

Department of Economics and Finance

Working Paper No. 12-15

Qiwei Chen

# Risk and Seasonal Effects: International Evidence

September 2012

http://www.brunel.ac.uk/economics

# Abstract

Various explanations have been investigated to the January effect in existent literature, but no conclusive explanation has been given to distinguish particular explanation from others. A time-series GARCH-M model with the conditional variance as proxies for market systematic risk is applied in this paper to investigate the seasonal effects in the USA, the UK, China and Australia with different tax system and tax year end. Empirical evidence showed January effect in the USA, January and April effect in the UK, July effect in Australia and no significant seasonal effect in China. The pattern consistently links to tax year end and tax system in the sample countries. But no clear evidence has been found to support the proposition that market risk is higher or priced highly only in certain calendar month with seasonal effect. However, with an interactive dummy variable to reflect the seasonal effect added into the time-series GARCH-M model, the seasonal effects are explained away. The results in the sampled countries support the proposition that market volatility increases when it is close to the date of financial statement performance due to the uncertainty of the financial information.

JEL classification: G12

Key Words: seasonal effect; January effect; market volatility; risk pricing; GARCH

#### Introduction

January effect, which is an evidence that the mean return of common stocks is higher in most of months in January, has been one of the most intriguing topics in financial economics since Rozeff and Kinney (1976) reported evidence that the returns of common stocks in January, especially small firms, are significantly higher than those of other months during the year. Thereafter subsequent research by Reinganum (1981), Keim (1983), Roll (1983) reconfirmed that the January effect is a phenomenon more pronounced in small-capitalised companies.

While the January effect is documented worldwide, there is no consensus on what causes the anomaly. Various explanations have been advanced thereafter: tax-loss selling (Branch (1977), Dyl (1977), Reinganum (1983), Roll (1983), Ritter (1988), Chen and Sngal, (2004) and Chen, Jack and Woods (2007) et al.); risk explanations: (Change and Pinegar (1989, 1990), Kramer (1994) and Sun and Tong (2010) et al., ); window-dressing (Haugen and Lakonishok (1988), (Lakonishok et al. (1991)); transaction cost (Stroll and Whaley (1983), Bhardwaj and Brooks, (1992) ); liquidity (Ogden(1990)) and business cycle (Kohers and Kohli (1992) and Kramer (1994)) and microstructure explanation (Keim (1989), Menyah and Paudyal (1996) and Draper and Paudyal (1997)).

Among the above-mentioned explanations, the most extensively investigated explanation is the tax-loss selling hypothesis, according to which tax-motivated investors sell off stocks with declined prices to realise losses towards the end of tax year. The realised losses will be eligible to offset capital gain realised elsewhere, creating tax

benefit to investors. The increased selling pressure will put the prices downwards at the end of tax year. Stock prices will bounce back with the relieved selling pressure and the picking-back buying trend, causing the January effect. The empirical evidence on the taxloss selling explanation is mixed. Using U.S data sample, Branch (1977), Dyl (1977), Schultz (1985), and Brauer and Chang (1990) all provided empirical evidence, supporting the tax-loss selling hypothesis. More recently Chen and Singal (2004) reported that taxloss selling is the most important cause of this seasonality. While Jones, Pearce, and Wilson (1987) and Haug and Hirschey (2006) argued that tax-loss selling hypothesis is weak.

More research has extended the study into international market. Griffiths and White (1993) provide strong evidence for the influence of tax by exploiting the five day difference between the end of Canadian and US tax-years. Reinganum and Shapiro (1987) provided partial support to this hypothesis with the UK data. On the other hand, Brown et al. (1983) with Australian data, Berges, McConnell, and Schlarbaum (1984) with Canadian data, Kato and Schallheim (1985) with Japanese data and Ho (1990) with nine Asia Pacific markets data all report evidence inconsistent with the tax loss selling hypothesis.

