirical evidence suggests that the relationship between average asset returns and the beta was positive, but not too strong. To test the model implication that beta is the only relevant risk variable, they also included the squared beta and the residual variance as explanatory variables. These variables did not significantly improve the explanatory power.

In studies of the US stock market, (Friend, Granito, & Westerfield, (1978),Lakonishok & Shapiro, (1986), and Fuller & Wong, (1988)found there was a significant relationship between non-systematic risk and stock returns. The findings of Corhay, Hawamini, & Michal, (1988) in relation to the British stock market were similar. There was a positive relationship between returns and non-systematic risk. In Asian marketsWong & Tan (1991)tested the validity of the CAPM in the Singapore Stock Exchange. Their results indicated that the relationship between systematic risk and average return appeared to be linear in beta. However, the sign of the beta risk premium was opposite to that predicted by the CAPM and only a few beta coefficients were significant. Skewness appeared to be significant in two of the five years with individual stocks but with portfolio data, the significant effect of skewness disappeared. Bark (1991) used the Fama and MacBeth methodology to test whether the CAPM is applicable to the Korean stock market. A positive trade-off between market risk and return was rejected and other factors such as unique risk were shown to play an important role in pricing risky assets. (Cheung & Wong, 1992)studied the relationships between stock returns and various measures of risk in the Hong Kong Equity Market over the period 1980-89. On the whole, the application of the CAPM in Hong Kong appeared weak. The market risk was only priced for the year 1984-85. Cheung, Wong, & Ho, (1993)performed empirical tests on the relationships between average stock returns and some measures of risk, including skewness, on two of the most important emerging Asian stock markets, Korea and Taiwan. The applicability of the CAPM seemed weak in both markets, particularly in Taiwan. Huang Y. S. (1997)also reported an inverse relationship between returns and systematic risk, unique risk, and total risk respectively, in the Taiwan stock market.

Research into beta is broad and has highlighted a number of limitations particularly in regards to the stability of the beta coefficient over time which has been found in both developed and developing markets(Harvey, 1989; Ferson & Harvey, 1991; Fama & French, 1992; Ferson & Korajczy, 1995; Huang H. C., 2001; Oran & Soytas, 2009; Mollik & Bepari, 2010).Beta instability can be reduced however as both portfolio size and sample duration increases (Fama &

Macbeth, 1973; Odabasi, 2000). A paper by Kapusuzoglu, (2008)examined the alpha and beta values in the Istanbul Stock Market and highlighted the variability of the beta parameter. It encouraged investors to utilize the CAPM as a supplementary instrument in the process of portfolio information and to avoid relying on it as a sole indicator guiding investment strategy. There appears to be no comprehensive research or analysis based on market betas and alphas, for bank stocks in Saudi Arabia.

In recent years, the CAPM has been attacked as an incomplete model for explaining market pricing behavior, but academics and practitioners cannot agree on a good replacement. Hence, the CAPM remains an important model in practical investment analysis and financial management decision making.

DATA AND METHODOLOGY

This analysis was conducted on daily historical stock prices and indices collected from the Saudi Stock Exchange (Tadawul). The data consist of stock prices of 11 banks, the Tadawul Banking Financial ServicesIndex (TBFSI), and the Tadawul All Shares Index (TASI), covering the period June 3rd2008 to October 5th2011. A total of 832 daily usable observationswere collected. The risk free rate in this paper is proxied by the Saudi Inter Bank Offering Rate (SIBOR) for three months of the same period and was obtained from Reuters.There were six mismatches between the daily closing stocks prices dates and the three months SIBOR dates. The mismatches were adjusted as follow: if a mismatch was recorded, one day for three months SIBOR before that date was selected, if not available, then one day for three months SIBOR after that date was selected; if that was not available, the closest date for three months SIBOR wasthen selected.

Initially June 1st2006 was chosen as the start date for several reasons. The market had reached its peak by 25thFebruary 2006 (20,634.86 points), after that the bubble burst. Stock par values were reduced from 50 Saudi Riyals (SR) to SR10. This was implemented through four phases in April 2006. The Banking and Communication Sectors stocks par value wasreduced from 8thApril 2006. Thursday trading was cancelled from 15thJune 2006. Trading time was also changed from two shifts per day to one shift. The new trading time is now 11:00 am to 3:30 pm for all months (including Ramadan). Trading in the Saudi Stock Market starts on Saturday through to Wednesday.

