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Author

E. Marrett, George, Worthington, Andrew

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The day-of-the-week Effect in the Australian Stock Market: An Empirical Note on the Market, Industry and Small Cap Effects

George E. Marrett
School of Accounting and Finance
University of Wollongong
Wollongong NSW 2522
Australia
Tel: 61-2-4221-3609 E-mail: gmarrett@uow.edu.au
Andrew C. Worthington
Department of Accounting
Finance and Economics
Griffith University
Nathan QLD 4111
Australia
Tel: 61-7-3735-4273 E-mail: a.worthington@griffith.edu.au

Abstract

This note examines the day-of-the-week effect in Australian daily stock returns at the market and industry levels and for small capitalization stocks from Monday 9 September 1996 to Friday 10 November 2006. A regression-based approach is employed. The results indicate that while the Australian market overall provides no evidence of daily seasonality, there is evidence of a small cap day-of-the-week effect with systematically higher returns on Thursdays and Fridays. The analysis of the sub-market returns is also partly supportive of day-of-the-week effects in the banking, diversified financial, energy, healthcare, insurance, materials and retail industries. However, these rarely coincide with the lower Monday or lower Tuesday returns typified in earlier work.

Keywords: Calendar effects, Market anomalies, Market efficiency

1. Introduction

A consistent theme in the market efficiency literature has concerned the presence of calendar anomalies or seasonality in stock market returns. If, and as hypothesised, readily identifiable seasonal patterns occur there are, amongst other things, the possibility of abnormal returns through market timing strategies. Within this burgeoning and widely-spread literature, one of the more well-known calendar anomalies comprises the day-of-the-week effect, where returns on some trading days are higher than others.

A number of hypotheses have been put forward to explain the presence of this seasonality: namely, an information release hypothesis, whereby firms delay the release of negative information until late in the week, a settlement regime hypothesis, associated with differences in the timing of transactions and settlement, and an information processing hypothesis linked with the asymmetry in information costs across small and large investors [see, for example, Keim and Stambaugh (1984), Thaler (1987), Rystrom and Bensen (1989), Chang *et al*. (1993; 1998), Abraham and Ikenberry (1994), Agarwal and Ikenberry (1994), Arsad and Coutts (1997), Wang et al. (1997) and Keef and Roush (2005) Chang *et al*. (1993)].

The most commonly reported empirical finding in this literature is significantly lower (if not negative) Monday returns. Interestingly, this effect is rarely consistent in all market contexts, with Jaffe and Westerfield (1985), Finn *et al*. (1991), Easton and Faff (1994), Agrawal and Tandon (1994) and Davidson and Faff (1999) finding a significantly negative Tuesday effect in Australian stock returns, and Jaffe and Westerfield (1985) proposing a linkage between Tuesdays in the Asia-Pacific and the (negative) Monday effect in the US. At the same time, some recent studies have shown a decline in the Monday effect in the US (Chen and Singal 2003; Marquering *et al*. 2006), especially in stocks with actively traded options.

The purpose of this note is to re-examine the day-of-the-week effect in the Australian stock market. While it resembles previous research in this context, it complements existing work by including marketwide, industry and small cap returns, thereby providing a more detailed understanding of the day-of-the-week effect in all its manifestations. The remainder of the paper is divided into four main areas. Section 2 provides a description of the data employed in the analysis. Section 3 discusses the empirical methodology used. The results are dealt with in Section 4. The paper ends with a brief conclusion in Section 5.

2. Description and properties of the data

Twelve different stock indices are used to test for the day-of-the-week effect in the Australian stock market. Each index series runs from 9 September 1996 to 10 November 2006 providing 2,635 end-of-day observations on the Australian Stock Exchange (ASX). Unfortunately, the sample period is the longest period over which daily prices are available for all twelve series. This is because the ASX, in association with Standard and Poor's (S&P), only introduced new indices based upon the Global Industry Classification Standard (GICS) in April 2000. While the daily price series for the market as a whole spans this change in classification, only a small number of sub-market series have been created by Global Financial Data (2006) using the post-April 2000 ASX/S&P series and the earlier ASX series. All data is sourced from Global Financial Data (2006).

