The day of week anomaly in market return, volume and volatility in SAARC countries

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Calendar Anomalies

- Seasonality: systematic variation in time series that happens after certain time period within a year:
  - Monthly effect
  - Day of week Effect
  - Turn of Year Effect

Day of week Effect

- Stock returns on Mondays are often significantly lower than those of the Friday returns.

- Essential reasons:
  - Investors trading scheme
  - Risk analysis through Volatility
  - Extent of market Efficiency

Theoretical Background

Efficient market hypothesis

- Fama (1970) firstly defined term Efficient market as:

"a market in which prices always fully reflect available information" (p. 384)

Form of efficiency	Set of Information Reflected in Security Prices
Weak	Previous prices of securities
Semi-strong	All Publically available information
Strong	All information, both public and Private.

Objective of the study

- To Examine presence of day of week effect in major four SAARC courtiers for both returns and volumes
- To analyze the Volatility Patterns in studied markets
- Impact of asymmetric news on stock returns or leverage effect.
- How DOWE varies from country to country and either volatility on various days is related to trading volume

Literature Review

Authors	Market understudy	Period of Study	Methodology Used	Results
Sunil Poshakwale (1996),	Indian Stock Market	1987-1994	KS Test, Runs Test, Serial Correlation	Mean returns except Monday and Wednesday were positive. SD is larger for first and last days of Week.
Kalavani and Srinivasan (2013)	Indian Stock Market	1997-2012	GARCH, EGARCH, TGARCH	Tuesday have negative impact on volatility after controlling persistence and asymmetric effects.
Bhattacharya et al (2003),	Indian Stock Market	1997-2012	OLS, GARCH	Both models provide different results.
Nath and Dalvi (200$)	Indian Stock Market	1999-2003		Monday and Friday were significant days.
Husain, Fazal (2000),	Pakistan	1989-1993	Regression Analysis	Results did not indicate any significant differences in stock returns across days in the Pakistani equity market.
Nishat and Mustafa (2002)	Pakistan	1991-2001	Mean and median approach, GARCH	No day of week effect was found. However Tuesday and Wednesday has significant positive variance.
Hussain et al (2011)	Pakistan	1991-2006	OLS	Tuesday returns are higher than other days of week.

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authors	Market understudy	Period of Study	Methodology Used	Results
Islam and Gomes (1999)	Bangladesh	1991-1998	Parametric and non-Parametric Test	Returns variations and large positive returns were found on last trading day of week.
Rahman (2009)	Bangladesh	2005-2008	Dummy variable regression and GARCH	Mean return for Monday and Thursday were negative and for all other days were positive.
Fernando and Pathirawasam (2006)	Sri Lanka	1985-2004	Regression	No significant day of week effect was found.
Tgukajerathne et al. (2007)	Sri Lanka	1985-2004	OLS, GARCH	Friday has statistically significant returns.

Data

- Source: yahoo finance, DSE, KSE
- Period: Aug 01, 1999 - July 01, 2014 except DSE.
- Frequency: Daily

Country	Indices
	KSE-100
	CSE
	DSEGEN
	BSESN

Research Methodology

Ordinary Least Square

- $R_{it} = \alpha o + \alpha_m D_{Mt} + \alpha_T D_{Tt} + \alpha_W D_{Wt} + \alpha_F D_{Ft} + \sum_{i=1}^{n} \beta o$ return $_{t-i} + \varepsilon_t$
- R_{it} are returns, calculated as:

$R_t = \ln (P_t / P_{t-1}) * 100$

- E_t is error term assumed to be identical and independently distributed.
- D_{Mt}, D_{Tt}, $D_{Wt}$and D_{Ft} are dummies for Monday, Tuesday, Wednesday and Friday respectively.
- Thursday is not included to avoid dummy variable trap.

Drawbacks of OLS

- Stock market data, leads to violation of many assumptions of OLS
  - Auto-correlated errors
  - Non-normal distribution of residual
  - Negative or positive Skewness of data
  - Lepto-kurtosis
- So to solve problem of auto-correlation, lagged value of returns is incorporated.
- Equality test are employed for checking that either return and variances are same for different week days.

GARCH Models

- Volatility clustering property of financial data
- control time varying variances

- $R_{it} = \alpha_1 D_{Mt} + \alpha_2 D_{Tt} + \alpha_3 D_{Wt} + \alpha_4 D_{Ft} + h_t$

  $\varepsilon t \approx N(0, h_t)$

  $h_t = \omega + \delta h_{t-1} + \gamma \varepsilon^2_{t-1}$

Asymmetry Effect

- Bad news tends to increase volatility more than good news.
- TGARCH: multiplicative dummy variable is added to capture asymmetries in term of negative and positive shocks.
- EGARCH:
  - Test for asymmetries as well as TGARCH
  - Either positive shocks produce less volatility or negative shocks

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- GARCH-M model capture risk by adding conditional variance term in mean equation
- Diagnostic test by Engle and Ng (1993) is used.
- To capture asymmetric effects, EGARCH-M and TGARCH-M models are employed.
- Order of GARCH model is selected on basis of Schwarz Bayesian information criteria.

