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Asset Pricing Behaviour with Dual-Beta in Case of Pakistani Stock Market

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This study investigates the dynamics of beta by the asymmetric response of beta to bullish and bearish market environment on 50 stocks traded in Karachi Stock Exchange during 1993-2007. The results show that the betas increase (decrease) when the market is bullish (bearish). The results however suggest that investors receive a positive premium for accepting down-side risk, while a negative premium is associated with up-market beta. The results suggest that the conditional Fama and French three factor model has performed better than the conditional CAPM when news asymmetry was taken into account compared with the unconditional Fama and French three factor model and the unconditional dual-beta CAPM in explaining the relationship in beta and returns in case of Pakistani market.

JEL classification: G12, G15
Keywords: Beta Instability, High Market Beta, Low Market Beta, EGARCH Model, News Asymmetry, Fama and French Three Factor Model

1. INTRODUCTION

In the realm of asset pricing models the Sharpe (1964) and Lintner (1965) Capital Asset Pricing Model (CAPM) continues to be the primary and dominant model. However, after the introduction of CAPM academics have presented many critiques invalidating its statistical significance [Fama and French (1993) and numerous other studies]. They have consistently held that the CAPM's single factor (beta) defined as covariance of asset returns with market return was unable to capture all risks associated with the explanation of an assets expected returns. On the one hand, it leads to the development of a two-beta model that incorporates the up and down market responses of stock returns which allows the separation of systematic risk into favourable and unfavourable variations respectively from up-side and down-side responses[Kim and Zumwait (1979)]; on the other hand, the characteristics of the firms that are likely to explain the anomalies in asset returns need to be specified such as small firm effect, January effect, earning-to-price ratio, book to market value and leverage. The most prominent work in this regard is the series of papers by Fama and French (1993, 1995,

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1996, 1998 and 2004),[1] which construct hedge portfolios with long/short positions in firms with attributes that are known to be associated with mean returns. The three-factor model of Fama and French (1996) says that the expected returns in excess of risk free rate are explained by the excess market return, the difference between the returns on portfolio of small stocks and returns on portfolio of large stocks and the difference between the returns on portfolio of high book-to-market stocks and returns on a portfolio of low book-to-market stocks. The three-factor model of Fama and French (1993) is now widely used in empirical research that requires a model of expected returns. Among practitioners, the model is offered as an alternative to the CAPM for estimating the cost of equity capital (for example, Ibbotson Associates), and portfolio performance [Fama and French (2004)].

Since the Fama and French (1992) study, several studies have argued that it might be too early to reject beta as systematic measure of risk [Clare, Priestley, and Thomas (1998); Kathori, Shanken, and Salon (1995); Davis and Desai (1998) and Faff (2001)]. The empirical evidence shows that the downside risk may be a more appropriate measure of portfolio risk than the conventional single beta [Grundy and Malkiel (1996) and Kim and Zumwalt (1979)]. One view is that the inadequacy of the single factor CAPM is due to non-stability or randomness of betas. Fabozzi and Francis (1977) document the results to determine that the regression coefficient of standard CAPM are significantly different in bull and bear markets. Levy (1974) allows the beta to change with good news and bad news in the model, while Black (1993) estimates the regression model in which intercept term varies overtime. Another view is that the time variability is due to the time varying nature of beta, therefore, testing CAPM in various market conditions with constant risk parameters is over-simplified because the returns distribution is time varying in nature.[2] This stylised fact is first examined in the time varying behaviour of conditional covariances by Engle, Lillen, and Robins (1987), Bollerslev, Engle, and Wooldridge (1988), and Bollerslev, Engle, and Nelson (1994). Some studies investigate the effect of good and bad news measured by positive and a negative return i.e., the leverages effects, on beta of CAPM [Braun, Nelson, and Sunier (1995); Chou and Engle (1999) and Granger and Silvapulle (2002)]. Pagan and Sussounov (2000) show that the nature of bull and bear market depends on the type of data generating process which generates capital gains in the market.[3] Granger and Silvapulle (1999) use value-at-risk to define various market conditions. Maheu and McCurdy (2000) use duration dependence as a source of non-linearity in the stock market cycles.[4]

[1]There are several arguments on the firm specific attributes that are used to form Fama and French factors. Haugen and Baker (1996), Daniel and Titman (1997) are of the view that such variables may be used to find assets that are systematically mispriced by the market. Others argue that these measures are proxies for exposure to underlying economic risk factors that are rationally priced in the market [Fama and French (1993, 1995 and 1996)]. Another view is that the observed predictive relation are largely the result of data snooping and various biases in the data [MacKinley (1995), Black (1993), Kothari, Shanken, and Sloan (1995)].

[2]Harvay (1995) for emerging markets, Iqbal and Brooks (2007) and Javid and Ahmad (2008) for Pakistani market.

[3]Pagan and Sussounov (2000) argue that the macroeconomics is able to interpret some of the observed characteristics of data which are based on some economic behaviour. For example it may be that the volatility seen in equity prices stem from volatility in the making of monetary policy and hence might disappear as monetary policy regime changes.

[4]They argue that possible explanation of persistence of bull is that investors become more optimistic about the future and hence wish to invest more in the stock market. This positive feedback means that the probability of switching out of the bull market decreases with duration.

The purpose of the present study is to look in to the failure of beta to explain the cross-section variation in expected returns for Pakistani market and to investigate the hypothesis that stock returns respond differently to up and down markets. The model allows total systematic risk to be separated into variation due to upside response which is considered as good news and variation due to down side response which is viewed as bad news.[5] In the next stage, the dual-beta CAPM model is extended by including Fama and French (1993) size and book to market value as risk factors. Thereafter, dual-beta CAPM and Fama and French three factor models are extended by incorporating conditional information by allowing variance equation to capture news asymmetry. The final issue investigated is the risk premium for market risk in the bull and bear market conditions in conditional and unconditional settings. The dual-beta CAPM and Fama and French three factor models have not been tested for Pakistan. The current study contributes to existing literature firstly by testing the static and dynamic dual-beta CAPM and Fama and French three factor models on individual stocks' daily and monthly data. Secondly, different time intervals are investigated as the market has different sentiments at different periods.

The study is organised as follows. The previous empirical findings are briefly reviewed in Section two. Section three outlines the empirical methodology. The results are presented in Section four, followed by a concluding section.

2. REVIEW OF PREVIOUS EMPIRICAL FINDINGS

The standard CAPM has been extensively tested by many studies and evidence shows that there is no significant relationship between average returns and market beta. That beta does not sufficiently explain the variation in expected return is strongly presented in the study by Fama and French (1992) and (1993). Further this finding is confirmed by Grinold (1993), Davis (1994), He and Ng (1994), Fama and French (1995), (1996) , (1998) and (2004) and Javid and Ahmad (2008) in addition to numerous other studies. On the other hand there is considerable counter evidence that supports beta to explain risk return relationship such as Black (1993), Bhardwaj and Brooks (1993), Harris and Marston (1994), Pettengill, Sundaram, and Muthar (1995), Kothari, *et al.* (1995) and Clare, *et al.* (1998).

Fabbozi and Francis (1978) and Levy (1974) extend CAPM by computing separate betas for bull and bear markets to test for the instability of beta and the validity of the return-beta relationship. Following Levy (1974) several studies test for randomness of beta. Fabozzi and Francis (1977) estimate and test the stability of betas over the bull and bear markets but they find no evidence supporting beta instability. Chen (1982) allows beta to be non-stationary in up and down markets and conclude that under the condition of either constant or changing beta, investors get premium for downside risk. Braun, *et al*. (1995) and Chou and Engle (1999) investigate the effect of good and bad news called leverage effects, as measured by positive and negative returns on beta. Braun, *et al.* (1995) examine the variability of beta using exponential GARCH models allowing

[5]There is positive relationship between beta and return in up market and a negative one in the down market, so the beta-return relationship is not shown up in aggregate. It is possible that the positive beta-return relationship in bull markets offsets the negative beta return relationship in the bear market. Therefore unless the positive beta relationship in bull market is stronger than negative beta-return in bear market, the overall long run relationship between return and beta would not be positive.

market volatility, portfolio-specific volatility and beta to respond asymmetrically to positive and negative market and portfolio returns using monthly data, however they do not uncover this relationship. Chou and Engle (1999), on the other hand, use a two-beta model with an EGARCH variance specification and daily stock returns of individual firms and conclude that news asymmetrically affects the betas. Woodward and Anderson (2001) find different betas for bull and bear conditions using the Australian industry portfolios. Faff (2001) apply multivariate one-step procedure to investigate CAPM in bull and bear market conditions and find that there is minimal evidence of a difference between up-market and down-market industry beta. However, when the excess market return is negative (positive) he finds strong evidence of a negative (positive) relationship between beta and return.

An alternative approach to capture market movements is through various market volatility regimes. Galagedera and Faff (2003) examine the validity of a conditional three-beta model in the low, flat and high volatility regimes and find most of the asset portfolio betas not significantly different in the three regimes. The Markov regime switching model is used by Huang (2000) to investigate the instability of beta and concludes that CAPM is stable in the low risk state and not stable in the high risk state**.**

While investigating whether the variation in the stock returns volatility is different in expansionary and in contractionary phases of business cycles, Schwert (1989), Hamilton and Lin (1996) and McQueen and Thorley (1993) show that conditional volatility in stock returns exists which is counter-cyclical, and this behaviour is more pronounced in the recession than in the expansion phases of the business cycle. Some studies investigate the conditional CAPM and conclude that the fluctuations and events that affect the market might change the leverage of the firm and the variance of stock return and change the beta. Bhaduri and Durai (2006) explore the stability of beta for India for individual stocks and strongly validate that betas are stable in all market conditions.

The poor empirical response of standard CAPM due to a number of seemingly unexplained patterns in asset returns has resulted in using sorted portfolios of stocks to represent the factors in a multifactor model. The lack of any generally acceptable explanation and acceptance and persistence of these patterns are the main reasons why they are described as anomalies. Some of such puzzling anomalies are the small firm effect, January effect, earning-to-price ratio, book to market value and leverage etc. The most influential work in this regard is the three-factor model of Fama and French (1993, 1995, 1996, 1997, 1998 and 2004), which adds two variables besides the market return, namely the returns on SMB and the returns on HML stock. Fama and French (1993) show that there is virtually no cross-sectional beta mean returns relationship. They show that variation on average returns of 25 size and book/market sorted portfolio can be explained by betas on the latter two factors. Fama and French explain the real macroeconomic aggregates as non-diversifiable risks that are provided by the returns of HML and SMB portfolios. In a later study, Fama and French (1996) extend their analysis and find that HML and SMB portfolios comfortably explain strategies based on alternative price multiplier strategies based on five-year sale growth and the tendency of five-year returns to reverse. All these strategies are not explained by CAPM betas. Fama and French (1996) conclude that many of the CAPM average returns anomalies are

related and can be captured by their three-factor model. However Chang, Johnson, and Schill (2001) have observed that as higher-order systematic co-moments are included in the cross-sectional regressions for portfolio returns, the SMB and HML generally become insignificant. Therefore, they argue that SMB and HML are good proxies for higher-order co-moments. Ferson and Harvey (1999) claim that many multifactor model specifications are rejected because they ignore conditioning information. They have shown that identified predetermined conditional variables have significant explanatory power for cross-sectional variation in portfolio returns. They reject the three factor model advocated by Fama and French (1993). They come to the conclusion that these loadings are important over and above the three factors of Fama and French and also the four factors of Elton, Gruber, and Blake (1995).

This study investigates the risk return relationship under different market conditions for the Pakistani equity market. It is believed that testing the dual-beta CAPM and dual-beta Fama and French three-factor models in unconditional and conditional context would yield some interesting results for the Pakistani equity market**.**

3. EMPIRICAL METHODOLOGY AND DATA

The analysis begins by estimating the model developed by Sharpe (1964) and Lintner (1965) in which a relationship for expected return is written as:

$$r_t = \alpha + \beta_{rm} r_{mt} + \varepsilon_t \qquad \varepsilon_t \sim (0, h_t) \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

Where r_t is the excess return on asset *i* and r_{mt} is the excess return on market portfolio over the risk-free rate. The α_i and β_{rm} are regression coefficients and β_{rm} is the measure of risk or market sensitivity parameter defined $\beta_{rm} = \text{cov}(r_t, r_{mt}) / \text{var}(r_{mt})$. The market beta is the slope coefficient of time series regression of asset return on market portfolio given in the above Equation (1) and it is used as explanatory variable in the following cross-section regression equation estimated by the Generalised Least Square (GLS):

$$r_t = \lambda_0 + \lambda_{rm} \beta_{rm} + \varepsilon_t \qquad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

The coefficient λ_1 is the premium associated with beta risk and an intercept term λ_0 has been added in the equation. If $\lambda_0 = 0$ and, $\lambda_{rm} > 0$ this implies that Sharpe-Lintner CAPM holds.

The poor empirical response of standard CAPM [Javid and Ahmad (2008) and Iqbal and Brooks (2007)] motivated to extend the standard CAPM by incorporating Fama and French (1993) three-factor model, in order to examine whether size and book to market value can explain the portion of expected returns, which cannot be explained by CAPM.[6] Fama and French (1993) have incorporated two more risk factors: the difference between the expected return on portfolios of stocks of small and larger firms (SMB) and difference between the expected return on portfolios of stocks that exhibit high and low

[6]The ratios involving stock prices have information about expected return missed by the betas. This is because stock's price depends not only on expected cash flows but also on the expected return that discount on expected cash flow back to the present. Thus a high expected return implies a high discount rate and a low price. These ratios thus are prime candidates to expose shortcomings of CAPM [Basu (1977)]. The earning-price ratio, debt-equity, and book-to-market ratios play their role in explaining expected return.

book to market value HML. Book to market value and firm size are risk proxies which means that a firm with a high book to market equity ratio (a relatively low market equity value) is likely to be a distressed firm and such firms have sustained losses recently and consequently have a substantial risk of bankruptcy (may have high leverage as well). Likewise, a small firm has more chances of failure than a large firm. The two step procedure is followed to estimate Fama and French three-factor model. The following time series regression model is estimated in the first stage:

$$r_t = \alpha + \beta_{rm} r_{mt} + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad (3)$$

The risk premium associated with these risk factors are estimated by cross-section regression Equation (3) that is estimated by GLS,

$$r_t = \lambda_0 + \lambda_{rm} \beta_{rm} + \lambda_{SMB} \beta_{SMB} + \lambda_{HML} \beta_{HML} + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad (4)$$

Where SMB (Small minus Big) represents the risk factor diverge of the rate of returns with size effect; the HML (High minus Low) represents the risk factor of return rate with ratio book to market value effect. The βs measure the sensitivity of each asset associated to these variables. The λs are GLS coefficient which indicate the extent to which the cross-section of asset returns can be explained by these variables each year.

In this study the SMB portfolio is sorted by market value or size following Fama and French (1996), and the mean market equity is calculated which is the cutting point. All stocks are divided into two parts; companies having market value of more than cutting point are big company stocks (B) while companies having market value of less than cutting point are small company stocks (S). It is believed that high and low market conditions have asymmetric effect on beta. In addition to bringing the book to market value the ratio of stocks is divided into three groups according to book to market sorting: the first group with 30 percent of whole stocks has the highest book to market ratio called high group (H), the second group with 40 percent of whole stocks has medium book to market ratio called medium group (M) and the last group with 30 percent of whole stocks has the lowest book to market ratio called low group (L). In the next step, stocks are organised into six groups according to the cross of stocks group in the first and second step as S/L, S/M, S/H, B/L, B/M, B/H. The weight average monthly returns of each group is calculated equally according to the method of Fama and French (1996).[7]

The standard CAPM is extended by incorporating two betas, one for high market and the other for low market conditions and thereafter it is modified with Fama and French (1993) size and book to market risk factors. Following Fabozzi and Francis (1977) the positive market return is defined as up (bull) market while negative market return is defined as down

[7]SMB (Small minus Big) represent the risk factor diverge of rate return which involve with size effect, SMB will different in each month among average return rate of small sample group (S/L, S/M and S/H) with the average return rate of 3 large groups (B/L, B/M, B/H).

SMB = Small minus Big = Average Returns of Small Size minus Big Size

= 1/3 (S/H + S/M + S/L) – 1/3 (B/H + B/M + B/L)

HML (High minus Low) represent the risk factor of return rate that involve with ratio book to market value (BE/ME) effect. HML each month has differ between average return rate of two portfolios that has BE/ME high (S/H and B/H) with average return rate of two portfolios has BE/ME low (S/L and B/L)

HML = High Minus Low = Average Returns of High BE/ME minus Low BE/ME ratio

= 1/2 (S/H + B/H) – 1/2 (S/L + B/L)

(bear) market. To capture the asymmetric effects of various market conditions on beta, two betas are estimated for each stock corresponding to bear and bull market conditions by introducing two dummy variables D_H and D_L in the models (1) and (3). Dummy variable D_H is defined as 1 if market return is greater than zero and 0 otherwise and D_L is defined as1 if market return is negative and zero otherwise. In order to examine the beta coefficient in the bull and bear market conditions the Equation (1) is modified as:

$$r_t = \alpha + \beta_H D_H r_{mt} + \beta_L D_L r_{mt} + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (5)$$

Equation (5) gives the dual-version of the standard model, where two betas β_H and β_L are estimated for each stock corresponding to positive and negative market conditions. The asymmetric effects of various market conditions on beta is investigated by estimating two betas for each stock corresponding to bear and bull market conditions and to test the equality of the up and down market betas on pair-wise basis by applying the Wald test. The cross sectional beta-return relationship using these two sets of beta estimates is as follows:

$$r_t = \lambda_0 + \lambda_H \beta_H + \lambda_L \beta_L + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (6)$$

$$r_t = \lambda_0 + \lambda_H \beta_H + \lambda_L \beta_L + \lambda_{SMB} \beta_{SMB} + \lambda_{HML} \beta_{HML} + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad (7)$$

The $\lambda_L$and λ_H are risk premium corresponding to bull and bear market conditions. According to Kim and Zunwait (1979) and others as $\lambda_L>0$ an investor would like to receive a positive premium for accepting downside risk and as $\lambda_H<0$ an investor is willing to pay a positive premium in the up market. The equality of these pricing parameters is tested by applying the Wald test. The λ_{SMB} and λ_{HML} are risk premium for size and book to market value risks respectively.

In models (3) and (4) is a dual-beta CAPM and Fama and French three-factor model in which the asymmetric effect on expected return is captured in unconditional context. It has been argued in the empirical literature that as beta depends on good news and bad news defined as negative and positive returns respectively, the volatility is also affected by news asymmetry [Braun, *et al.*(1995)]. Nelson (1991) points out that the changes in stock returns' volatility have negative correlation with returns themselves. As a result, volatility increases in response to bad news and falls in response to good news.[8] To capture the asymmetric effect on conditional variance, the exponential GARCH model suggested by Nelson (1991) is used. The main advantage of this model is that the parameters are not restricted to be non-negative. The following Equations (8) and (9) allow the asymmetric effect of various market conditions on volatility of stock returns in conditional CAPM-with EGARCH(1,1) model:

[8]The asymmetry between positive and negative shocks can be explained as follows. An unexpected decline in prices causes volatility, thereby increasing the expected volatility in future. Since the increase in the volatility has to be compensated by an increase in risk premium, the expected rate of return must rise. Therefore the unexpected shock result in decline in the current stock price, and hence further reinforce the initial negative shock and increase the level of current and future volatility. In case of positive price shock the initial impact is the same however, the decrease in stock price tend to offset the impact of positive shock. Therefore the initial increase in level of current and future volatility is partially offset. At firm level the asymmetry between the effects of good and bad news on the level of volatility can be explained through the leverage effect [Bakaert and Wu (1997)].

$$r_t = \alpha + \beta_{rm} r_{mt} + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (8)$$

$$\log(h_t) = \gamma_0 + \delta \log h_{t-1} + \mu \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \gamma_1 \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (9)$$

The extended Equations (10), (11) and (12) are estimated to capture the asymmetric effect of high and low market conditions on mean and volatility of stock returns in dual-beta CAPM-with-EGARCH(1,1) model and dual-beta Fama and French-with-EGARCH (1,1) model:

$$r_t = \alpha + \beta_H D_H r_{mt} + \beta_L D_L r_{mt} + \varepsilon_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (10)$$

$$r_t = \alpha + \beta_H D_H r_{mt} + \beta_L D_L r_{mt} + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \varepsilon_t \quad \ldots \quad \ldots \quad (11)$$

$$\log(h_t) = \gamma_0 + \delta \log h_{t-1} + \mu \left| \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} \right| + \gamma_1 \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \theta_{Ht-1} D_{Ht-1} r^2_{mt-1} + \theta_{Lt-1} D_{Lt-1} r^2_{mt-1} \quad (12)$$

The conditional variance on the left hand side of Equations (9) and (12) are in log form implying that the forecasts of conditional variance are always positive. The news impact is asymmetric if $\gamma_i \neq 0$ for at least one *i* in Equations (9) and (12). Furthermore, if $\gamma_i < 0$ it implies that the leverage effect is present. To examine if betas of CAPM and Fama and French model respond differently in two market conditions, the equality of high and low market beta is tested in Equations (10) and (11), the equality of θ_L and θ_H in volatility Equation (12) is tested by the Wald test.

The risk premium for conditional CAPM-with-EGARCH(1,1) is estimated by the cross section Equation (2) and extended cross-section regression Equations (6) and (7) that estimate the risk premium for conditional dual-beta CAPM and Fama and French-with-EGARCH(1,1).

Data and Sample

The econometric analysis to be performed in the study is based on the data of 50 firms listed on the Karachi Stock Market (KSE), the main equity market in the country for the period January 1993 to December 2007. These 50 firms contributed 90 percent to the total turnover of KSE in the year 2000.[9] In selecting the firms three criteria were used: (1) companies have continuous listing on exchange for the entire period of analysis; (2) almost all the important sectors are covered in data, and (3) companies have high average turnover over the period of analysis.

From 1993 to 2000, the daily data on closing price turnover and KSE 100 index are collected from the Ready Board Quotations issued by KSE at the end of each trading day, which are also available in the files of Security and Exchange Commission of Pakistan (SECP). For the period 2000 to 2007 the data are taken from KSE website. Information on dividends, right issues and the bonus share book value of stocks are obtained from the annual report of companies. Using this information,

[9]Appendix Table A1 provides the list of companies included in the sample.

daily stock returns for each stock are calculated.[10] The six months' treasury-bill rate is used as risk free rate and KSE 100 Index as the rate on market portfolio. The data on six-month treasury-bill rates are taken from *Monthly Bulletin* of State Bank of Pakistan. The test of CAPM and Fama French three-factor models is carried out on individual stocks.

4. EMPIRICAL RESULTS

The empirical validity of unconditional and conditional dual-beta CAPM is examined by using daily as well as monthly data of 50 individual stocks traded at Karachi Stock Exchange during the period 1993 to 2007. The extended dual-beta CAPM with Fama and French three-factor model (1993) are tested in unconditional and conditional context using monthly data. The tests of these models are carried out in the excess return form and the risk factor in excess market return above the treasury-bill rate. The sample period is divided into sub-periods of three years: 1993-1995, 1996-1998, 1999-2001, 2002-2004 and 2005-2007; two large sub periods: 1993-2000 and 2001-2007; and for the whole sample period 1993-2007.[11]

First, it is established how well the extended version of CAPM with dual beta (one beta for the bull market and one for the bear market) explains the cross-section variation in the expected returns, which is tested by using daily as well as monthly data of 50 individual stocks. The dual version of CAPM is extended by including Fama and French (1993) size and book to market variables to examine whether these variables can explain the portion of expected returns, which cannot be explained by CAPM. The two-step procedure proposed by Fama and McBeth (1973) is followed, the betas or sensitivity of asset returns to market returns (high beta and low market betas) and firm characteristic variables (size, and book-to-market value), which capture anomalies are estimated in the first stage using Generalised Method of Moment approach (GMM) and the lagged market return and lagged asset returns are used as instruments. In the second step, a cross section regression of actual returns on betas is estimated for each month in the test period by applying the Generalised Least Square (GLS). The standard deviations of residuals from the beta estimation equation are used for the estimation of error covariance matrix involved in the GLS estimation procedure.[12] Finally, the parameter estimates are obtained for all the months in the test periods by taking the average of the premium for the test period. The mean risk premium so obtained is used to test, applying t-statistics, the null hypothesis that the risk premium is equal to zero. Since betas are generated in the first stage and then used as explanatory variables in the second stage, the regressions involve error-in-variables problem. Therefore the t-ratio for testing the hypothesis

[10] $R_t = \ln P'_t - \ln P'_{t-1}$, where R_t is stock return and P_t', the stock price is adjusted for capital changes that is dividend, bonus shares and rights issued.

[11] In financial economics it is common practice to test the models for different sub periods to check the robustness of the results.

[12] For the empirical analysis of individual stocks GMM is used for time series estimation technique due to non-synchronous returns. Instrument variable is considered as a better choice [Scholes and William (1977)]. The cross-section regression has problem because the returns are correlated and heteroskedastic, therefore *GLS* is used in cross-section regression.

that average premium is zero is calculated using the standard deviation of the time series of estimated risk premium which captures the month by month variation following Fama and McBeth (1973). The alternative t-ratios are also calculated using a correction for errors in beta suggested by Shanken (1992).[13] The R^2 is average of month by month coefficient of determination.

In the first stage the sensitivity of the asset returns to market return in high and low market conditions is estimated using the daily data and monthly data in excess return form over risk free rate for the period 1993 to 2007. In the second stage the risk premium is estimated using high and low betas estimates from the first stage. The results from the first stage, presented in Appendix Table A3, show for almost all cases that bull and bear market betas are significantly different as shown by the Wald test. However, for 33 stocks, beta estimates are higher for positive market return than for negative market return, while for other 16 stocks the reverse is true based on monthly data. Including the Fama and French variables for 21 stocks, the greater beta estimate is obtained for positive market while for the rest the opposite is found to be true. These results are in accordance with the widely held view that the stock beta is higher in the bull market than in the bear market. It is also evident that the hypothesis of pair-wise equality of up-and-down market betas is rejected. These results confirm the other findings in the literature. Kim and Zunwait (1979), Davis and Desai (1998), Faff (2001) Granger and Silvapulle (2002) find that in bull market, higher beta stocks provide higher return than do the lower beta stocks.

Table 1 presents the results of dual-beta CAPM based on daily and monthly data. The results indicate that the risk premium for high market conditions has the correct sign, negative in all sub-periods, but it is significantly different from zero in the sub-period 2002-2004, 2005-2007, 2001-2007 and for the overall period 1993-2007. For low market conditions, the risk premium is positive but significant in 1993-1995, 2002-2004, 2005-2007 and 1993-2007. In the other sub period the risk premium corresponding to up market is negative and for down market it is positive but not significantly different from zero. The theoretical proposition is supported by these empirical findings in some sub-periods that the risk premium is positive in the down market and negative in the up market respectively. The hypothesis of pair-wise equality of risk premium in bull and bear market is rejected. The positive beta-return relationship in bear market is consistent with other findings [Chan and Lakonishok (1993); Davis and Desai (1998); Faff (2001); Granger and Silvapulle (2002)] which conclude that in bear markets high beta stocks fare worse than do the low beta stocks.[14]

[13]Shanken (1992) suggests multiplying $\hat{\sigma}^2(\hat{\lambda}_{it})^2$ by the adjustment factor $[1+(\mu_m-\hat{\lambda}_{it})^2]/\sigma_m^2$, where μ_m is mean of market return and σ_m is standard deviation of market return.

[14]Davis and Desai (1998) report the difference in average return between the lowest beta portfolio and highest beta portfolio is 11.28 percent, and beta-return is monotonic and positive. They find that difference in average return between the lowest beta portfolio and highest beta portfolio is –14.03 percent and beta return relationship is again monotonic, but negative. Grundy and Malkiel (1996) find similar results in their study for bear markets and argue that beta can still be used as measure of down-market risk.

Table 1

Average Risk Premium for Unconditional CAPM with High /Low Market

	Daily Data				Monthly Data			
	λ_H	λ_L	H_0: $\lambda_H=\lambda_L$	R^2	λ_H	λ_{0L}	H_0: $\lambda_H=\lambda_L$	R^2
1993-95	0.11	0.04	0.31*	0.31	0.01	0.03**	0.32*	0.32
	(0.32)	(1.84)			(–2.10)	(1.82)		
1996-98	–0.12	0.10	0.47*	0.47	0.02**	0.01**	0.21*	0.38
	(–0.67)	(0.24)			(2.24)	(0.37)		
1999-01	–0.01	0.02**	0.77**	0.77	–0.01	0.01	0.17**	0.36
	(–0.49)	(2-06)			(0.94)	(0.30)		
2002-04	–0.03*	0.03**	0.26*	0.36	–0.01**	0.01**	0.48*	0.38
	(–2.43)	(1.84)			(–1.86)	(1.94)		
2005-07	–0.11*	0.11	0.65***	0.65	–0.01	0.01	0.10***	0.39
	(–2.75)	(0.92)			(–3.04)	(0.87)		
1993-00	–0.01	0.01**	0.53**	0.53	–0.01	0.01	0.20**	0.38
	(–0.97)	(1.89)			(–0.57)	(0.78)		
2001-07	–0.01**	0.04	0.50*	0.50	–0.11**	0.05**	0.87*	0.40
	(–1.87)	(1.11)			(–1.88)	(1.87)		
1993-07	–0.12**	0.04**	0.57*	0.57	–0.12**	0.11**	0.89*	0.41
	(–1.87)	(1.83)			(–1.87)	(1.89)		

Note: The t-values reported in the parenthesis is error adjusted Shanken t-values. *Shows significant at 1 percent, ** is significant at 5 percent and *** is significant at 10 percent level.

