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Behavioural Timing, Valuation and Post-Issue Performance of UK Rights Issues

Heba Ali*

Using a comprehensive sample of 2853 UK rights issues launched from 1975-2007, this study introduces a new angle on testing the behavioural timing hypothesis in the context of SEOs via investigating the inter-relationships between the magnitude of firm mis-valuation and post-issue 3-year stock price performance. Firm mis-valuation is measured using (i) a methodology developed in Rhodes-Kropf, Robinson and Viswanathan (2005) of decomposing market-to-book ratios into mis-valuation and growth options components, and (ii) intensity of rights issuance activity (hot vs. cold markets). The findings exhibit compelling evidence in support of significant over-valuation of rights-issuing firms relative to non-issuing firms. The findings show an evidence in support of the behavioural timing hypothesis, robust to the used measurement method and benchmark return, which stands in line with the findings of Loughran and Ritter (1995), Brown, Gallery and Goei. (2006), Chen and Cheng (2008), and Hertzel and Li (2010).

JEL Codes: G02, G12, G14 and G32

1. Introduction

Previous studies have shown that SEOs are associated with two puzzling phenomena not found around other non-issuing firms. These two anomalies are: **(i)** the short-run abnormal returns associated with the offering (represented by negative returns around the SEOs-announcement), and **(ii)** the long-run post-issue stock price under-performance for SEOs. Over decades, these puzzles have inspired a large body of theoretical and empirical literature that has offered a wide range of explanations attempting to interpret and analyse these phenomena, and this literature is still a subject of intense debate. However, traditional finance theories, such as asymmetric information models, generally appeared to play a limited role in understanding and linking these phenomena, in contrast to the behavioural finance theories that have been recently adopted by a considerable array of academic works in explaining these puzzles (e.g. Jegadeesh, 2000; Brown et al., 2006; and Chen and Cheng, 2008). Nonetheless, much work remains to be done in the field (e.g. Barberis and Thaler, 2003; and Subrahmanyam, 2008).

Recently, it has been argued that if the issuance decision is behaviourally timed, then the main empirical implication is poor post-issue stock performance, that is, post-issue returns will be poor following the high optimism, high SEO volume periods because investors that overpay the most in this case will realise their mistakes (e.g. Ritter, 1991; and Lowry, 2003). Consequently, an alternative way to empirically distinguish the behavioural timing story is to inspect the post-issue performance in the sense that if firms time their offerings to take advantage of stock mis-valuations and investor sentiment, this will be seen later in poor post-

*Dr. Heba Ali, Department of Accounting and Finance, German University in Cairo, Egypt.
Email : Heba.abbas-ali@guc.edu.eg

issue stock returns (e.g. Ritter, 1991; Liungqvist, 1995; and Lowry, 2003). This way presents an indirect approach to empirically test the behavioural timing hypothesis.

In this study, the link between mis-valuation of rights issues[1] and post-rights stock returns is empirically tested using two approaches. The first approach directly investigates the relative over-valuation of rights issues, applying a methodology developed in Rhodes-Kropf, Robinson and Viswanathan (2005) of decomposing market-to-book ratios into mis-valuation and growth options components, then testing the link between the relative over-valuation of rights issues and stock price performance. Another approach proposed to test the behavioural timing hypothesis is to examine how the post-issue performance differs between hot issues markets (i.e. periods of high issuance activity) and cold issues markets (i.e. periods of low issuance volume).

These approaches introduce a new angle on testing the behavioural timing hypothesis in the context of UK rights issues as there have been no studies in the UK yet that examine between behavioural timing ability, mis-valuation and post-issue performance, and so this study attempts to fill in this gap in the literature. This study also adds not only to the sparse literature on the cyclical nature of issuance activity of UK right issues[2] but to the implications of these anomalous patterns for post-issue stock returns in the context of UK rights issues. The paper now proceeds as follows. Section 2 reviews the literature and develops the hypotheses set out to test. Section 3 describes the data set and the research method. Section 4 examines behavioural timing hypothesis via investigating relationships between mis-valuation and post-issue stock price performance of right issues. The final section concludes.

2. Literature Review and Hypothesis Development

The announcement of rights issues has been shown to convey negative information to the market in form of negative abnormal stock returns associated with the announcement of the offering (e.g. Mikkelson and Partch, 1986; Levis, 1995; and D'Mello and Ferris, 2000). For long time, this negative return has been mainly attributed to asymmetric information-based interpretations, according to which, managers take advantage of asymmetric information to make new issues when shares are overvalued, and so investors might react negatively to the announcement of new equity, driving the stock price to fall.

Theoretically, Myers and Majluf (1984) argue that managers (based on their private information), acting in the interest of current shareholders, issue new shares when they believe that their stocks are overvalued. Rational investors, interpreting the equity issue announcement as conveying firm's view that the stock is overvalued, would bid down the price of the shares. To avoid that, managers might avoid issuing equity during periods of higher asymmetric information (Choe, Masulis and Nanda, 1993). Empirically, Myers and Majluf's (1984) predictions have been supported by numerous studies, such as Korajczyk, Lucas and McDonald (1990), Choe et al. (1993) and Bayless and Chaplinsky (1996). In these studies, hot market issues are expected to be associated with less negative abnormal returns as a result of the decreased asymmetric information and so decreased adverse selections costs during these hot periods. In other words, hot issue markets can result from the clustering of equity issues during periods of reduced levels of asymmetric information (Bayless and Chaplinsky, 1996). Built on this, traditional asymmetric information models expect a positive association between the equity issuance volume and announcement-period abnormal returns (i.e. abnormal returns become less negative during hot issuance markets).