All data was extracted from the Thompson-Reuters Datastream database. The data for non-tradingdays as a result of weekends and national holidays were adjusted by setting the daily return tozero.The data was collected from 1st June 2006 up to 5th October 2011. Finally another adjustment had to be made. Due to the establishment of a new bank, the Alinma Bank, on the 3rdJune 2008, the starting date of the data set for all banks was further refined from 3rdJune 2008. Alinma Bank has one of the highest numbers of shares, 1.5 billion shares, and represents

1.1%proportion of the market capitalization and 4% of the banking sector. Due to this importance the starting date was revised.

Table-3. The threecycles and number of observations

Period	Date	Daily Observations
Cycle 1 Global Financial Crisis	3/6/2008 – 9/3/2009	189
Cycle 2 Recovery	10/3/2009 – 29/12/2010	451
Cycle 3 Arab Spring	1/1/2011 – 5/10/2011	192
Overall Phase	3/6/2008 – 5/10/2011	832

Table 3 identifies the dates and number of the daily data for each observed climate. These periodscapture: the global financial and economic collapse in late 2008 to early 2009; the gradual recovery of global markets in 2010 associated with wide-spread Central Bank quantitative easing activities; and 2011, a period dominated by unrest in the Middle East, the so-called: Arab Spring.

Table-4. Descriptive statistics of daily shares for all Saudi banks listed on TASI

Bank Name	Mean % change of share price	Standard Deviation	Kurtosis	Skewness	Number of Observation
Al-Bilad Bank	-0.07	1.98	7.90	0.30	832
Alinma Bank	-0.05	1.90	8.16	0.43	832
Bank Aljazira	-0.08	2.24	5.18	-0.03	832
AlRajhi Bank	-0.01	2.08	6.11	0.20	832
Saudi Hollandi Bank	-0.07	2.27	9.52	-0.51	832
Saudi Investment Bank	-0.06	2.24	8.88	-0.64	832
Riyadh Bank	-0.04	2.03	7.52	0.31	832
Saudi British Bank	-0.07	2.43	14.00	-1.02	832
SAMBA Bank	-0.05	2.33	4.47	0.18	832
Banque Saudi Fransi	-0.06	2.46	10.50	-0.59	832
Arab National Bank	-0.07	2.53	12.94	-1.06	832
TBFSI	-0.05	1.74	7.33	0.07	832

Descriptive statistics of daily share returns by banks between 2008 and 2011 were calculated. Table 4 shows 11 banks in addition to the TBFSI, all have negative average daily returns. Al-Rajhi bank has highest average daily return (-0.01) and Bank Al-Jazira has the lowest (-0.08). The standard deviations are relatively high, reflecting wide fluctuations of bank share prices. Islamic banks are positively skewed (Al-Rajhi Bank, Alinma Bank, Al-Bilad Bank) except Bank Al-Jazira.

Conventional banks are mostly negatively skewed (Banque Saudi Fransi, Saudi British Bank, Arab National Bank, Saudi Hollandi Bank and Saudi Investment Bank). The TBFSI is positively skewed. Movements at the right tail of the return distribution reflect higher percentage returns and can be construed as beneficial to market investors.

The CAPM model was used as the basis for calculating thesystematicrisk. The error term was assumed to be zero (e_i=0). The return on a risky security and its beta coefficients was calculated using the following model:

$$R_{it} = \alpha_i + \beta_i R_{mt} + e_{it}$$

R_{it}: the daily return on stock i in period t.
α_i: the alpha coefficient.
β_i: the beta coefficient,
R_{mt}: the daily return on the Saudi stock market (TASI Index) in period t.
e_{it}: error term.

ANALYSIS AND RESULTS

The daily data for each bank and the TBFSIare regressed against the TASI for all observations. A series of beta coefficients are calculated. These betas identify the sensitivity of the bank and banking sector returnsto the market returns for each period (Period 1, Period 2 and Period 3) and the full sample phase (Periods 1 – 3). Risk is assessed by measuring beta coefficient. Table 5represents the daily beta for banks and the TBFSI against the TASI across all three market cycles as well as the overall phase.