Results and Conclusion

Tests for equality of mean and variance in returns

	Pakistan	India	Bangladesh	Sri Lanka
ANOVA F-stat	2.299***	0.317	5.293*	6.63*
Kruskal-Wallis H-stat	11.767**	0.396	26.467*	9.629*
Levene test W-stat	7.039*	4.817*	5.563*	0.735
Bartlett	51.872*	57.389*	54.818*	6.150

DOWE in returns by OLS AR model

Parameters	Pakistan	India	Bangladesh	Sri Lanka
Mon	-0.041	0.027	-0.046	-0.088**
Tue	0.075	0.029	0.410*	-0.046
Wed	0.194*	0.068	0.211	0.194*
Thu	0.072	0.030	0.459*	0.244*
Fri/sun	0.132*	-0.021	-0.149	0.405*
AR(1)	0.017*	-0.002*	0.013*	-0.009

DOWE in Volumes by OLS AR model

Parameters	Pakistan	India	Sri Lanka
Fri/sun	2.213*	4.209*	7.224*
Mon	-0.043	0.025***	-0.013
Tue	-0.034	0.046*	0.007
Wed	-0.160*	0.045*	0.027
Thu	-0.046	0.044*	-0.039

DOWE on Returns in GARCH(1,1) mean equation

Parameters	Pakistan	India	Bangladesh	Sri Lanka
Mo	-0.019	0.062	-0.319***	-0.127*
Tuesday	0.079	0.083	0.252*	0.008
We	0.198*	0.099**	0.061	0.153*
Thursday	0.078	0.077***	0.389*	0.320*
Fr	0.176*	0.077	0.023	0.348*
AR(1)	-0.019*	0.063	0.019	0.061*
AR(2)	0.079*			

DOWE on Volumes in GARCH(1,1) mean equation

Parameters	Pakistan	India	Sri Lanka
C	2.247*	4.216*	7.189*
Mo	-0.008	-0.028*	0.065*
Tuesday	-0.095*	-0.008	0.150*
We	-0.094*	0.027*	0.109*
Thursday	0.033**	0.017***	0.055***
C	0.027*	0.004*	0.044*
AR(1)	0.582*	0.261*	0.332*

Engle-Ng test for asymmetries in volatility

	Pakistan	India	Bangladesh	Sri Lanka
Sign bias	1.259*	1.426*	2.146**	0.209***
Negative size bias	-0.141	-0.512***	-0.956**	0.885**
Positive size bias	-1.018*	-1.838*	-1.887*	-0.988**
Joint bias	0.798*	0.627*	0.871**	1.221*

DOWE on Returns in TGARCH-M mean equation

Parameters	Pakistan	India	Bangladesh	Sri Lanka
GARCH-M	-0.028	0.012	-0.174**	0.088***
Mo	0.013	0.045	-0.093	-0.182*
Tuesday	0.084	-0.003	0.194***	0.016
We	0.191*	0.011	-0.005	0.150*
Thursday	0.074	-0.013	0.318*	0.2998
Fr	0.175*	-0.020	0.267***	0.337*
AR(1)		0.028	0.009	0.035**

DOWE on Returns in EGARCH-M mean equation

Parameters	Pakistan	India	Bangladesh	Sri Lanka
GARCH=M	-0.106***	-0.008	0.009	0.089***
Mo	0.166***	0.041	0.001*	-0.149*
Tuesday	0.060	0.018	-0.601*	-0.027
We	0.155*	0.037	0.254	0.149*
Thursday	0.053	0.013	0.039*	0.283*
Fr	0.156**	0.026	0.409	0.349*
AR(1)	-0.106		0.021	0.051

Summary of results

- In Pakistan, there are observed
  - positive returns for Friday (haroon 2013) and Wednesday
  - negative Monday (haroon 2002) returns just by EGARCH-M.
  - higher variance for Monday while lower variance for Wednesday (nishat 2002), Thursday and Friday.
  - highest trading volume on Friday while lowest trading volume on Tuesday in line with Nishat 2002

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- In India, there are observed
  - positive Tuesday and Wednesday effect in returns just by GARCH(1,1)
  - Higher Monday and lower Tuesday (Kalaivani and Srinivasan2013) and Wednesday effect in variance
  - Highest trading volume on Friday while negative trading volume on Monday

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- In Bangladesh, there are observed
  - positive Tuesday and Thursday effect in returns in line with Islam and Gomes (1999) for Thursday and positive returns for Tuesday and Thursday by Rahman (2009).
  - Positive variance for Monday, negative variance for Tuesday and Thursday.
- in Sri Lanka,
  - Negative Monday and positive Wednesday, Thursday and Friday effect in returns in line with Thilakerthne et al (2007) in case of negative Monday and positive Friday
  - Positive variance for Monday while lower variance for Tuesday and Thursday.
  - Highest trading volume on Monday while lowest on Thursday.

Thank You…