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Can Large Industries Predict the Stock Market?

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Abstract: This paper empirically examines the hypothesis that diffusion of information is not uniform across all sectors of a market. Large industries or industries where trading volume is substantially larger attract attention of a large number of investors who in turn make these industries informationally efficient. Such industries are expected to help in predicting the movements of a stock market. For testing the above hypothesis, the study uses monthly data of 3 industries listed at the Karachi Stock Exchange over the period 2001 to 2008. These include Oil and Gas, Chemical and Cement industries. In separate regressions, current market returns are regressed on the lagged portfolio returns of the given industries and other control variables. The results do not provide any evidence that these industries can predict movements of the stock market. However, there is some evidence that dividend yield can forecast market returns up to two months. The paper contributes to the literature as this is the first-ever study on this topic in Pakistan.

Key words: Slow diffusion of information · Large industries · Stock market predictability · KSE · Stock market efficiency

INTRODUCTION

Previous research studies have identified the existence of lead-lag relationship between industry returns and market returns. The association between the two is rationalized by several explanations like the liquidity factor [1, 2, 3], the size factor [4] and the information diffusion hypothesis [5, 6, 7]. The liquidity hypothesis states that some industries attract attention of a large number investors who make these industries informationally efficient. These industries have the potential to lead the stock market and can serve as good predictors of the market. To the contrary, asset pricing theories and the efficient market hypothesis assume equal market participation and equal efficiency of all sectors of the market [8]. However, several research studies have found evidences that a large group of investors trade only in stocks which they know best. As a result those stocks which are not much known to investors are traded at a high discounts and the investor base and trading volume in such stock are often very limited. Moreover, financial behavioralists argue that attention is a precious cognitive resource [9, 10]. Investors who do not specialize in an industry will under-react to information originating in that industry due to lack of attention to that information or due to limited ability to process that information. This is known as slow diffusion of information hypothesis. According to this hypothesis, the ability of industries to predict movements in the stock market stems from the slow diffusion of information. If information moves sluggishly in the stock market and/or processed at a slower rate, smart investors or investors who have access to private sources of information will be able to beat the market. The stock market will react to the information but with a delay. Thus, some industries which generate information about macroeconomic fundamentals are expected to generate and diffuse information at much quicker rate than the rest of the market [7]. These industries are thus expected to lead the market.

Building upon the above, we conjecture that the forecasting ability should be higher with larger industries than with smaller ones. The rationale for our conjecture is that much of the economic activity takes place in larger industries. Second, investors' base is usually larger in such industries, which in turn make these industries informationally efficient. The main objective of this paper is to test this hypothesis. If efficient market hypothesis holds, then there should be no difference between large

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industries and the market with respect to generation and diffusion of information. Consequently, large industries should not be able to lead the market. The empirical methodology for testing the information efficiency of large industries in this paper is to regress the market returns on the lagged portfolio returns of some of the large industries in Pakistan. To control for other relevant factors, the paper also includes inflation rate and dividend yields. Previous research studies argue that these variables are proxies for time-varying risk factors [11, 12].

This paper contributes to the literature as this is a first ever study in Pakistan on the mentioned topic. Despite the fact that the largest stock exchange in Pakistan, the Karachi Stock Exchange (KSE), has provided an annual compounded returns of 18% in the last 18 years and that this market can be of great importance to international investors for portfolio diversification, this market has not attracted due attention of the empirical researchers. Given that, this study will be of interest not only to local investors, but also to international portfolio investors to know about the underlying characteristics of the KSE. The rest of the paper is organized as follows. Section 2 reviews the extant literature. Section 3 discusses the data, data sources, variable definition and the choice of empirical model. Section 4 presents and discusses results of the regression. Section 5 concludes the paper.

Literature Review: The discussion on industries and stock market lead-lag relationship was pioneered by Lo and MacKinlay [4] who found that that returns on large stocks lead returns on small stocks. Later on the lead-lag relationship was criticized by Boudoukh, Richardson and Whitelaw [13] on grounds that such relationships are characterized primarily by auto-correlations of the portfolios' own returns. However, this area did not lose its attraction to empirical and theoretical researchers especially in the wake of developments in the behavioral finance. The behaviorists maintain that investors do not have unlimited capacity to process information [14, 15] which is why information moves at a slower pace from one market to another. This provides a chance that information may diffuse with delays in markets where the information is not generated and hence such markets may be led by markets where information is generated.