To start with, the capitalisation-weighted All Ordinaries index is used to measure marketwide returns. Currently, the index includes the top ASX-listed stocks by capitalization, covering about 92 percent of domestic companies by market value. To be included in the index stocks must have an aggregate market value of at least 0.02 percent of all domestic equities, and maintain an average turnover in excess of 0.5 percent of quoted shares each month. Following this, the Small Ordinaries index is used to measure the returns on small capitalisation stocks. This index is composed of companies included in the S&P/ASX300 (top-three hundred companies by capitalisation), but not in the S&P/ASX100 (top-one hundred companies by capitalisation), and covers approximately 7 percent of the ASX. Because the Small Ordinaries index does not contain any of the hundred largest stocks it is regarded as a better proxy for small firms.

Finally, ten ASX/S&P industry indices are used to measure returns in different industries. The industries selected are banking, diversified financials, energy, healthcare, insurance, materials, media, retailing, telecommunications and transportation. Each index consists of fifty stocks in business areas within the industry. First, the banking, diversified financials and insurance indices contain companies involved in activities such as banking, mortgage finance, consumer finance, specialized finance, investment banking and brokerage, asset management and custody, corporate lending, insurance and financial investment and real estate. Second, the energy index comprises companies whose businesses are dominated by either of the following activities: the construction or provision of oil rigs, drilling equipment and other energy related service and equipment, including seismic data collection; or, companies engaged in the exploration, production, marketing, refining and/or transportation of oil and gas products, coal and other consumable fuels.

Third, the healthcare index encompasses two main industry groups. The first group includes companies who manufacture health care equipment and supplies or provide healthcare related services, and owners and operators of healthcare products, providers of basic healthcare services, and owners and operators of healthcare facilities and organizations. The second group includes companies primarily involved in the research, development, production and marketing of pharmaceuticals and biotechnology products. Fourth, the materials index encompasses a wide range of commodity-related manufacturing industries. Included in this index are companies that manufacture chemicals, construction materials, glass, paper, forest products and related packaging products, and metals, minerals and mining companies.

Fifth, the transport index consists of companies involved in three main groups; manufacturers, suppliers and repairers of commercial vehicles including coaches and buses, and their components; transport operators engaged in the movement of freight; and public and private operators involved in the movement of passengers. Sixth, the media index contains companies involved with communication services as well as printing and publishing. Seventh, the retail index contains companies involved with clothing and footwear, miscellaneous manufacturing and retail trade. Lastly, the telecommunications index contains companies involved in communication services, internet service providers and the manufacturing of communications equipment.

The natural log of the relative price is computed for the daily intervals to produce a time series of continuously compounded returns, such that:

$$r_t = \log\left(p_t / p_{t-1}\right) \times 100 \tag{1}$$

where p_t and p_{t-1} represent the index price at time t and t-1, respectively. Table 1 presents descriptive statistics of the daily returns. The sample and annualised means, medians, standard deviations, skewness, kurtosis and Jacque-Bera statistics are reported.

By and large, the distributional properties of the twelve return series appear non-normal. Most series, with the exception of the healthcare and media industries, are significantly negatively skewed, indicating the greater probability of large deceases in returns than rises. The kurtosis or degree of excess, in all return series is also significantly large, thereby indicating leptokurtic distributions with many extreme observations. Finally, the calculated Jarque-Bera statistics are used to test the null hypotheses that the daily distribution of returns is normally distributed. All p-values (not shown) are smaller than the .01 level of significance suggesting the null hypothesis can be rejected. None of these return series are then well approximated by the normal distribution.

3. Empirical methodology

The approach used to test the day-of-the-week hypothesis is a regression-based approach. The day-of-the-week effect is examined on the basis of a trading time hypothesis whereby returns are created only on trading days during the week. As an alternative, Mills et al. (2000) proposed a calendar time hypothesis whereby returns are also created on non-trading days: that is, the Monday return would be expected to be some three times larger than returns on other days if the market efficiency null hypothesis holds. The following model is specified:

$$R_t = \sum_{i=1}^{5} \alpha_i W_{it} + \varepsilon_t \qquad (2)$$

where W_i is a dummy variable taking a value of one for day i and zero otherwise where i = 1 (Monday), 2 (Tuesday)…5 (Friday), α are parameters to be estimated and ε is the error term. The hypothesis tested is:

$$H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 \qquad (3)$$

against the alternative that not all α are equal. If the null hypothesis is rejected, then the returns exhibit day-of-the-week seasonality.