Al-Rajhi Bank has the highest beta 1.04 and Al-Bilad Bank the lowest beta of 0.70. Al-Rajhi Bank and Arab National Bank have the highest beta coefficient across other banks and TBFSI. The overall beta of 1.04 suggests that for every 1% increase in overall market returns, the returns for the Al-Rajhi Bank and Arab National Bank will increase by 1.04%.Betas of bankswith one or lower values, indicate a lower risk compared to the overall Saudi Stock Market. Therefore the results of these betas in Table 5 show banks such as Saudi Hollandi Bank and Al-Bilad Bank should be less sensitive to market movements compared to Al-Rajhi Bank and Arab National Bank. Banks with betas below one are interpreted as lower risk investment or a defensive type of stock. These stocks are therefore seen as potentially attractive to risk-averse investors.

Table 5 further reveals that the beta coefficientsfor each bank fluctuate over time, Cycle 1, Cycle 2 and Cycle 3. The variation in these‘cyclical’ betas compared to the ‘overall’ beta coefficient captures the individual short-term exposure of the market-moving events (systematic risks) identified earlier in Table 3. The efficacy of applying a single beta coefficient over a long period of

time to signal future forecasts of asset performance and required returns challenges its reliability as a market signal. Clearly investors formulating an investment strategy based on beta values could be misled by relying on a single static beta value, particularly one which may encompass major systematic market-moving events.The final column on Table 5 uses the coefficient of variation (CV) to measure the stability of the beta across the different cycles. A higher CV implies higher volatility. Results show high relative volatility across all the banksin this sample.

Table-5. Beta values for all listed banks in TASI across each cycle

Bank Name	Cycle 1 Global Financial Crisis (Beta)	Cycle 2 Recovery (Beta)	Cycle 3 Arab Spring (Beta)	Cycle 1 - 3 Overall Phase (Beta)	CV – Beta Volatility
AlRajhi Bank*	1.03	1.20	0.83	1.04	14.49%
Arab National Bank*	1.08	0.97	1.00	1.04	4.58%
Bank Aljazira*	0.96	1.03	1.05	0.99	3.89%
Banque Saudi Fransi*	0.95	0.88	1.01	0.94	5.48%
TBFSI	0.91	0.99	0.92	0.93	3.56%
SAMBA Bank*	0.77	1.09	1.20	0.91	19.25%
Alinma Bank	0.94	0.79	0.75	0.86	10.05%
Saudi British Bank	0.85	0.86	0.96	0.86	6.18%
Riyadh Bank	0.84	0.82	0.87	0.84	2.90%
Saudi Investment Bank	0.83	0.75	0.92	0.83	8.23%
Saudi Hollandi Bank	0.85	0.63	0.71	0.77	12.14%
Al-Bilad Bank	0.66	0.76	0.74	0.70	6.10%

To improve the reliability of the beta coefficient signal and overcome the limitations of a single beta coefficient derived from a period of past returns, the authors suggest calculating a ‘rolling’ beta. Since economies are dynamic and the gathering of information is perpetual, a rolling regression technique is applied to generate daily beta values for each sector. A rolling regression of 100 daily returns is conducted and rolled on a daily basis throughout the entire sample period. By applying a rolling regression technique 772 daily beta estimates are generated instead of one single beta estimate which best fits the sample data. Descriptive statistics of the beta values across all banks are presented in Table 6.

The rolling beta coefficient identifies the daily risk-return relationship between the bank and the market, based on historical daily return data. The CV provides the relative volatility of the rolling beta. A high CV suggests high variability of the beta coefficient. Hence without reference to the CV, the beta alone disguises the true signal of the sector-market relationship. The Samba Bank

and the Al-Bilad Bank have the highest CV volatility results yet this is camouflaged by their relative low, stable overall beta value. These imply that both banks are less sensitive to market movements (because of low betas), which further implies lower risk which in turn would be attractive to risk-averse investors. However, the high rolling beta volatility (as measured by CV) implies high risk, which contradicts the readings of the low static beta value. It is therefore helpful to calculate the rolling beta, as well as calculating the CV, to allow a more informed investment decision.