Hong, *et al.* [7] developed and empirically tested a model where industries lead the boarder market index. Their main hypothesis was that industries which have information about macroeconomic fundamentals will lead the market in a sense that information from the industries will reach with a delay to investors who trade and specialize in only the broader market index. Their main focus was on the ability of the industry to contain information about the macroeconomic fundamentals. In their model, if an industry does not have information about the market, it will not lead the market whether or not information moves slowly. They found a strong support for their hypothesis.

We build upon the hypothesis of Hong, *et al.* [7] and expect that large industries may lead the market. Our expectations are based on the fact that much of the economic activity takes place in large industries. Second, large industries attract more investors and hence may be more liquid than smaller ones. This argument seems to be true if we look at Table 1 where the absolute and relative trading volumes are the highest for the three largest industries listed at the KSE. These features enable large industries to contain more information than the rest of the market. Our postulation is also in line with the model of Merton [5] where he proves that investors trade only in stocks which the investors are more familiar with or have more information about.

Empirical evidence on how quickly market adjusts to new information is mixed. Mitchell & Mulherin [16] studied the prediction of market returns from public information. Results of their study indicated that the relation between public information and market return at times was strong, but they also observed that this relation is often weak. Brown [17] found evidence that the market failed to adjust instantaneously to the new EPS announcement or information because the market take about 45 days to adjust to new information. Hong and Stein [6] made two groups of "news watchers" and "momentum traders". They observed that every news watcher was looking only at private information and could not extract information from the price of the stock. This implies that information diffuses among the population would be slow and the prices in other sectors would under-react for shorter period of time.

There exists some empirical evidence from the KSE on lead-lag relationship. Rehman and Rehman [18] tested the ability of large stock portfolios to lead small stocks portfolios of KSE over the period 2000-2009. They found that portfolios returns of large stocks lead the portfolio returns of small stocks by almost one month time. However, their study did not control for the widely used stock returns predictors such as dividend yield and inflation.

Since this study tries to predict market returns with lagged industries' returns, it is essential to include control variables in the analysis. To account for the autocorrelation in market returns, we include lagged market excess returns. This is in line with the argument of Boudoukh, Richardson and Whitelaw [13] who objected to the hypothesis of lead-lag relationship between portfolio returns and market returns on grounds of autocorrelations in the portfolios own returns. Besides the lagged market excess returns, we also include two other control variables which are proxies for time varying risk. These two are inflation [12] and dividend yield [11]. Several other explanations exist on the relationship of inflation and stock prices. For example, Fama [19] presented proxy hypothesis which suggested an inverse relationship between stock returns and inflation. He pointed out that high inflation rate is a proxy of lower economic activity because inflation reduces demand for money that in turn reduces growth in real activity. Malkiel [20] adds one more angle to the relationship between inflation and stock prices. He argued that change in inflation generates a level of uncertainty which lowers the stock prices.

MATERIALS AND METHODS

Sample and Data Sources: The data covers 8 years from January 2001 to December 2008 for KSE100 Index returns and returns of the 3 industries, namely the Oil and Gas industry, Cement industry and Chemical industry. To calculate market and industry returns, we took index points and share prices data from Business Recorder website. Data on inflation were retrieved from the monthly reviews of Federal Bureau of Statistics. And dividend yield data were obtained from State Bank of Pakistan (SBP).

The Selected Industries: Since the main objective of the paper is to test the ability of large industries to predict market returns, the selection of large industries is based on the relative size of the industries. We use the proxy of total paid-up capital for size of an industry. We follow the SBP that classifies the listed non-financial firms into 11 distinct economic groups plus one miscellaneous group. Absolute and relative paid up capitals the industries are given in Table 1. These figures are based on the 2005 data which were retrieved from the *Balance Sheet Analsyis - 2005*, a publication of the SBP. The year 2005 has been selected for the above mentioned purpose because it is the middle year of the sample period. The three largest industries are Fuel and Energy, Chemical and Cement with relative paid up capital of 40.07%, 10.40% and 8.40% of the total paid up capital of all industries, respectively. We select these 3 industries for our analysis.