4. Empirical results

The estimated coefficients and standard errors of the parameters detailed in Equation (1) are presented in Table 2. Breusch-Godfrey Lagrange multiplier and White's heteroskedasticity tests (not shown) were initially used to test for higher-order serial correlation and/or heteroskedasticity in the least squares residuals, respectively. As expected, almost all of the least squares residuals displayed some form of both heteroskedasticity and serial correlation: the energy and retail industries models displayed only heteroskedasticity. Accordingly, all standard errors and p-values in Table 2 with the exception of the energy and retail industries incorporate corrections for heteroskedasticity and autocorrelation following Newey-West. The energy and retail industries models include corrections for heteroskedasticity following White.

Consider the day-of-the-week model of returns on the All Ordinaries. While returns on Friday and Tuesday are lower in magnitude than Monday, Wednesday or Thursday, in no instance are the estimated coefficients significant. Clearly, and contrary to the results found in earlier studies, there is no evidence of a day-of-the-week effect in Australia at the market level. However, the Small Ordinaries returns model does display significant day-of-the-week seasonality; namely, significantly higher returns on Thursdays and Fridays. A small firm effect then appears to be present in the day-of-the-week effect, at least in Australia.

The results for the industry return models also illustrate the varying impact of the day-of-the-week effect in Australia. Significantly higher returns are observed on Mondays in the energy industry, on Tuesdays in the banking and diversified financials industries, on Wednesdays in the retail and banking industries, on Thursdays in the diversified financials, healthcare and insurance industries and on Fridays in the materials industry. In terms of the magnitude of returns, the Tuesday and Wednesday effects in the banking industry are the most substantial, being more than double the mean daily return over the sample period in this particular industry. There is no evidence of a day-of-the-week effect in the media, telecoms or transport industries.

In only three instances is there a significant negative day-of-the-week effect in the industry returns: Friday in the banking industry, Wednesday in the diversified financials industry and Tuesday in the healthcare industry. The mean daily return in the banking industry on any day of the week is .051 percent whereas mean returns on Fridays are -.078 percent. A possible explanation for the consistently negative Friday returns in the banking industry could be due to investor psychology whereby investors who have made high returns on bank stocks during the week may wish to close out their positions on Friday. The diversified financials index exhibits significantly negative returns on Wednesdays. The mean return for the diversified financials index on any day of the week is .312 percent whereas Wednesday returns are -.039 percent. One possible explanation may be related to the market for bank bills and treasury notes in Australia. Keef and Roush (2004), for example, have found that bank bills and treasury notes generally have higher returns on Wednesdays. As finance companies often use these instruments as a form of short-term financing, the increased returns imply increased costs to the borrower. Low returns on diversified financial stocks may then result.

Lastly, the healthcare index displays a significantly negative Tuesday return. The mean return on the healthcare index during the sample is .0373 percent whereas returns on Tuesdays are -.031 percent. This may be related to defensive behaviour by investors. The healthcare industry has traditionally been one of the most defensive of industries (Korn 2001). Investors may purchase healthcare stocks toward the end of the week to immunise their portfolio against any negative effects over the weekend. After observing the local market and US market openings, investors then sell the defensive healthcare stocks and re-invest in riskier stocks.

5. Conclusion

This study examines the presence of the day-of-the-week effect in Australian market and industry returns over the period 1996 to 2006. In only one instance (Healthcare) are the results consistent with the typical manifestation of daily seasonality in Australian returns: a negative Monday and/or Tuesday effect (the latter conceivably corresponding to a lagged US market influence). No evidence is found of a day-of-the-week effect at the market level, though there is an indication of a positive Thursday and Friday effect in small cap returns, perhaps associated with the information processing hypothesis. At the sub-market level, day-of-the-week effects are found in the banking, diversified financials, energy, healthcare, insurance, materials and retail industries, but not in the media, telecoms and transport industries. The three most substantial day-of-the-week effects over the entire sample period at the industry level are all found in the banking industry.

The low level of observed daily seasonality implies that the Australian stock market overall is approximately weak-form efficient. A number of contributory factors are possible, including the growth in derivative markets, the increasing internationalisation and liberalisation of the domestic capital market, increased trading by institutional rather than individual investors, and the dramatic fall in transaction costs, especially those relating to brokerage, taxation and information procurement. However, day-of-the-weeks are found in small cap and some industry stocks. Since these represent unexploited profit opportunities and violations of market efficiency, interesting opportunities for research exist in terms of identifying whether market conditions such as liquidity and/or industry-specific operational factors represent the source of these anomalies.