Table-6. Descriptive Statistics of rolling daily Betas 2008 – 2011, by banks

Bank Name	Mean	Standard Deviation	Kurtosis	Skewness	C.V. Volatility
AlRajhi Bank*	1.06	0.19	2.47	-0.24	17.92%
Arab National Bank*	0.99	0.15	3.01	-0.51	15.15%
Bank Aljazira*	0.94	0.18	2.44	0.98	19.15%
Banque Saudi Fransi*	0.87	0.28	2.04	0.04	32.18%
TBFSI	0.96	0.13	4.23	1.22	13.54%
SAMBA Bank*	1.09	0.70	2.76	0.53	64.22%
Alinma Bank	0.75	0.14	2.65	-0.20	18.67%
Saudi British Bank	0.85	0.26	2.88	-0.58	30.59%
Riyadh Bank	0.82	0.16	6.61	1.37	19.51%
Saudi Investment Bank	0.77	0.17	2.03	-0.22	22.08%
Saudi Hollandi Bank	0.70	0.18	3.04	0.05	25.71%
Al-Bilad Bank	0.57	0.28	1.88	-0.35	49.12%

To further highlight the importance of calculating the rolling beta as opposed to the simple linear beta value, Figures 1and 2 illustrate how the beta value for each bankfor each day changes dramaticallyas it is rolled through the sample period. The two graphs illustrate two banks AlBilad Bank, lowest beta (0.66) value, and AlRajhi Bank with the highest (1.03) beta value, (these values are shown on Table 5). The graphs also compare the bank with the highest average beta value for the complete Banking Sector, and the highest and lowest average sector valuesof the 15 different sectors within the TASI.

Figure 1 shows the daily changes of the rolling beta for AlBilad Bank compared to the average banking sector static beta is 0.91; the highest sector, Petroleum, static beta, 1.37; the lowest sector Energy Utilities, static beta 0.59; and the average static beta value for AlBilad Bank of 0.66. Figure 2 showsAlRajhiBank also compares these data. Both Figures 1 and 2 clearly highlight how beta substantially deviates from the overall linear beta calculation presented earlier in Table 5.The static betas paint a very different picture of market risk compared to the rolling beta. (Further data of other banks are available from the authors).

This therefore underlines the limitation of using a static beta value over a period of time to guide risk management. A rolling beta better reflects any changes in current market conditions and provides a more accurate and reliable beta coefficient estimate. Risk-seeking investors choosing stocks/indices based on beta values above one, do so without knowing the relative volatility of the linear beta value. Paradoxically, a linear beta greater than one, may simultaneously have a rolling beta less than one. Hence the signal being sent to investors from the linear beta value may be completely misleading.

Figure-1. Albilad Bank rolling beta values and other comparative beta values

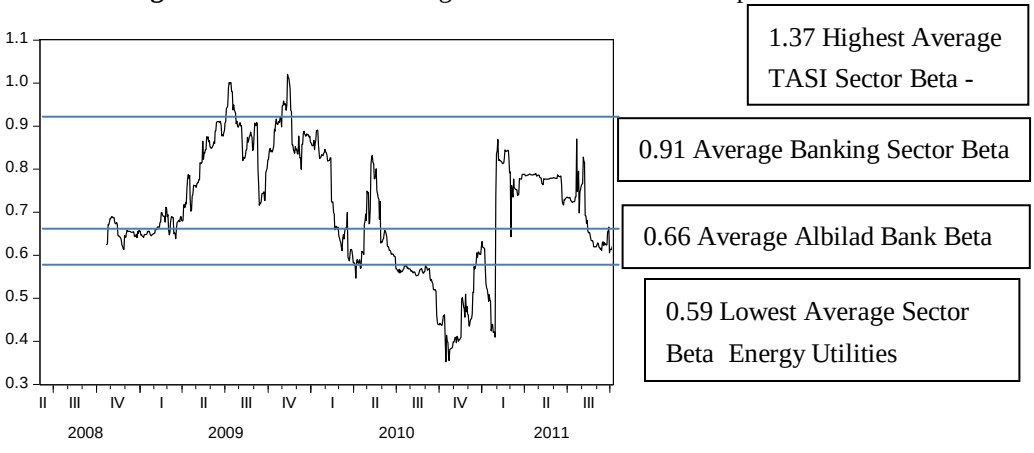
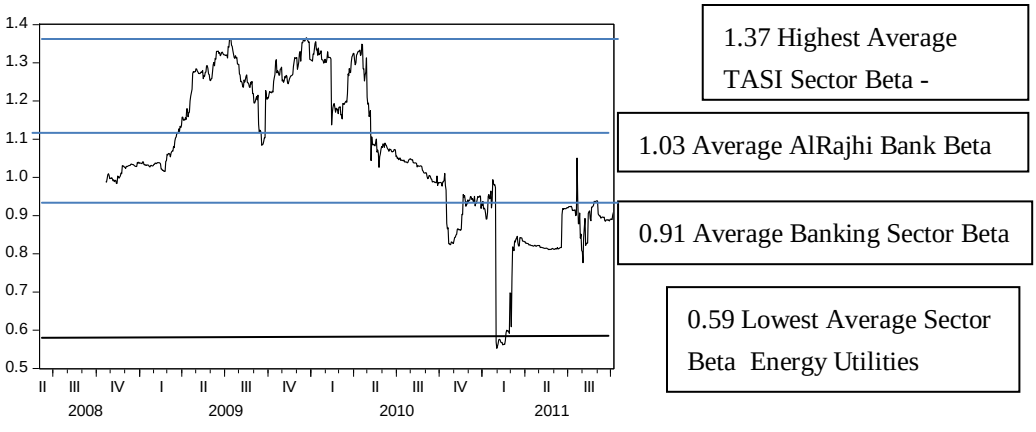