The second explanation to this seasonality is the risk explanation. Rozeff and Kinney (1976) and Keim (1983) documented higher mean return as well as higher volatility in January. They argued that the higher volatility is due to the uncertainty linked to the impending release of financial statement information. Rogalski and Tinic (1986) found

Moreover a number of studies have contributed the cause of January effect to market microstructure, transaction cost, liquidity or even business cycle. Bhardwaj and Brooks (1992) argued that before transaction cost, low share price stocks earn abnormal returns in January, however, when transaction cost and bid-ask bias are taken into account, no positive abnormal returns are found. Menyah and Paudyal (1996) and of the reasons, as January effect can be the result of the combination of various causes? In this vein, The UK, China and Australia offer an interesting testing ground to distinguish from tax-loss selling hypothesis for the reason that the tax year and tax regimes are different for these countries. While a lot of literature reported January and April effects in the UK and July effects in Australia, it is not strange that the seasonalities in these two countries would be attributed to tax-loss selling. China differs from other countries in the tax system. No capital gain tax is applied for both companies and investors in the equity market. Existent literature found no significant seasonal effect in Chinese stock market.

A lot of literature found evidence supporting the risk explanation for the January Effect. However no evidence has been given to explain why risk is higher only in January. The results of this paper contribute to the literature that evidence indicates that market volatility is higher in the calendar months linked to the financial statement announcement. This supports the risk explanation that market volatility increases due to the uncertainty of the company performance announcement. The results indicate that the seasonal effects in the four sample countries are due to the compensation for the increased market volatility linked to the financial information release.

Data and Methodology

#### Data

The tests use monthly equally weighted return series comprise of all listed stocked in the UK, the USA, Australia and China. The data sample of the UK is from January, 1971 to June, 2012; the data sample of the USA is from January, 1973 to June, 2012; the data

January dummy is equal to 1 for equally-weighted average return of all listed equities for January and 0 otherwise.

2. Following Sun and Tong (2011), the basic GARCH (1, 1) model with a seasonality dummy is structured as follows:

$$R_{t} = {}_{0} = {}_{1}R_{t} = {}_{2}seasonaldummy_{t} = {}_{t} = {}_{t} | {}_{t} = {}_{1} \sim N(0, h_{t})$$
(2)

 $h_t = {}_0 = {}_1h_{t-1} = {}_2seasonaldummy_t = {}_3 {}_{t-1}^2$ 

where seasonal.

$$R_{t} = {}_{0} = {}_{1}R_{t-1} = {}_{2}seasonaldummy_{t} = {}_{3}h_{t} = {}_{t}$$
(3)

$$h_t = {}_0 = {}_1h_{t-1} = {}_2seasonaldummy_t = {}_3 {}_{t-1}^2$$

In the GARCH-M model, the conditional variance has been added into the mean equation.

If risk is the driving factor for the seasonality, as a proxy of the anticipated market risk, the conditional variance should have explanatory power for the seasonal dummy. Therefore when conditional variance is included in the mean equation, the coefficient of the seasonal dummy should become insignificant or, at least, smaller than the in Model 2.

4. The above easo

certain calendar month, would be expected to be significantly positive. While at the same time, if the interactive dummy has explanatory power for the seasonality, in Model 4 should be insignificant and even smaller than s in Model 3 and Model 2. Quasi-maximum likelihood estimator has been used in estimation, since standardized residuals are usually not normally distributed.

# Results

#### 1. Seasonal effects

Model 1 is run first to check if there is any seasonality exists in the four sample countries. Empirical results presented in Table 1 are consistent with most existent literature. In the USA, the mean monthly return in January during the sample period between January, 1973 and June, 2012 is 5.09%, which is significantly higher than the average monthly return of all other months. In the UK, the results support Gultekin and Gultekin (1983), Reinganum and Shapiro (1987) and Chen, Jack and Wood, (2007) that the seasonalities incur in both January and April. The mean return of January is 2.56% and the return of April is 2.34%. While at the same time, interestingly that with our sample period, the seasonality incur@y@@2@9i&5JII(09f%)]TJET2JE0()]TJEd fact seems to support the tax-loss selling hypothesis explanation for the seasonalities. The results of the two sub-sample periods are consistent with the results of the whole sample, except that consistent with previous literature that the magnitude of the coefficients has reduced in the latter period, suggesting that the trend of the seasonality is decreasing. Same as the result of Model 1, for the UK, the seasonal effect occurs in both January and April. In January, the mean return is 3.16% higher than the mean return of 0.29% in the other months; and in April, the mean return is 1.68% higher than the average return significant at 1% level; and for April effect, is 0.0313, which is positively significant at 1% level as well. The same result is concluded for Australia, with a positively significant coefficient of 0.0379, the market risk seems not to be able to explain July effect during the sample period. Test has been conducted on every single month during the year in China to check the possible seasonality<sup>1</sup>, and no seasonality has been detected.

