

THE SHARE PRICE MOVEMENTS DURING 1971 - 1980

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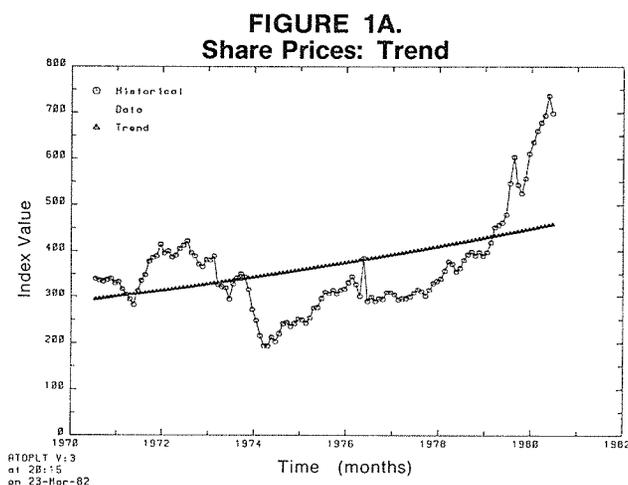
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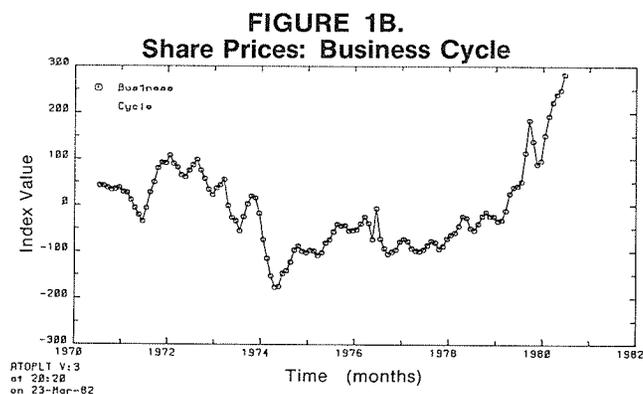
This paper describes some results of an analysis of recent data on share prices. The so-called state space approach of modern control theory is employed. Applications of linear stochastic control theory in economics have been reported in the literature (e.g., Chow 1975, Vishwakarma 1970, 1974). A fairly general and flexible computer program has been developed for calculations. Analysis of other key economic indicators with it, such as housing construction and the yield of government bonds, has been described elsewhere (Vishwakarma 1981a, b). As mentioned, here we examine share market prices. However, a knowledge of control theory or the computer program is not necessary for reading this report.

We consider the All Ordinaries Index of the Australian Stock Exchange (with base = 500 on December 31, 1979). In particular we take the monthly averages from January 1971 to December 1980. There are thus 120 observations in the data set over ten years.

The historical data is plotted in Figure 1A. The estimated exponential trend is plotted as well. The growth is found to be 0.37 per cent each month. This is fairly appreciable growth.



A business cycle component was identified through the computer program. It is graphed in Figure 1B. In fact one-month-ahead predictions are shown in Figure 1B. It is seen that the business cycle varies both in its amplitude (measured from the trend level to corresponding peak or trough) and phase (timing of peaks and troughs). The Stochastic, random shock models of control theory are well suited to handle this type of phenomenon.



The periodicity with which the business cycle repeats itself is found to be nearly 42 months. The next peak after December 1980, the end of sample period, is estimated to occur 41 months later, i.e. around May or June of 1984. In other words, the end of 1980 itself exhibits a peak and the business cycle will be in the downswing for the next 20 months. Thus, 1981 and 1982 are not expected to show above trend price levels.

The estimated business cycle component in the share prices is very pronounced. Its amplitude is estimated to be 44.3 points for January 1971, the start of the sample data. In contrast, it is estimated to be nearly 250 points at the end, i.e. in December 1980. In effect this indicates that the share price movements have become more pronounced in their cyclical component.

The computer program provides statistics relating to the one-month-ahead predictions. In the present case, these predictions have an average forecast error (true value - predicted) of less than 1 point over the entire sample. The standard deviation is nearly 25 points which is about 7 per cent of the trend level in the middle of the sample (368 points). In other words, the statistical model results in forecast errors with a standard deviation of about 7 per cent of the trend level.

TABLE 1 shows a part of the printed output obtained from the program. It gives numerical values of the one-month-ahead forecasts. Corresponding trend level and the business cycle component are also printed. The program allows only a part of the calculations to be printed and this option was used. Accordingly, calculations for 1980 only appear in the table, the printing of previous data being omitted. The base of the share price index used in these calculations is 5.000 for December 31, 1979 unlike the base of 500 used by the Australian Stock Exchange. The conversion from one base to the other is of course easy. Thus, for

December 1980 the table shows a mean forecast of 7.405 which would be 740.5 with a base of 500. The corresponding trend level would be 457.7 and the business cycle component 282.8 instead of the printed figures of 4.577 and 2.828, respectively. The table includes a single *ex ante* forecast as well. To recall, data for the period January 1971 - December 1980 are used in this study for estimation. The forecast for January 1981 is therefore a true *ex ante* prediction. The calculated figure is 708.8 (with a base = 500). (The corresponding actual value now known is 693.0. The additional data available can be used to update various estimates. However, as mentioned, this is not described in the present report.)

For illustration purposes we have employed monthly data for the share price index. The index is calculated each trading day. The daily data contain more information on price movements than their monthly averages. It is of course possible to analyse and predict daily data in the same fashion as illustrated here. In fact, improvement in the tracking and forecasting performance of the statistical models is to be expected.

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