MARKET REACTION TO & ANTICIPATION OF ACCOUNTING NUMBERS

One way in which accounting numbers can be assessed is to see how they relate to stock returns. Accounting numbers which update the market's beliefs will generate a change in returns. But the key issues are (i) how do we measure the change and (ii) how do we know that any observed change is due to the information we have identified.

The technique for measuring the market impact of accounting numbers was developed primarily by Ball and Brown, and was called the Abnormal Performance Index. Ball & Brown were interested in measuring the impact of the information at the time it is disclosed, but also its anticipation in the period up to the announcement.

Ball & Brown, "An empirical evaluation of accounting income numbers", Journal of Accounting Research, Autumn 1968.

1. The main idea

Intuitively, the method is simple. Information arrival is associated with unexpected stock returns.

In order to implement this, first of all we need to identify a model that describes equilibrium share returns like CAPM. This says that

$$E\,[R_{i,t}\,] = R_f(1 - \beta_i) + E\,[R_{m,t}\,] \cdot \beta_i$$

The empirical equivalent of this is

$$R_{i,t} = R_f + [R_{m,t} - R_f\,] \cdot \beta_i + e_{i,t}$$

If the model is stable then the distribution of the error term $e_{i,t}$ will be distributed around zero. The consequence of this is that if we keep the parameters constant and then examine the error term through time we can then check if the error really is distributed around zero. If this test fails, then we know that the model has changed, ie. new information has arrived at the market. Hence we detect the arrival of new information by examining the behaviour of the CAPM residuals.

2. Calculating the API for an individual company.

Time is divided in to two:

the estimation period　　=　　the period needed to estimate the parameter (β_i) of the model,

the test window　　=　　the period we use to identify if the model has changed as a consequence of information (say earnings) arrival.

To explain how it works, we need some further definitions relating to the test window.

period -k　　=　　the first return period in the test window

period 0   =   the final return period in the test window; this is the period during which the announcement of the information is made.

period p   =   the last observed return period after the announcement

API_i is constructed from the company's CAPM residuals, e_i. Since these residuals are measured for each period between -k ,0 and p, the API can then be constructed between the beginning period -k and to the end of any subsequent period T, up to T=p.

$API_{i,T}$ is   the abnormal performance index for a given company i, from the beginning of period -k to the end of period T.

The API for the company is calculated by adding 1 to each residual and multiplying them together through the relevant periods. For example, the API between periods -k and T is defined as:

$$API_{i,T} = \mathop{\mathbf{k}}_{t=-k}^{T} (1 + e_{i,t})$$

The reason for defining the API like this is that it has an intuitive meaning. It tracks the excess returns (returns over and above the equilibrium rate) that would be generated by investing a £1 in company i at the beginning of period -k, and holding it until the end of period T. These excess profits are the result of information arriving which in turn affect returns.

3. The API for a portfolio of companies

In the Ball & Brown paper, and in most subsequent studies, the purpose is to identify the impact of a certain type of information (in Ball & Brown, it is earnings) and this is achieved by constructing portfolios. To illustrate this for earnings, define:

E_{-k} =   the market's expectation, during period -k, of earnings E_0

E_0 =   the value of earnings announced during period 0.

Companies are then grouped in to portfolios according to the information which we wish to observe being impounded. For example, often companies are classified in to 2 groups, good news and bad news.

Companies are defined as good news companies if $E_0 \$ E_{-k}$ and as bad news companies if $E_0 < E_{-k}$. Then we can also label a company's residuals according to the good news/bad news classification.

$e^{good}_{i,t}$ =   the residual for period t (t = -k..0..p) of company i (i = 1 .... n1) in the good news portfolio

$e^{bad}_{i,t}$ =   the residual for period t (t = -k..0..p) of company i (i = 1 .... n2) in the bad news portfolio

The API for a portfolio is calculated by averaging the APIs of the companies which are included in the portfolio. For example, the API from period -k to T for the good news portfolio is defined

as:

$$API^{good}_{T} = \frac{1}{n1} \cdot \sum_{i=1}^{n1} \left[\prod_{t'=-k}^{T} (1 + e^{good}_{i,t'}) \right]$$

and the API from period -k to T for the bad news portfolio is defined as:

$$API^{bad}_{T} = \frac{1}{n2} \cdot \sum_{i=1}^{n2} \left[\prod_{t'=-k}^{T} (1 + e^{bad}_{i,t'}) \right]$$

The API statistic normally is intended to capture:

> any anticipation of the information from period -k to period -1;

> the impact of the announcement (say earnings) at period 0; and

> any drift after the announcement, from period 1 to period p, when the market is trying to digest the information.

This can be seen   from the figure taken from the Ball & Brown study.

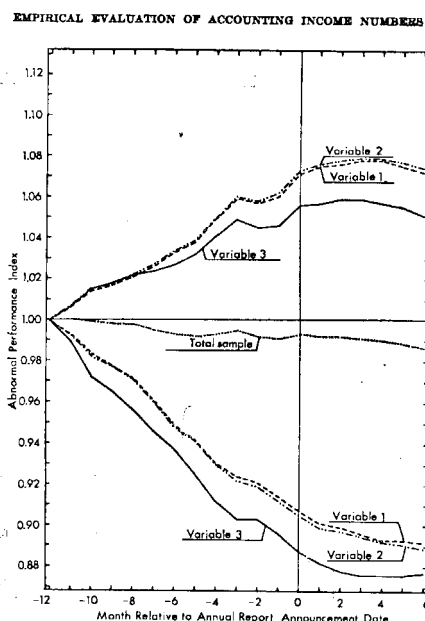EMPIRICAL EVALUATION OF ACCOUNTING INCOME NUMBERS

FIG. 1 Abnormal Performance Indexes for Various Portfolios

All portfolios start at 1, but the good news portfolios rise prior to announcement at 0, whilst the bad news portfolios fall prior to announcement. Other characteristics are:

(i) the total sample remains at approximately 1; and
(ii) there is some post announcement drift (the API continues to fall after 0) for bad news companies.