With the addition of Fama and French (1993) size and book to market portfolios in the cross-section equation with high and low market betas, the premium for market beta for bull remain almost the same. However, for the bear market the risk premium becomes positive and significant for all sub-periods and the overall sample period. The premium of size of the firm is positive and significant except for period 1993-95. The book to market value remains insignificant for only two sub-periods 2005-2007 and 1993-2000 while in the rest of the periods the premium for book-to-market value is positive and significant. This suggests that the risk factors associated with high and low market returns, size and style of the firm are significantly rewarded in the market. The intercept terms are significantly different from zero. These results are consistent with other findings in literature, such as the one for the UK market by Clare, Priestly, and Thomas (1998) and for Pakistan by Iqbal and Brooks (2007).

Table 2

Average Risk Premium for Unconditional Fama French Model with High /Low Market

	λ_0	λ_H	λ_L	H_0: $\lambda_H=\lambda_L$	λ_{SMB}	λ_{HMLL}	R^2
1993-95	–0.33	–0.11	0.13**	0.27*	0.34	0.15**	0.38
	(–0.88)	(–1.13)	(1.89)		(0.88)	(0.46)	
1996-98	–0.12	–0.15	0.21**	0.43*	0.31**	0.16**	0.39
	(–0.67)	(–0.67)	(1.88)		(2.24)	(0.37)	
1999-01	–0.01	–0.12	0.12**	0.65**	0.42	0.15	0.40
	(–0.49)	(–0.88)	(1–97)		(0.94)	(0.30)	
2002-04	–0.11	–0.11*	0.12**	0.31*	0.31**	0.23**	0.38
	(–1.43)	(–2.01)	(1.89)		(1.86)	(1.94)	
2005-07	0.03	–0.22*	0.13**	0.57***	0.27	0.19	0.39
	(–2.75)	(–2.01)	(1.95)		(–3.04)	(0.87)	
1993-00	–0.01	–0.21**	0.17**	0.50**	0.31	0.15	0.39
	(–0.97)	(–1.97)	(1.89)		(–0.57)	(0.78)	
2001-07	–0.01**	–0.22**	0.14**	0.46*	0.29**	0.17**	0.41
	(–0.68)	(–1.85)	(1.93)		(1.88)	(1.85)	
1993-07	–0.02**	–0.12 *	0.13*	0.51*	0.30**	0.21**	0.42
	(–0.98)	(–2.08)	(2.06)		(1.87)	(1.89)	

Note: The t-values reported in the parenthesis is error adjusted Shanken t-values. *Shows significant at 1 percent, ** is significant at 5 percent and *** is significant at 10 percent level.

The conditional version of dual beta CAPM with EGARCH specification is tested and the results are presented in Table 3. The betas acquired from dual beta CAPM-with-EGARCH model are used to test the conditional relationship between beta and returns and the results of time series betas based on monthly data estimates are reported in Appendix Table A4. The results indicate a positive and significant relation between stock returns and market returns as shown by market β.

Table 3

Average Risk Premium for Conditional CAPM with High /Low Market

	Daily Data				Monthly Data			
	λ_H	λ_L	H_0: $\lambda_H=\lambda_L$	R^2	λ_H	λ_{0L}	H_0: $\lambda_H=\lambda_L$	R^2
1993-95	0.11	0.04	0.31*	0.31	–0.01	0.03**	0.32*	0.39
	(0.32)	(1.84)			(–2.10)	(1.82)		
1996-98	–0.12	0.10	0.47*	0.47	–0.02**	0.01**	0.21*	0.38
	(–0.67)	(0.24)			(–2.24)	(0.37)		
1999-01	–0.01	0.02**	0.77**	0.77	–0.13*	0.14	0.80**	0.39
	(–0.49)	(1–96)			(–2.57)	(0.30)		
2002-04	–0.03	0.03**	0.26*	0.36	–0.01**	0.01**	0.12**	0.40
	(–2.43)	(1.84)			(–1.86)	(1.94)		
2005-07	–0.14*	0.12	0.65***	0.48	–0.21	0.14	0.07***	0.40
	(–2.75)	(0.92)			(–3.04)	(0.87)		
1993-00	–0.14*	0.11	0.12**	0.49	–0.12	0.13	0.20**	0.41
	(–2.01)	(0.34)			(–0.57)	(0.78)		
2001-07	–0.13**	0.13***	0.14**	0.50	–0.14**	0.12**	0.76*	0.41
	(–2.84)	(1.74)			(–1.83)	(1.93)		
1993-07	–0.15**	0.14***	0.13*	0.53	–0.13**	0.14**	0.89*	0.42
	(–2.82)	(1.76)			(–1.94)	(1.93)		

Note: The t-values reported in the parenthesis is error adjusted Shanken t-values. The * shows significant at 1 percent, ** is significant at 5 percent and *** is significant at 10 percent level.

The asymmetric effect of positive and negative shock is measured by γ_t. If the coefficient is not equal to zero it would imply that the impact of negative and positive shocks is asymmetric. This coefficient is significant for 38 stocks with daily data, and for 24 stocks with monthly data. It is confirmed that good and bad news have asymmetric effect on volatility. Out of 38 significant parameters, 24 are negative (out of 24 cases 19 are negative with monthly data). This implies that volatility tends to fall in more cases when return surprises are negative, that is, when they come as bad news. For the remaining stocks γ_t is positive indicating that negative shocks cause more volatility than positive shocks. Ahmad and Qasim (2004) come up with the same conclusion using sector indices for the Pakistani market. The results of conditional CAPM and conditional Fama and French three-factor model extended for two-beta CAPM equation as the mean equation along with EGARCH specification are reported in the Appendix Table A5 and A6. Two market conditions are allowed to affect the conditional mean and variance of market return through the nonlinear threshold regime switching model. The results show that there is statistically significant difference in beta in high and low market conditions which suggests that the betas are significantly affected by high and low market conditions. In the variance equation the additional effect of negative effect on variance compared to positive effect is measured by γ_t. The results reveal that this coefficient is significant in 32 cases based on CAPM model and 36 cases based on Fama and French model. Out of 32 significant parameters, 16 are negative and out of 36 cases 25 are negative, which implies that variance tends to fall when return surprises are negative. In other words negative shocks cause the same volatility as the positive shocks. The coefficient for remaining cases is positive, indicating that in these firms negative shock causes more change in variance than positive shocks. The magnitude of coefficients however, shows that the incidence of asymmetry though significant is not very large. These results provide support for the theoretical proposition that negative shocks cause greater volatility than positive shocks. The parameters of sensitivity to firm attribute suggested by Fama and French (size, and book-to-market value), that is β_{SMB} and β_{HML} reported in Table A6 have shown a mixed relationship. The effect of increase in size of the firm and book-to-market value on asset return is not consistent as indicated by the estimated values of β_{SMB} and β_{HML}, but for most of the firms it is positive, while only for a few firms these factor loadings are negative.

After estimating two conditional betas for each stock corresponding to bull and bear market conditions, using the dual-beta-with-EGARCH models, the cross-section regressions are estimated with these betas to estimate the premium. The results of testing the conditional single factor CAPM with EGARCH specification are given in Table 3. The results show that there is positive and significant compensation on an average to bear conditional market risk in the period 1999-2001, 2002-2004, 1993-2000, 2001-2007 and in overall sample period 1993-2007. The intercept terms λ_0 are not significantly different from zero in most of the sub-periods. These results support the Sharpe-Lintner model when symmetry of beta is taken into account in the model. The results of cross-sectional regression using two-betas with Fama and French (1993) variables are reported in Table 4. The risk premium for high market conditions has the correct sign, negative in all sub-periods and is significantly different from zero in sub-periods 1993-1995, 1996-1998, 1999-2001, 2005-2007, 2001-2007 and the overall period 1993-2007. For low market conditions the risk premium is positive but significant in 1993-1995 and 1999-2001,

Table 4

Average Risk Premium for Conditional Fama French Model with High /Low Market

	λ_0	λ_H	λ_L	H_0: $\lambda_H=\lambda_L$	Λ_{SMB}	Λ_{HMLL}	R^2
1993-95	–0.33	–0.17	0.15*	0.27*	0.67**	0.53**	0.41
	(–0.88)	(–1.32)	(2.01)		(1.98)	(1.90)	
1996-98	–0.12	–0.24	0.19*	0.33*	0.31**	0.42**	0.40
	(–0.67)	(–1.67)	(2.24)		(1.88)	(1.92)	
1999-01	0.02	–0.23*	0.22***	0.25**	0.42	0.15*	0.41
	(0.92)	(–2.25)	(1.98)		(0.94)	(2.30)	
2002-04	–0.03	–0.27*	0.15**	0.29*	0.65**	0.52**	0.40
	(–2.43)	(–2.43)	(1.97)		(1.96)	(2.24)	
2005-07	0.03	–0.24*	0.21	0.52***	0.40*	0.70	0.43
	(–2.75)	(–2.75)	(0.92)		(3.04)	(0.87)	
1993-00	–0.01	–0.18	0.14**	0.47**	0.94*	0.71**	0.44
	(–0.97)	(–1.03)	(1.89)		(2.42)	(1.98)	
2001-07	–0.01**	–0.12**	0.15	0.43*	0.53**	0.80**	0.44
	(–0.68)	(–1.85)	(1.83)		(1.88)	(1.85)	
1993-07	–0.01**	–0.21**	0.17**	0.41*	0.73*	0.84**	0.45
	(–0.98)	(–1.98)	(1.95)		(2.07)	(2.09)	

Note: The t-values reported in the parenthesis is error adjusted Shanken t-values. The * shows significant at 1 percent, ** is significant at 5 percent and *** is significant at 10 percent level.

2005-2007, 2001-2007 and the overall period 1993-2007. In the other sub period the risk premium corresponding to up market is negative and for down market it is positive which supports the theoretical proposition and empirical findings. These results are consistent with the findings of Davis and Desai (1998) which show that if the relationship beta and returns are positive in bull market and bear market combined, it does not show up in aggregate unless the positive relationship is strong.

The results of dual-beta Fama and French model with EGARCH (1,1) are presented in Table 4. The risk premium for high market conditions is negative in all sub-periods and for down market it is positive which supports the theoretical proposition and empirical findings. When the dual beta CAPM is augmented by the size and style variables, the market risk premium for both high and low become positive and negative respectively for almost all sub-periods and overall sample period. The book-to-market value is positively and significantly priced except the sub-period 2005-2007. The premium of size of the firm is positive for 1993-95, 1996-98, 2002-04, 2001-2007 and 1993-2007. These results indicate that the conditional Fama and French (1993) model shows improvement in explaining the cross-section variation in the expected returns. These results are consistent with the ones obtained in a series of papers for US market by Fama and French (1992, 1993, 1995, 1997, 2004), which suggest that these variables have some role in explaining cross-section of expected return and these variables outperform the market returns. Similarly Chan, Hamao, and Lakonishol (1991) find a strong relationship between book-to-market value and average return in Japanese market, while Capual, Rowley, and Sharpe (1993) observe a similar effect that is book-to-market value effect in four European stock markets. Likewise Fama and French (1998) find that the price ratios produce the same results for twelve major emerging markets. Grundy and Malkiel (1996) and Davis and Dasai (1998), Kim and Zumwait (1979) document that downside risk may be a more appropriate measure of portfolio risk than the conventional single beta. Pettengill, *et al.* (1995) using the dual-beta framework find consistent and

significant relationship between beta and return and positive payment for beta risk. For Australian resource and industrial sector, Faff (2001) finds contrary evidence that success of the model does not depend on a beta instability argument. Granger and Silvapulle (2003) find that for bull, bear and usual market conditions the risk premium is positive and significant for usual market condition while for extreme market conditions these are insignificant. Davis and Desai (1998) comparing the analysis of beta-return and return-firm size relationship across bull, bear and flat market conditions find that beta is a superior measure of down-market risk, while firm size is positive in flat market. Iqbal and Brooks (2007) also confirm that Fama and French three-factor model performs better than the higher moments CAPM model.

To sum up, it can be argued that the overall positive risk-return relationship could occur if the relationship is stronger in bear market than in bull market. However this is not the case in Pakistan where the relationship is marginally stronger in bull market than in the bear market.[15] Davis and Desai (1998) find that if the relationship beta and return is positive in bull market and bear market combined, it does not show up in aggregate like Fama and French (1992, 1993) because the beta-return relationship in the flat market is opposite to extreme market conditions: high beta stocks have lower return than low beta stocks. Based on these results one can say the dual-beta Fama and French three factor model performed very well in the conditional context compared to dual-beta conditional CAPM model.

5. CONCLUSION

The beta dynamics is investigated by asymmetric response of beta to bullish and bearish market environment applying the dual beta CAPM and dual beta Fama and French three factor model on the 50 stocks traded in Karachi Stock Exchange during 1993-2007. There is evidence of beta instability when its randomness is investigated. Comparing it in the high and low market conditions the results show that beta is higher in most of the cases in the bullish market than in the bearish market. These results are in accordance with the widely held view that betas increase (decrease) when the market is bullish (bearish). The Wald test pair-wise equality of up and down market betas is rejected. These findings suggest that there is difference in up and down market beta across stocks. These findings show that risk premium corresponding to up market is negative and the beta pricing parameter for down market is positive in all cases. However, these pricing parameters are significant in a few sub-periods. The dual beta CAPM is extended with Fama and French (1993) variables, size and book-to-market value, in unconditional and conditional settings. The conditional Fama and French (1993) model shows improvement in explaining the cross-section variation in the expected returns. The findings however suggest that investors receive a positive premium for accepting down-side risk, while a negative premium is associated with up-market beta, which is in accordance with theoretical proposition. It is observed that the dynamic size and style coefficient explains the cross-section of expected returns in almost all sub-periods and in the overall sample period. The results suggest that in case of Pakistani market when news asymmetry is taken into account to explain the relationship in terms of

[15]Davis and Desai (1998) findings show that when they combine both bull and bear market, the beta return relationship is slightly positive and their result shows that the difference between the lowest beta portfolio and the highest beta portfolio is 2.23 percent and the relationship is positive and monotonic.

beta and returns, the conditional Fama and French three factor model performs better than the conditional CAPM for comparing unconditional Fama and French three factor model and unconditional dual-beta CAPM.

Appendices

Appendix Table A1

List of Companies Included in the Sample

Name of Company	Symbol	Sector
Al-Abbas Sugar	AABS	Sugar and Allied
Askari Commercial Bank	ACBL	Insurance and Finance
Al-Ghazi Tractors	AGTL	Auto and Allied
Adamjee Insurance Company	AICL	Insurance
Ansari Sugar	ANSS	Sugar and Allied
Askari Leasing	ASKL	Leasing Company
Bal Wheels	BWHL	Auto and Allied
Cherat Cement	CHCC	Cement
Crescent Textile Mills	CRTM	Textile Composite
Crescent Steel	CSAP	Engineering
Comm. Union Life Assurance	CULA	Insurance and Finance
Dadabhoy Cement	DBYC	Cement
Dhan Fibres	DHAN	Synthetic and Rayon
Dewan Salman Fibre	DSFL	Synthetic and Rayon
Dewan Textile	DWTM	Textile Composite
Engro Chemical Pakistan	ENGRO	Chemicals and Pharmaceuticals
Faisal Spinning.	FASM	Textile Spinning
FFCL Jordan	FFCJ	Chemicals and Pharmaceuticals
Fauji Fertiliser	FFCL	Fertiliser
Fateh Textile	FTHM	Textile Composite
General Tyre and Rubber Co.	GTYR	Auto and Allied
Gul Ahmed Textile	GULT	Textile Composite
Habib Arkady Sugar	HAAL	Sugar and Allied
Hub Power Co.	HUBC	Power Generation & Distribution
I.C.I. Pak	ICI	Chemicals and Pharmaceuticals
Indus Motors	INDU	Auto and Allied
J.D.W. Sugar	JDWS	Sugar and Allied
Japan Power	JPPO	Power Generation & Distribution
Karachi Electric Supply Co.	KESC	Power Generation & Distribution
Lever Brothers Pakistan	LEVER	Food and Allied
Lucky Cement	LUCK	Cement
Muslim Commercial Bank	MCB	Commercial Banks
Maple Leaf Cement	MPLC	Cement
National Refinery	NATR	Fuel and Energy
Nestle Milk Pak Ltd	NESTLE	Food and Allied
Packages Ltd.	PACK	Paper and Board
Pak Electron	PAEL	Cables and Electric Goods
Pakistan Tobacco Company	PAKT	Tobacco
Pakland Cement	PKCL	Cement
Pakistan State Oil Company.	PSOC	Fuel and Energy
PTCL (A)	PTC	Fuel and Energy
Southern Electric	SELP	Cables and Electric Goods
ICP SEMF Modarba	SEMF	Modarba
Sitara Chemical	SITC	Chemicals and Pharmaceuticals
Sui Southern Gas Company	SNGC	Fuel and Energy
Sui Northern Gas Company	SSGC	Fuel and Energy
Tri-Star Polyester Ltd	TSPI	Synthetic and Rayon
Tri-Star Shipping Lines	TSSL	Transport and Communication
Unicap Modarba	UNIM	Modarba

Table A2

Summary Statistics of Daily Stock Returns

Company	No. of Obs.	Mean	St. Dev.	Skewness	Excess Kurtosis	Jarque-Bera
AABS	1990	0.13**	3.57*	0.65*	4.54*	1849.67*
ACBL	2697	0.10***	2.81*	–0.02	8.62*	8342.60*
AGTL	2094	0.21*	3.15*	0.40	11.48*	11556.03*
AICL	2681	0.08	3.54*	0.02	8.25*	7604.82*
ANSS	1544	0.00	7.75*	–0.61	11.34*	8364.52*
ASKL	2426	0.09	3.46*	0.22	8.32*	7016.92*
BWHL	1644	–0.01	4.61*	0.31	7.29*	3665.67*
CHCC	2491	0.07	3.42*	0.36**	4.36*	2023.86*
CRTM	2149	0.07	4.36*	0.20	11.14*	11127.45*
CSAP	1829	0.12	4.44*	0.49	12.77*	12504.90*
CULA	1664	0.06	4.31*	0.34	6.07*	2528.65*
DBYC	2166	0.00	6.57*	0.45	16.36*	24229.89*
DHAN	1489	–0.05	4.34*	1.37*	9.23*	5749.70*
DSFL	2707	0.02	3.25*	0.48**	4.85*	2753.04*
DWTM	385	–0.02	4.90*	0.68	11.43*	2125.84
ENGRO	2660	0.08	2.63*	0.11	8.55*	8107.69*
FASM	1405	0.18	2.96*	–1.28	23.45*	32574.22*
FFCJ	2080	0.03	3.26*	0.62**	7.23*	4656.48*
FFCL	2704	0.08	2.29*	–0.24	5.54*	3479.76*
FTHM	239	0.50	8.33*	0.39	5.63*	321.46*
GTYR	2192	0.08	3.51*	1.40*	13.89*	18339.20*
GULT	587	0.26	5.96*	0.43*	10.28*	2601.98*
HAAL	1863	0.20**	3.81*	0.45*	3.77*	1167.39*
HUBC	2380	0.08	3.13*	–0.81	17.86**	31877.97*
ICI	2667	0.03	2.90*	0.34	4.32*	2128.42*
INDU	2659	0.06	3.13*	0.59***	4.41*	2307.69*
JDWS	1716	0.14	5.74*	0.25*	8.01*	4607.77*
JPPO	1944	–0.02	4.10*	0.94*	8.13*	5637.21*
KESC	2702	–0.02	3.97*	0.69*	6.52*	5002.83*
LEVER	2429	0.06	2.35*	0.51**	8.54*	7491.23*
LUCK	2310	0.04	4.13*	0.47**	6.31*	3914.20*
MCB	2714	0.08	3.20*	–0.07	4.76*	2567.14*
MPLC	2430	–0.04	4.18*	0.54	3.75*	1540.80*
NATR	2391	0.09	3.19*	0.47***	6.14*	3850.41*
NESTLE	986	0.26**	4.18*	0.14	7.44*	2279.29*
PACK	1856	0.09	3.20*	–0.43	10.24*	8169.93*
PAEL	1933	0.02	5.79*	0.42	19.20*	29760.13*
PAKT	1862	0.01	3.97*	–0.02	9.26*	6654.47*
PKCL	1776	0.02	4.53*	0.21	5.57*	2307.90*
PSOC	2713	0.11***	2.71*	–0.28	11.19**	14189.96*
PTC	2402	0.03	2.80*	0.08	7.35*	5415.82*
SELP	2024	0.01	3.92*	–0.47	43.68*	161003.70*
SEMF	2598	0.10	3.14***	0.91***	9.67***	10486.12*
SITC	1807	0.09	3.24*	0.38	11.33*	9708.85*
SNGP	2711	0.08	3.13*	0.29	4.59*	2418.05*
SSGC	2706	0.05	3.25*	0.56	10.77*	13220.94*
TSPI	1833	–0.05	11.32*	0.12	7.71*	4542.77*
TSSL	1304	–0.11	8.79*	–0.34	18.43*	18478.51*
UNIM	1999	–0.04	10.35*	0.54	16.61*	23068.60*

Note: *Indicates significant at 1 percent, ** at 5 percent and *** is at 10 percent.

Table A3

Market Sensitivity for High and Low Market

	β_H	β_L	H_0: $\beta_H=\beta_L$	R^2	β_H	β_L	H_0: $\beta_H=\beta_L$	R^2
AABS	0.35*	38*	83*	03	0-31**	0.75	0.75	0.61
ACBL	0.96*	0.99*	0.51*	0.35	1.24*	0.99*	0.60*	0.59
AGTL	0.54*	0.37*	0.11*	0.06	0.94*	0.51*	0.03	0.64
AICL	0.96*	0.99*	0.51*	0.35	1.24*	0.99*	0.60*	0.64
ANSS	0.41**	0.79*	0.36*	0.01	1.26*	0.47*	0.36*	0.63
ASKL	0.76*	0.78*	0.90*	0.25	1.15*	0.93*	0.95*	0.67
BWHL	0.50*	0.90*	0.06***	0.26	0.43	0.23**	0.71*	0.61
CHCC	0.87*	0.84*	0.76*	0.17	1.26*	0.97*	0.19**	0.59
CRTM	0.63*	1.00*	0.02	0.19	1.56*	0.96*	0.05	0.62
CSAP	0.75*	0.68*	0.74*	0.26	0.69*	0.66*	0.001	0.63
CULA	0.66*	0.63*	0.89*	0.27	1.25*	0.38*	0.93*	0.63
DBYC	0.96*	1.51*	0.03	0.19	1.93*	1.18*	0.18**	0.68
DHAN	0.95*	0.69*	0..10*	0.23	0.70*	0.90*	0.49*	0.62
DSFL	1.21*	1.18*	0.72*	0.38	1.40*	1.33*	0.15**	0.66
DWTM	0.31	0.70*	0.47*	0.02	0.02	0.16*	0.60***	0.65
ENGR	0.81*	0.91*	0.19*	0.27	0.57*	0.78*	0.91*	0.66
FASM	0.31**	0.73*	0.16*	0.22	1.00*	0.63*	0.47*	0.66
FFCJ	1.16*	1.14*	0.76*	0.4	0.07	–0.03	0.79*	0.58
FFCL	0.88*	0.85*	0.63*	0.41	0.73*	0.82*	0.67*	0.62
GTYR	0.51*	0.70*	0.10*	0.29	0.66**	0.71*	0.89*	0.67
GULT	0.23	0.38***	0.731	0.01	–0.25	0.14	0.30*	0.62
HAAL	0.30*	0.61*	0.02	0.05	0.73*	0.56*	0.61*	0.67
HUBC	1.21*	1.37*	0.01	0.54	0.63*	1.32*	0.01	0.59
ICI	1.18*	1.09*	0.26*	0.41	0.91*	1.38*	0.08**	0.62
ICPS	1.09*	0.93*	0.10*	0.3	1.47*	1.05*	0.143**	0.59
INDU	0.803*	0.74*	0.49*	0.2 7	1.27*	0.89*	0.19**	0.62
JDWS	0.46*	0.17**	0.23*	0.21	0.92	0.41*	0.26*	0.67
JPPO	1.43*	1.24*	0.11*	0.35	1.71*	0.89*	0.01	0.59
KESC	1.51*	1.33*	0.06**	0.37	1.53*	1.63*	0.75*	0.64
LEVER	0.48*	0.50*	0.78*	0.23	0.29**	0.55*	0.20*	0.63
LUCK	1.19*	1.21*	0.87*	0.22	1.42*	1.13*	0.34*	0.59
MCB	1.14*	1.21*	0.38*	0.39	1.39*	1.23*	0.51*	0.65
MPLC	1.29*	1.14*	0.21*	0.25	1.74*	1.15*	0.11*	0.64
NATR	0.80*	0.78*	0.85*	0.27	1.05*	0.83*	0.47*	0.65
NESTE	0.47*	0.62*	0.53*	0.24	–0.09	–0.02	0.79*	0.62
PACK	0.49*	0.55*	0.61*	0.27	0.64*	0.68	0.86*	0.65
PAEL	0.93*	0.79*	0.53*	0.26	1.99*	0.68*	0.04	0.63
PAKT	0.46*	0.85*	0.03	0.26	1.61*	0.51*	0.02	0.62
PKCL	0.81*	0.90*	0.577*	0.1	0.17	0.84*	0.18**	0.64
PTC	1.09*	1.14*	0.41*	0.49	0.85*	1.38*	0.02	0.71
PSO	1.40*	1.30*	0.06**	0.72	0.74*	1.13*	0.03	0.69
SELP	1.28*	1.28*	0.95*	0.35	0.87*	0.91*	0.92*	0.63
SITC	0.57*	0.39*	0.16**	0.16	0.76*	0.54*	0.34*	0.63
SNGP	1.23*	1.27	0.611*	0.46	1.42*	1.36*	0.07**	0.71
SSGC	1.23*	1.16*	0.41*	0.39	1.42*	1.23*	0.37*	0.71
TSPI	0.4	1.03*	0.20*	0.21	1.23*	0.75*	0.46*	0.62
TSSl	0.22	0.67*	0.28*.	0.21	0.35	0.39*	0.94*	0.64
UNIM	0.78*	1.04*	0.52*	0.22	1.11*	0.81*	0.66*	0.69

Note: *Indicates significant at 1 percent, ** at 5 percent and *** is at 10 percent.