Figure-2. AlRajhi Bank rolling beta values and other comparative betas values



The final part of this paper determines whether bank returns are over-valued or under-valued using the CAPM. Members of the financial community that don't believe in the Efficient Market Hypothesis attempt to construct investment strategies that generate a positive alpha. Alpha measures the securities actual return minus the expected return as predicted by the CAPM. Positive alphas indicate a security which has outperformed its expected return. Simultaneously it provides

an indication of securities/indices that are undervalued by the market. Using the rolling betas generated previously, daily alphas are constructed for each of the 11banks' indices in the TASI.

Utilizing average rolling beta values across each of the three macroeconomic cycles, expected returns for each of the banks are calculated using the CAPM model equation:
Bank Required Return = Risk Free Rate + Beta (Market Return – Bank Return)

The risk free rate in this paper is proxied by the Saudi Inter Bank Offering Rate (SIBOR) for three months of the same period and was obtained from Reuters.The market return is the TASI Index return. The calculated bank's required returns can then be compared with the bank's actual returns to derive the bank's alpha coefficient. A positive alpha indicates a bank that has outperformed (a bank that is undervalued by the market) according to the CAPM. This in turn signals an opportunity for investors to buy. Conversely a negative alpha indicates a bank that has underperformed (a bank that is overvalued by the market).

The results provide an interesting story. When relying on a static beta value to calculate required returns, every bank in the TASI throughout the four year period is overvalued. But closer scrutiny, using the rolling beta regression technique, enables the CAPM to more accurately capture valuation swings caused by market-moving events over time.

With the onset of the global financial crisis (Cycle 1), all banks in the TASI returned negative alphas implying the market has incorrectly overvalued these sectors. As the global economy recovered in Cycle 2, many banks generated positive alpha values in a period of massive quantitative easing, much of which found its way into commodities fuelling the resurgence in world oil prices. These banks generated returns that exceeded the required returns determined by the CAPM calculations.Despite the Arab Spring and global uncertainty in 2011 (Cycle 3) results show an increasing number of banks becoming undervalued. This suggests investment opportunities are re-emerging in the TASI - a very different story to the one being told when applying the static beta value analysis.

DISCUSSION AND CONCLUSION

This paper analyses the sensitivity of 11 bank risk-return relationships in the TASI over the period 2008-2011. Analysis found that using the traditional linear beta value alone without consideration to daily market moving eventsoverlooks sector-market relationship signals and lead to spurious information. The policy implication suggests that investors should not rely on the single linear beta value as a sole guiding investment tool. The contribution of this paper provides a more refined technique, a rolling beta, to accurately capture daily valuation swings caused by market-moving events over time. Alpha values were calculated using the CAPM enabling more dynamic risk-return valuations to emerge. These valuations identified three key phases of varying bank stock

market activity and bank sector market valuations, previously unrecognized when using the single linear beta value.These results suggest that in general, despite the relative instability within and between Saudi banks during the turbulent GFC, the contribution of SAMA strict regulations(and the banks themselves) ensureda less tempestuous performance within the Saudi banking sector overall compared to the devastating impact that shook, and continues to shake, the banking sectors of the industrialized countries today. In addition, this analysis surprisingly reveals thatinvestment opportunities are presently re-emerging in the Saudi banks contrary to present global banking happenings.

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