4. Calculating the API on a spreadsheet

The API can be constructed easily using a worksheet package, as follows. This is for one single company.

	A	B	C	D	E	F
1	Period	Company returns	Index returns	Residual	API	Formula for API
2	-k				1	1
3		0.005	0.003	0.002	1.002	1+D3
4		-0.004	-0.005	0.001	1.003002	(1+D4)*E3
5		0.006	0.007	-0.001	1.001999	(1+D5)*E4
6		0.0056	0.002	0.0036	1.005606	(1+D6)*E5
7	0	0.0087	0.007	0.0017	1.007316	(1+D7)*E6
8		0.0001	0.009	-0.009	0.998351	(1+D8)*E7
9		-0.008	0.002	-0.01	0.988367	(1+D9)*E8
10	p	0.007	0.03	-0.023	0.965635	(1+D10)*E9

5. Interpreting the API

The API attempts to track the information impounding process of a particular signal between -k and p. Take the case of good news companies. If the API $^{good}_T$ rises soon after time = -k and then flattens out up to time = 0, then this means that much of the information was anticipated and the actual signal at 0 did not contain significant information. However, if there is a large rise in API $^{good}_T$ around time = 0, then this means that the signal substantially updates the market's information set. This is our interpretation of the API.

However, there is a problem. The researcher is interested in the information that is announced at t=0. But we can't stop the world spinning just because we want to observe this. Information is arriving at the securities market all the time. So, how do we know that the API movements before and after the announcement are due to the information we are interested in.

In particular, how do we know that movements of API prior to time=0 are due to the anticipation of the announcement and not due to the arrival of other information ?

The elimination of other information is done in three stages.

I - MACROECONOMIC INFORMATION

Don't forget that we are tracking residuals, which are purged of market movements. So macro information is removed. But that still leaves firm specific and industry specific information.

II - FIRM SPECIFIC INFORMATION.

Since the API of the portfolio is an average of each firm's API, firm specific influences will be averaged away (if the portfolio is large enough and if the firm specific influences are not correlated).

III - INDUSTRY INFORMATION

But, this still leaves industry specific influences. So if firms in the portfolio belong to the same industry, how will the industry effects be averaged out? The answer to this is to notice that the API tracks residuals in event time, between -k and time 0, the announcement of the event. This will (hopefully) be a different calendar time for different companies. If this is so, then any industry effects (which take place in calendar time) will be scattered throughout event time. In the example below, the industry effect occurs before the announcement (time 0) of the first firm, but after announcement of the second firm.
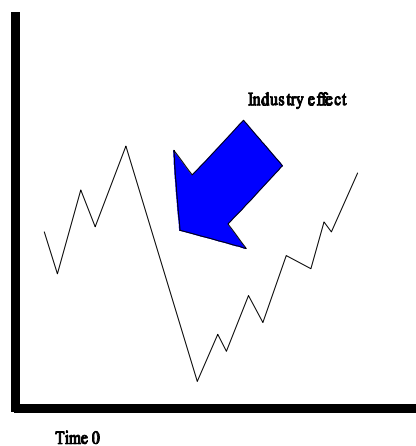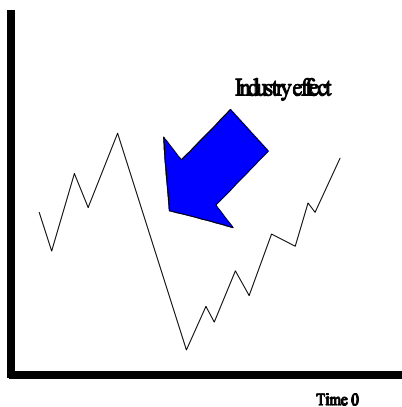
So if w have eliminated macro effects, and averaged out both firm and industry information from the portfolio, what is left? The answer is that all these companies are in the same portfolio and have that characteristic in common; that they are all either good news or all bad news companies. Therefore, the API movements can be interpreted as being due to these characteristics.

6. Results from API studies

There have been literally hundreds of studies of information arrival at the market. A good survey is by:

> Lev and Ohlson "Market based empirical research in accounting: a review, interpretation and extension", Journal of Accounting Research, Supplement 1982, 249-322.

Typically, the evidence suggests that earnings information is well anticipated by the time of its announcement. However, there is some evidence of post earnings announcement drift. The market appears to take a substantial amount of time to work out the implications of some earnings announcements. The most often quoted and thorough study is:

> Bernard and Thomas, Post earnings announcement drift: delayed price response or risk premium?, Journal of Accounting Research, 1989, Supplement 1-36.

There is also a UK study:

> Hew, Skerratt, Strong & Walker, "Post-earnings-announcement drift: some preliminary evidence for the UK", Accounting and Business Research, Autumn 1996, pp. 283-293.

7. Market efficiency tests

It is worth noting that the API type of efficiency tests are different from that in Shiller, *American Economic Review*, June 1981. The benchmarks are different.

- Shiller's benchmark relates to <u>fundamentals</u>, the present value of the dividend stream. The research question is: are market prices correct in relation to the underlying fundamentals, the present value of the dividend stream ?

- by contrast, the API tests examine whether or not <u>relative performance</u> of companies ($R_j - R_m$) can be explained news arrival.

It seems to me that API efficiency is consistent with Shiller inefficiency. It is quite possible that relative pricing is efficient with respect to information, whereas over time the absolute pricing level changes in a manner which is not justified by the arrival of information.