Measurement of Variables

Dependent Variable: Dependent variable is the stock market return. Since stock index is a composite measure of the basket of securities included in the index, we can use the proxy of stock index for market returns. Holding period market return (R_m) was calculated as follows:

$$R_m = \frac{\text{Index points}_{\text{t}} - \text{Index points}_{\text{t-1}}}{\text{Index Points}_{\text{t-1}}}$$

Independent Variables

Industry Returns: We measure the industry returns in two steps. In the first step, stock returns (R_i) are calculated from percentage increases in monthly share prices for all firms in a given industry. In the second step, the individual firm returns are equally weighted into an industry portfolio return (R_p), as shown below;

Step 1: $R_i = (Pt - P_{t-1}) / P_{t-1}$ Step 2: $R_p = \sum_{i=1}^{n} W_i R_i$ where P represents stock price and W represents weight of a stock in a portfolio return.

Dividend Yield: As discussed in the literature review section, change in dividend yield can be a proxy for time varying risk factors. Second, since investors compare risk-returns of shares to other classes of financial assets, a dividend yield considerably lower or higher than its historical average will always tend to pull the share price back to its fair level. Following Campbell and Shiller [11] and Hong *et al.* [7] we include dividend yield as a predictor of the stock market return:

DYD = Dividend /price, where *DYD* is the dividend yield on the market index.

Inflation: Inflation can be a proxy for time varying risk factors [12], a proxy for real activity in the economy [19]), or an agent of uncertainty [21]. To account for all these possibilities, we include inflation as a predictor of market returns. Inflation is a general increase in price level of goods and services. As inflation rises the purchasing

power of goods and services decreases for the same level of income. The measure of inflation is the consumer price index which has been taken from the monthly review of price indices issued by federal bureau of statistics.

Lagged Market Returns: The definition of lagged market returns (*RM*) is the same as the definition of market returns, excpt that the former is lagged for one, two and three months in different specifications.

Model Specification: Following Hong *et al.* [7], we test the ability of large industries to forecast the market returns with the following model;

$$R_{mt} = \alpha_i + \lambda_i R_{p,t-1} + A_i Z_{t-1} + e_{i,t}$$

A separate regression model is estimated for each of the 3 industries. R_{mt} is the market return, $R_{p,t-1}$ are the lagged industry returns and Z_{t-1} are additional market predictors which include lagged market returns, inflation and market dividend yield. λ_i is the coefficient of a given industry which will measures the extent to which an industry leads the market. For the gradual diffuseness of information hypothesis to hold, it is necessary that λ_i is significantly different from zero. The lag lengths of the explanatory variables range from one month to three months.

An alternative to the above method can be to estimate a single regression for all industries. However, as suggested by Hong *et al.* [7], the cost of doing so would be larger standard errors due to limited number of observations, which will render estimation of the individual industry effect on market less precise.

RESULTS AND DISCUSSION

This section discusses results of the regression models. Table 1, 2 and 3 reports results of regressions where market returns were regressed on the one-month, two-month and three-month lagged values of the explanatory variables., respectively. R_{CHEM}, R_{CEM} *and* R_{OIL} are the coefficients of the Chemical, Cement and Oil and Gas industries. *RM* is lagged market return; *INF* refers to the rate of inflation while *DYD* is the market dividend yield.

The results of the F-tests show that only a model with two-months lag (Table 2) is statistically significant, whereas the other sets of regressions (where one-month lagged and two-months lagged industry returns were used as explanatory variables) seem to be mis-specified. For the sake of parsimony, results of these regressions are not reported.

The coefficients of industry returns are insignificant for all of the three industries. This rejects the hypothesis that large industries originate information that is slowly diffused in the rest of the market. This finding is in sharp contrast to what financial behaviorist propagate. Two possible explanations can be offered in this regard. First, large industries do originate information, but the information diffusion process is quicker than the time lags we use. The market soon adjusts to new information, rendering any attempt to forecast the market ineffective. This view supports the efficient market hypothesis. Second, one might say that large industries like Cement, Chemical and Oil and Gas did not, in fact, originate information about macroeconomic fundamentals during the period of this study.