Table A4

CAPM-with EGARCH Specification Based on Monthly Data

	α	β	γ_0	δ	γ_i	μ_i	R^2
AABS	0.02*	0.22*	–2.76*	–0.35**	0.55*	0.32*	0.57
ACBL	0.02*	1.03*	–0.33	0.07	–0.12*	0.94*	0.54
AGTL	0.02*	0.72*	–8.47*	0.41*	–0.05**	–0.92**	0.62
AICL	0.03*	1.42*	–2.50**	0.54*	–0.14	0.46***	0.71
ANSS	–0.01	0.39*	–1.82*	0.54*	0.17***	0.63*	0.69
ASKL	0.01	0.91*	–5.09**	0.49**	–0.11	–0.11	0.67
BWHL	–0.01	0.19**	–0.56*	0.21*	–0.14**	0.89*	0.63
CHCC	0.02*	0.98*	–6.89*	0.58*	–0.22***	–0.36***	0.69
CRTM	0.01	0.96*	–5.09	0.27	0.11	–0.15	0.70
CSAP	0.02***	0.60*	–7.59*	–0.14	–0.16***	–0.80*	0.73
CULA	0.02	0.001	–0.35*	0.17*	0.07	0.94*	0.71
DBYC	0.01	1.44*	0.05	–0.13*	–0.04	0.99*	0.66
DHAN	–0.01	0.93*	–3.60**	–0.27**	0.12	0.08	0.62
DSFL	0.01	1.37*	–4.93***	0.20	0.05	–0.11	0.66
DWTM	0.03	0.001	–1.98*	0.52*	–0.09	0.70*	0.70
ENGRO	0.01***	0.79*	–5.30	0.18	–0.10	–0.13	0.75
FASM	0.01	0.62*	–0.09*	–0.09*	–0.11*	0.96	0.65
FFCJ	0.001	0.004	–1.12*	0.50*	–0.10	0.82*	0.65
FFCL	0.01**	0.75*	–0.67	0.19**	–0.10**	0.90**	0.62
GTYR	0.02*	0.55*	–7.17*	1.03*	–0.08	–0.58*	0.66
GULT	0.01	0.14*	–1.50*	0.70*	–0.20***	0.75*	0.62
HAAL	0.01	0.49*	–1.11*	0.41*	0.08	0.81*	0.76
HUBC	0.02*	1.11*	–7.57*	0.26	–0.46*	–0.55*	0.56
ICI	0.002	1.29*	–3.79**	0.29	–0.08	0.23	0.61
ICPSEMF	0.02*	1.31*	–3.07*	0.80*	–0.34*	0.47*	0.67
INDU	0.01	0.88*	–6.07*	0.003	0.34*	–0.34	0.71
JDWS	0.01	0.27*	–5.83*	0.62*	0.16***	–0.47*	0.71
JPPO	0.01	0.91*	–1.51*	0.56*	0.01	0.74*	0.65
KESC	0.01	1.57*	–0.79	0.17**	–0.12**	0.85*	0.64
LEVER	0.01	0.47*	–2.46*	0.74*	–0.46*	0.64*	0.69
LUCK	0.01	1.18*	–6.71*	0.18	0.05	–0.50	0.69
MCB	0.01**	1.23*	–8.42*	0.18	0.24*	–0.69*	0.65
MPLC	0.002	1.26*	–3.98*	0.54**	0.11	0.10	0.63
NATR	0.02	1.05*	–2.77*	0.35**	–0.10	0.43**	0.63
NESTLE	0.03	0.002	–0.773	0.513	–0.243	0.893	0.69
PACK	0.01	0.67*	–7.63*	0.40*	–0.31*	–0.47*	0.65
PAEL	–0.01	0.81*	–3.87*	0.19**	–0.24*	–0.03	0.68
PAKT	0.01	0.701	–1.421	0.531	0.261	0.751	0.67
PKCL	0.00	0.78*	–5.78*	0.18	–0.03	–0.67***	0.63
PSO	0.03*	1.22*	–3.46**	0.12	–0.34*	0.33	0.68
PTC	0.01	1.19*	–2.21*	0.81*	0.10	0.71*	0.68
SELP	0.02*	0.003	–0.01	–0.34*	–0.68*	0.95*	0.64
SITC	0.02	0.67*	–0.03	–0.18*	–0.26*	0.96*	0.67
SNGP	0.01*	1.25*	–9.58*	0.28*	0.17*	–0.87*	0.70
SSGC	0.01***	1.28*	–0.78*	0.21*	0.07	0.88*	0.70
TSPI	–0.02	0.95*	–1.37*	0.49*	0.08	0.66*	0.88
TSSl	–0.03*	0.58*	0.08	–0.16*	–0.03	0.98*	0.73
UNIM	0.01	0.73*	–0.60	0.04	0.14**	0.79*	0.88

*Note:**Indicates significant at 1 percent, ** at 5 percent and *** is at 10 percent.

Table A5

CAPM in Bull and Bear Market with EGARCH Specification Based on Monthly Data

	β_H	β_L	H_0: $\beta_H=\beta_L$	h_0	δ_i	γ_i	μ_i	θ_H	θ_L	H_0:$\theta_H=\theta_L$	R^2
AABS	0.48*	0.31*	0.11*	–4.49*	0.51*	0.01	0.39	2.17^	1.07*	0.03	0.63
ACBL	0.93*	0.91*	0.95*	–2.47*	0.41*	–0.14	0.73*	1.28*	2.94*	0.01	0.65
AGTL	0.42*	0.49*	0.49*	–2.71*	0.55*	0.07*	0.69*	1.42*	1.80*	0.42*	0.66
AICL	0.82*	1.09*	0.001	–0.40*	0.28*	–0.03*	0.97*	–0.26*	0.67*	0.01	0.64
ANSS	0.68*	0.70*	0.92*	–0.18*	0.15*	–0.04*	0.99*	2.98*	–0.56*	0.01	0.61
ASKL	0.65*	0.64*	0.95*	–2.78*	0.53*	0.01	0.67*	1.46*	3.17*	0.01	0.55
BWHL	0.45*	0.76*	0.11*	–0.26*	0.18*	–0.03*	0.98*	1.37*	0.41*	0.02	0.66
CHCC	0.95*	0.82*	0.16*	–1.35*	0.34*	0.02	0.85*	1.79*	0.59*	0.01	0.57
CRTM	0.78*	0.89*	0.47*	–0.72*	0.21*	0.01	0.92*	1.51*	0.30**	0.01	0.59
CSAP	0.72*	0.50*	0.10*	–0.55*	0.31*	–0.05*	0.95*	2.01*	–0.18	0.01	0.56
CULA	0.001	0.07*	0.04	–0.50*	0.41*	–0.03*	0.97*	0.58*	0.22*	0.13*	0.61
DBYC	1.41*	1.24*	0.38*	–1.02*	0.37*	–0.05*	0.88*	2.76*	1.42*	0.01	0.68
DHAN	1.03*	0.78*	0.11*	–1.43*	0.31*	0.03*	0.83*	3.59*	0.61*	0.02	0.63
DSFL	1.19*	1.34*	0.03	–1.01*	0.28*	0.05*	0.90*	1.47	0.68*	0.01	0.58
DWTM	0.43	0.44*	0.99*	–0.55*	0.09*	0.15*	0.94*	7.50*	2.79*	0.01	0.62
ENGR	0.96*	0.88*	0.15*	–4.80*	0.91*	0.01	0.45*	3.09*	1.66*	0.01	0.66
FASM	0.28*	0.77*	0.03	–0.96*	0.43*	0.01	0.90*	1.61*	5.94*	0.02	0.62
FFCJ	1.17*	1.04*	0.13*	–2.29*	0.41*	–0.06*	0.74*	1.91*	0.71*	0.01	0.64
FFCL	0.86*	0.83*	0.57*	–1.45*	0.19*	0.01	0.84*	1.05*	1.69	0.10*	0.61
GTYR	0.58*	0.71*	0.19*	–1.61*	0.43*	0.05*	0.82*	2.16*	0.63**	0.002	0.59
GULT	0.52*	0.72*	0.52*	–0.38*	0.24*	0.07*	0.96*	1.00*	0.32	0.22*	0.61
HAAL	0.45*	0.43*	0.92*	–1.37*	0.32*	0.01	0.83*	–0.24	1.17	0.03	0.64
HUBC	1.17*	1.07*	0.070*	–1.42*	0.34*	–0.03*	0.86*	1.97*	2.11*	0.09*	0.52
ICI	1.14*	1.10*	0.61*	–1.95*	0.35*	–0.10*	0.78*	2	1.19*	0.02	0.61
ICPS	1.11*	1.02*	0.17*	–2.33*	0.49*	–0.05*	0.74*	2.81*	1.99*	0.10*	0.53
INDU	0.86*	0.78*	0.38*	–0.70*	0.17*	0.02*	0.92*	1.15	0.46	0.001	0.57
JDWS	0.41*	0.25*	0.34*	–0.81*	0.38*	0.06*	0.91*	1.57*	0.99*	0.11*	0.51
JPPO	1.18*	1.28*	0.36*	–1.50*	0.33*	0.02	0.82*	1.92*	0.65*	0.02	0.55
KESC	1.46*	1.34*	0.23*	–1.24*	0.25*	–0.01	0.86*	2.18*	1.04	0.03	0.57
LEVE	0.41*	0.38*	0.65*	–1.71*	0.41*	–0.04*	0.82*	1.82	1.27*	0.21*	0.53
LUCK	1.17*	1.48*	0.003	–0.64*	0.26*	–0.04*	0.94*	0.49*	1.41*	0.002	0.61
MCB	1.13*	1.18*	053*	–1.97*	0.29*	0.07*	0.77*	1.02*	1.50*	0.30*	0.69
MPLC	1.38*	1.24*	0.26*	–1.86*	0.26*	0.04	0.76*	2.49*	1.07*	0.001	0.64
NATR	0.86*	0.74*	0.22*	–1.18*	0.27*	0.03*	0.87*	2.34*	1.28*	0.003	0.67
NESTE	0.33*	0.18*	0.27*	–0.61*	0.38*	0.01	0.95*	0.19	0.54	0.57*	0.63
PACK	0.44*	0.47*	0.727*	–0.72*	0.27*	–0.01	0.93*	0.44*	1.76*	0.01	0.67
PAEL	0.68*	0.70*	0.82*	–0.47*	0.39*	–0.06*	0.97*	0.85*	0.29	0.09**	0.65
PAKT	0.47*	0.65*	0.18*	–0.52*	0.29*	0.01	0.96*	0.33	1.13*	0.021	0.66
PKCL	0.89*	0.64*	0.10*	–0.91*	0.38*	–0.04*	0.91*	1.23*	0.65*	0.23*	0.63
PTC	1.29*	1.23*	0.15*	–1.58*	0.40*	0.03*	0.86*	1.93*	2.09*	0.59	0.71
SELP	1.03*	1.16*	0.12	–0.51*	0.19*	–0.07*	0.95*	0.50*	1.09*	0.01	0.64
SITC	0.42*	0.44*	0.89*	–0.48*	0.32*	0.01	0.96*	0.59	0.16	0.29*	0.65
SNGP	1.24*	1.27*	0.62*	–1.93*	0.32*	0.02*	0.79*	2.41*	1.97	0.19*	0.66
SSGC	1.22*	1.21*	0.05	–1.81*	0.36*	–0.02*	0.80*	2.87	1.27*	0.002	0.69
TSPI	1.03*	1.61*	0.09**	–0.38*	0.25*	–0.06*	0.96*	1.07*	0.95*	0.76*	0.62
TSSl	0.75*	0.78*	0.94*	–0.04*	0.02*	–0.05*	0.99*	1.23*	–0.16*	0.01	0.69
UNIM	1.55*	1.23*	0.28	–0.11*	0.12*	0	0.99*	0.37*	–0.23*	0.001	0.71

Note: *Indicates significant at 1 percent, ** at 5 percent and *** is at 10 percent.

Table A6

Fama French Three Factor Model in Bull and Bear Market with EGARCH Specification Based on Monthly Data

	β_H	β_L	β_{SMB}	B_{HML}	H_0: $\beta_H=\beta_L$	h_0	δ_i	γ_i	μ_i	θ_H	θ_L	H_0:$\theta_H=\theta_L$	R^2
AABS	0.65*	0.17*	0.29	0.56	0.40*	–2.83*	0.33*	0.51*	0.28*	–1.42*	15.4*	0.18*	0.63
ACBL	0.99*	1.11*	0.12*	0.22*	0.24*	–6.18*	–0.07	–0.13	–0.31	37.41	–23.50*	0.22	0.54
AGTL	0.87*	0.39*	0.36	0.39	0.34*	–8.32*	0.94*	–0.02	–0.76*	1.84	13.51*	0.42*	0.56
AICL	1.86*	1.32*	0.30	0.17	0.49*	(–2.34)	0.54*	–0.22**	0.52**	24.76	0.95	0.87*	0.55
ANSS	1.95*	0.46*	0.56	0.20	0.32*	(–5.14)	0.60*	0.27*	–0.14	71.03	10.86	0.54*	0.63
ASKL	1.22*	0.86*	0.80	0.59	0.88*	(–5.53)	0.53**	–0.07	–0.18	28.7	4.24	0.61*	0.71
BWHL	0.53*	0.48*	0.10	0.64	0.93*	–5.79*	0.04	0.15	–0.40*	–18.34*	29.04*	0.61*	0.70
CHCC	1.45*	0.94*	0.38	0.11	0.12**	–0.68*	–0.64*	–0.19*	0.78*	–19.76*	17.43*	0.14**	0.69
CRTM	1.66*	0.90*	0.24	0.80	0.05	–0.49	0.03	0.12	0.85	–22.49	–14.80*	0.01	0.62
CSAP	0.66*	0.69*	0.17	0.13	0.003	–3.96**	–0.28**	–0.06	0.03	–11.14	6.9	0.21**	0.73
CULA	0.02	0.40*	0.3	0.14	0.61*	–6.49*	–0.86	–0.25*	–0.15	21.22*	17.36*	0.78*	0.68
DBYC	2.04*	1.20*	0.39	0.90	0.25*	–1.16	0.18	0.08	0.74*	–3.35	8.54	0.31*	0.62
DHAN	0.49*	0.73*	0.023	0.033	0.98*	–9.08*	0.54*	0.37*	–0.79*	10.76	18.44*	0.74*	0.56
DSFL	1.50*	1.40*	0.004	0.003	0.15**	–4.27*	0.27**	0.04	0.1	7.75	17.02*	0.13	0.67
DWTM	0	0.02*	0.041	0.025	0.49*	–1.36*	0.36*	–0.09	0.77*	–38.53*	–20.77*	0.01	0.62
ENGRO	0.90*	0.96*	0.11	–0.06*	0.96*	–0.56*	–0.38*	–0.04	0.87*	13.42*	17.16*	0.11*	0.67
FASM	1.07*	0.71*	0.040	0.036	0.03	–0.11	–0.33*	–0.13	0.91*	–11.54*	3.38***	0.23**	0.64
FFCJ	0.56	0.18*	0.21*	0.34	0.99*	–0.53*	0.25**	–0.15*	0.92*	–4.28	1.81	0.57*	0.69
FFCL	0.71*	0.80*	0.001	–0.008	0.67*	–1.5	–0.01	–0.11	0.74*	0.4	13.39**	0.33*	0.62
GTYR	0.28*	0.56*	0.041	–0.020	0.20**	–7.21*	1.11*	–0.13*	–0.56*	–10.22	–0.77	0.78*	0.64
GULT	–0.03	0.05	0.24	0.41	0.81*	–3.52*	0.38*	–0.79**	0.33*	72.29*	40.33*	0.10**	0.63
HAAL	0.63*	0.49*	0.28	0.45	0.56*	–0.64**	0.30**	–0.04	0.85*	–27.9**	–21.9**	0.72*	0.69
HUBC	0.35	0.92*	0.30	0.61	0.07**	–3.87*	–0.13	–0.03	0.32	81.68*	57.69*	0.48*	0.63
ICI	0.81*	1.38*	0.31	0.25	0.04	–1.01*	–0.07	0.02	0.78*	–36.1**	9.65***	0.03	0.63
ICPS	1.56*	1.29*	0.015	–0.030	0.32*	–3.14*	0.82*	–0.33*	0.49*	35.43	7.67	0.30*	0.71
INDU	0.94*	0.83*	0.39	0.43	0.41*	–5.60*	–0.06	0.40*	–0.26	(–47.2)	8.18	0.001	0.72
JDWS	0.68*	0.06*	0.36	0.14	0.04	–7.52*	0.85*	0.07	–0.73	2.53	–20.20*	0.41*	0.74
JPPO	1.71	0.002	0.28	0.13	0.001	–2.09*	0.92*	–0.27*	0.78*	63.76*	30.33*	0.100**	0.79
KESC	1.14*	1.45*	0.51	0.46	0.45*	–5.05*	0.34**	–0.03	0.01	35.86	36.70*	0.97*	0.68
LEVER	0.49*	0.51*	0.11	0.32	0.79*	–2.55*	0.52*	–0.39*	0.61*	–11.45*	16.58**	0.001	0.69
LUCK	1.50*	1.12*	0.19	0.25	0.18**	–5.53*	0.29	0.06	–0.16	–14.34	23.86*	0.59*	0.70
MCB	1.35*	1.21*	0.32	0.12	0.62*	–8.36*	0.26	0.22**	–0.68*	–3.74	–12.01	0.81*	0.68
MPLC	1.24*	1.27*	0.14	0.26	0.94*	–4.49*	0.48*	0.15	0.04	21.73	21.77*	0.99*	0.59
NATR	1.05*	0.88*	0.23	0.34	0.69*	–1.44*	–0.22*	–0.1	0.69*	66.07*	17.48*	0.003	0.72
NESTE	0.37*	0.21*	0.25	0.13	0.38*	–9.56*	0.801*	–0.12*	–0.77*	–17.57	15.31*	0.23*	0.73
PACK	0.61*	0.60*	0.26	0.15	0.956*	–8.39*	0.63*	–0.28*	–0.53*	–10.9	24.46*	0.34*	0.69
PAEL	1.93*	0.59*	0.27	0.29	0.003	–3.47*	0.19**	–0.29*	0.1	–9.26	–1.34	0.833*	0.62
PAKT	1.25*	0.43*	0.17	0.30	0.02	–0.28**	–0.34*	0.09**	0.91*	17.49*	14.87*	0.60*	0.59
PKCL	0.39	0.90*	0.10	0.15	0.60*	–2.63	0.04	–0.01	0.21	12.4	–9.57	0.58*	0.74
PTC	0.82*	1.30*	0.32	0.28	0.02	–4.68*	0.03	–0.13	0.16	4.82	34.54*	0.67*	0.65
PSO	0.85*	1.27*	0.25	0.27	0.01	–1.75	0.67*	0.1	0.81*	6.07	16.14*	0.70*	0.59
SELP	1.11*	0.67*	0.35	0.51	0.001	–1.79*	–0.52*	–0.63*	0.57*	–65.10*	32.87*	0.003	0.71
SITC	0 .83*	0.63*	0.10	0.47	0.20*	0.06	(–0.09*	–0.20*	0.98*	–12.93*	–0.06	0.99*	0.56
SNGP	1.37*	1.33*	0.32	0.24	0.68*	–2.87*	–0.27*	0.03	0.46*	66.22*	28.90*	0.45*	0.67
SSGC	1.61*	1.23*	0.42	0.15	0.003	–0.1	–0.21	–0.11	0.95	–8.88	3.6	0.12**	0.64
TSPI	1.1	0.90*	0.57	0.25	0.83*	–1.24*	0.42*	0.07	0.69*	13.11	–3.2	0.62*	0.63
TSSl	0.46*	0.40*	0.31*	0.27	0.49*	–5.79*	6.28**	–0.07	–0.65*	–33.5*	–6.88	0.30*	0.71
UNIM	0.74	0.52	0.047	0.033	0.75*	–0.44	0.10	0.07	0.80	–20.49	–17.49		

Note: *Indicates significant at 1 percent, ** at 5 percent and *** is at 10 percent.

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The Foreign-Income and Real-Exchange-Rate Elasticities of Bangladesh Exports

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Bangladesh began implementing trade-reform policies in the mid 1980s, leading to a gradual change in its anti-export-policy. Since then the share of exports in her GDP has been rising steadily with the economy growing at about 5 percent per annum. This growth is associated with structural change in the country's export composition favouring non-traditional exports, namely garments and frozen foods. This paper specifies and estimates an aggregate export-demand function; deploys Pesaran's bounds-testing approach to estimate export-elasticities of foreign income and the exchange rate; and tests for the stability of the estimated function. The empirical results, based on annual data for the period 1973–2010, suggest a long-run relationship between real exports and export-weighted foreign real income. Similarly, real exports and the real effective exchange rate of the taka are found to be related. Finally, the results suggest that the dynamic behaviour of exports possesses an error-correction representation. The CUSUM and CUSUMSQ tests suggest no significant instability in the export-demand function. However, the recursive and rolling-regression coefficients indicate that the export-demand function has undergone some structural change since the early 1990s. This is reflected in the decreasing sensitivity of real exports *vis á vis* the exchange rate.

JEL classification: C32, F11
Keywords: Exports' Elasticities, Pesaran's Bounds Test, Export-demand Stability, Bangladesh

I. INTRODUCTION

As part of an outward-oriented, and therefore strongly market-oriented development strategy, Bangladesh has undertaken a series of trade reforms since the mid-1980s. Initially trade reforms were implemented to conform with IMF structural adjustment programmes aimed at reducing pressure on Bangladesh's foreign exchange reserves. This was achieved by lowering trade deficits [Hossain (1996); Rahman (1992)]. Subsequent reforms that were made were also expected to raise economic growth and lower inflation. These measures included the removal of quantitative restrictions on imports and the reduction and streamlining of import tariffs. As a result the anti-export bias in the inward looking trade policy of the earlier decades that relied on import substitution, gradually weakened.

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The anti-export bias in Bangladesh's external sector had reached a peak during the mid-1970s. By the mid-1990s the trade regime had become moderately 'liberal' (market-oriented, due to its export orientation) [World Bank (1997)]. Although the pace of trade reform has slowed down since the early 2000s, this has not prevented Bangladesh's emergence as an export-oriented economy. This contrasts sharply with the autarkic trade regime of the 1970s.[1] Some empirical studies suggest that the export-oriented trade liberalisation process, which is necessarily also real-exchange-rate-oriented, has raised economic growth in Bangladesh.[2] This finding is consistent with the literature which suggests a causal linkage between export orientation and economic growth.[3]

Bangladesh's economy has maintained a steady economic growth rate at about 5 percent per annum since the mid-1980s. This has been associated with structural change in its export-composition in favour of non-traditional exports, namely garments and frozen foods. The main aim of this paper is to investigate the export-demand behaviour in Bangladesh with annual data for the period 1973–2010. It specifies and estimates an aggregate export-demand function, deploys Pesaran's bounds-testing approach to estimate exports' elasticities of foreign income and exchange rate and tests for stability of the estimated function.[4]

The remainder of the paper is organised as follows. Section II reviews trade liberalisation measures under successive political regimes since the early 1980s. Section III shows the lessening of anti-export bias in policy and associated structural change in the composition of exports since the 1970s. Section IV specifies an aggregate export-demand function with foreign real income and the real exchange rate of the taka[5] as its key arguments. Section V reports the sources of data deployed for this study and their compilation. Section VI illustrates the estimation techniques and reports the results. Section VII investigates whether the export-demand function was stable over the sample period of study. Section VIII summarises the findings of this study and states some conclusions.

[1]The exports-to-GDP ratio has increased from less than 5 percent in the early 1970s to about 20 percent in the late 2000s.

[2]The studies include Begum and Shamsuddin (1998); Islam (1998); Ahmed (2000); Hossain (2000); Mamun and Nath (2005); Hossain and Alauddin (2005); Love and Chandra (2005); and Kemal, Uddin, Fernando and Colombage (2005).

[3]Several reasons can go towards explaining the suggested linkage between export-orientation and economic growth. First, in the Keynesian model, export growth leads to economic growth via a foreign-trade multiplier. Second, an increase in export growth raises foreign-exchange holdings, thereby mitigating the foreign-exchange constraint on economic growth. This permits the country to finance an increasing volume of imports of capital goods and technology. Third, foreign competition promotes scale economies and technological progress. Fourth, a higher level of export-orientation creates positive externalities, namely efficient management and adoption of the latest production methods and techniques. For details on these arguments, see Balassa (1978), Chow (1987), Dawson (2006), Jung and Marshall (1985), Michaely (1977), Ram (1987) and Tyler (1981).

[4]Ahmed (2000) has investigated the impact of the real exchange rate on export-response in Bangladesh. His findings suggest a positive response of exports to depreciation of the real exchange rate brought about under trade liberalisation programmes. This paper examines whether the real exchange rate of the taka remains significant in the export-demand function for Bangladesh. Bangladesh's current export basket is dominated by import-dependent manufactured goods. It is plausible that such exports are relatively less sensitive to movements of the real exchange rate.

[5]The taka is the currency unit of Bangladesh.

II. TRADE LIBERALISATION AND ECONOMIC OPENNESS[6]

Following independence from Pakistan in 1971, the Bangladesh government under Sheikh Mujibur Rahman opted for a socialist model of development [Islam (1977)]. Such development models set national economic self-sufficiency as the primary goal. Consequently, they view foreign trade with suspicion. To achieve the goal of national self-sufficiency, a high degree of protection was accorded to the import-substituting industries through import tariff-and non-tariff barriers and subsidies. This and other macroeconomic developments created an anti-export policy bias. Under the then exchange-rate system pegging the taka to pound sterling, monetary and fiscal policies that were set to be expansionary, in service of the self-sufficiency goal, caused high inflation. This resulted in a real exchange rate that overvalued the taka, thereby creating an incentive-structure in favour of the import-substituting industries and against the exporting industries. This anti-export policy bias lowered exports and created foreign-exchange shortages which, in turn, squeezed imports, reinforcing economic opportunity for expansion of the domestic import-substituting industries. The restrictive foreign-exchange constraints led to a regulatory system employing licences and permits that allowed only selected items to be imported. The imported goods carried high price-premiums. Consequently, black markets flourished and corruption became rampant [Hossain (1995)]. Bangladesh's trade openness under these anti-trade policies, measured by the share of exports plus imports in GDP, was about 5 percent which meant, the economy had become highly inefficient.

The fall of the Mujib government in 1975 and other political developments led to the introduction in late 1975 of an outward-oriented model of development under the *de facto* political leadership of General Ziaur Rahman. The Zia government emphasised export-led industrialisation and initiated trade reform measures. The major impetus to trade liberalisation, however, came during the period of General Ershad's government of 1982-1990, with the implementation from 1986 of two successive IMF-supported structural-adjustment programmes. Since the early 1980s, the policy agenda for trade liberalisation has moved forward in three phases: 1982-1986 (first phase), 1987-1991 (second phase) and 1992 to date (third phase). The first two phases coincided with two formal industrial-policy plans—the *New Industrial Policy of 1982* and the *Revised Industrial Policy of 1986* [CPD (1995)]—and were initiated during the Ershad era. The third phase (1992-present) covers the era of elected civilian governments of the Bangladesh Nationalist Party (BNP) and the Awami League. The period of BNP governments has been the longest but at the time of writing this study (January 2012) the Awami League was in power.

First Phase: 1982-1986

During the first phase of trade liberalisation, both export-diversification and import-liberalisation received priority. Until the early 1980s, exports were dominated by a few commodities, namely raw jute, jute goods and tea. Some government schemes had been instituted to shift the incentive structure towards the export-oriented industries. Export-promotion measures were introduced to promote non-traditional export items,

[6]This section draws some materials from Hossain (2012a).

especially ready-made garments and frozen foods. These measures included unrestricted duty-free access to imported inputs, concessionary duties on imported machinery, easy access to bank credits, subsidies to non-traditional exports, and tax rebates on export incomes [Rahman (1994)]. On the import side, policy changes included the lowering of tariff rates, rationalising of tariff structure, the removal of quantitative restrictions, and simplification of procedures and formalities. There was public support for the acceleration and deepening of trade reform from 1986, despite the fact that the reform was imposed by a military government operating under the externally-imposed strictures of IMF-supported structural-adjustment programmes. The explanation for this extraordinary public acceptance can be found in the emergence after the 1960s of the 'East Asian miracle' syndrome, whose success had turned the tide of both professional and public opinion against import-substituting-industrialisation. This contributed to the gradual build-up in Bangladesh, throughout the period from the mid-1970s to the mid-1980s, of a favourable political climate for trade liberalisation. Over the same period, growth of overseas workers' remittances had begun to relieve the country's foreign-exchange constraint on the importation of capital and consumer goods. These imports benefited both consumers and nascent industrialists. Especially, they benefited the latter who, until 2005, made high profits from exportation of ready-made garments under the Multi-Fibre Arrangement.

Second Phase: 1987-1991

During the second phase, the government introduced a range of incentive schemes to promote non-traditional exports, especially the burgeoning ready-made garments industry. Import-liberalisation measures remained effective. For example, the pace of import-liberalisation had increased in the first phase, with the policy switch abolishing the relatively long 'positive' list of import items permitted under licence, leaving only the much shorter 'negative' list whose importation was stopped without official permission. During this second phase, the number of items on this already relatively short 'negative' list was reduced even further.

Third Phase: 1992-Present

The third phase of trade liberalisation began in 1992. The country had been under two IMF structural adjustment programmes from 1986 to 1993 and a World Bank enhanced-surveillance programme during 1993-1994. The two IMF programmes were the *Structural Adjustment Facility (SAF)*, from 1986-87 to 1988-89; and the *Enhanced Structural Adjustment Facility (ESAF)*, operational from August 1990 to June 1993. The World Bank programme was the *Industrial Sector Adjustment Credits: ISAC-I and ISAC-II*. Significant trade liberalisation measures were introduced during *ESAF* (1990-1993) and the two *ISAC* programmes (1993-1994). Under *ISAC-II* import controls were removed; tariff structure was rationalised; trade-neutral taxes were introduced including a Value Added Tax (VAT); and customs administration was strengthened. Despite this raft of reforms, an IMF Report [IMF (1998)] estimated that the overall restrictiveness of Bangladesh's trade regime fell from a rating of 10 (most restrictive) in the early 1990s to 7 (moderately restrictive) by 1996. The major factor hindering more thoroughgoing trade

reform at the time was caution on the part of policy-makers. They harboured concerns over the potential of trade reforms to negatively impact Bangladesh's fiscal and balance-of-payments positions.

The import trade has since been further liberalised by a combination of relaxation and phased removal of quantitative import restrictions, together with sharp reduction in import tariffs. For example, the number of effective tariff slabs in 1992 was 18 and the highest tariff rate was 350 percent. By the end of 1999, the number of slabs had fallen to 7 and the highest rate slashed to just 40 percent. Both operative and statutory tariff rates remained in effect until 2000. Since 2001, the tariff structure has been further rationalised with the equalisation of operative and statutory tariffs and Bangladesh has implemented a Most Favoured Nation tariff policy, in which all nations from which Bangladesh imports a given product receive the lowest tariff rate that Bangladesh is prepared to impose on the product (i.e., the rate offered to the most favoured nation from which the product is sourced). Currently the number of tariff slabs is five, including a zero tariff rate, and the maximum rate of tariff is 25 percent [Bangladesh (2011)]. Counter to this trend, however, non-tariff barriers, which had earlier been reduced, have once again been increased.