# 4. Market value interacted with seasonal dummy variable/s

In Model 4 interactive dummy variable of the month/s with seasonal effect is added into GAROH-M model. Extremely interesting results shown in Table 4 are generated. In the USA, the results of sample period between 1973 and 2012 are consistent with Sun and Tong (2011). When interactive dummy variable is added into the mean equation, the coefficient of January dummy becomes even smaller and, most importantly, only marginal significant at 10% level. is 0.041 with a T-value of 1.90. Interesting results were found both in the UK and Australia. The coefficient decreases to 0.0199 with a T-value of 0.46. However the difference between the UK and the USA result is that the interactive dummy is not significant in the UK, implying that although the coefficient of January dummy has become insignificant, market risk has not been highly priced in January.

Another interesting founding is that besides January, interactive dummy variable can explain other seasonal effects in either the UK or Australia. The coefficient has significantly decreases to be insignificant with the interactive dummy in the mean

<sup>&</sup>lt;sup>1</sup> For simplicity, just certain months with lower p-value is exhibited.

equation. For the April effect in the UK, the coefficient has decreases to be insignificant at 0.0369. While at the same time, for the July effect in Australia, the coefficient has decreases to be insignificant at 0.016.

The test is conducted in both the sub sample periods and the results are robust. From all the results presented, it seems that with the interactive dummy variable added in to GAROH-M model, the seasonal effects in our four sample countries with different tax implication can be explained. However, the results did not support the argument that in certain calendar month, the market risk has been priced highly. As the seasonal effects are consistent with the tax year end and tax system in the four sampled countries, the results support the proposition that market volatility increases when it is dose to the financial statement announcement period due to the uncertainty attached to company performance.

# Conclusion

The seasonal effect has been continuously discussed. Various explanations have been investigated. The difficulty of this topic is to conduct a test which can distinguish specific explanation from others. This paper is motivated by the idea to test the risk explanation of seasonal effect with four different countries (the USA, the UK, Australia and China) with different tax regimes and tax year end.

When GAROH-M model with interactive seasonal dummy is applied, the seasonal effects can be explained. The empirical evidence supports the risk explanation for the seasonal effects. The results differ from Sun and Tong (2011) that no empirical evidence has been

found that the market risk is priced higher in the calendar months linked to seasonal effects.

assets: Tax-

255 80.

Brown, P., Keim, D. B., Kleidon, A

and the tax-

\_\_\_\_\_, 12, 105\_27.

\_\_\_\_, 3,

\_\_\_\_\_, 24, 59 74.

Gultekin, M.N., and Gultekin, N.B., 1983, Stock market seasonality: international evidence, \_\_\_\_\_\_, 12, 469-82.

-Irwin.

\_\_\_\_\_, 2, 47-77.

\_\_\_\_\_, 20, 243 60.

indow Dressing by Pension

\_\_\_\_\_, 81(2), 227\_231.

-of month evaluations of liquid profits and stock returns: A

\_\_\_\_\_, 45,

1259 1272.

\_\_\_\_\_, 9, 19–46.

ty: Evidence

\_\_\_\_\_, 60, 281-295.

Ritter, J., 1988, Buying and selling behavior of individual investors at the turn of the year,

\_\_\_\_\_, 43, 701-717.

-of the-

\_\_\_\_\_, 44, 149 166.

\_\_\_\_\_, 12, 371 386.

Rogalski, R.

Schultz,

\_\_\_\_\_, 40, 333 43.

\_\_\_\_\_, 12, 57 80.

\_\_\_\_\_, 34, 965-974.

interpretation: empirical

7 88:**)** 

Table 1 Test of seasonal effects in the four sample countries

coefficients

1 (**January**) Table 2

 Table 3 Test of the seasonal effect on the monthly equally-weighted they equally

Table 4 Test of the seasonal effect on the monthly equally-weighted return series

with interactive dummy in the GARCH-