Table 1: Names, Sizes and Trading Volume of the Industries

	Names of the Industries	Paid-up Capital (dollars in millions)	Relative Sizes of the Industries	Shares Traded (in Millions)	Relative Trading Volume
1.	Cotton & Other Textiles	380.71	6.55%	3,126.91	5.71%
2.	Chemicals	636.15	10.94%	6,317.64	11.54%
3.	Engineering	135.16	2.33%	30.82	0.06%
6.	Sugar & Allied	96.78	1.67%	122.52	0.22%
7.	Paper & Board	27.34	0.47%	19.73	0.04%
8.	Cement	487.98	8.40%	15,691.90	28.67%
9.	Fuel & Energy	2329.29	40.07%	19,045.62	34.80%
10.	Miscellaneous	1565.78	26.94%	10,380.59	14.24%
Total		5812.65	100%	54,735.73	100%

Table 2: Regression results with two- months lag of the explanatory variables

Chemical Variables	Coef.	Std. Err.	T-values	P-values			
RM	-0.120	0.065	-1.820	0.072			
R_{CHEM}	0.092	0.152	0.600	0.548	F(3, 90)	=	5.86
INF	0.570	0.459	1.240	0.218	Prob> F	=	0.0011
DY	-0.040	0.011	-3.730	0.000	R-squared	=	0.1635
CONS	0.002	0.030	0.060	0.949	Adj R-squared	=	0.1356
Cement							
RM	-0.134	0.123	1.082	0.234			
R_{CEM}	-0.064	0.099	-0.640	0.523	F(3, 86)	=	5.5
INF	1.035	0.760	1.360	0.177	Prob> F	=	0.0017
DY	-0.039	0.011	-3.620	0.000	R-squared	=	0.1609
CONS	0.010	0.022	0.430	0.670	Adj R-squared	=	0.1316
Oil and Gas							
RM	-0.113	.0612	1.849	0.0871			
R_{OIL}	-0.030	0.114	-0.260	0.793	F(3, 88)	=	5.77
INF	0.377	0.375	1.010	0.317	Prob> F	=	0.0012
DY	-0.041	0.011	-3.780	0.000	R-squared	=	0.1644
CONS	0.016	0.025	0.660	0.511	Adj R-squared	=	0.1359

One caveat that must be kept in mind is that our data set is not as larger as used in previous studies. Goetzmann and Jorion [21] argue that most of the time series studies of small sample size are more open to biasness. It is, therefore, suggested for future research that a much longer data set, spanning at least two or three decades, should be used. Such a longer period will also help in comparing the results with other studies such as Hong *et al*. [7] who used data from 1946 to 2002.

One of the control variables seems to have some predictive power. In Table 2, dividend yield (*DY)* is statistically significant in all of the industries regressions. It shows that one percentage point increase in dividend yield forecasts an almost four percentage decline in market returns in coming two months. This confirms to the argument put forward by Campbell and Shiller [11] that higher dividend yield actually refers to overpriced levels of the market. Inflation does not have statistical significance in any of the regressions.

Table 2 reports results of the regression where market returns are regressed on the two-months lagged values of industry returns and a set of control variables that include lagged market returns, inflation and market dividend yield. A separate regression is estimated for each industry.

CONCLUSSION

This paper empirically examines the possibility whether or not returns of some of the largest industries can predict the future returns of the stock markets in Pakistan. For this purpose, the study uses the data of three industries from Pakistani market. These industries include Oil and Gas, Chemical and Cement industries for which data were collected for 8 years from January 2001 to December 2008. KSE 100 Index returns were regressed on the lagged industries returns, lagged returns of the market itself, market dividend yield and inflation rate. The results of our regression model provide no evidence that industries returns can predict the market returns. Our results do not approve the slow diffusion of information hypothesis, which is propagated by financial behaviorists. Among the control variables, market lagged returns and dividend yields have some predictive power. Increase in these two variables forecast a negative market return in coming two months. To make our results at par with other studies, it is suggested for future research that a much longer data set, spanning at least two or three decades, should be used.

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