The Export Promotion Zones

To promote exports, Bangladesh began setting up Export Promotion Zones (EPZs) in the early 1980s. These are special enclaves where fully export-oriented firms are provided with favoured treatment with respect to custom regulations, the importation of raw materials and intermediate goods, company taxation, the provision of infrastructure, and industrial regulations. The first EPZ was established at Chittagong in 1983 and the second at Dhaka in 1993. Eight EPZs now operate in the country. In 2010, export earnings from the EPZs were US$1.7 billion, or about 10.5 percent of total exports [Bangladesh (2011); Hossain (2002)].

Economic Openness

The trade liberalisation policy has over the years boosted both the exports and imports of Bangladesh (Table 1). The exports-to-GDP ratio has increased from about 5 percent in the early 1980s to 19 percent during 2007-08. Import trade has expanded significantly from 11 percent during the late 1980s to 27 percent in 2007-08. The structure of imports has also altered in favour of industrial raw materials and intermediate goods. The government at present operates under the *Import Policy Order: 2010-2012,* which has been designed to conform to the country's agreements with the World Trade Organisation. This policy imposes certain restrictions on imports for reasons of public health, security, environment and religious imperatives. Currently there are 24 items on the import restriction list [Bangladesh (2010)]. This represents a moderately liberal import policy that has contributed to an increase in the production of export items which are dependent on imported raw materials and intermediate goods.

Table 1

Tariff Rate and Trade Openness, Bangladesh, 1970–2008

Year/ Period	Number of Tariff Bands	Maximum Tariff Rate (%)	Unweighted Average Tariff Rate (%)	Weighted Average Tariff Rate (%)	Exports (% of GDP)	Imports (% of GDP)	Exports plus Imports (% of GDP)
1970			85.0		2.4	2.3	4.7
1971-1975					3.5	7.0	10.5
1976-1980					4.8	12.0	16.9
1981-1985					5.2	14.1	19.3
1986-1990					5.7	11.3	17.1
1991-1995	12.8[a]	252.5[a]	41.7	23.2	8.1	12.9	20.9
1996-2000	6.6	43	20.9	15.8	11.1	17.2	28.3
2001-2005	5	32.5	16.0	10.8	13.3	19.5	32.9
2006	5	25	13.4	8.4	16.8	21.5	38.3
2007	5	25	12.2	7.0	20.4	28.5	48.8
2008	5	25	13.4	7.6	17.7	24.7	42.3

Source: Author's compilation based on BB, Economic Trends; GoB, *Bangladesh Economic Review*; BBS, *Bangladesh Statistical Yearbook*, and Razzaque and Raihan (2007).

Note:[a]1992-1994.

III. REDUCTION IN ANTI-EXPORT POLICY BIAS AND STRUCTURAL CHANGE IN THE COMPOSITION OF EXPORTS

From an historical perspective, the present trade and investment regime in Bangladesh is moderately liberal. The issue is the extent to which the modest softening in anti-export policy bias since the early 1980s has made a difference in export-orientation and industrialisation. As discussed earlier, the trade policy reform in Bangladesh aimed at turning the production-incentive structure in favour of exportables by lowering the protection of import-substituting industries by scaling down tariffs and removing quantitative restrictions on trade flows. Other policy instruments, including promotional measures such as export subsidies and tax holidays, were used to encourage short-run increases in output of exports as well as to create an export-friendly investment environment. This section provides information on the softening of anti-export policy bias in Bangladesh since the 1980s.[7]

Trade economists such as Krueger (1978) and Bhagwati (1978) have provided an analytical framework for classification of trade regimes. Using the real exchange rate as an indicator of the production-incentive structure across sectors, Bhagwati (1988) has distinguished between import-substituting (IS), export-promoting (EP) and ultra-export-promoting (ultra-EP) trade strategies. He has defined IS-strategy as the adoption of an effective exchange rate for the country's exports (EER_x) which is less than that for the country's imports (EER_m). Therefore, if $EER_m > EER_x$, it indicates that domestic producers face an incentive structure which is biased against exportables and in favour of domestic production of importables. Similarly, if $EER_m = EER_x$, a neutral production-incentive structure is indicated, in the sense that producers are indifferent to the distinction between exports and domestic sales. Although this IS trade strategy does not favour exports, Bhagwati considers it an export-promoting strategy. His logic is that developing countries start from an IS strategy and hence any trade-policy reforms that lead to $EER_m < EER_x$ reduce

[7]Anti-export policy bias is commonly estimated by an index based on the real-exchange-rate indices for exports and imports. Athukorala (1998) has used different measures of the real exchange rate to examine whether exporting is profitable to domestic sales.

the magnitude of anti-export policy bias and consequently improve export performance. Extending this logic, $EER_m < EER_x$ represents an ultra-export promoting strategy.

Table 2 reports data for the ratio of the effective exchange rate for imports (EER_m) to the effective exchange rate for exports (EER_x) in Bangladesh for the period 1974–2006.[8] Following Bhagwati's (1988) classification, the reported data suggest that despite trade reforms, Bangladesh maintains an import-substituting trade strategy. Anti-export policy bias has remained positive, at about 0.2, since the early 2000s although it decreased through the period from the mid-1970s to the late 1990s. Bangladesh can therefore be considered a partial trade reformer. It has discarded some restrictive trade practices but has not undertaken sufficiently comprehensive trade reforms to achieve a truly export-promoting trade strategy [World Bank (2007)].

Table 2

Anti-export Trade Policy Bias, Bangladesh, 1975–2006

Period/Year	Anti-export Policy Bias
1975	3.70
1975–1979	2.51
1980–1984	1.92
1985–1989	1.88
1990–1994	1.57
1995–1999	1.24
2000	1.19
2001	1.20
2002	1.20
2003	1.18
2004	1.20
2005	1.19
2006	1.19

Source: Author's compilation based on Hossain and Alauddin (2005) and World Bank (2007).

Note: Anti-export policy bias is defined as the ratio of the real effective exchange rate for imports to the real effective exchange rate for exports for the period 1975-1991 and thereafter the anti-export policy bias is defined as the ratio of the nominal effective exchange rate for imports to the nominal effective exchange rate for exports. Under a neutral trade regime that neither discriminates exports nor imports, the value of this ratio should be one. When the value of this ratio exceeds one, it indicates policy bias against exports.

Structural Change in the Composition of Exports

As has been observed an export-oriented development strategy raises allocative efficiency and brings with it structural change in trade composition, in favour of exports, promoting economic growth. Real-exchange-rate-based trade liberalisation reduces anti-export policy bias, increases exports and brings structural change in the composition of exports by promoting non-traditional exports which are frequently more sensitive to the real exchange rate than traditional exports.[9] This section provides an overview of Bangladesh's export composition, showing structural change in favour of non-traditional exports since the mid-1980s (Table 3).

[8]The data set is compiled based on World Bank (2007) and Hossain and Alauddin (2005).

[9]See Athukorala (1998); Bhagwati (1978, 1988); Krueger (1978); Little, Scitovsky, and Scott (1970); Michaely, Papageorgiou, and Choksi (1991); and ADB (2007).

Table 3

Composition of Commodity Exports, Bangladesh, 1977–2010

	1977–1984	1985–1990	1991–1995	1996–2000	2001–2005	2006	2007	2008	2009	2010
Total Exports	**700**	**1027**	**2031**	**4456**	**6471**	**10526**	**12178**	**14110**	**15709**	**16205**
Primary Commodities	**236**	**297**	**312**	**476**	**472**	**773**	**832**	**987**	**1015**	**884**
Raw Jute		112	89	93	72	148	147	165	148	196
Tea		45	39	38	18	12	7	15	12	6
Frozen Food		115	157	302	339	459	515	534	455	437
Agricultural Products		16	12	25	25	105	88	120	267	242
Other Primary Commodities		9	15	18	18	49	75	153	133	3
Manufactured Goods	**464**	**730**	**1719**	**3980**	**6000**	**9753**	**11346**	**13123**	**14694**	**15321**
Jute Goods		321	300	310	249	361	321	318	269	540
Leather		106	155	193	212	257	266	284	177	231
Naptha, Furnace Oil and Bitumen		18	22	11	20	88	84	185	142	301
Readymade Garments		247	988	2370	3274	4084	4658	5167	5919	6013
Knitwear		0	147	746	1605	3817	4554	5533	6429	6483
Chemical Products		19	39	93	96	206	215	216	280	103
Shoes					58	95	136	170	187	204
Paper and Allied Products		9	3		1					
Handicrafts		3	6	6	6	4	8	5	6	4
Engineering Products		4	10	14	13	111	237	220	189	311
Other Manufacturing Products		3	49	236	502	730	867	1025	1096	1131
Traditional Exports (including Raw Jute, Jute Goods and Tea)	**499**	**479**	**427**	**441**	**339**	**521**	**475**	**498**	**429**	**742**
Nontraditional (Defined as Total Exports Les Raw Jute, Jute Goods and Tea)	**201**	**549**	**1603**	**4014**	**6133**	**10005**	**11703**	**13612**	**15280**	**15463**
Memorandum Items										
Primary Commodities (% of Total Exports)	**33.8**	**29.9**	**15.9**	**11.0**	**7.3**	**7.3**	**6.8**	**7.0**	**6.5**	**5.5**
Raw Jute (% of Total Primary Exports)		37.6	28.9	19.4	15.4	19.1	17.7	16.7	14.6	22.2
Frozen Food (% of Total Primary Exports)		38.9	50.2	63.6	71.9	59.4	61.9	54.1	44.8	49.4
Agri. Products & Other Primary Comm. (% of Primary Comm. Exports)		8.2	8.5	8.9	8.9	19.9	19.6	27.7	39.4	27.7
Manufactured Goods (% of Total Exports)	**66.2**	**70.1**	**84.1**	**89.0**	**92.7**	**92.7**	**93.2**	**93.0**	**93.5**	**94.5**
Readymade Garments (% of Total Exports)		22.0	47.8	52.9	50.8	38.8	38.2	36.6	37.7	37.1
Knitwear (% of Total Exports)		0.0	6.7	16.3	24.6	36.3	37.4	39.2	40.9	40.0
Readymade Garments and Knitwear (% of Total Exports)		22.0	54.6	69.2	75.4	75.1	75.6	75.8	78.6	77.1
Export Classification (% of Total Exports)										
Traditional (Raw Jute, Jute Goods and Tea)	72.0	48.9	22.2	10.2	5.3	4.9	3.9	3.5	2.7	4.6
Nontraditional (Total Exports, Excluding Raw Jute, Jute Goods and Tea)	28.0	51.1	77.8	89.8	94.7	95.1	96.1	96.5	97.3	95.4

Source: Data for 1985-2010: Bangladesh (Various Years) *Bangladesh Economic Review* and data for 1977–1984 are drawn from Sattar (1997).

Traditional Exports

Raw jute, jute goods and tea were the traditional exports from Bangladesh until the mid-1980s. Since then these exports have lost prominence and some non-traditional export items, especially ready-made garments and frozen-foods, have become dominant.

Raw Jute

World trade in raw jute has been declining steadily since the 1950s. The main reasons are the rapid growth of jute manufacturing industries in jute-producing countries and declining demand for jute fibre in jute consuming countries [IFC (2005)]. Bangladesh dominated the global raw jute market in the 1950s and 1960s [Mahmood (1981)]. As raw jute was the major cash crop, it came to be called the 'golden fibre' of Bangladesh, and is still known as such. Raw jute exports from Bangladesh have, however, been declining steadily since the 1960s to the extent that it has lost its significance as an export item. For example, the share of raw jute in Bangladesh's total export earnings was about one percent in 2008. The corresponding number in 1985 was about 41 percent. While some recent studies have suggested a positive outlook for raw jute exports on environmental grounds, it is unlikely to regain its former prominence in Bangladesh's export basket. Increased demand for food crops relative to jute and other cash crops continues to attract the interest of Bangladeshi farmers, leading to an allocation of resources towards food production and away from large-scale jute cultivation.

Jute Goods

World trade in jute goods has declined significantly since the 1950s. Bangladesh was the predominant raw jute exporter in the 1950s, graduating in the late 1950s to become a major exporter of jute goods throughout the 1960s and 1970s. Bangladesh gained its share of the world trade in jute goods at the expense of India, which until the 1960s had been the major exporter of jute goods [Mahmood (1981); Hossain (1995)]. The declining trend of world trade in jute goods has been reflected in the declining trend of jute-goods exports from Bangladesh. This occurred despite the fact that the lower demand for Bangladesh's jute goods in industrialised countries was partly compensated by increased demand from other developing countries. Currently the share of jute goods in Bangladesh's total exports is about 2.3 percent against 44 percent in the mid-1980s. Like raw jute exports, jute goods are unlikely to regain their former export significance for Bangladesh.

Tea

While tea is a traditional export item of Bangladesh, the world trade in tea has, however, received only marginal contributions from Bangladesh. The share of tea in Bangladesh's export earnings has declined from about 6 percent in the 1970s to less than 0.2 percent. This dramatic decline in the share of tea is largely explained by a sharp rise in export earnings from non-traditional items (especially ready-made garments); however, a significant part of the explanation lies in the fact that Bangladesh has not been successful in regaining some of its traditional tea export markets lost in the aftermath of the country's independence from Pakistan.

Leather and Leather Products

Bangladeshi exports of hides and skins, and of leather and leather products, exhibited an increasing trend between the early 1970s and the late 1980s. Export earnings from these items have declined since then, due mostly to supply constraints. Currently the share of leather and leather products in Bangladesh's total export earnings is about 2 percent.

Non-traditional Exports

Since the mid-1980s, some non-traditional export items, especially ready-made garments and frozen food products, have become dominant in the export trade of Bangladesh. Ready-made garments have emerged as the leading export item since the 1990s. Currently, ready-made garments and knitwear products contribute about 76 percent of total export earnings of more than $14 billion. The abolition of the Multi Fibre Arrangement in 2005 did not have major impact on Bangladesh's garment and knitwear exports. The share of frozen food items in total export earnings is about 4 percent and rising steadily. Other developing non-traditional export items include pharmaceuticals, ceramic, light engineering, and horticultural products.

The trends and composition of exports show that the traditional export items (raw jute, jute goods and tea), which contributed about 35 percent of total export earnings in the mid-1980s, nowadays contribute only about 7 percent. Leather and leather products showed some promise during the 1980s but have not realised their earlier potential to become important non-traditional export items.

This review of Bangladesh's export trade reveals some weaknesses. First, there is apprehension that Bangladesh may not sustain its successes in the ready-made garment trade in a genuine quota-free environment. Bangladesh finds itself in competition with some fiercely competitive suppliers of textile and clothing goods, namely Cambodia, China and Vietnam. Second, the success of ready-made garments has not been replicated in other non-traditional exports. Consequently, Bangladesh's export base remains relatively undiversified, which makes exports vulnerable to competition, as well as to domestic and external shocks. Furthermore, there is doubt that trade reforms have altered the production-incentive regime sufficiently to be effective in raising exports by the full available potential. This weak export-response of trade liberalisation[10] reflects the dominance of quota-based garment exports, which are dependent on imports of raw materials and intermediate inputs. It also indicates supply-side problems that cannot be removed without major capital expenditures on infrastructure development over and above revenue measures such as tariff reduction or monetary measures such as exchange-rate adjustment. Some recent policy measures suggest it is unlikely that necessary investment on development-

[10]Hossain (2012b) has investigated this issue by estimating an export-response function. The empirical results provide only weak-evidence in support of a positive export-response due to devaluation-based trade liberalisation. This paper does not examine export-response behaviour. Although an anonymous referee indicates its usefulness, this paper does not develop a simultaneous equation system involving both export demand and export supply functions. The exclusion of a supply-response function has the advantages of avoiding both conceptual and econometric problems while producing policy-credible results. An alternative approach uses domestic output in a hybrid export-volume function, which is presently controversial and not adopted here.

promoting infrastructure would be undertaken any time soon. For example, the government's recent escalation of para-tariffs—a policy that is incompatible with the outward-oriented development strategy which has served the country so well for so long [Razzaque and Raihan (2007)].

IV. MODEL SPECIFICATION

In trade literature[11] it is generally assumed that the exports of developing countries are supply-determined [Balassa (1978); Tyler (1981)]. A corollary of this assumption is that the external demand for an individual country's exportable goods is infinite. Two other related assumptions are often made. First, for a small exporting country, export prices are given and determined in the international market under free market forces of demand and supply. Second, the demand for exportable goods is perfectly price elastic. The essence of these assumptions is that a small exporting country is a price taker for its exportable items and that its volume of exports is determined by excess supply in the domestic market. This is not considered to be true as exports from small economies are often found demand determined. Foreign demand for an exporting country's goods depends on foreign income and the relative export prices in international markets. Accordingly, real exports are specified as an increasing function of foreign real income and a decreasing function of the real exchange rate of domestic currency.[12] Such an aggregate export-demand function is specified for Bangladesh in the following log-log form:[13]

$$LREX_t = \beta_0 + \beta_1 LRY_t + \beta_2 LREER_t + U_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (1)$$

where *LREX* is the log of real exports of Bangladesh,[14] *LRY* is the log of export-weighted foreign real income,[15] *LREER* is the log of the real effective exchange rate[16] of the taka, and *U* is a random error term with zero mean and a constant variance. In this specification, an increase in foreign real income increases the demand for Bangladesh's products. Depending on the value of β_1, Bangladesh's exports can be income-elastic ($\beta_1>1$) or income-inelastic ($\beta_1<1$). Similarly, an appreciation of the real effective exchange rate of taka is expected to lower demand for Bangladesh's products. Depending on the absolute value of β_2, Bangladesh's exports can be price-elastic ($|\beta_2|>1$) or price-

[11]The trade literature is voluminous. The major studies include Houthakker and Magee (1969); Goldstein and Khan (1985); Arize (1990, 2001); Athukorala (1981); Boltho (1996); Doyle (1998); Giles and Williams (2000); Roy (1991); Marquez and McNeilly (1988); Muscatelli and Stevenson (1995); Bahmani-Oskooee (1996); Bahmani-Oskooee and Nirooman (1998); Masih and Masih (2000); Hamori and Matsubayashi (2001) and Singh (2002).

[12]An implicit assumption behind this export-demand function is that supply is not a constraint on export trade.

[13]A log-log form is the standard model used in the foreign trade literature. This specification allows for direct estimation of the income- and price-elasticities of exports. The log-log specification also has various statistical advantages; in particular, it lowers heteroskedasticity problem.

[14]Export volume is defined as total export earnings in taka deflated by the export price index.

[15]Foreign real income is estimated as the export-weighted real GDPs of five developed countries (Canada, Germany, Japan, United Kingdom, and United States) plus other importers' GDPs, proxied by world real GDP.

[16]The IMF data series for the real effective exchange rate are used for estimation purposes. An increase (decrease) in the value of the REER represents an appreciation (depreciation) of the taka.

inelastic ($|\beta_2| < 1$).[17] If the coefficient on the real effective exchange rate is found not different from zero, Bangladesh's exports can be interpreted as unresponsive to the real exchange rate-based trade liberalisation. Such insensitivity may also originate from changes in the composition of exports in favour of products which are heavily import-dependent.

V. DATA

The data deployed for this study are compiled from both domestic and international statistical publications. The data for export earnings in taka and the export price index are drawn from *Economic Trends* (Bangladesh Bank), *Economic Review of Bangladesh* [Ministry of Finance, Government of Bangladesh (GoB)] and the *Statistical Yearbook of Bangladesh* (Bangladesh Bureau of Statistics). The data for the export-weighted foreign real income are estimated by the author based on Bangladesh's export shares for five major importing countries and the rest of the world. The five countries are the United States, the United Kingdom, Japan, Germany and Canada. Bangladesh's export shares for these countries are estimated based on data drawn from the Asian Development Bank's *Key Indicators of Developing Member Countries of the Asia-Pacific* and the *Economic Review of Bangladesh*, published by Government of Bangladesh. The GDPs at constant prices for these five developed countries and the World are drawn from IMF, *International Financial Statistics Yearbook*. The GDP volume for the world is used as a proxy for the GDP volume for the rest of the world. The data for the real effective exchange rate of the taka (REER) are obtained from the IMF by the author through personal communication. The data gap for the REER for the period 1970-1979 are estimated using the bilateral real effective exchange rate of the taka with the US dollar. The data for the REER estimated this way are spliced with the IMF data to generate a series with a common base. All the empirical results are generated after logarithmic transformation of the data series for all the variables in the level form over the sample period 1973–2010.[18] Figures 1a to 1c report the data series in the level form where LREX is the log of real export earnings (taka), LRY is the log of export-weighted foreign real income (index), and LREER is the log of the real effective exchange rate of the taka (index). An increase in the value of this index represents an appreciation of the real effective exchange rate. Table 4 reports descriptive statistics for the data series deployed for this study.

[17]In the current literature there is debate on the role of the real exchange rate in export performance. With a significant increase in Bangladesh's intermediate-goods trade over recent decades, the impact of the real exchange rate on its import flows has arguably diluted the impact of the real exchange rate on its export flows. ADB (2007:64) has developed this view: 'The depreciation (or appreciation) of a currency lowers (raises) the foreign-currency price of exports but also increases (reduces) the home-currency price of component imports. To the extent that import content costs rise (decline), this will offset any expansion in demand induced by depreciation (appreciation)'.

[18]Transformation of data in the first-order log-difference form and the use of one to three lagged terms have shortened the estimation period from 1973–2010 to 1975/1977–2010.

Table 4

Descriptive Statistics of the Data Series

	LREX	LRY	LREER
Mean	11.35	4.32	4.62
Median	11.43	4.32	4.60
Maximum	13.38	4.86	5.33
Minimum	8.97	3.76	4.43
Standard Deviation	1.35	0.35	0.16
Skewness	–0.16	–0.01	2.68
Kurtosis	1.82	1.75	12.31
Jarque-Bera	2.37	2.47	182.83
Probability	0.31	0.29	0.00

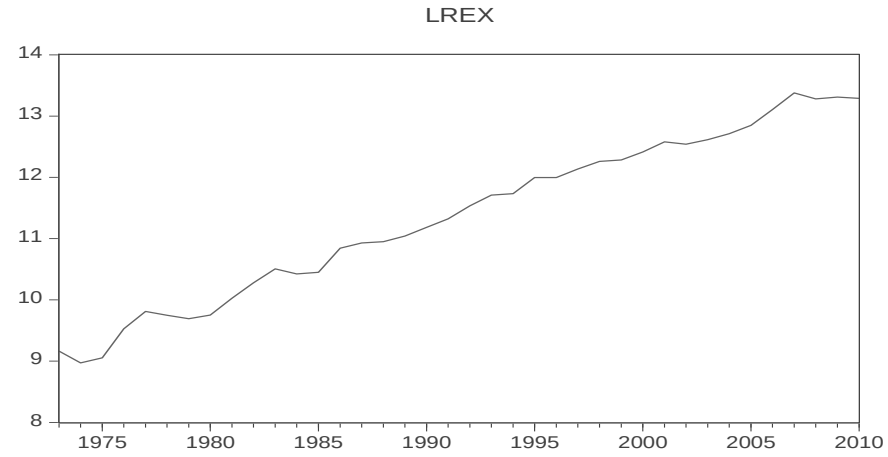


Fig. 1a. Log of Real Export Earnings (Taka) (LREX)

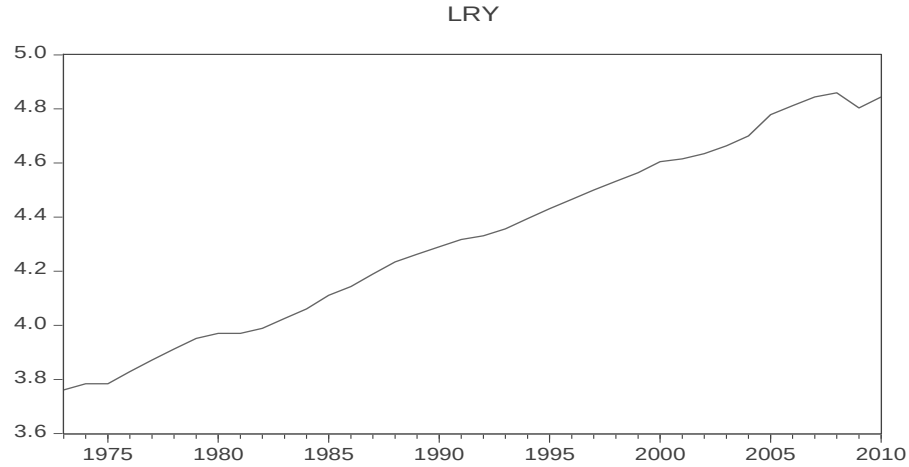


Fig. 1b. Log of Export-weighted Foreign Real Income (Index) (LRY)

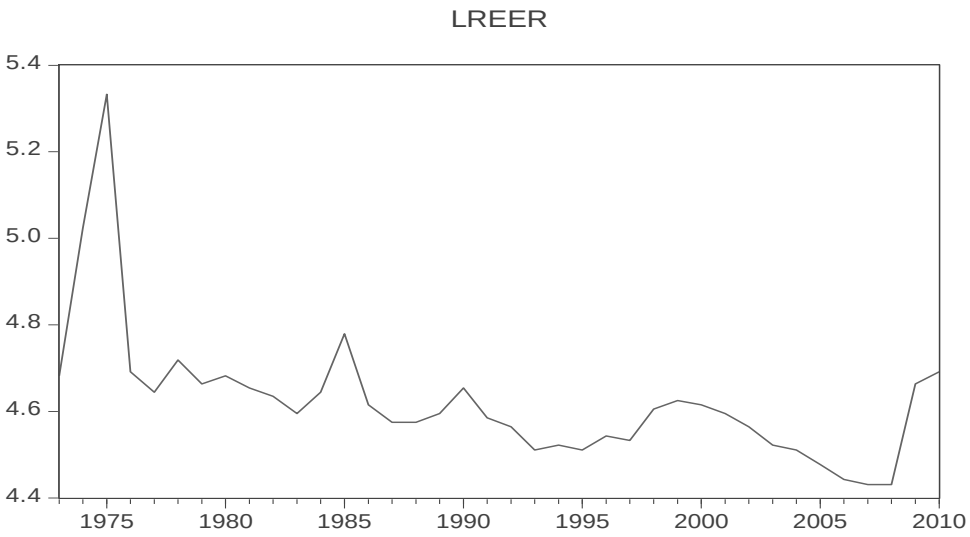


Fig. 1c. Log of the Real Effective Exchange Rate of the Taka (Index) (LREER)

VI. ESTIMATION AND RESULTS

This section deploys Pesaran's bounds-testing approach to cointegration[19] to establish a long-run relationship between real exports, foreign real income and the real effective exchange rate of the taka. This approach to determining a cointegral relationship is appropriate for the present study for at least two reasons. First, Pesaran's bounds test does not require pre-testing of the time-series properties of variables in the regression, although such information could be useful for inference when the test results are inconclusive. Second, the results obtained by Pesaran's test are more robust for small samples than most alternatives, especially Johansen's multivariate cointegration tests.

The ARDL Bounds Testing Approach to Cointegration

The error-correction form of the auto-regressive distributed lag (ARDL) model in the variables of LREX, LRY and LREER is specified as follows:

$$\Delta LREX_t = \alpha_0 + \alpha_1 T + \Sigma\beta i \Delta LREX_{t-i} + \Sigma\gamma_i \Delta LRY_{t-i} + \Sigma\phi i \Delta LREER_{t-i} + \delta_1 LREX_{t-1} + \delta_2 LRY_{t-1} + \delta_2 LREER_{t-1} + U_t \quad \ldots \quad \ldots \quad \ldots \quad (2)$$

where the coefficients β_i,γ_i and ϕ_i represent the short-run dynamics of the underlying variables in the ARDL model and the coefficients δ_s represent the long-run relationship. This specification is based on the maintained hypothesis that the time-series properties in the export-demand relationship in Bangladesh can be approximated by a log-linear VAR(p) model, augmented with intercept (α_0) and (probably) trend (T). Although in the specification the value of '*i*' can be infinity, the model is estimated sequentially with one to three lag terms.[20]

[19]See Pesaran and Shin (1996); Pesaran and Pesaran (2009); Pesaran and Smith (1998); and Pesaran, Shin, and Smith (2001).

[20]Pesaran and Pesaran (1997) suggest that a lag length of one period can be a reasonable choice when the data frequency is annual.

Testing for the Hypothesis that $\delta_1 = \delta_2 = \delta_3 = 0$

Equation (2) is estimated first in a restricted form by excluding the level-form lagged variables and is then tested for the significance of the lagged level variables through a variable-addition test (F-test). The estimated F-statistic for the restriction that $\delta_1=\delta_2=\delta_3=0$ in the specification with *LREX* as dependent variable is denoted by *F*(*LREX* | *LRY*, *LREER*), where, as defined above, *LRY* is the log of foreign real income and *LREER* is the log of the real effective exchange rate of the taka. This process is repeated for the specification with *LREER* or *LRY* as dependent variable. The estimated F-statistic for the restriction that $\delta_1=\delta_2=\delta_3=0$ in the latter specifications is denoted by *F*(*LRY* | *LREX*, *LREER*) or *F*(*LREER* | *LREX*, *LRY*). Finally, the estimated F-statistics are compared with the critical values to determine whether a long-run relationship exists between real exports, foreign real income and the real effective exchange rate of the taka. In addition, the estimated F-statistics can be used to draw infer whether any of these variables can be considered a long-run forcing variable in determining the others.

