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SOUTH-EAST ASIAN STOCK MARKETS FOLLOW A NON-RANDOM WALK

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Are the returns of the major South-East Asian stock markets forecastable? If so, can those returns be forecast by models that rely entirely on one variable - the stock price itself?

To seek answers to the above questions, we resorted to time-series modelling, a methodology which is rooted in the same principles as technical analysis. A time-series model demands nothing more than the historical records of the variable under investigation, whereby the movements of the variable are explained solely in terms of its own past.

Parallels have even been drawn between the recent trend in non-linear time-series modelling (where the output from a model is not proportional to the sum of its input variables) and technical analysis. Clyde and Osler (1997) argued that technical analysis could be viewed as a simple way of exploring the non-linear behaviour of financial time-series. For example, patterns such as head-and-shoulders are clearly attempting to find some kind of non-linearity in the series.

In our study we looked at daily stock market indices from the five major South-East Asian countries (ASEAN-5: Indonesia, Malaysia, Philippines, Singapore and Thailand) from January 1990 to October 2001. From this data, we computed the percentage daily returns (based on the price move from the close of one trading day to the next). Figure 1 provides an example of the resulting time-series; a plot of the daily returns from Singapore's Strait Times Index.

The data was divided into two periods. Data from January 1990 to October 2000 was used to create six time-series models (two linear and four non-linear) and a random walk model. The seven models were then used to generate 1-day, 1-week, 1-month, 3-month, 6-month, 9-month and 1-year forecasts.

The forecasts from these models were then compared with the actual data from November 2000 to October 2001 and their performance was measured using the root mean squared error (RMSE) method.

Forecasting Performance

The forecasting performances of the seven models are summarized in Table 1 (note that models with better performance have smaller average values). In addition, the average ranking of the models (based on RMSE for each forecast horizon) is given in Table 2.

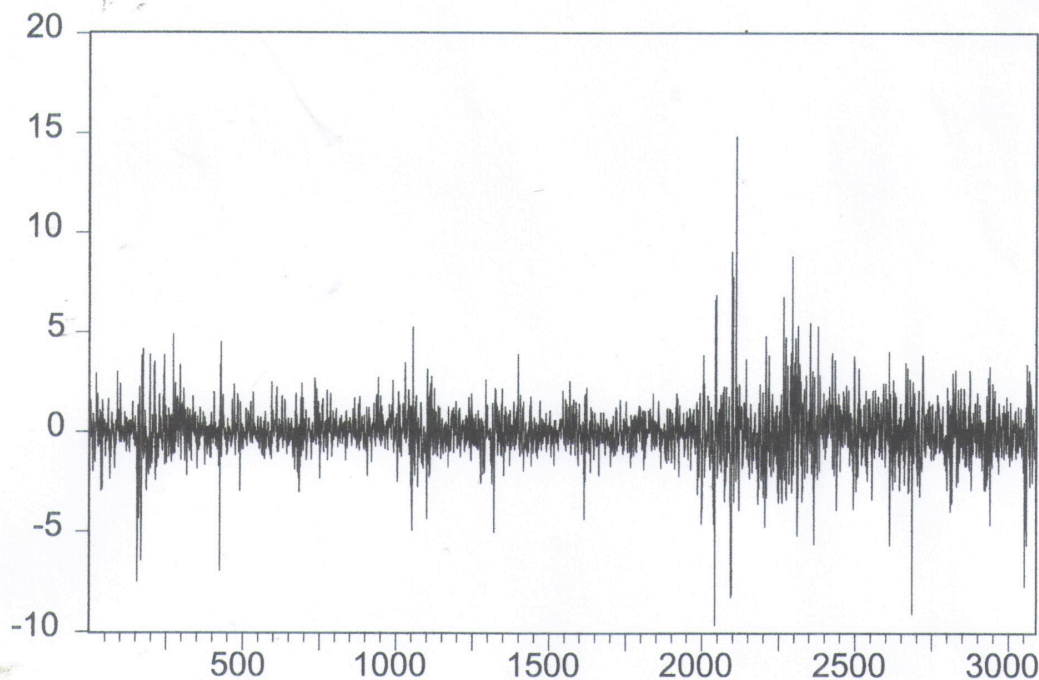On average, linear models are superior to non-linear models for forecast horizons of