Table 1. Selected descriptive statistics

	Sample mean	Annualised mean	Median	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
All Ordinaries	0.0333	8.6798	0.0348	0.7540	-0.6586	10.9597	7200.765
Small Ordinaries	0.0160	4.0807	0.0356	0.6691	-1.6818	31.8639	115019.2
Banking	0.0510	13.5948	0.0299	0.9532	-0.2755	5.5501	745.04
Diversified financials	0.0312	8.1110	0.0304	0.9718	-0.3633	9.0491	4033.73
Insurance	0.0261	6.7417	0.0000	1.2442	-1.3052	22.1254	40876.94
Energy	0.0459	12.1563	0.0371	1.1886	-0.2947	6.5117	1391.02
Healthcare	0.0373	9.7717	0.0033	1.0889	0.1773	13.8789	12997.83
Materials	0.0263	6.7950	0.0000	1.2837	-0.1147	7.7426	2473.31
Transport	0.0427	11.2631	0.0135	1.1310	-0.3924	9.2485	4341.03
Media	0.0261	6.7417	0.0000	1.7913	0.5310	13.6408	12507.61
Retail	0.0418	11.0131	0.0067	1.0880	-0.0718	7.6393	2363.48
Telecommunications	0.0036	0.9040	0.0000	1.2738	-0.1993	11.8887	8685.34

Notes: Sample period is Monday 9 September 1996 to Friday 10 November 2006. The means and medians are expressed as percentages; All Jarque-Bera statistics for normality are significant at the .01 level; critical values for significance of skewness and kurtosis respectively at the .05 level are 0.0935 and 0.1870. The annualised mean assumes 250 trading days per year.

Table 2. Estimated coefficients and standard errors

		Monday	Tuesday	Wednesday	Thursday	Friday
All Ordinaries	Coefficient	0.0455	0.0296	0.0404	0.0469	0.0039
	Std. error	0.0327	0.0327	0.0327	0.0327	0.0327
Small Ordinaries	Coefficient	-0.0293	-0.0270	0.0134	0.0462	0.0766
	Std. error	0.0343	0.0337	0.0320	0.0283	0.0243
Banking	Coefficient	0.0404	0.1135	0.1313	0.0480	-0.0778
	Std. error	0.0416	0.0411	0.0411	0.0409	0.0415
Diversified Financials	Coefficient	-0.0215	0.0972	-0.0393	0.0739	0.0457
	Std. error	0.0466	0.0386	0.0453	0.0440	0.0406
Energy	Coefficient	0.0889	0.0095	-0.0012	0.0698	0.0626
	Std. error	0.0518	0.0518	0.0518	0.0518	0.0518
Healthcare	Coefficient	0.0033	-0.0310	0.0846	0.0815	0.0483
	Std. error	0.0420	0.0470	0.0530	0.0474	0.0462
Insurance	Coefficient	-0.0233	-0.0316	0.0707	0.0850	0.0300
	Std. error	0.0656	0.0521	0.0536	0.0482	0.0503
Materials	Coefficient	0.0763	-0.0476	-0.0535	0.0498	0.1066
	Std. error	0.0555	0.0539	0.0541	0.0578	0.0567
Media	Coefficient	0.1097	0.0008	-0.0096	0.0449	-0.0154
	Std. error	0.0770	0.0791	0.0821	0.0832	0.0737
Retail	Coefficient	0.0089	0.0634	0.0893	0.0381	0.0090
	Std. error	0.0474	0.0474	0.0474	0.0475	0.0475
Telecoms	Coefficient	0.0620	0.0327	-0.0562	-0.0279	0.0076
	Std. error	0.0615	0.0558	0.0577	0.0492	0.0484
Transport	Coefficient	0.0596	0.0421	0.0434	0.0529	0.0156
	Std. error	0.0471	0.0477	0.0492	0.0494	0.0482

Notes: Dependent variables are daily returns on the market or industry in the first column. Sample period is Monday 9 September 1996 to Friday 10 November 2006. All standard errors and p-values incorporate either White's corrections for heteroskedasticity of unknown form (energy and retail industries only) or Newey-West corrections for heteroskedasticity and autocorrelation of unknown form (all other industries and markets). Significant coefficients (*p*-value <.10) in bold.

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