Table 5 reports the F-statistics produced when one, two and three lags are included in the specification. The model is estimated for two cases: with both intercept and trend (C,T) and with intercept only (C). The results are sensitive to the inclusion of trend in the specification for real exports as dependent variable. In the specification with both unrestricted intercept and unrestricted trend, the critical value band for k=2 is {4.205-5.109} and {4.903-5.872} at the 90 percent and 95 percent significance levels, respectively. In the specification with the intercept only, the critical value bands for k=2 are {3.182-4.126} and {3.793-4.855} at the 90 percent and 95 percent levels, respectively. The *F*(*LREX* | *LRY*, *LREER*) statistic in the specification with or without trend is above the upper limit of the critical band with one-period lag, suggesting that the null hypothesis of no long-run relationship between *LREX*, *LRY* and *LREER* can be rejected at the 95 percent significance level. In the specification *LREER* as dependent variable (with trend), the statistic *F*(*LREER* | *LREX*, *LRY*) again exceeds the upper bound of the band and therefore the null hypothesis of no long-run relationship between *LREER*, *LREX* and *LRY* is rejected. These results suggest that *LREER*, in particular, cannot be treated as a 'long-run' forcing variable for explanation of *LREX*. The results for *LRY* are sensitive to the inclusion of trend in the specification. Foreign real income can, however, be considered a long-run forcing variable in determining real exports or the real effective exchange rate of the taka.

Table 5

Testing for the Long-run Relationship between LREX, LRYand LREER (F-test)

	F-statistics F(LREX ê LRY^f; LREER)		F-statistics F(LRY^f ê LREX;LREER)		F-statistics F(LREER ê LREX; LRY^f)	
Lags	1975/1977-2010	1983-2010	1975/1977-2010	1983-2010	1975/1977-2010	1983-2010
With Constant						
1	6.03	3.24	2.98	1.17	7.43	4.04
2	2.07	3.64	2.12	1.5	18.38	1.04
3	3.3	4.8	1.29	1.47	2.55	2.51
With Constant and Trend						
1	7.65	3.17	7.52	5.16	7.31	4.06
2	1.46	2.87	1.98	0.56	16.31	1.07
3	3.15	4.53	1.25	0.99	2.1	1.81

Source: Pesaran and Pesaran (2009).

Note: The critical value bounds of the F-statistic for k = 2 with constant are {3.182 to 4.126} and {3.793 to 4.855} at 90 percent and 95 percent confidence respectively and those for k = 2 with constant and trend are {4.205 to 5.109} and {4.903 to 5.872} at 90 percent and 95 percent confidence respectively.

Testing for the Hypothesis that $\delta_1 = 0$

To complement the Wald test results for the joint hypothesis, the presence of a long-run relationship among *LREX*, *LRY* and *LREER* can be examined via a t-test using the specified error-correction model (2). This can be done by testing for the significance of the coefficient on one-period lagged dependent variable, $LREX_{t-1}$.[21] Pesaran, Shin and Smith (2001) have provided the lower and upper bound critical values for this statistic. Table 6 reports the test results, which weakly support the presence of a long-run relationship among *LREX*, *LRY* and *LREER*.

Table 6

Testing for the Long-run Relationship between LREX, LRY and LREER (t-test)

	Coefficient on $LREX_{t-1}$ (t-statistics are in Parentheses)	
Lags	(1975/1977-2010)	(1983-2010)
With Constant		
1	–0.40(–2.30)	–0.66(–2.75)
2	–0.31(–1.92)	–0.59(–3.01)
3	–0.42(–2.91)	–0.65(–3.57)
With Constant and Trend		
1	–0.69(–3.24)	–0.73(–2.73)
2	–0.35(–1.65)	–0.61(–2.61)
3	–0.46(–2.44)	–0.56(–2.26)

Note: The critical value bounds of the t-statistic with constant are {–2.57 to –3.21} and {–2.86 to –3.53} at 90 percent and 95 percent confidence respectively and those with constant and trend are {–3.13 to –3.63} and {–3.41 to –3.95} at 90 percent and 95 percent confidence respectively [Pesaran, Shin, and Smith (2001)].

Estimating Coefficients of the Long-run Relationship

The second stage of the ARDL modelling involves estimating coefficients of the long-run relations and inferring their values. In general, in estimating long-run coefficients, the ARDL technique estimates $(p+1)^k$ number of regressions to obtain the optimal lag-length for each variable, where p is the maximum number of lags and k is the number of variables in the equation. This paper uses the *Schwarz Bayesian Criterion* (SBC) to select the optimal order of lag.

Table 7 reports the estimated coefficients on foreign real income and the real effective exchange rate with real exports as the dependent variable. The export-demand equation has been estimated with three lag terms in the variables and no time trend. The model is also estimated for two sample periods: 1975/1977-2010 and 1983-2010. Table 8 reports the error-correction models associated with the estimated long-run relationships for the sample periods: 1977-2010 and 1983-2010.

[21]Banerjee, Dolado and Mestre (1998) also suggest that the presence of a long-run relationship can be examined via the t-statistic on the coefficient on the lagged dependent variable.

Table 7

Long-run Coefficients on Foreign Income and the Real Effective Exchange Rate

Regressors	Model: ARDL (1,0,0) (1977-2010) Coefficient (t-ratio)	Model: ARDL (1,0,0) (1983-2010) Coefficient (t-ratio)
Intercept	3.70 (0.60)	–1.54(–0.54)
LRY^f	3.44 (12.04)	3.45 (23.12)
LREER	–1.47 (–1.34)	–0.37 (–0.71)
The Wald test:		
H_O: Coefficient on $LRY^f = 0$	$c^2_{(1)}$ =144.89	$c2_{(1)}$ = 534.31
H_O: Coefficient on $LRY^f = 1$	$c^2_{(1)}$ = 72.84	$c2_{(1)}$ = 269.52
$H_{O:}$ Coefficient on LREER = 0	c2 (1) = 1.79	c2(1) = 0.50
$H_{O:}$ Coefficient on LREER = 1	c2 (1) = 5.06	$c2_{(1)}$ = 6.83

In the estimated model for the complete or shorter sample period, the coefficient on foreign real income bears a positive sign and is significant at the 5 percent level. The Wald test rejects the proposition of unit elasticity of foreign real income. The estimated income elasticity for the post-reform period 1983-2010 is 3.45, which is significantly greater than one. The coefficient of the real effective exchange rate bears a negative sign but is not statistically significant. The overall results suggest that Bangladesh's exports are highly income-elastic but price-inelastic.

The error-correction model (associated with the long-run export demand relationship) suggests that real export growth is sensitive to changes in the real exchange rate but not the growth rate of foreign real income. Quibria (1997) notes that in the early years of trade liberalisation, Bangladesh maintained a competitive real exchange rate through monetary and fiscal policy discipline. In addition, although the nominal exchange rate was pegged to the US dollar, it was adjusted frequently to avoid creating an overvalued currency originating from relatively high and volatile inflation. Together with exchange-rate adjustment, import tariffs were reduced. The liberalised import policy lowered the incentive structure for the production of import-substitutes. The resultant reduction in anti-export policy bias led to an increase in the production of exportables. A negative coefficient on the real effective exchange rate is consistent with the theory behind real-exchange-rate-based trade liberalisation. In a recent study, ADB (2007) has suggested that in a country where primary and manufactured goods dominate the export trade, such exports are sensitive to the real exchange rate. Exports of labour-intensive manufactured products and primary commodity exports (which use domestic raw materials) are more sensitive to the real exchange rate. The short-term impact of changes in the real exchange rate on export growth is consistent with this interpretation. It is, however, not clear why Bangladesh's exports, which are now dominated by import-dependent manufacturing products, would show short-term sensitivity to changes in the real exchange rate.

Table 8

Error-correction Model of Real Exports

Regressors	Model: ARDL (1,1,1) (1976-2010) Coefficient (t-ratio)	Model: ARDL (1,0,0) (1983-2010) Coefficient (t-ratio)
DLY[f]	–0.71 (–0.66)	1.98 (3.01)
DLREER	–0.96 (–3.15)	–0.87 (–2.69)
Error-correction Term (–1)	–0.31 (–2.18)	–0.58 (–3.21)
The Wald test:		
H_O: Coefficient on D LY = 0	$c^2_{(1)} = 0.44$	$c2_{(1)} = 0.38$
H_O: Coefficient on D LREER = 0	$c^2_{(1)} = 9.87$	$c2_{(1)} = 8.51$
H_O: Coefficient on Error-correction Term (–1) = 0	$c^2_{(1)} = 4.76$	$c2_{(1)} = 12.59$

Figure 3 reports the actual and fitted values of the growth of real exports as estimated by the error-correction model. The model fits the data well. In particular, the predicted growth of real exports closely matches their recorded growth.

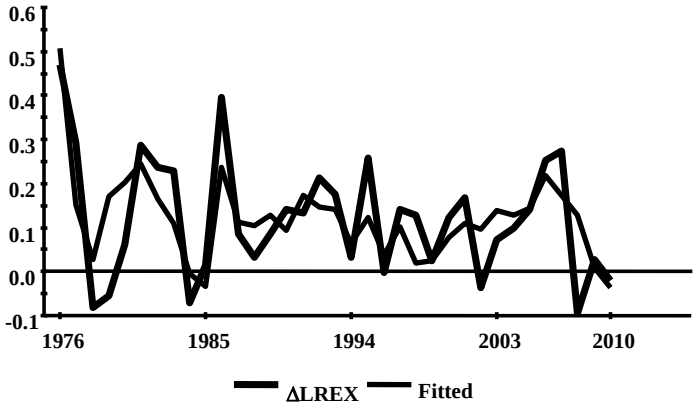


Fig. 3. Plot of Actual and Fitted Values of ΔLREX

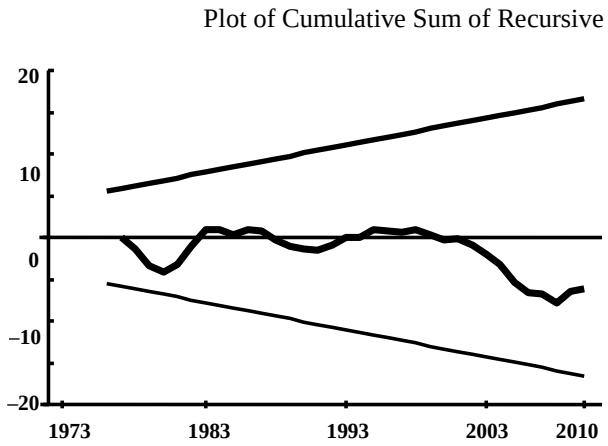
VII. STRUCTURAL CHANGE IN THE EXPORT-DEMAND FUNCTION

Pesaran's bounds-test results suggest that foreign real income and the real effective exchange rate of the taka are the key determinants of real export earnings in Bangladesh. Stock and Watson (2007) suggest that structural changes in parameter values can take place due to changes in economic policy regimes; economic transformation associated with economic growth; and inventions and innovations that affect different sectors of the economy differently or at different rates. This section examines whether the export-demand function was stable over the sample period of study.

The CUSUM and CUSUMSQ Tests

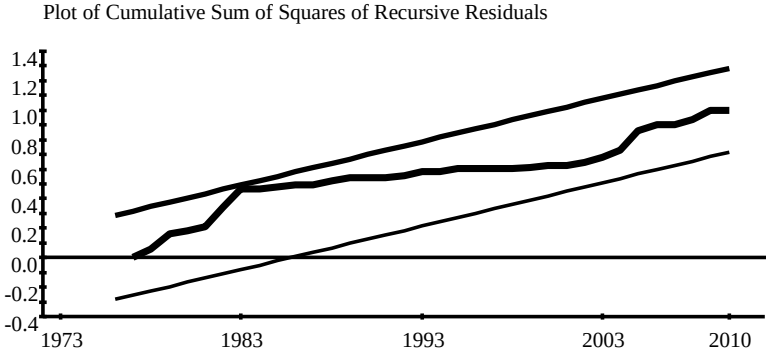
The stability of the export-demand function can be analysed formally by conducting the CUSUM and CUSUM of squares of residuals tests. In doing so, the

export-demand equation is estimated by OLS over the sample period 1973–2010. The plotted CUSUM and CUSUMSQ Figures (4a to 4b) do not show parameter-or variance instability. The paper earlier noted that, from the late 1980s to the late 1990s, gradual trade reform in Bangladesh raised its level of export orientation and brought structural change in export composition. However, this did not cause instability in the export-demand function. To examine further the possibility of any sharp break in the export-demand relationship, the Quandt-Andrews unknown-breakpoint test is conducted. The test results suggest a break in the export-demand relationship in 1992 (Table 9). This breakpoint coincides with rapid trade reforms during the early years of the BNP government that came to power in 1991.



The straight lines represent critical bounds at 5 percent significance level.

Fig. 4a. The CUSUM Test



The straight lines represent critical bounds at 5 percent significance level.

Fig. 4b. The CUSUM of Squares Test

Table 9

The Quandt-Andrews Unknown Breakpoint Test

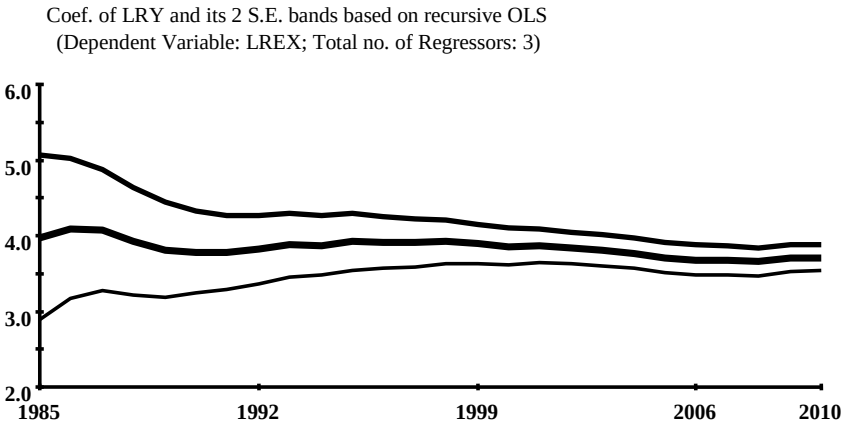
Statistic	Value	Prob.
Maximum LR F-statistic (1992)	4.38	0.08
Exp LR F-statistic	1.49	0.04
Average LR F-Statistic	2.6	0.01

Notes: 1. Null hypothesis: no breakpoints within 10 percent trimmed data.
2. Varying regressors: All equation variables.
3. Test sample: 1977-2007.
4. Number of breaks compared: 31.

Recursive and Rolling Regression Results

Any sharp or rapid structural change in the export-demand function can be observed by estimating the equation for a base sample period and then estimating sequentially by adding one or more observations. This is the recursive approach to estimating a long-run relationship for different sub-samples on a sequential basis. Estimating an export-demand relationship by this approach may reveal smooth or abrupt changes in parameter values during shocks and reforms. By releasing earlier observations and including new observations to keep the sample size fixed, the rolling regression technique provides information on changes in parameter values in a double-logarithmic model.

Figures 5 to 6 plot the recursive and rolling regression coefficients in the export-demand function. The sample size for the rolling regression is 25. The estimated recursive coefficients show that the income elasticity of demand for exports remains relatively stable while the (absolute) value of export elasticity with respect to the real exchange rate has been decreasing since the early 2000s. The rolling regression results suggest that the real exchange rate has become insignificant in the export-demand function since the 2000s. Foreign income elasticity of demand for exports, however, remains significantly greater than one.



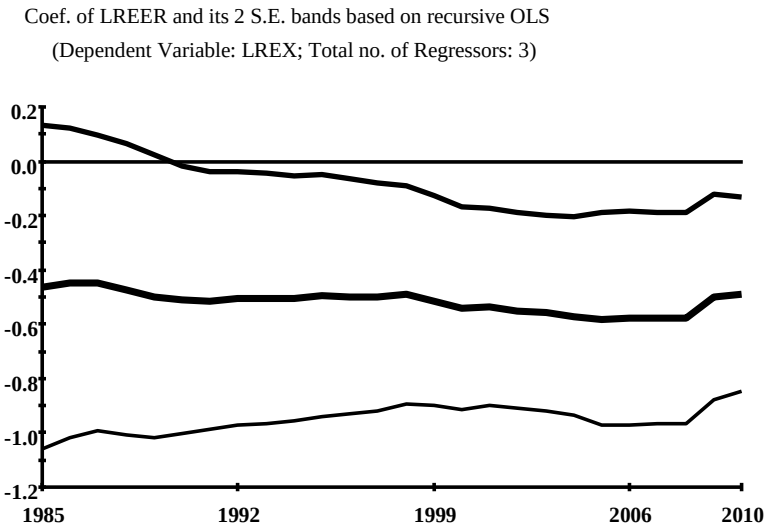
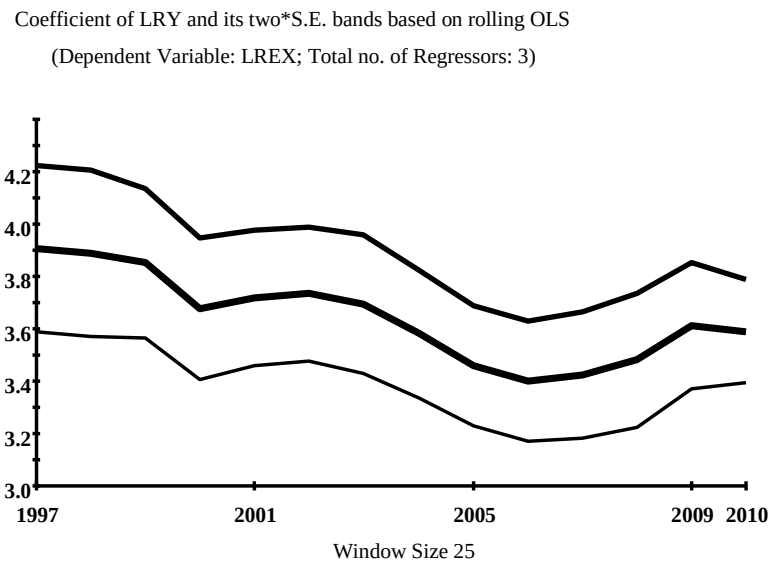


Fig. 5. Recursive Coefficients



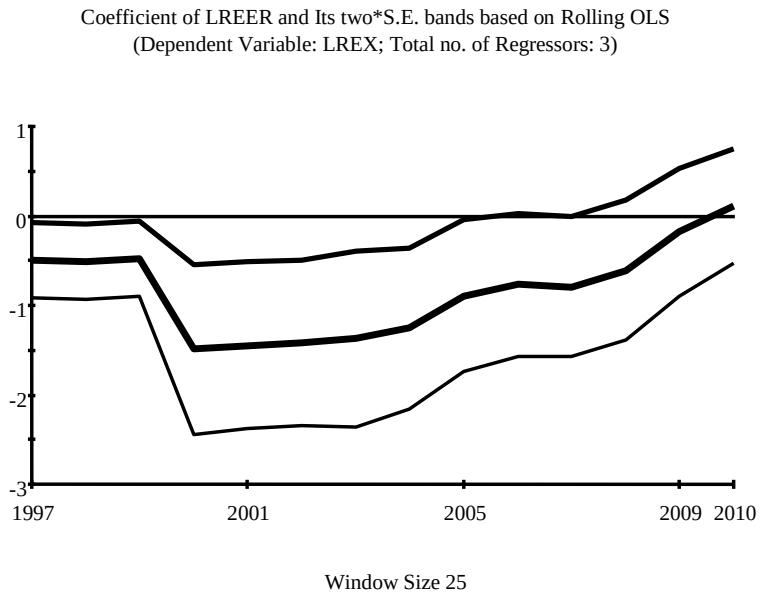


Fig. 6. Rolling Regression Coefficients

VIII. SUMMARY AND CONCLUDING REMARKS

In the mid-1980s, Bangladesh began implementing trade-reform policies, which led to slow but steady softening of its anti-export-policy bias. Since then the share of exports in GDP in Bangladesh has steadily increased and its economy has grown at about 5 percent per annum. Such economic growth has been associated with a structural change in export composition in favour of non-traditional exports, namely garments and frozen foods. This paper has specified an aggregate export-demand function, deployed Pesaran's bounds-testing approach to estimate exports' elasticities of foreign income and exchange rate and tested for its stability. The empirical results (based on annual data for the period 1973–2010) suggest that in Bangladesh, there exists a long-run relationship between real exports, export-weighted foreign real income and the real effective exchange rate of the taka and that the dynamic behaviour of exports has an error-correction representation. The CUSUM and CUSUMSQ tests suggest no significant instability in the export-demand function. However the recursive and rolling regression coefficients indicate that the export-demand function has undergone some structural change since the early 1990s, which is reflected in the decreasing sensitivity of real exports with respect to the exchange rate.

The empirical results reported have some implications for the export trade. Since the mid-1980s there has been significant structural change in the composition of Bangladesh's exports. Manufacturing products have become more dominant in the export basket. Generally, both primary and manufactured exports are sensitive to changes in the

real exchange rate. However, as the ADB (2007) study has suggested, with the rise in the export share of manufacturing products with high import content, the sensitivity of exports with respect to the real exchange rate may decrease. Although Bangladesh's exports remain sensitive to changes in the real exchange rate, the rolling regression results suggest that the sensitivity of exports with respect to the real exchange rate was not significantly different from zero in recent years. To the extent that the growth of real exports is sensitive to changes in the real exchange rate, an exchange rate policy under a managed floating system can be used to avoid exchange-rate misalignment. This objective can be achieved through fiscal and monetary policy discipline and adjustment of the nominal exchange rate to shocks to the economy.

The empirical results suggest that foreign income remains the major determinant of Bangladesh's exports. While the growth of foreign real income remains the key factor in the country's rapid export growth, there is some scope for promotion of non-traditional exports with low import-content that may have remained sensitive to the real exchange rate. Unlike most countries of East Asia, Bangladesh has an advantage in labour-intensive non-traditional products given its low real wages. The experience gained in the garment export industry remains useful to other labour-intensive industries. As all successful economies of East Asia have done since the beginning of the 1960s, Bangladesh can, and should, use this situation to its advantage [Rhee (1990)].

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The Contemporaneous Correlation of Structural Shocks and Inflation-Output Variability in Pakistan

MUHAMMAD NASIR AND WASIM SHAHID MALIK

Monetary policy has changed in a number of ways in the last two decades. Along with other characteristics, modern monetary policy is forward-looking and today central banks, to maintain credibility, respond contemporaneously to structural shocks that might make inflation deviate from the target in future. This study aims at investigating this aspect of monetary policy for Pakistan. Using the modified version of Structural Vector Autoregression (SVAR) developed by Enders and Hurn (2007), the authors have found a weak policy response to supply side shocks as the correlation coefficient between demand and supply shocks is only 0.041. Moreover, the results show that the demand shocks have no significant contribution in output variability. On the other hand, both demand and supply shocks, along with foreign supply shocks, significantly contribute to inflation variability.

JEL classification: E31, E42, E52, E58
Keywords: Monetary Policy, Contemporaneous Correlation, Pakistan, Structural Shocks, Vector Autoregression

1. INTRODUCTION

In the last two decades monetary policy has changed in a number of ways. It all started with the adoption of inflation targeting as monetary policy by the Reserve Bank of New Zealand (RBNZ) in 1989. After recognition that inflation targeting was a better option to control inflation, academicians and researchers started working on theoretical modelling of the framework [for early contributions, see for instance, Svensson (1997, 1999); Bernanke and Mishkin (1997) among others].[1]

Among other things a modern monetary policy would announce an explicit inflation target and make its achievement its prime objective, ensure transparency of policy decisions and implementation, make the monetary authority credible, the central bankers accountable and keep policy decisions forward-looking. This last characteristic makes central banks to respond contemporaneously to structural shocks that are expected to deviate inflation from the target in future. Any contemporary news that is relevant to

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[1]For critics on the subject, [see Calvo and Mendoza (2000); Calvo (2001) and Ball and Sheridan (2003), among others].

inflation is reflected in the inflation forecast, which in turn calls for changes in the operational target or policy instrument. Doing so makes demand and supply shocks contemporaneously correlated. A supply shock, which may result in the deviation of inflation from the target, calls for policy response that in turn affects the aggregate demand. This issue is of particular importance for decomposition of structural innovations into demand and supply shocks. More details on the issue are given in Blanchard and Quah (1989) and Enders and Hurn (2007).

Work on this aspect of monetary policy issues relating to Pakistan is limited. The authors may be right in thinking their study to be the first such attempt to estimate the contemporaneous response of demand to supply shocks and to find the contribution of structural shocks in output and inflation variability. The prime objective of this study, therefore, is to investigate the presence of contemporaneous correlation between demand and supply shocks in Pakistan. For this purpose the methodology of Enders and Hurn (2007) has been used which is a modification of the Blanchard and Quah (BQ) method. The second objective is to use the identified structural shocks, which otherwise are unobserved, to estimate the contribution of demand and supply shocks in output and inflation variability with the help of impulse response functions (IRFs) and forecast-error variance decomposition.

The rest of the study proceeds as follows: Section 2 discusses the theoretical model whereas econometric methodology used in the study is explained in Section 3. The fourth section deals with data and the construction of variables. The results and discussion are given in Section 5, and Section 6 concludes the study identifying some policy implications.

2. THEORETICAL FRAMEWORK

In a forward-looking monetary policy, inflation forecast is used as an intermediate target. Consequently, any shock which affects inflation forecast calls for contemporaneous change in the monetary policy instrument. The resultant changes in aggregate demand induced by this simultaneous response make demand and supply shocks contemporaneously correlated. Accordingly, we first develop a theoretical model that shows how the monetary policy instrument responds to contemporaneous shocks of inflation and economic activity.[2] Consider the following AS-AD model:

$$\pi_t = \alpha y^e_{t-1} + v_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.1)$$

$$y_t = -\beta r^e_t + u_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.2)$$

Equation (2.1) represents expectations-augmented-phillips curve, where π_t is inflation rate.[3] Equation (2.2) describes aggregate demand relationship where output gap, y_t, negatively depends on expected real interest rate, r^e.[4] Both u_t and v_t are independently and identically distributed and contemporaneously uncorrelated to demand and supply shocks. After simple mathematical manipulation the above equations take the following form:[5]

$$\pi_t = \gamma_1 \pi_{t-1} + \gamma_2 y_{t-1} + \omega_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.3)$$

[2]For this type of model, see for instance, Svensson (1997).
[3]y_{t-1}^e is the expected value of aggregate expenditures for period t, expected in period t–1.
[4]r_t^e denotes real interest rate for period t+1, expected in period t.
[5]The detailed mathematical derivations of Equations (2.3) and (2.4) are given the Appendix.

$$y_t = \lambda_1 y_{t-1} - \lambda_2 r_t + \eta_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.4)$$

The coefficients γ_2 and λ_2 are assumed to be positive; where as λ_1 is non-negative and less than 1 and γ_1 may be less than or equal to 1. In case the monetary policy is forward-looking, the objective of the central bank in period *t* is to choose an arrangement of current and future course of action for policy rates that minimises the expected sum of discounted squared future deviations of inflation from the target [Svensson (1997)], is referred for more details] Moreover, the choice of a policy rate in period *t* by the central bank is conditional upon the information available in that period. The period loss function is, therefore, given as

$$L(\pi_t) = \frac{1}{2}(\pi_t - \pi^*)^2 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.5)$$

Taking Equation (2.3) one period forward and then making use of Equations (2.3) and (2.4) would result in the following equation:

$$\pi_{t+1} = c_1 \pi_{t-1} + c_2 y_{t-1} - c_3 r_t + (\gamma_1 \omega_t + \gamma_2 \eta_t + \omega_{t+1}) \quad \ldots \quad \ldots \quad \ldots \quad (2.6)$$

where

$$c_1 = \gamma_1^2, c_2 = \gamma_2(\gamma_1 + \lambda_1), c_3 = \gamma_2 \lambda_2$$

In this case, the interest rate in period *t* will only affect the inflation rate in period *t*+1, and onwards, and the interest rate in period *t*+1 will only affect the inflation rate in period *t*+2 and onwards, and so on. Hence, the solution to the optimisation problem can be obtained by assigning the policy rate in period *t* to hit, on an expected basis, the inflation target for period *t*+1. The same is possible for the future periods. Thus, the central bank can find the optimal policy rate in period *t* as the solution to the simple period-by-period problem:

$$\min_i E_t \delta^2 L(\pi_{t+1}) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.7)$$

where δ is the discount factor whose value lies between 0 and 1. The first-order condition for the minimisation of Equation (2.7) with respect to i_t gives the following result:

$$\pi_{t+1/t} = \pi^* \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.8)$$

where $\pi_{t+1/t}$ denotes $E_t \pi_{t+1}$. According to Equation (2.8), the policy rate in period *t* should be such that the forecast of the one-period forward inflation rate, conditional upon information available in period *t*, equals the inflation target. Consequently, we can write the loss function as:

$$L^i(\pi_{t+1/t}) = \frac{1}{2}(\pi_{t+1/t} - \pi^*) \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (2.9)$$

The expectations of Equation (2.6) illustrate that the one-period inflation forecast is affected by both the previous and the current state of the economy as is evident from Equation (2.10) below:

$$\pi_{t+1/t} = c_1 \pi_{t-1} + c_2 y_{t-1} - c_3 r_t + \gamma_1 \omega_t + \gamma_2 \eta_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots (2.10)$$

Assuming $\pi^* = 0$ and equating the terms on the right hand side of Equations (2.8) and (2.10) would result in optimal reaction function of the central bank,

$$r_t = d_1\pi_{t-1} + d_2 y_{t-1} + d_3\omega_t + d_4\eta_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots (2.11)$$

where

$$d_1 = \frac{c_1}{c_3},\ d_2 = \frac{c_2}{c_3}, d_3 = \frac{\gamma_1}{c_2},\ \text{and}\ d_4 = \frac{\gamma_2}{c_3}$$

Equation (2.11) is like the Taylor (1993) type rule. From this equation it is clear that the demand side variable, r_t, is contemporaneously correlated with the supply side shock, ω_t. This explains why the methodology of Enders and Hurn (2007) has been used to identify structural shocks, allowing for contemporaneous response of aggregate demand to aggregate supply shocks. Moreover, Equation (2.11) states that this contemporaneous response is possible only if monetary policy is forward-looking. In case monetary policy minimises the loss function described in Equation (2.5), rather than that given in Equation (2.9)—when the policy is not forward-looking—the contemporaneous response of aggregate demand to supply shock will be zero.