Figure 1. Daily returns of the Strait Times Index

Forecast Horizon	RMSE		
	Random Walk	Linear Models	Non-Linear Models
Jakarta Composite Index			
1 Year	1.854	0.001 - 0.006	0.009 – 0.029
9 Months	1.826	1.342	1.344 - 1.349
6 Months	1.779	1.061 - 1.062	1.064 - 1.069
3 Months	2.079	1.638 - 1.639	1.635 - 1.637
1 Month	1.431	1.430 - 1.432	1.433 - 1.434
1 Week	1.264	1.403	1.403
1 Day	1.480	1.414	1.413
Kuala Lumpur Composite Index			
1 Year	1.789	1.296 - 1.299	1.295 - 1.298
9 Months	1.706	1.343 - 1.346	1.341 - 1.345
6 Months	1.793	1.263 - 1.288	1.260 - 1.270
3 Months	1.767	0.819 - 0.825	0.815 - 0.823
1 Month	1.389	0.882 - 0.897	0.886 - 0.915
1 Week	1.256	1.222 - 1.233	1.211 - 1.230
1 Day	1.932	0.006 - 0.044	0.022 - 0.036
Philippines Composite Price			
1 Year	2.252	1.716 - 1.719	1.718 - 1.720
9 Months	2.274	1.720 - 1.723	1.721 - 1.724
6 Months	2.426	1.913 - 1.914	1.913 - 1.915
3 Months	3.052	2.484 - 2.485	2.484 - 2.486
1 Month	4.290	3.810 - 3.814	3.812 - 3.815
1 Week	2.090	1.605 - 1.611	1.609 - 1.636
1 Day	3.127	0.136 - 1.605	0.129 - 0.238
Strait Times Index			
1 Year	2.062	1.431 - 1.436	1.430 - 1.434
9 Months	2.035	1.425 - 1.430	1.423 - 1.428
6 Months	1.955	1.282 - 1.285	1.282 - 1.284
3 Months	2.040	1.285 - 1.341	1.340 - 1.345
1 Month	1.828	1.350 - 1.351	1.351 - 1.356
1 Week	2.172	2.171 - 2.174	2.173 - 2.189
1 Day	1.598	0.255 - 0.316	0.256 - 0.401
Stock Exchange of Thai			
1 Year	2.135	1.677	1.677 - 1.679
9 Months	2.115	1.725	1.725 - 1.727
6 Months	1.981	1.559 - 1.565	1.560 - 1.569
3 Months	2.361	1.799	1.795 - 1.802
1 Month	2.421	2.161 - 2.184	2.167 – 2.197
1 Week	2.105	1.726 - 1.767	1.718 - 1.789
1 Day	2.297	0.036 - 0.089	0.013 - 0.155

Table 1. Forecasting Performance by the RMSE

ASEAN-5 Average	RMSE		
	Random Walk	Linear Models	Non-Linear Models
1 Year	7.0	1.6 - 3.6	3.2 - 3.8
9 Months	7.0	1.6 - 3.6	2.8 - 3.6
6 Months	7.0	2.0 - 4.6	2.8 - 3.8
3 Months	7.0	3.0 - 3.8	2.4 - 4.2
1 Month	7.0	1.2 - 3.8	3.0 - 4.8
1 Week	6.0	2.6 - 2.8	2.6 - 4.2
1 Day	7.0	3.0 - 4.0	1.6 - 4.2

Table 2. Ranking of Forecasting Models by Forecast Horizon

1-month and longer, whereas non-linear models are superior for 1-day forecasts. For a forecast horizon of 1-week, linear models are at most comparable with non-linear models. Thus, although there is evidence of non-linearity on stock returns (Tse, 2001), information on non-linearity seems to produce little gain in the prediction of stock returns.

More significantly, Table 1 shows that the RMSE values of the random walk models are substantially greater than all the time-series models considered, for nearly all the forecasting horizons and across all five countries. In other words, the random walk model ranked last in all cases, with the only exception being the 1-week horizon for the Strait Times Index (in which the random walk managed to rank second out of the seven models under study). This suggests that the returns of the ASEAN-5 stock markets do not follow a random walk and are forecastable by time-series models, thus providing further justification for the work of technical analysts.

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