3. EMPIRICAL METHODOLOGY

Econometrics got new life from Sims (1980), in which he introduced the Vector Autoregression (VAR) model. Sims responded to "Lucas Critique" given in Lucas (1976) by treating all variables in the model as endogenous. The VAR in standard form is a reduced form methodology which could be estimated by Ordinary Least Squares. This, however, gave birth to the "identification problem", which calls for imposing restrictions on some of the structural parameters so that identification could be achieved. One response came in the form of Cholesky decomposition which provided an additional equation for the identification of the structural models [Enders (2004)].

However, the VAR analysis was criticised by many economists arguing that these models could only be used for forecasting purpose and not for policy analysis [Sargent (1979, 1984); Learner (1985)]. In response to this criticism, the Structural Vector Autoregression (SVAR) approach was developed by Sims (1986), Bernanke (1986) and Blanchard and Watson (1986). The SVAR approach allows for imposing restrictions on the basis of economic theory. Nevertheless, the SVAR developed by the above mentioned authors imposed only short-run restrictions on the structural parameters for identification purpose. An extension to the SVAR of Sims (1986) and others were made by Shapiro and Watson (1988) and Blanchard and Quah (1989) by imposing long-run restrictions on the structural parameters. Especially, the methodology developed by Blanchard and Quah (1989), henceforth B-Q, got tremendous popularity among the economists because the assumptions used by this methodology for the exact identification of structural shocks were innocuous. This methodology assumes that the structural shocks are orthogonal; these shocks are normalised to have unit variance; and one structural shock has no long run effect on one of the variables. In an AD-AS model, the first assumption would mean that the aggregate demand and aggregate supply shocks are uncorrelated, while the third assumption would imply that the aggregate demand shocks have no effect on output in the long run.

However, the assumptions of B-Q also faced criticism by both economists and econometricians. For example, the New Keynesian economists argue that monetary shocks need not be neutral [Mankiw and Romer (1991)]. On the other hand, Waggoner and Zha (2003) and Hamilton, *et al.* (2004) gave information about the important consequences for statistical inference of different normalisations in a structural VAR. Similarly, Cover, *et al.* (2006) argues that there are sound economic reasons for allowing a contemporaneous correlation between the aggregate demand and aggregate supply shocks. Specifically, it points to the intertemporal optimising models and the New Keynesians models in which aggregate supply may respond positively to a positive aggregate demand shock. Hence, Cover, *et al.* (2006) allowed for the contemporaneous correlation between the structural shocks and this correlation was found to be 0.576 for the US. Enders and Hurn (2007) then extended the alternative methodology developed in Cover, *et al.* (2006) for a small open economy and allowed for the contemporaneous correlation between the structural shocks for the reason that the economy was following an inflation targeting policy. The correlation between the structural shocks was found to be 0.736.

In the following lines we discuss the econometric methodology used in the study. We discuss both the B-Q methodology, proposed by Blanchard and Quah (1989), and the alternative methodology developed by Enders and Hurn (2007) for a small open economy, as both the methodologies are used in the study.

3.1. The Blanchard-Quah Methodology

Suppose the real foreign output, the real domestic output, and the domestic inflation rate are represented by $\hat{y}_t, y_t$ and π_t respectively. Then a VAR model for a small open economy, as in Enders and Hurn (2007), can be written as:

$$\hat{y}_t = \sum_{j=1}^{k} \phi_{11} \hat{y}_{t-j} + e_{1t}$$

$$y_t = \sum_{j=0}^{k} \phi_{21} \hat{y}_{t-j} + \sum_{j=1}^{k} \phi_{22} y_{t-j} + \sum_{j=1}^{k} \phi_{23} \pi_{t-j} + e_{2t}$$

$$\pi_t = \sum_{j=0}^{k} \phi_{31} \hat{y}_{t-j} + \sum_{j=1}^{k} \phi_{32} y_{t-j} + \sum_{j=1}^{k} \phi_{33} \pi_{t-j} + e_{3t} \quad \ldots \quad \ldots \quad \ldots \quad (3.1)$$

It is obvious from the structure of the above equation that the foreign output evolves independently of domestic variables for the reason that the domestic country is assumed to be a small open economy. Nonetheless, the same small-country assumption requires the domestic variables to be dependant on the current and lagged values of foreign output.

The regression residuals, e_{1t}, e_{2t} and e_{3t} are assumed to be linked to each other through three different structural shocks, namely, a foreign productivity shock, ε_{1t}, a domestic supply shock, ε_{2t}, and a domestic demand shock, ε_{3t}. One of the important tasks is the identification of the three structural shocks, ε_{1t}, ε_{2t} and ε_{3t}, from the VAR residuals, since these structural shocks are not observable. Suppose the unobservable structural shocks and the observable VAR residuals are linked by the following relationship:

$$\begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \end{bmatrix} = \begin{bmatrix} h_{11} & h_{12} & h_{13} \\ h_{21} & h_{22} & h_{23} \\ h_{31} & h_{32} & h_{33} \end{bmatrix} \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.2)$$

So there are fifteen unknowns in this set-up that need to be identified. These unknowns include nine elements, h_{ij}, of the matrix H, and three variances $\sigma^2_{\varepsilon_1}, \sigma^2_{\varepsilon_2}, \sigma^2_{\varepsilon_3}$ along with the three covariances $\sigma_{\varepsilon_1\varepsilon_2}, \sigma_{\varepsilon_1\varepsilon_3}, \sigma_{\varepsilon_2\varepsilon_3}$ of the variance-covariance matrix of the structural shocks. The variance-covariance matrix of the VAR residuals is given by:

$$\sum_e = H \sum_s H' \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.3)$$

Hence, six of the fifteen restrictions, required for the exact identification, are provided by the distinct elements of the variance-covariance matrix of the VAR residuals. The standard Blanchard-Quah methodology assumes that all the variances are normalised to unity $(\sigma^2_{\varepsilon_1} = \sigma^2_{\varepsilon_2} = \sigma^2_{\varepsilon_3} = 1)$ and all covariances are equal to zero ($\sigma_{\varepsilon 1\varepsilon 2} = \sigma_{\varepsilon 1\varepsilon 3} = \sigma_{\varepsilon 2\varepsilon 3} = 0$). Moreover, the domestic shocks do not affect the large country, $h_{12} = h_{13} = 0$, and finally and most importantly, the demand shocks have no effect on domestic output in the long run:

$$h_{23}\left[1 - \sum_{i=1}^{k} \phi_{33j}\right] + h_{33}\left[1 - \sum_{i=1}^{k} \phi_{23j}\right] = 0 \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.4)$$

Thus, with all these fifteen restrictions, the identification is achieved in the B-Q methodology. However, Waggoner and Zha (2003) and Hamilton, *et al.* (2004) have warned that normalisation can have effects on statistical inference in a structural VAR. The main objection, nonetheless, is raised by Cover, *et al.* (2006) and Enders and Hurn (2007) about the assumed orthogonality of the structural shocks in BQ methodology. They argue that, in the presence of a normal demand curve, a negative supply shock will reduce output and increase inflation. However, if the country is following the inflation targeting strategy, then the monetary authorities will contemporaneously raise the policy rate to shift the demand curve inward in order to keep inflation on target. The reverse will be done in case of a positive supply shock. This implies that the correlation between the demand and supply shocks may not necessarily be zero. The orthogonality assumption of B-Q methodology does not let demand to respond to supply shocks and hence in this methodology the correlation is forcibly set equal to zero.

3.2. The Alternative Methodology

Enders and Hurn (2007) start with the following simple AD-AS model:

$$\begin{aligned} y_t^s &= E_{t-1} y_t + \rho(\pi_t - E_{t-1}\pi_t) + \varepsilon_{2t} + \theta\varepsilon_{1t} \\ y_t^d + \pi_t &= E_{t-1}(y_t^d + \pi_t) + \varepsilon_{3t} \\ y_t^s &= y_t^d \end{aligned} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad (3.5)$$

In this model, $E_{t-1}\, y_t$ and $E_{t-1}\, \pi_t$ are the expected domestic output and inflation in period t conditional upon the information available at the end of period t–1. The superscripts s and d represent supply and demand, respectively. It is obvious that the first equation is the Lucas supply curve and the second equation represents aggregate demand relationship.

This AD-AS model is consistent with a VAR if agents form their expectations based on it. Taking one period lag of Equation (3.1) and then taking the conditional expectations will result in $E_{t-1}\, y_t$ and $E_{t-1}\, \pi_t$. The parameters of the macroeconomic model enter into the following matrix H, placing restrictions on the relationships between the regression residuals and the structural shocks:

$$H = \begin{bmatrix} h_{11} & 0 & 0 \\ \theta/(1+\rho) & 1/(1+\rho) & \rho/(1+\rho) \\ -\theta/(1+\rho) & -1/(1+\rho) & 1/(1+\rho) \end{bmatrix} \quad \ldots \quad \ldots \quad \ldots \quad (3.6)$$

Here the six elements of the estimated variance-covariance matrix of VAR residuals can be used for the identification of three variances and three covariances of structural innovations along with h_{11}, θ, ρ. For the identification of the whole system, three more restrictions include $h_{11} = 1$, $\sigma_{\varepsilon 1 \varepsilon 2} = 0$, and the long-run neutrality of demand shock. This decomposition differs from the standard BQ decomposition in three ways. First, the assumption of normalisation of all structural shocks to unity is not imposed. Second, no restriction has been imposed on the contemporaneous correlation between structural shocks. It is allowed to be determined independently within the model. Third, the small country assumption outlines that domestic shock has no effect on global economy.

4. DATA AND CONSTRUCTION OF VARIABLES

This study uses quarterly data over the period 1991:4 to 2010:2 for Pakistan's economy.[6] The constant price GDP is used to represent domestic real output. For this purpose, we need to have the series of quarterly real GDP for Pakistan. Kemal and Arby (2004) have constructed such series for Pakistan for the period 1975-2004, whereas we use data up to 2010:2. Nonetheless, the absence of trends and the negligible variance in the already identified shares for the respective quarters in different years justify the use of average of these quarterly shares for the next few years to obtain the values of quarterly real GDP. Data on GDP is then seasonally adjusted using X12 method. Furthermore, the domestic inflation rate is calculated using the data on CPI.

We have not used United States' GDP to represent foreign output. Due to its large size of the economy and being the major trading partner of many countries, the United States is expected to affect the economic environment of its partners. That is why most studies take the real GDP of the US as proxy for the entire external sector, [for instance in Enders and Hurn (2007)]. However, this may not be a true representative of an external shock. Subsequently, the US GDP may not be a suitable proxy of foreign output for

[6]The reason for not extending this period beyond 1991 is that the SBP was not independent in setting the policy instrument before financial sectors reforms initiated in 1989.

Pakistan as it is not the only trade partner which can have significant effects on Pakistan's economy. Although the US has major share in the export composition of Pakistan, Saudi Arabia has a major import share in the import portfolio. In order to avoid any ambiguity, therefore, we have constructed an index of the foreign output where major trading partners of Pakistan are represented. These countries include the US, UK, Japan, Germany, Saudi Arabia, Kuwait and Malaysia. The index is constructed by taking the weighted average of its partners' GDP where the weights are Pakistan's trade shares with each country.[7] The sources of data for construction of the index of foreign output include *International Financial Statistics* (IFS) and various issues of *Economic Survey of Pakistan*.

5. RESULTS AND DISCUSSION

5.1. Unit Root and Cointegration Tests

The application of Vector of Autoregression (VAR) requires absence of unit roots in variables. Moreover the variables should not be cointegrated. Therefore, in order to check whether the variables are stationary or integrated to some order, the Augmented Dickey-Fuller (ADF) test has been used. The results of the ADF test are reported in Table 1 below.

Table 1

Results of the Unit Root Test Statistics

Variables	Level	First Difference	Conclusion
Foreign Output	–1.190	–3.610 **	I(1)
Domestic Output	–1.464	–12.230 ***	I(1)
Inflation	–1.490	–6.395 ***	I(1)

Note: The regressions include a constant. The ** and *** show rejection of null hypothesis at 5 percent and 1 percent levels of significance respectively.

The results of the ADF test in the above table indicate that all variables are non-stationary at conventional levels of significance. However, all these variables are stationary at first difference and hence are integrated of order 1. Nonetheless, the application of the VAR model necessitates the absence of any cointegrating relationship among the set of non-stationary variables. Thus it is desirable to check the number of cointegrating vectors among these variables. For this purpose, we make use of Johansen's approach to investigate the relationship among the three variables. Table 2 portrays the results.

[7]A problem that is confronted is the unavailability of both Real GDP in volume and GDP Index for some countries such as Saudi Arabia and Kuwait on quarterly basis. So we have taken the Index of Crude Petroleum Production as proxy of GDP Index for these two countries.

Table 2

Johansen Test for the Cointegrating Relationship

No. of CE(s)	Trace Statistics	5% Critical Value	Max. Eigen Statistics	5% Critical Value
None	15.131	29.797	8.833	21.131
At most 1	6.297	15.494	5.560	14.264
At most 2	0.737	3.841	0.737	3.841

Note: The Johansen cointegration test is conducted using two lags which are chosen using AIC. The test used the specification which allows for an intercept term but there is trend neither in cointegrating equation nor in VAR.

Results in Table 2 reveal that the null hypothesis of the absence of cointegrating relationship cannot be rejected at the conventional significance levels. Both trace statistics and maximum eigenvalue statistics confirm the absence of any cointegration vector. The absence of cointegrating relationship necessitates the application of VAR in the first difference.

5.2. Estimation Results

5.2.1. *Results of the Standard B-Q Decomposition*

The results of the standard Blanchard-Quah decomposition bring forth the determinants of output and inflation in Pakistan.[8] It is evident from the forecast-error variance decomposition reported in Table 3 that demand shocks do not explain any significant variation in domestic output at any forecasting horizon. After three periods, the explained variation in output due to demand shocks remains at 0.12 percent for the rest of the horizon. On the other hand, domestic supply shocks have a dominant role in output variation. Almost 88 percent of variation in output is attributed to domestic supply shocks. However, the foreign GDP shocks explain little (around 11.7 percent) output variability. Results in Table 3 also demonstrate the determinants of inflation variability. Interestingly, all the three shocks contribute to inflation variability. For the first two quarters, for instance, both domestic supply shocks and foreign GDP shocks explain 23 percent and 38 percent variations respectively. However, beyond this two-step horizon, the explained variation by the two shocks changes to 36 percent and 33 percent respectively. Likewise, the demand shocks initially explain 38 percent variation in inflation which then slides down to 30.5 percent after the two-period horizon.

Table 3

Forecast-error Variance Decomposition Using B-Q Decomposition

	Percentage Variation in Domestic Output due to			Percentage Variation in Domestic Inflation due to		
Horizon	FGDPS	DSS	DDS	FGDPS	DSS	DDS
1	11.437	88.484	0.079	38.114	23.454	38.340
2	10.894	89.022	0.085	38.226	23.396	38.377
3	11.350	88.530	0.119	33.003	36.072	30.925
4	11.655	88.224	0.121	33.083	36.296	30.621
5	11.683	88.196	0.121	33.137	36.261	30.602
6	11.724	88.156	0.121	33.218	36.219	30.563
7	11.729	88.150	0.121	33.215	36.225	30.559
8	11.733	88.146	0.121	33.225	36.220	30.555
9	11.734	88.145	0.121	33.225	36.220	30.554
10	11.735	88.145	0.121	33.226	36.220	30.554

Note: FGDPS= Foreign GDP Shock, DSS= Domestic Supply Shock, DDS= Domestic Demand Shock.

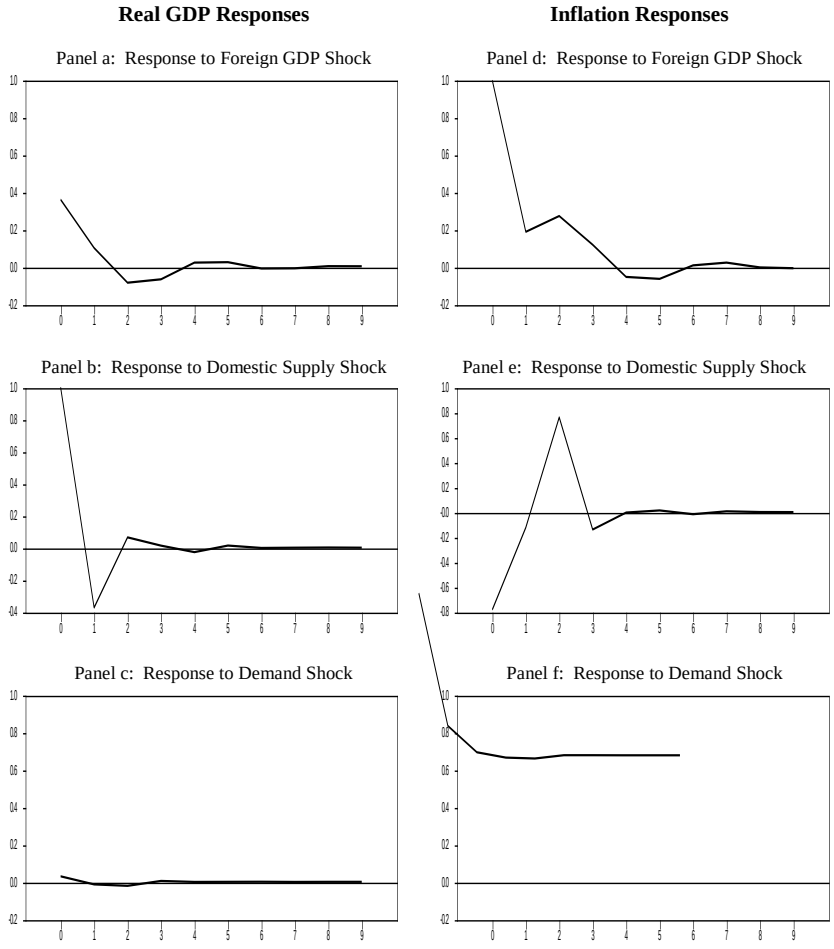
[8]The estimation results are obtained using RATS software.

The results of Table 3 highlight some important issues that call for attention. First, the foreign GDP shocks explain smaller variation in output and relatively greater variation in inflation. So the effects of the shocks transmit more to price level than to output in Pakistan. This is true for most developing countries which confront the problem of capacity utilisation due to various reasons such as unskilled workforce, energy crises, weak infrastructure etc. Furthermore, this pattern is more likely if the basket of imported goods contain more finished products than intermediate products. The second issue is concerned with the effects of the shock on different forecast horizons. As is evident from the above table, after the two-step horizon, the inflation variability, explained by foreign output shocks, reduces whereas that by the domestic supply shocks increases. One possible interpretation is that the effects of foreign shocks translate into domestic supply shocks. For example, an adverse oil price shock is initially a foreign supply shock for Pakistan. However, after some time the effects of increased oil price transmit to domestic prices which ultimately result in backward shift of the aggregate supply curve.

The impulse response functions for the standard B-Q model are illustrated in Figure 1. One can easily observe the similarity of results shown both by the variance decomposition and the impulse response functions. Panel *a* of Figure 1 demonstrates that one unit shock in foreign output shifts the domestic output up by 0.35 units in the first quarter, 0.09 standard deviation in the second quarter, and –0.08 standard deviations in the third quarter. Afterwards, the successive values of domestic GDP steadily converge to zero. The reason for the positive effect of foreign GDP shock on domestic output is more than obvious. A favourable output shock in foreign countries will raise their national incomes. Since a country's exports depend on her trading partners' income, there will be an increase in demand for Pakistani exports, thereby boosting the domestic output. Panel *b* confirms that the domestic supply shocks have significant effect on output. The effect, however, is short-lived as it converges to zero in the second quarter. Demand shocks do not affect output as is evident from Panel *c*. The possible reason could be the assumptions in the standard Blanchard-Quah model that call for long run neutrality of demand shocks and the zero correlation between aggregate demand and aggregate supply shocks.

The results in panel *d* illustrate that foreign output shocks have positive effects on domestic inflation as well. As explained earlier, the effect of foreign shocks, whether positive or negative, are absorbed more by the price level than by domestic output. Panel *e* suggests that a favourable domestic supply shock will reduce inflation in the first quarter. Though it goes up in the second quarter, possibly due to the cobweb phenomenon, it converges to zero in the fourth quarter. Panel *f* indicates that demand shocks positively affect inflation. A one unit demand shock increases inflation by 0.97 units in the first quarter. However, the successive values of the effect on inflation, thereafter, converge to zero. This means that in the B-Q methodology, approximately the whole effect of the demand shock is absorbed by inflation only. Cover, *et al.* (2006) and Enders and Hurn (2007) argue that these results may be the consequence of the assumptions of standard B-Q model. We now turn to the results obtained by using Enders and Hurn (2007) methodology.

Fig. 1. Plots of the Standardised Impulse Response Functions for B-Q Decomposition



5.2.2. *Results of the Alternative Decomposition*

Interestingly, the results obtained by using the alternative model are not much different from those of the standard Blanchard-Quah model. This is obvious from both Table 4 and Figure 2. Both the forecast-error variance decomposition and the impulse response functions obtained using the identified structural shocks demonstrate almost the same pattern as was found for B-Q decomposition. Table 4 results indicate that demand shocks explain only 0.16 percent variation in output beyond a two-step horizon. This suggests that demand shocks do not have significant effect on output in Pakistan. On the other hand, output variability is explained more (88 percent) by the domestic supply shock. Foreign output shocks explain only 11.86 percent of the variation in output.

Table 4

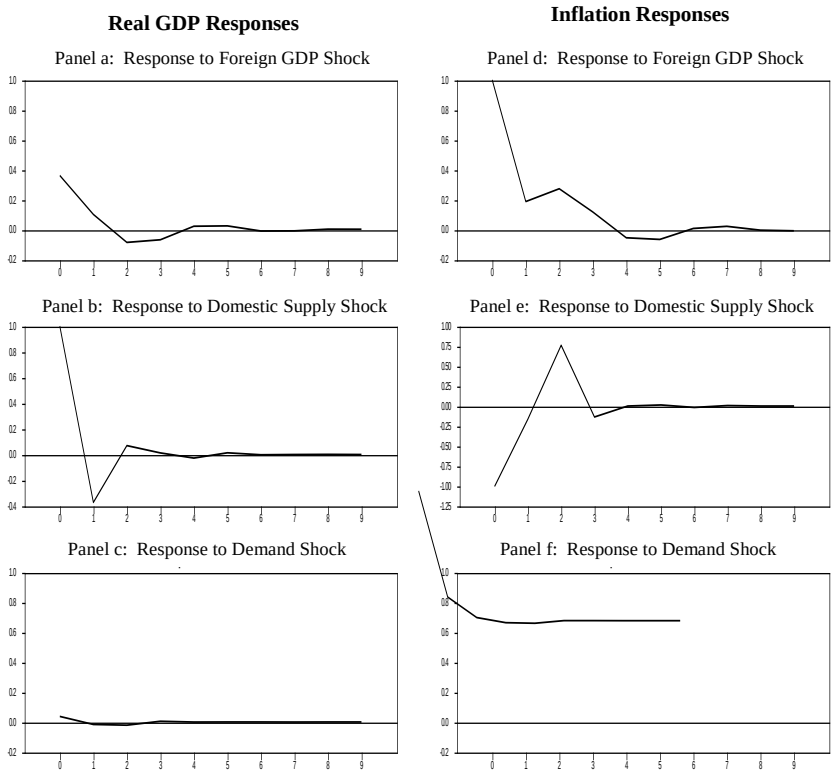
Forecast-error Variance Decomposition Using Alternative Decomposition

	Percentage Variation in Domestic Output due to			Percentage Variation in Domestic Inflation due to		
Horizon	FGDPS	DSS	DDS	FGDPS	DSS	DDS
1	11.564	88.311	0.126	33.370	33.568	33.062
2	10.019	88.849	0.132	33.479	33.416	33.105
3	11.474	88.361	0.165	29.666	42.948	27.387
4	11.782	88.052	0.167	29.774	43.074	27.152
5	11.810	88.023	0.166	29.826	43.036	27.138
6	11.851	87.982	0.166	29.903	42.991	27.107
7	11.856	87.977	0.166	29.901	42.995	27.104
8	11.861	87.973	0.166	29.910	42.990	27.100
9	11.861	87.972	0.166	29.910	42.990	27.100
10	11.862	87.972	0.166	29.911	42.989	27.099

As reported in Table 4, all the three types of structural shocks contribute in explaining variation in inflation even in this decomposition. However, the variation explained by domestic supply shocks increased to 43 percent in the current decomposition compared to 36 percent obtained using the BQ method. Nevertheless, the contribution of demand shocks and foreign output shocks to inflation variability declines from 30.5 percent and 33 percent to 27 percent and 30 percent respectively. Hence, the results obtained from alternative decomposition do not significantly differ from those obtained through B-Q decomposition. However, the findings of this work are in significant contrast to both Enders and Hurn (2007) and Covers, *et al.* (2006) who found that the effect of demand shocks was more on output and less on inflation.

The results of impulse response functions in Figure 2 tell a similar story. These response functions are obtained using structural shocks identified by alternative decomposition. Results in panel *a* show that a one unit foreign GDP shock raises the output by 0.35 units in the first quarter, and after the third quarter, the successive values of the shock converge to zero. It is clear from panel *b* that a favourable domestic supply shock has immediate effect on output, and the effect starts declining to zero after the second quarter. Yet again, demand shocks fail to show any significant impact on output as is evident from Panel *c*. The impact of foreign output shocks, domestic supply shocks, and demand shocks on inflation are portrayed in Panels *d*, *e* and *f* respectively. These response functions confirm and validate the results shown by the forecast-error variance decomposition.

Fig. 2. Plots of Standardised Impulse Response Functions for Alternative Decomposition



5.3. Contemporaneous Correlation of Demand and Supply Shocks

The main objective of this study is to establish whether or not the State Bank of Pakistan (SBP) responds contemporaneously to supply side shocks. For this purpose, the contemporaneous correlation was allowed between the two structural shocks. Using the alternative decomposition method mentioned above, the findings suggest that there is correlation of only 0.041 between the two shocks which is negligible. Consequently, it may be concluded that the SBP has not been responding contemporaneously to supply side shocks.[9] This result points to the fact that the policy has not been forward-looking in the sample period. Another possible reason for this result may be the absence of a proper forecasting model with the SBP, at least until recently.

5.4. Estimation Results for Sub-sample Period

It is usually believed that the appointment of Ishrat Hussain as Governor of the SBP was the beginning of an era when the central bank started enjoying relatively greater

[9]The finding that the SBP has not been following inflation targeting policy is consistent with Malik and Ahmed (2007) who find, while estimating Taylor rule, the coefficient of inflation is less than one failing to satisfy the requirement of Taylor principle.

independence from the government since the institution of financial sector reforms. This provides the grounds for the use of a sub-sample period for this analysis. Using data over the period 1999:1 to 2010:2, both the B-Q and alternative methodologies have been used for the identification of structural shocks as well as for the detection of any contemporaneous correlation among these shocks. The results of forecast-error variance decomposition using both methodologies are reported in Table 5 and Table 6. It is clear that there is no significant difference in outcomes of both methodologies. The results in Table 6 show that the foreign output shock, domestic supply shock and domestic demand shock explain, respectively, 31 percent, 69 percent and 0.12 percent of variation in output. Similarly, it is found that 52 percent of inflation variability is explained by foreign output shock, 31.5 percent by domestic supply shock, and 16.6 percent by domestic demand shock. The results for the B-Q model are the same with a slight difference of approximately 1 percent.

Table 5

Forecast-error Variance Decomposition Using B-Q Decomposition

	Percentage Variation in Domestic Output due to			Percentage Variation in Domestic Inflation due to		
Horizon	FGDPS	DSS	DDS	FGDPS	DSS	DDS
1	33.417	66.518	0.064	58.446	19.294	22.261
2	30.670	69.254	0.085	59.123	18.909	21.968
3	30.653	69.242	0.106	53.712	28.994	17.294
4	30.607	69.283	0.110	53.027	29.892	17.081
5	30.673	69.217	0.110	52.992	29.943	17.065
6	30.758	69.132	0.110	52.972	29.988	17.041
7	30.770	69.119	0.110	52.979	29.988	17.033
8	30.783	69.107	0.110	52.994	29.979	17.027
9	30.784	69.105	0.110	52.997	29.977	17.026
10	30.785	69.105	0.110	52.999	29.976	17.025

Table 6

Forecast-error Variance Decomposition Using Alternative Decomposition

	Percentage Variation in Domestic Output due to			Percentage Variation in Domestic Inflation due to		
Horizon	FGDPS	DSS	DDS	FGDPS	DSS	DDS
1	33.510	66.416	0.074	56.816	21.640	21.544
2	30.767	69.137	0.096	57.535	21.180	21.285
3	30.751	69.132	0.117	52.584	30.558	16.858
4	30.707	69.171	0.122	51.935	31.407	16.658
5	30.772	69.106	0.122	51.903	31.453	16.643
6	30.857	69.021	0.122	51.886	31.494	16.620
7	30.870	69.008	0.122	51.894	31.494	16.613
8	30.883	68.996	0.122	51.908	31.484	16.608
9	30.884	68.994	0.122	51.911	31.482	16.607
10	30.885	68.993	0.122	51.913	31.481	16.606

However, the results of this sub-sample are much different in terms of explanation of variation in output and inflation from those of the full sample. For instance, with the alternative decomposition, variability in output and inflation explained by foreign GDP shock increase from 12 percent and 30 percent to 31 percent and 52 percent respectively. This indicates the increased exposure of domestic economy to foreign shocks in the sub sample period. Likewise, the role of domestic supply shock in both output and inflation variability reduces to 69 percent and 31.5 percent respectively. Nonetheless, it still remains the major source of variation in output. Interestingly, the role of demand shock in inflation variability reduces from 29 percent to 16.6 percent. This is an important result for the SBP to consider when it goes for tight monetary policy to reduce inflation in the economy. The lesser share of demand shocks in explaining inflation variability suggests that the SBP should be careful while controlling inflation, through demand management policy, as it may be caused more by supply shocks. Yet again, demand does not play any significant role in output variability for the sub-sample period.[10] Finally, the findings of this study give no indication of a forward-looking policy even in this era of central bank independence. In fact, the contemporaneous correlation coefficient between demand and supply shocks reduces to 0.012, which is less than the value obtained for the entire period of the analysis. This shows the presence of enough fiscal pressure for the SBP to be not able to target an explicit inflation rate.

6. CONCLUSIONS AND POLICY IMPLICATIONS

The objectives of this study include the identification of structural shocks, examining the relative contributions of these structural shocks in output and inflation variability, and the investigation of whether or not the SBP responds contemporaneously to supply side shocks. For this purpose, use has been made of the Structural Vector Autoregression (SVAR) by considering both Blanchard-Quah methodology and an alternative methodology initially developed by Cover, *et al.* (2006) and later extended by Enders and Hurn (2007). Some important findings are given in the following lines.

The first and the main finding of the study is that the SBP has not been pursuing a forward-looking policy. The contemporaneous correlation between the aggregate demand and aggregate supply in Pakistan is only 0.041, which suggests a negligible contemporaneous policy response to supply-side shocks. The second outcome is concerned with the role of structural shocks in explaining variation in both inflation and output. Interestingly, but not surprisingly, the results of both methodologies do not differ significantly. The domestic supply shock is considered to be the major factor contributing in output variability, followed by foreign shock. Domestic demand shock, on the other hand, does not play a significant role in output variation. Moreover, the domestic supply shock is the central cause of variation in inflation with foreign supply shock at the second and domestic demand shock at the third place.

The third finding concerns the impact of foreign supply shock on domestic output and inflation. A positive foreign supply shock affects domestic inflation more than the domestic output. This may be due to the fact that whenever due to increase in foreign

[10]Like the forecast-error variance decomposition, there is not any significant difference in the impulse response functions of the two decompositions for the selected sub-sample. These results of the IRFs can be obtained on request from the authors.

output, the income of foreigners and, consequently, the demand for Pakistani exports rises, the economy does not respond positively or in a suitable manner. Instead of increasing domestic output, the effect of the shock is allowed to transmit more to the price level. The weak response of output may be the result of an inefficient real sector because of unskilled labour force, weak infrastructure, and energy constraints etc.

The results of this study bring forth important policy implications. Firstly, and most importantly, the central bank should be careful in controlling inflation through tight monetary policy. An increase in interest rate in order to reduce demand may not reduce inflation to the desired extent as demand contributes less to inflation. Rather, the cost channel of monetary policy may come into play. In this context, the continuous increase in the policy rate by the SBP in recent times can be said to be undesirable. Moreover, a tight monetary policy may not be efficient in the absence of coordination between demand management policies. Secondly, the policy-makers should avoid exploiting inflation-output trade-off, since the role of demand in output growth is negligible.

In this study the researchers have modelled monetary policy on the contemporaneous response of demand to supply shock. Therefore, for future research, it will be more appropriate if interest rate is directly included in the VAR as a monetary policy instrument. This is important as monetary policy is not the only factor that makes changes in demand. Subsequently, by including interest rate in the model, one can differentiate among changes in demand brought about by monetary policy and those by the other factors.

APPENDIX

Let the expectation augmented Phillips Curve is given by the following equation:

$$\pi_t = \alpha y^e_{t-1} + v_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(I)}$$

Also we know that

$$\Delta y^e_t = a(y_{t-1} - y^e_{t-2})$$

or

$$y^e_{t-1} = a y_{t-1} + (1-a) y^e_{t-2} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(II)}$$

Now taking Equation (I) one period backward and solving for y^e_{t-2} gives the following equation:

$$y^e_{t-2} = \left(\frac{1}{\alpha}\right)\pi_{t-1} - \left(\frac{1}{\alpha}\right)v_{t-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(III)}$$

Substituting Equation (III) in Equation (II) would result in following:

$$y^e_{t-1} = a y_{t-1} + (1-a)\left[\left(\frac{1}{\alpha}\right)\pi_{t-1} - \left(\frac{1}{\alpha}\right)v_{t-1}\right] \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(IV)}$$

Substituting equation (IV) in Equation (I) would give the following result:

$$\pi_t = \gamma_1 y_{t-2} + \gamma_2 \pi_{t-1} + \omega_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(V)}$$

Where

$$\gamma_1 = a\alpha\,,\ \gamma_2 = (1-a)\,,\ \omega_t = v_t - (1-a)v_{t-1}$$

Similarly the aggregate demand relationship is given by following equation:

$$y_t = -\beta r_t^e + u_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(VI)}$$

Since

$$\Delta r_t^e = b(r_t - r_{t-1}^e)$$

Or

$$r_t^e = br_t + (1-b)r_{t-1}^e \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(VII)}$$

Now taking Equation (VI) one period backward and solving for r_{t-1}^e gives the following result:

$$r_{t-1}^e = \left(\frac{1}{\beta}\right)y_{t-1} + \left(\frac{1}{\beta}\right)u_{t-1} \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \text{(VIII)}$$

Substituting the Equation (VIII) in Equation (VII) and then putting the resultant value of r_t^e in Equation (VI) gives the following equation:

$$y_t = \lambda_1 y_{t-1} - \lambda_2 \gamma_t + \eta_t \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \ldots \quad \text{(IX)}$$

Where

$$\lambda_1 = (1-b)\,,\ \lambda_2 = \beta b\,,\ \eta_t = \left(\frac{1-b}{\beta}\right)u_{t-1} + u_t$$

Equations (V) and (IX) are the ones representing Equations (2.3) and (2.4) in the text.

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A Strategic Tool for Managing Intellectual Capital of Pakistan

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In the post-industrial world, the Intellectual Capital (IC) of nations has become critical for wealth and value creation. In this era of knowledge-based economy, one real challenge that a nation faces is maintenance of its economic growth and its competitiveness in the international market. Policy-makers presently need to have a strategic management tool to measure and develop IC assets of a country. The paper extends the framework of Skandia Navigator [Edvinsson and Malone (1997)] from the corporate to the national level and develops a tool on the extended framework to visualise the intellectual capital of Pakistan.

The Intellectual Capital of a country is indirectly visualised through various indices. These indices change from year to year, not necessarily in a consistent manner, so that having a general view would be baffling. To overcome this limitation, this paper proposes three methods of measuring the change in IC based on Financial Index (FI), Human Index (HI), Process Index (PI), Market Index (MI) and Research Index (RI). These tools produce composite IC indices for Pakistan (2005-2010) that can be useful for the development of national policies.

Keywords: Intellectual Capital Measurement, Knowledge Management, Strategic Management, Pakistan Economy

1. INTRODUCTION

The phenomenon of globalisation has stiffened competition among industrial countries, while the emergence of information technology has accelerated the shift towards innovation-driven societies [Bismuth and Tojo (2008**)]**. Intellectual Capital provides the foundation for socio-economic development and value creation for modern societies. It determines the competitiveness of a country by linking key resources for national wealth creation and represents the strength of a nation [Malhotra (2003)]. As the dynamics of nation's economy are shifting towards knowledge orientation instead of natural resources, the importance and significance of intellectual capital is growing. There is now an immediate need to evaluate the measure and map the IC for countries, regions, cities [see Pomeda, *et al.* (2002); Bontis (2004); Bonfour and Edvinsson (2004); Lerro, *et al.* (2005); Pascher and Shachar (2005)].

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Roos, *et al.* (2005) explains that in the era of knowledge economy business resources comprise 20 percent tangible value and 80 percent intangible value. It is argued that focusing on tangible assets of a country and ignoring the intangibles slows down or even stops the economic growth of a country. Moreover, contemporary measurement techniques used for economic development are focused on the financial aspects alone and ignore the intangible aspects of national wealth. The paper advocates the inclusion of intellectual capital as a regular feature of annual development reports.

There is no consensus yet on the definition of IC, its measurement and management. A number of methods and classifications of intellectual capital were developed during the last twenty years, but as a scientific approach, the field of national IC is still in a formative stage. As the world's economy is transforming from industrial to knowledge-based societies, it is important for Pakistan to get into this era by orienting its IC management towards competitiveness not only in the region but also in the developed world.

2. CONCEPTUAL FRAMEWORK OF THE STUDY

The Intellectual Capital of a country is indirectly visualised through various indices. These individual indices may change from year to year not necessarily in the same direction making it difficult to form a general view. For example, an analysis using five years data covering 2005–2010 shows that the Human (HI) and Research (RI) indices in Pakistan are increasing, while the Financial (FI), Process (PI) and Market (MI) indices are decreasing. To overcome this limitation, this paper proposes three methods that are based on these five indices.

The study follows a three-stage process to achieve this end: in the first stage, Skandia Navigator which is a recognised strategic management tool used in corporate sector is extended for measuring the IC of nations. Then country specific indicators are developed for measuring the IC assets for Pakistan and finally, in the last stage, a composite index is developed and weighted data of five years is plotted to visualise the IC performance of the country.

The secondary data for the study is collected from various official sources such as the *Economic Survey of Pakistan 2009-10* of the Ministry of Finance, publications of the Federal Bureau of Statistics, Ministry of Science and Technology, State Bank of Pakistan and the Higher Education Commission. Data has also been collected from reputed databanks like WDI, ILO, and CIA Fact book.

3. LITERATURE REVIEW

IC is being viewed by researchers in different perspectives. Machlup (1962) coined the word "intellectual capital" and has used it to highlight the importance of knowledge as essential for growth and development. The intellectual capital thought is further expanded and built on by Drucker (1993) in his description of the post-capitalist society. Drucker highlights the importance and the advent of a society that is dominated by knowledge resources and the competitive landscape of intellectual capital allocation. Stewart (1994) describes IC as something that is intangible but is still important. Moore (1996) notes IC as customer capital, innovation capital and

organisational capital. While Edvinsson and Malone (1997) explain Intellectual Capital as "realising your company's true value by finding its hidden brainpower" and define IC as the sum of knowledge, information, intellectual property, expertise and human mind's creative ability which could be converted into value. Edvinsson while developing the IC model explains that Skandia defines IC as the possession of knowledge, applied experience, organisational technology, customer relationships and professional skills that provide a competitive edge in the market. As the domain is still in its emergent stage, researchers are giving their own nomenclature to IC [Luthy (1998)], but mostly researchers agree that IC includes hidden values of company, region and country in the form of knowledge.

For IC measurement, there are four approaches [Luthy (1998); Roos, *et al.* (2005)]. One approach identifies and evaluates different components of IC in terms of money. The other multiplies excess percentage of return on assets with company's average tangible assets to calculate extra annual earnings. Then the value of IC is calculated on dividing these extra annual earnings by company's average cost of capital. The third approach focuses on cost and tries to compute the IC through the difference between market and book value. Another approach calculates a composite index of IC after identifying and reporting different components on a scorecard.

World Bank (2008) KAM has been developed under the Knowledge for Development Programme. The objective of KAM is to find out challenges and opportunities for countries so they will continue to move towards a knowledge-based economy. To measure the performance of a country, four Knowledge Economy pillars have been developed. These are—Economic Incentive and Institutional Regime, Education, Innovation and Information and Communications Technologies. There are 83 structural and qualitative variables for 140 countries of the world. Variables are normalised on a scale of 0 to 10 relative to other countries in the comparison group. The OECD (2001) Science report recognises that investment in knowledge is by nature much more difficult to measure. A rough indication can be gained by including public and private spending on higher education, expenditure on R&D and investment in software. Malhotra (2003) explains that "In the formative phase of developing theoretically sound measures, OECD interprets the inputs rather than outputs or outcomes as representative of a knowledge-based economy".

There are also some other models which are at their conceptual stage. These models may be helpful in the future for developing IC measurement frameworks and related indicators for regional and international comparison of socio-economic development. UNECE conducted an assessment of existing practices and methodologies for valuing intellectual capital. The objective was to support the innovation and commercialisation of knowledge assets. The assessment focused on appraisal of intellectual assets (inventions), intellectual property rights (patents), valuation of managerial flexibility, stock market valuation of companies, and R&D project valuation [UN (2003)]. The recommendations were for sustainable innovation and value creation process. The valuation process examined the human resources as an innovative domain and recommended that more focus was required for the same. The eEurope national knowledge assets measurement models focus on forming an information society which is based on knowledge sharing and generation. Their focus is on the digitisation for the

public sector. To get customer trust, their priority is to develop an innovative entrepreneurial culture and a socially inclusive process to support the subject. The European KM Forum tool describes itself as "the initial concepts for assessing the maturity of organisations towards KM". This model gives more importance to human motivation and commitment as this has been ignored in many other models. Interestingly, it also focused on the human motivation issues that have been generally neglected in other tools for knowledge assets' measurement. Moreover, most metrics and indicators from this forum are yet to be developed based upon a very comprehensive knowledge audit questionnaire. The definition of 'e-readiness' is the extent to which a market is conducive to Internet-based opportunities to demarcate areas where government policy can guide investment for growth. To compare and appraise the e-business, the Economic Intelligence Unit has developed a comparative index ranking system. Popular interest in Internet and Web-based interconnected infrastructures started with the worldwide discussions on development of National Information Infrastructures in early 1990s [Malhotra, *et al.* (1995)]. It is evident in World Bank and OECD studies that there are many overlaps in the indices and indicators used in these comparisons with the structural and process aspects of ICT infrastructures. On the other hand, ICT represents one of the structural inputs that must be leveraged by human appropriation and utilisation for performance [Hildebrand (1999)].

4. IC MEASUREMENT TOOL FOR PAKISTAN

There are various perspectives from which national wealth can be accessed, for instance the status with regard to education, health, ICT, poverty, and gender empowerment [Bontis (2004)]. The underlying framework is based on the scorecard approach in which IC components are identified and reviewed for better decision making. As Skandia Navigator is a strategic management tool, we firstly need to define the vision of a nation in order to determine the development path for the country. This vision is taken from the directions given by the founders of the nation. Secondly, the socio-economic progress of the country on the development path is measured. This progress is determined by measuring the IC indicators on five facets. The combined result of the five indices gives a scorecard picture of the country progressing towards its vision. Pakistan came into being with the vision of welfare state, in which there will be no discrimination and the state will have a modern infrastructure to compete with the rest of the world. But the current situation reveals that we have deviated from that vision. Pakistan is suffering from chronic bad governance, which has resulted in grave policy imbalances. The lack of alignment of the policies with the needs of the system, has resulted in corruption, inflation, shortage of energy, water and many other problems. No doubt Pakistan has set millennium goals for its success but the question is whether the policies and methods adopted can achieve the goals and whether these have any relationship with the original vision set by the Father of the Nation.

The concepts with regard to the indicators discussed in this paper are given below. The selection of components relevant to an indicator has the endorsement of a number of experts in various business organisations.

4.1. Financial Capital Indicators

Financial capital reflects the tangible economic achievements of a country. It can be measured using indicators such as GDP, the structure of industry, workforce, growth rate of services and products per year, etc. To derive the Pakistan National Financial Index (PNFI), the real growth rate of GDP, exports, federal government's revenue receipts, gold and foreign exchange reserves and the growth of the manufacturing sector (percent of GDP) have been selected as the *five* vital components of the economy of Pakistan.

4.2. Market Capital Indicators

The market capital of a country reflects the relationship of a country with its trading partners in terms of exports and imports. It presents a country's capabilities to provide competitive services to its clients compared to other competing countries. The indicators selected to measure the Market Capital of Pakistan are balance of trade, foreign direct investment, tourism, and workers' remittances etc. Foreign relations play an important role in the economy of a country. To derive the Pakistan National Market Index (PNMI) *five* indicators have been selected. Bontis (2004) explains that market capital is the social intelligence which is being created by elements such as laws, market institutes and social networks. He also holds that it is basically a social capital backed by foreign relations that is attained through satisfying the other country's needs and demands.

4.3. Human Capital Indicators

Bontis (2004) describes human capital as the knowledge, competence and education of individuals in realising national tasks and goals. It is obvious that the economic growth of a country is closely associated with the development of human capital. A higher literacy rate helps to adopt new technologies, new ideas, research and development etc. Along with that the health and earning power of the human resource also reflect the standard of living. For Pakistan National Human Index (PNHI), *five* indicators have been selected which are employed total, expenditure on education as percent of GDP, women empowerment, health expenditure as a percentage of GNP and literacy rate. Bontis (2004) stated that the human capital of a country begins with the intellectual wealth of its population OECD (2001). The concept of intellectual wealth is versatile and includes knowledge about the facts, laws, principles along with less defined knowledge of teamwork and communication skills.

4.4. Process Capital Indicators

Process capital represents the infrastructure of a country. Pakistan's growth is based on agriculture, manufacturing and services sector. Secondly, it's economy is in a transition stage from agriculture to manufacturing and then to services. *Five* indicators here have been selected keeping in mind the transition stage factor. These indicators selected for Pakistan National Process Index (PNPI) are agriculture sector growth as percent of GDP, water availability, services sector growth, IP broad band consumption/ inhabitants and electricity/power.

4.5. Renewal and Development Capital

Renewal and Development capital is defined as a nation's real investment to increase its future competitiveness. This includes investment and support to research and development programme, higher education, patents etc. Four indicators selected for Pakistan National Research Index (PNRI) are growth in number of PhDs, number of patents registered with Pakistan, citable documents, development and non-development expenditure on higher education.

5. DEVELOPING PAKISTAN INDICES FOR IC

Maintenance of the official statistics is the responsibility of the Bureau of Statistics and the State Bank of Pakistan. Consistent yearly data is required for scholars and policy-makers for further analysis and making development programmes. But unfortunately, some social and economic indicators which are being used by other nations have not been added into the data bases of Pakistan. This generates a gap in understanding the current situation and status of the economy. However, to complete the research, we have data (Appendix I) taken from *Economic Survey of Pakistan*, State Bank of Pakistan, Federal Bureau of Statistics, Water and Power Division of Pakistan, Intellectual Property Organisation, *The Global Competitiveness Report 2009-10* and *SCImago Journal and Country Ranking* etc. This study is quantitative and is based on six years' data. The six-year period was selected because it presents long-term planning of the project being initiated.

5.1. Proposed Methods

We develop the year-wise PNFI, PNMI, PNHI, PNPI and PNRI of IC following three approaches (without reference to their limitations in this section). First we consider the information on a component with the unit in its current form and linearly mix the relevant components attaching specified weights. The percentage change in the yearly weighted component over the base period 2005 is computed to measure the change in the IC. The second option considers the percentage change of each component over its value in the base period 2005 and then a weighted composite index for IC is computed. The third option is similar to the second method with equal weights. These methods are likely to produce different perceptions but the choice of an option calls for rational support. Appendix III shows the individual graphs depicting the percentage change of each component relative to its value in the base period 2005.

The choice of a weight to reflect the importance of a component in an indicator is a debatable subject but as a principle of Scandia Navigator, weights are assigned in view of importance and the degree of an indicator's value. For our study, these weights (given in Appendix II) were formulated through direct consultation with more than 20 experts from different organisations such as the Chamber of Commerce and Industry, associations, statisticians and academicians.

5.1.1. *Pakistan National Financial Index (PNFI)*

To derive the Pakistan National Financial Index, five indicators have been selected. These indicators have been selected after detailed discussion with field experts. Table 1 outlines the summary of these indicators using information provided in Appendices I and II, while Figure 1 gives its graph in three different methods with weights assigned to all the indicators. The highest weight has been assigned to exports on the basis that the financial capital will improve with increase in exports.

Table 1

Pakistan National Financial Index (PNFI)

Years	Option 1	Option 2	Option 3
FY05	0	0	0
FY06	0.079	–0.027	–0.028
FY07	0.314	0.114	0.106
FY08	0.107	–0.066	–0.071
FY09	–0.018	–0.182	–0.176
FY10	–0.030	–0.116	–0.106

Fig. 1. Pakistan National Financial Index (PNFI)

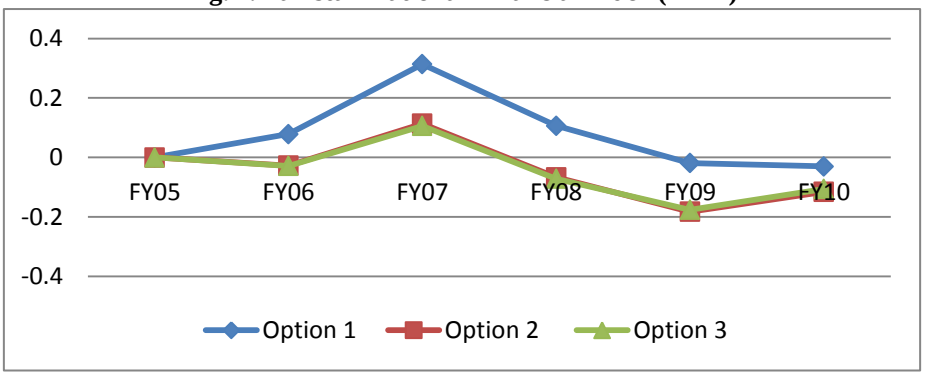


Figure 1 shows a nearly perfect consistence in the trends by the last two options. All three options display similar trends in PNFI. The decline in this index from 2008 till 2010 may be attributed to the war on terrorism and energy crisis affecting exports, revenue collection, decrease in gold and foreign exchange reserves and industry value added.

5.1.2. *Pakistan National Human Index (PNHI)*

For Pakistan National Human Index, the five indicators 'labour force, expenditure on education, women empowerment, and health expenditure and literacy rate were used to compute Table 2.

Table 2

Pakistan National Human Index

Years	Option 1	Option 2	Option 3
FY 2005	0	0	0
FY 06	0.034	–0.003	–0.003
FY 07	0.206	0.101	0.101
FY 08	0.335	0.153	0.153
FY 09	0.516	0.151	0.151
FY 10	0.613	0.188	0.188

Fig. 2. Pakistan National Human Index (PNHI)

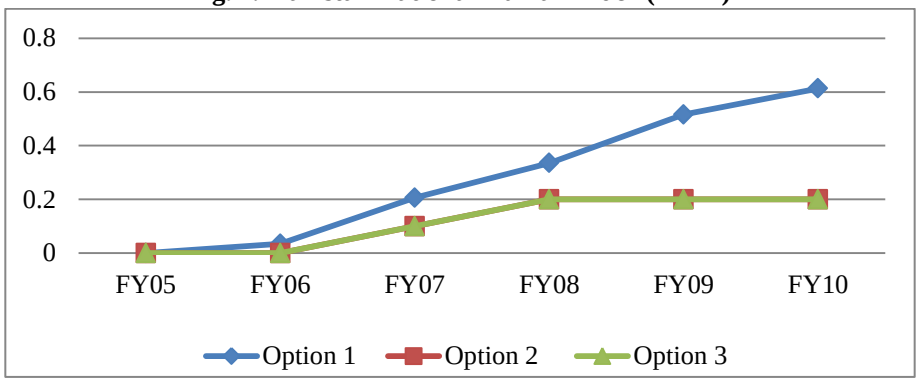


Figure 2 reveals the growing PNHI by both methods.

5.1.3. *Pakistan National Market Index (PNMI)*

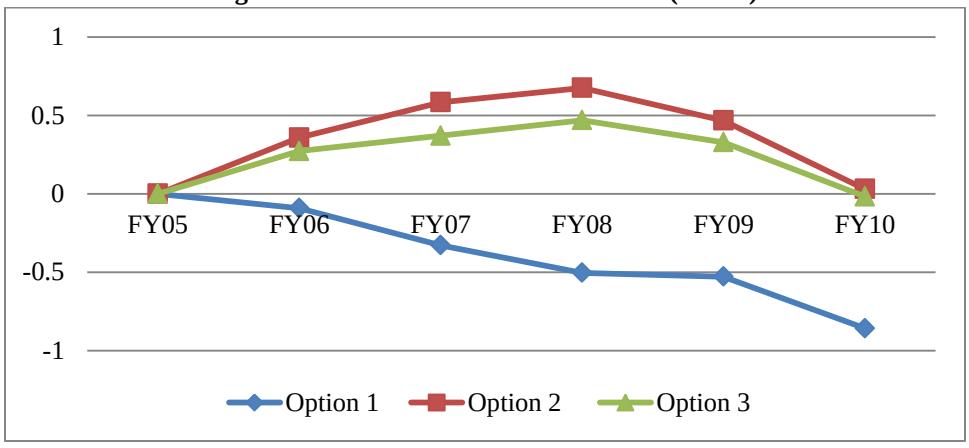
To visualise Pakistan National Human Index over the years, the four indicators in Appendix I and the information on weights in Appendix II go to make up Table 3 and Figure 3.

Table 3

Pakistan National Market Index (PNMI)

Years	Option 1	Option 2	Option 3
FY 2005	0	0	0
FY 06	–0.092	0.358	0.272
FY 07	–0.329	0.584	0.370
FY 08	–0.505	0.675	0.469
FY 09	–0.529	0.467	0.328
FY 10	–0.859	0.031	-0.018

Fig. 3. Pakistan National Market Index (PNMI)



5.1.4. *Pakistan National Process Index (PNPI)*

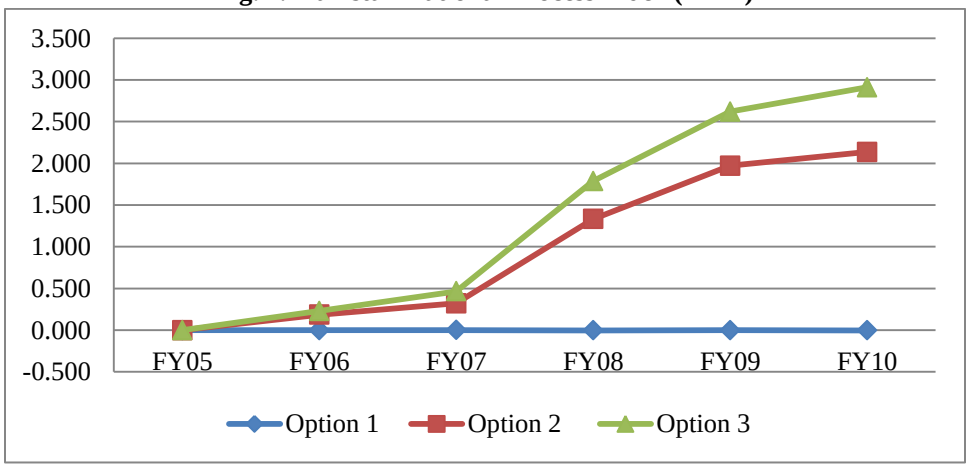
Pakistan National Process Indices are given in Table 4 and Figure 4.

Table 4

Pakistan National Process index

Years	Option 1	Option 2	Option 3
FY 2005	0.000	0	0
FY 06	0.000	0.186	0.229
FY 07	0.001	0.321	0.466
FY 08	–0.002	1.332	1.787
FY 09	–0.001	1.971	2.619
FY 10	–0.002	2.137	2.911

Fig. 4. Pakistan National Process Index (PNPI)



5.1.5. *Pakistan National Research Index (PNRI)*

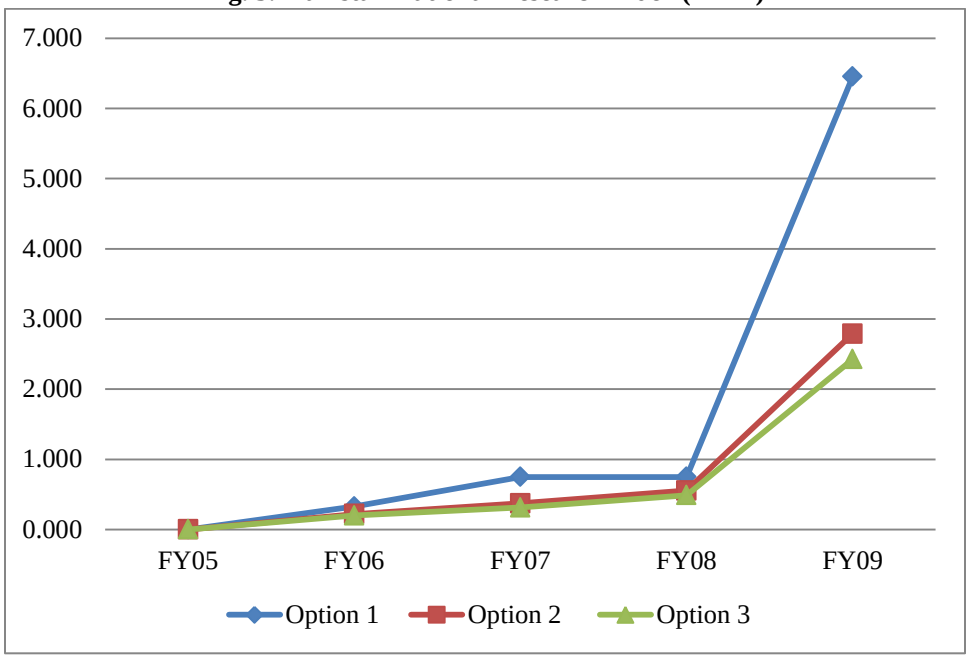
For Pakistan National Research Index, the four components are ‘growth in number of PhDs, number of patents registered with Pakistan, citable documents and development and non-development expenditures on education. Table 5 outlines the results on these indices based on information in Appendices I, II.

Table 5

Pakistan National Research Index

Years	Option 1	Option 2	Option 3
FY 2005	0.000	0	0
FY 06	0.326	0.220	0.200
FY 07	0.749	0.373	0.312
FY 08	0.747	0.553	0.488
FY 09	6.453	2.788	2.427

Fig. 5. Pakistan National Research Index (PNRI)



5.2. IC Management Tool for Pakistan

The prime purpose of the research is to give an idea how the five broad IC indices have been undergoing changes from 2005 onward. Essentially these measures are useful for strategic planning and policy development for the uplift of the country's socio-economic status. The five indices relating to IC, that is, PNFI, PNMI, PNHI, PNPI and PNRI when viewed simultaneously send a message, a concern and a guideline. Below, for the convenience of readers we present this information on indices developed in Figure 7.

These indices capture the effects of government policies and the effects of crises that Pakistan has been a victim of. PNFI exhibits the financial performance from year to year with year 2005 as a base. Similarly, PNMI, PNHI, PNPI and PNRI provide a comparative picture in their spheres of activities through the years.

Each indicator is based on three to five relevant components. Three methods were initiated to consolidate each basket of components to compare performance of a specific activity with what its position was during the year 2005. The first method uses information on a component in its unit, the weightage is given and indices for comparison computed. The other two methods first express the percentage change in the component relative to 2005, and then the weights are assigned. The units essentially influence an indicator and in some cases may distort the comparison. As for the other two methods, the second option appears more realistic in measuring a change.

The second option seems most appealing in measuring the change in each PN indicator relating to IC. We provide below a graph showing year-wise information on these PN indicators to afford simultaneous comparison of their performance.

Fig. 7. IC Management Tool for Pakistan Reflecting Socio-economic Status (Option 2)

6. PRACTICAL IMPLICATIONS

Policy-makers are now beginning to understand the true impact of globalisation, as businesses integrate into networked economies around the world. The experience is relatively new for the policy-makers as they grasp the underlining dynamics of how recession in one country could cause an even larger recession in another country at the other end of the globe. They are now also becoming more aware of the interdependent nature of national policies. Initiatives taken to improve literacy under education policy are beneficial not only for health related initiatives, but they also strengthen economic activities in a region. Similarly, foreign policy of a country cannot work in isolation; it will have corresponding effect on the country's trade policy.

The increasing interdependency in the global environment requires that policy-makers adopted management tools that could handle the connectivity and complexity of the emerging challenges. This research is based on six years data using Skandia Navigator as the reference framework, and designed for Pakistan proposing three options to measure change in PNFI, PNMI, PNHI, PNPI and PNRI (Figure 7) that can be used to visualise the economic performance of a country and the status of the processes on which the economic performance is dependent. It provides the status of the integrated economic linkages at the specific country level. Policy-makers with an understating of these linkages would be able to use the resources of a country more effectively as they would be able to give importance to tangible as well as intangible assets of a country. The economic managers would have to admit that planning for economic growth in isolation is no longer applicable; they would have to pay equal attention to processes, and human factor indicators at the same time. The IC of a nation is the combined effect of these

assets that results in better well being of a country. This tool can be used by the Government of Pakistan to measure the socio-economic performance and to determine the strength and weakness of the country for better decision making.

Appendices

Appendix I

Business and Economic Data for 2005–2010

Table 6

Pakistan National Financial Index Indicators

Years	GDP-Real Growth Rate	Export-fob (Billion US$)	Total Revenue as % of GDP	Gold and Foreign Exchange Reserves Million US $	Industry Value Added (% of GDP)
FY05	9	16388	13.80	11227.00	27
FY06	5.8	17119	14.20	12810.00	27
FY07	6.8	20207	14.90	16414.00	27
FY08	3.7	18918	14.60	11465.00	27
FY09	1.2	15159	14.50	12190.00	25
FY10	4.1	14218	14.70	12995.50	25

Table 7

Pakistan National Human Indicators

	Employed Labour Force (Million)	Education Expenditure as % of GNP	Women Empowerment-Female Labour Force Participation	Health and Nutrition Expenditures (Rs Billion)	Literacy Rate (%)
FY05	42.4	2	39%	38.00	53%
FY06	43.2	2	33%	40.00	54%
FY07	47.3	2	34%	50.00	56%
FY08	48.1	2	34%	60.00	55%
FY09	49.5	2	22%	74.00	57%
FY10	52.7	2	23%	79.00	58%

Table 8

Pakistan National Market Data and Indicators

	Balance of Trade (Million US$)	Foreign Direct Investment in Pakistan (Million US$)	Foreigner Visitors at Archaeological Museums in Pakistan	Worker's Remittances (Million US$)
FY05	–8259	1524	27496.80	4152.29
FY06	–9495	3521	22626.00	4588.03
FY07	–14820	5139.6	15823.00	5490.97
FY08	–12492	5409.8	7801.00	6448.84
FY09	–10144	3719.8	6082.00	7810.95
FY10	–8024	2030.7	1330.50	6549.87

Table 9

Pakistan National Process Data and Indicators

	Agriculture Growth (Percent)	Water Availability (MAF)	Services sector Growth (% of GDP)	IP Broad Band Consumption/ Inhabitants(kbps)	Electricity-Firm Supply (MW)
FY05	6.5	135.68	0.49	0.005	15082
FY06	6.3	137.78	0.57	0.01	15072
FY07	4.1	137.8	0.53	0.018	15091
FY08	1	142.44	0.85	0.05	15055
FY09	4	142.86	0.70	0.07	15055
FY10	2	142	0.59	0.08	15055

Table 10

Pakistan National Research Data and Indicators

	Growth in Number of PhDs	Number of Patents Registered with Pakistan	Citable Documents	Development and Non-Development Expenditure on Higher Education (Million Rs)
FY05	326	416	2,358	15,935.68
FY06	407	393	2,981	21,384.29
FY07	432	247	3,598	28,741.68
FY08	613	188	4,406	27,926.95
FY09	675	447	5,348	132,186.83

Appendix - II

Table 11

Allocation of Weight

PNFI		PNHI		PNMI		PNPI		PNRI	
Weight	Indicators	Weight	Indicators	Weight	Indicators	Weight	Indicators	Weight	Indicators
20	GDP -Real Growth Rate	20	Employed Labour Force (Million)	15	Balance of Trade (Million US$)	25	Agriculture Growth (Percent)	25	Growth in Number of PhDs
25	Export-fob (Billion US$)	20	Education Expendi-ture as % of GNP	30	Foreign Direct Investment in Pakistan (Million US$)	20	Water Availability (MAF)	20	Number of Patents Registered with Pakistan
15	Total Revenue as % of GDP	15	Women Empower ment - Female Labour Force Participa-tion	25	Foreigner Visitors at Archaeolo gical Museums in Pakistan	25	Services Sector Growth (% of GDP)	25	Citeable Documents
20	Gold and Foreign Exchange Reserves Million US $	20	Health and Nutrition Expendi-tures (Rs Billion)	30	Worker's Remittances (Million US$)	15	IP Broad Band Consump-tion/Inha-bitants (kbps)	30	Develop-ment and Non-Develop-ment Expendi-ture on Higher Education (Million Rs)
20	Industry Value Added (% of GDP)	25	Literacy Rate (%)	–	–	15	Electricity-Firm Supply (MW)	–	–
100		100		100		100		100	

Appendix III

Individual graphs showing percentage change of each component relative to its value in the base period 2005.

Fig. 8. Financial Indicators

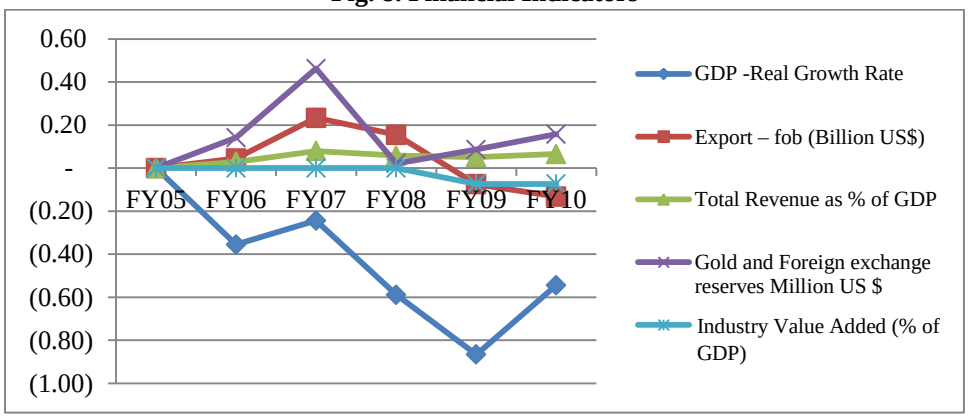


Fig. 9. Human Indicators

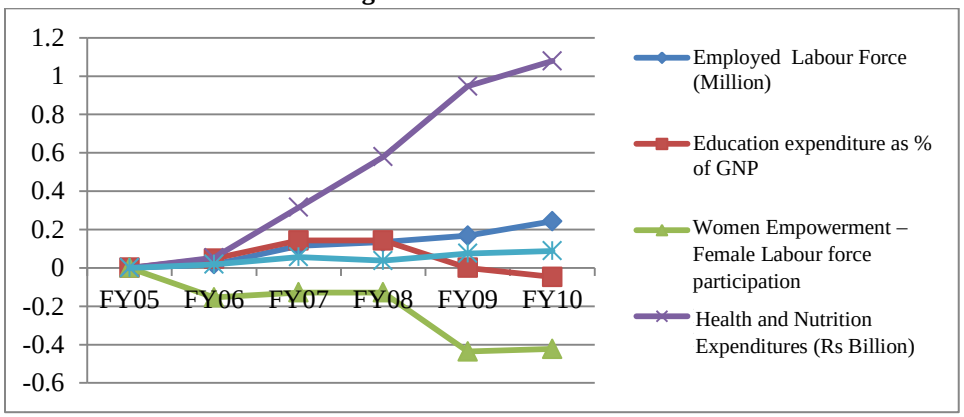


Fig. 10. Market Indicators

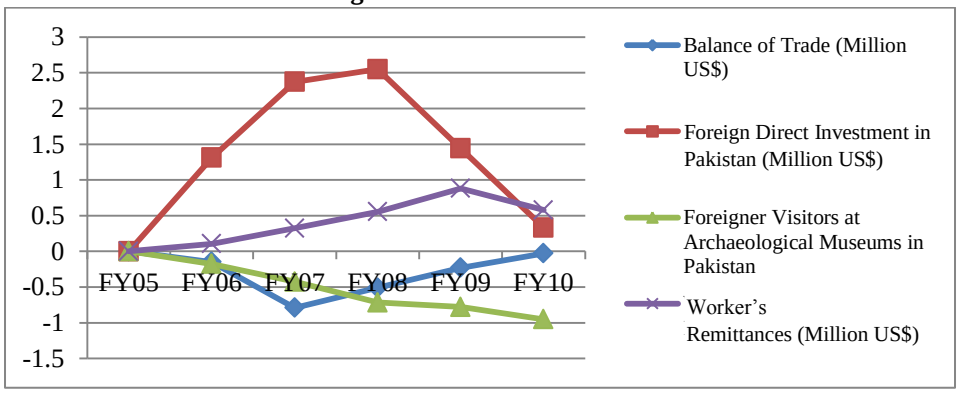


Fig. 11. Process Indicators

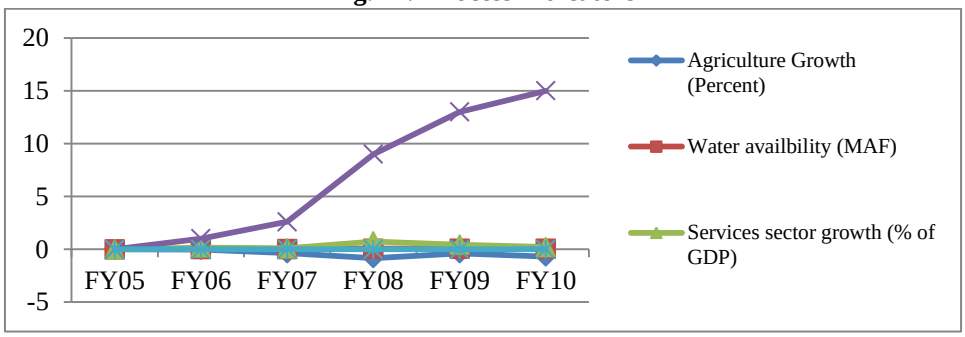
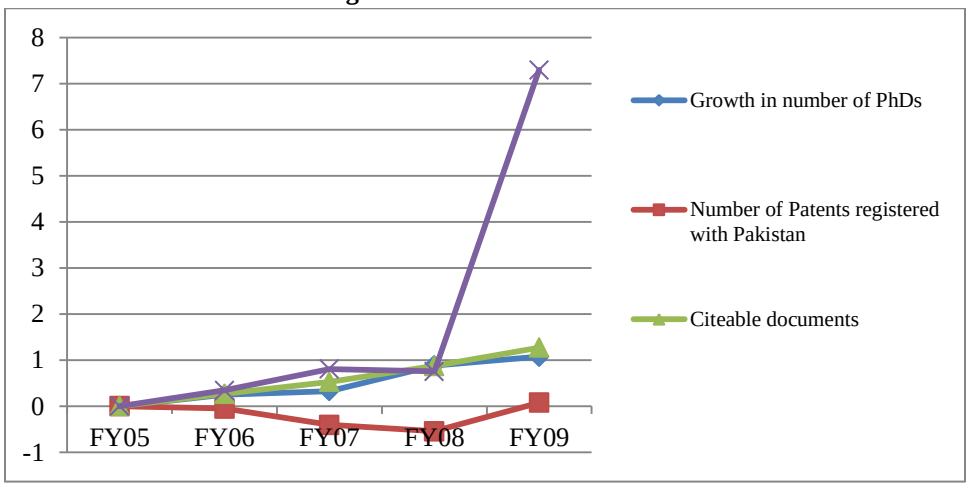


Fig. 12. Research Indicators



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Book Reviews

Kemal Dervis, Masahiro Kawai, and Domenico Lombardi (eds.). ***Asia and Policymaking for the Global Economy.*** Asian Development Bank Institute, Tokyo. Washington, D.C.: Brookings Institution Press, 2011. 200 pages, USD 19.95.

Asia and Policymaking for the Global Economy is a collection of analysis on global economic cooperation. In particular it highlights Asia's accomplishments, opportunities, its potential, and the role it can play in the global economy. It is divided into five chapters each constituting a different insightful article.

The first chapter gives an introduction and an over view of the topics analysed in this book. It focuses on the structural transformation in Asia and the world economy, and discusses the rise of Asia and implications for economic coordination at international level. The second chapter focuses on growth dynamics in Asia in a global context. It provides an important contribution to the subject issue as it analyses the sources of structural transformation experienced by world economy. It suggests that policy-makers should focus on global savings and investment structures to rebalance world economy. The rebalancing debate is then connected to the debate on the international monetary system and role of reserve currencies in this chapter.

Policy coordination among economies of the world is discussed in the third chapter. Global macro imbalances have been highlighted and the analysis presents rich information on the feasibility of rebalancing. The rebalancing could be achieved in three ways: structural reforms in major economies, reforms in the Asian financial sector, and via enhancing intra-regional trade and investment flows. The creation of physical infrastructure has also been advocated which will in turn help expand manufacturing activity, raise productivity levels and both will increase intra regional economic activity.

Chapter 4 analyses financial stability in the emerging Asia. Based on the financial crises that affected the US and Europe and then hit Asia through the trade channel, this chapter paves ways to look forward to increasing globalisation of financial activities and sustained economic growth. It suggests that the financial authorities in emerging Asia must set up financial supervision and carry out regulation in three ways: strengthening of micro prudential supervision, analysing financial markets and their interaction with economy, and re-examining monetary policy framework. This chapter also emphasises the need for increased financial interdependence between Asian financial authorities.

"The International Monetary System through the Lens of Emerging Asia" constitutes the fifth chapter of this book. It assesses the implications of the rise of Asia by focusing on the reform of international monetary system. The discussion elaborates the asymmetry between globalisation of economic and financial activities driven by integrated emerging economies. It also consists of some lessons from the IMF's role in

Asian crisis. The G-20 has come up with its own identity and a channel emerging economies can voice their concerns. Asia's support for IMF will be the initiative for its effectiveness and for providing better global economic policy cooperation. This volume is an insightful collection of policy oriented articles which can assist both academics and policy-makers in tackling issues of the emerging global economy.

Uzma Zia

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Islamabad.

Keri Facer. ***Learning Future, Education, Technology and Social Change.*** Routledge Publications, 2011. 192 pages. US$ 44.95.

Learning Future, Education, Technology and Social Change by Keri Facer is an informative book drawing on over 10 years of research on digital technologies, social change and education. The writer makes a compelling argument for thinking differently about the future for which education might need to prepare. Packed with case studies from around the world, the book helps to bring into focus the risks and opportunities for societies and for schooling over the coming two decades.

Most people recognise that current education systems are not meeting the needs of individuals and 'society' and several books have been written on the future of education. In this context, Keri Facer investigates the scenario of education, technology and social change over the coming two decades by considering nine assumptions about socio-technological change. These include that in next 20 years there would be significantly increased computing and communication at a distance will be taken for granted by the large majority of people. Moreover, working and living alongside sophisticated machines and networks will increasingly be taken for granted and biosciences will produce unpredictable breakthroughs and important new stories about us. Population is ageing globally and energy, mineral resources and climate warming will remain significant issues. And finally we will be facing radical national and global inequalities.

It is on the basis of these assumptions that the writer of this book argues that there is a need to rewrite the relationships between education, socio-technical change and the future in order to find solutions to problems like inequality and environmental degradation. Contrary to the viewpoint that rich educational ecosystem outside the school walls would be more important, the writer takes the stance that local schools would be more imperative. This is because there would be a dire need to create accessible spaces where we can work out on how to cope with the disruptions to intergenerational relationships that are promised by ageing populations and environmental degradations. Moreover, we would require curriculum and pedagogy that teach us how to live with our collective, multimodal and sometimes dangerous knowledge resources.

Furthermore, the writer argues that there is a need to have embodied educational relationships that emphasise the connection between our knowledge and the lived impact of our decisions upon people. In addition to that if we want to challenge the present social and economic systems, there would be a need to create schools that are capable of supporting communities and students to come together to imagine and build sustainable future for all. Facer takes the stance that local schools need to act as a powerful democratic resource and a public space that allows its students and communities to contest the vision of the future that they are presented with, and to work together through the spaces of traditional and emergent democratic practice, to fight for viable future for all.

Over the next 20 years, such a schooling system could plausibly be built drawing upon the changed socio-technical resource we will have at hand and building upon a new relationship between a school and its wider educational ecosystem. The writer gives many examples of such schools all over the world and illustrates how new curriculum, governance arrangements, technical systems and pedagogies can go a long way towards achieving such a change in the relationships between schools and the future.

While concluding, Keri Facer argues that building such schools requires wisdom, creativity, passion of educators, policy-makers, researchers and technologists. It also requires action in multiple areas such as building new governance and accountability arrangements for schools, ensuring that schools have the right to create a local curriculum, building tools for mapping students and schools' wider education ecology, and reconnecting education with housing, economic, transport, environmental policies.

This book makes an important contribution to the literature on the future of schooling by challenging conventional thinking about 21st century schools and by opening new avenues for thinking about the future of education that we might want.

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Paul Roberts (ed). ***The End of Food.*** New York: Mariner Books Houghton Mifflin Harcourt, Bosten. 2009. xv+330 pages. (Price not given).

The modern food economy has evolved over time. The calorie dense food (meat) has taken the place of plants and a technologically driven agriculture system has replaced the traditional food system. Several factors such as industrial revolution, opening of trade, end of communism, female market participation and technological change have contributed in shaping the rules of modern food production system. The endless efforts of the scientists geared towards discoveries has led to a green revolution in the field of agriculture and have done enough to untrue the earlier predictions of mass famine by Thomas Malthus. However, all such man made progress has not done much to resolve challenges of food security, food economy liberalisation and food safety being faced by every country today. This book presents well researched answers to questions raised at every forum on global food security such as; how did the primitive food system evolve into its present shape, what has motivated less spending on food, what has promoted the idea of convenience food in retail business, what has led to technology driven revolution in agriculture output, what radical steps are needed to escape from evils of hunger and malnutrition in the present world, what provokes food producers in developed countries to rule out unfettered functioning of food trade, and finally what turns around the progress that has ever been made in agriculture.

The book is divided into three sections each of which elaborates on the global food economy, its operations, its integrity and its interactions with the economic system. Part-1 has four chapters which discuss the evolution of the food economy, the forces that determine the functioning of food economic system in modern world, development of inputs in agriculture revolution and above all the marketing strategies of the big food companies in retail. Chapter 1 begins with the story of the shift from hunting to farming and gradually the discussion explores the first ever agriculture revolution that occurred between 10000BC and 6000BC. The revolution in wheat and barley production across Asia, Central America, and South East Asia at different times not only doubled the grain output but also provided the opportunity to farmers to make use of surplus grain as fodder for their livestock. The growth in grain production coupled with livestock growth brought double blessing for consumers in terms of lower food prices and higher volume of grain and meat. However, the author does not find a good reason behind this ever celebrated food revolution as centuries of malnutrition, wars and diseases (together termed as demographic accident in book) outpaced factors such as technology and capitalism.

Chapter 2 gives details on the true drivers of agriculture output growth in the times after the pessimistic forecast of Thomas Malthus. The use of fertiliser and dust Bowl phenomena turned around the abysmal performance of agriculture and led to explosive booms in agricultural output. The author surmises on the evolution of food production economy into food processing economy and elaborates the emergence of the idea of "convenience in food". This idea works through food manufacturing companies like Néstle, General food and Heinz which take care of processing calories, and market their products as a time saving alterative to home cooking. Chapter 3 highlights the benefits of

high volumes and low prices of food items that provide the building block for the modern economy. Food processing companies venture into innovative production lines of food not because of competition or consumer desperation for product use but to exploit the surplus grain. The author discusses the discovery of instant coffee by Néstle, which he finds was not the outcome of consumer time shortage but was made to make use of the cheap raw coffee beans available at that time. The author also points out to another interesting implication of low food prices as the compulsion of food manufacturing companies to embark on cost cutting strategies. Wall Mart (Food manufacturing company) that has stretched his operations to China, India and some Middle East countries is a glaring example. It accounts for one percent of the US labour force and has largely cursed unionisation and lowered its labour cost to a third of its competitors.

Chapter 4 highlights the importance of processed food in making agriculture history and at the same time reveals the pitfalls associated with the use of packaged food. The author mentions that processed foods are often packed with large quantities of salt, fats and additives some of which are linked to medical problems such as hyper activity. In addition to this, supersizing of food commodities by food processing companies created indulgence for more or non stop eating in consumer. This trend has caused the problem of obesity. According to research findings quoted in this book, obesity afflicts one billion people worldwide whereas roughly the same number is found to be malnourished.

The Section 2 of the books looks broadly at the implications of food production. This section contains four chapters. Chapter 5 discusses the "Newly accepted concept of self sufficiency" by which a country is not self sufficient if it produces enough to feed its people but is self sufficient only if it can import enough to feed its population. In fact the story of comparative advantage governs the rule of business in agriculture by which importing corn, chickens and cherries from producers who could grow them more cheaply not only lowers food prices but also free up resources for other uses. Moreover, the author discuses new dangers such as transformation of disease vulnerability, rising energy cost, and growing competition among the handful of food super powers that comes with food trade. Chapter 6 explains the persistence of global hunger in the presence of food abundance, and reveals the facts and figures mostly from sub Saharan Africa on how one billion people are being excluded from the food economy. Chapter 7 looks into the food born disease or pathogens that killed tens of thousands of people in a year. Moreover the author reveals the importance of food safety laws for the prevention of food borne diseases.

The third section has two chapters and each of them gives insights into required discoveries in agriculture to sustain the burgeoning population and required to meet with future food challenges. Chapter 8 concludes this section with a survey of several factors like farm soil contamination and land capacity to decay, supplies of energy etc. These factors undoubtedly demand from scientists to completely re-engineer the current food system. Finally, Chapter 9 presents a comparison of the primary contenders in the battle in the next food system-transgenic and organic food.

This is a well researched volume on the past, present and future of the global food economy and students, researchers, and policy-makers can equally benefit from it. The

only drawback it faces is its overemphasis on the biological and technological driven development in agriculture while overlooking the lives of those who live in developing part of the world and draw their livelihood directly from agriculture itself.

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Shorter Notices

Samia Waheed Altaf. *So Much Aid, So Little Development*. Washington, D.C.: Woodrow Wilson Centre Press. 2011. 204 pages. US$17.99.

"So Much Aid, so Little Development" is a novel like volume which discusses the important question of why most international development programmes in the health sector have achieved so little in Pakistan. The author, Saima Waheed Altaf, who is a public health specialist and a former senior advisor to the Office of Health in the USAID Mission in Islamabad, draws on her on ground experiences in order to explain how and why foreign support succeeds or fails in developing countries. She elaborates on the growing dependence of developing countries on international agencies and gives an insider's look at the bureaucracies of both donors and receivers. This book is a collection of the author's own experiences with the health programme and eye witness accounts from those that have suffered at the hands of the existing health policies and corruption in provincial health departments. Altaf has pinpointed several health projects that failed because of skewed incentives and misplaced priorities of those who were responsible for making them a success. She has also discussed several reasons behind the failure of the Social Action Programmes (SAP) in context to the health sector. The SAP could not induce any significant budgetary shifts from defense and non-social sector expenditures to the enhancement of social service delivery. Moreover, it faced lack of continuity in governmental policies, and was also affiliated with a climate of intense political instability where in Pakistan saw a change of eight governments over the course of a decade. The fact that the characters, events and the physical locations appearing in the book are all true to life makes this volume a highly informative and an interesting read for anyone who is interested in the political economy of the social sector projects in developing countries. (*Hamid Maqsood*)

William D. Savedoff and Pablo Gottret (eds.). *Governing Mandatory Health Insurance: Learning from Experience*. Washington, D.C.: The International Bank for Reconstruction and Development/The World Bank. 2008. 227 pages. US$ 30.00.

Little attention has been paid to the governance of the much needed mandatory or expanded health insurance programmes in most developing countries. While most of the existing literature focuses on the *operational features* of health insurance systems such as eligibility and premiums, it overlooks the institutional and political forces that influence the performance of such programmes. This book highlights the role played by social, historical and political factors in determining the success of health insurance programmes. It is divided into 7 chapters out of which the first 5 chapters discuss five dimensions of governance—coherent decision making structures, stakeholder participation, transparency and information, supervision and regulation, and consistency

and stability—all of which affect the coverage, efficiency and sustainability of health insurance programmes in the long run. Each aspect of governance has been illustrated by using experiences of four countries—Chile, Costa Rica, Estonia, and the Netherlands. *Governing Mandatory Health Insurance* provides guidance and offers various lessons for countries that are interested in reforming or establishing health insurance systems. (*Sofia Ahmed*)