However, periods of heavy issuance can be also associated with a window of opportunity whereby managers take advantage of investor optimism and favourable market prices to issue overvalued stocks. Indeed, in the case of a rights issue in which all the new shares are firstly offered to the existing shareholders, the argument that managers sell overvalued shares to new shareholders for the benefits of existing shareholders becomes less possible, yet, managers are still benefiting from selling these overvalued shares in the case of rights issues. So, a negative relation between the issuance activity and announcement-period abnormal returns would be expected (i.e. abnormal returns become more negative) if equity issues are believed to be driven by taking advantage of stock-mis-valuations (i.e. behavioural timing hypothesis).

When coming to the long-run underperformance, the fact that SEOs underperform following the issue does not itself indicate that this under-performance is driven by managers' behavioural timing of rights issues during periods of stock overvaluations and investor over-optimism. Also, the increase in the number of issuing firms during hot markets does not necessarily imply these stocks are over-valued and behaviourally timed. To support the behavioural timing story, an evidence of a direct association between the intensity of issuance activity as a proxy for mis-valuation, and stock price underperformance is needed. One way to test this hypothesis is to inspect the post-issue performance across hot and cold issuance markets. Generally, the literature has exhibit mixed empirical evidence on this positive link between hot issue markets and long-run under-performance. For instance, Loughran and Ritter (1995) find that the new issues launched in the high activity years significantly underperform compared to the issues during light issuance periods that do not significantly underperform the market. In contrast, Cai and Loughran (1998) and Wagner (2007) show no significant difference in the degree of underperformance across hot and cold issues market.

On the other hand, there are several other studies that inspect the mis-valuation of SEOs via either directly valuing the SEOs using different valuation methods (i.e. measuring the degree of mis-valuation relative to an intrinsic or fair value), or indirectly assessing this mispricing using related proxies, such as insider trading. However, mis-valuation of SEOs itself does not necessarily mean managers knowingly behaviourally time their offerings to take advantage of this mis-valuation. To test if the SEOs mis-valuations are behaviourally timed, an examination of how the post-issue stock performance differs between the undervalued and overvalued issues samples needs to be conducted. With respect to the negative abnormal returns around the SEOs, the asymmetric information models interpret the link between this market reaction and relative overvaluation of equity issues depending on issuing firms' ability to signal their quality. For example, firms with the ability to signal their value, in a way that shows their issues being motivated for reasons other than stock overvaluation, are expected to have less adverse market reaction (Myers and Majluf, 1984). So, firms that are believed to be overvalued should have more negative reaction than those that are believed to be undervalued.

The same conclusion would be also expected if one considers the behavioural interpretations of the link between the relative overvaluation of the issue and the market reaction to the issues (i.e. less favourable market reaction will be expected for firms with a greater degree of stock price overvaluation). So, both asymmetric information and behavioural timing hypothesis would expect a negative relation between the relative overvaluations of SEOs and announcement-period abnormal returns. However, under asymmetric information models poor post-issuing performance is not expected as the announcement reaction to the equity issue is viewed as the market revaluation to the firms so that issuing firms on average are not longer overvalued or undervalued (Loughran and Ritter, 1995). Jiang (2007) finds that the price drop associated with the SEO announcement is more severe for the firms issuing within six months after their

IPO since this SEO announcement shortly after IPO is usually viewed as a signal of greater stock overvaluation. Related to this, Loughran and Ritter (1995) explain their findings on the post-SEOs under-performance as an evidence of the market's failure to revalue the stocks appropriately (i.e. only part of the overvaluation would be corrected upon the issue announcement) and so the stocks perform poorly post-issue.

The link between the mis-valuation of SEOs and the long-run stock price underperformance is empirically supported by numerous studies. Brown et al. (2006) find a significant difference in abnormal returns between the lowest RIV/P SEOs and highest RIV/P SEOs groups up to five-year post-issue. Consistently, Chen and Cheng (2008) and Hertzel and Li (2010) show that issuing firms have greater mispricing and poorer long-run underperformance relative to the other non-issuing firms. Using other proxies of SEO mis-valuation, Teoh, Welch and Wong (1998) find that issuers that adjust discretionary current accruals (a proxy for mispricing) to report higher net income before an SEO have worse post-issue long-run abnormal stock returns. Dechow, Hutton and Sloan, (2000) find poorer post-issue performance for firms with the highest growth forecasts (a proxy for mispricing). Other studies have used insider trading as a proxy for stock overvaluation. Clarke, Dunbar and Kahle (2001) show that for completed SEOs, pre-filing insider trading is related to the long-run performance after completion, whereas for cancelled SEOs, pre-filing insider trading is related to stock performance between filling and cancellation.

So, we can conclude that if firms time their offerings to exploit stock mis-valuations and investor sentiment (i.e. behavioural timing hypothesis), then the main empirical implication would be seen in a direct relation between the poor post-issue returns and the degree of mis-valuation. This mis-valuation has been investigated using different approaches and proxies. One approach is to examine the intensity of the issuance activity, and then test how the post-issue stock performance differs for the issues launched during different issue markets (hot markets vs. cold markets). Another approach is to estimate an indicator of the relative overvaluation of rights issues. This valuation analysis will help to initially examine if UK rights issues are, on average, over-valued and to test thereafter if there is an association between this mis-valuation and the post-issue stock returns. Build on this, the hypotheses are as follows:

H_1: The rights issues launched during hot issuance periods are characterised by lower announcement-period abnormal returns and lower long-run abnormal returns than the issues that are launched during cold issuance periods.

H_2: The over-valued rights issues are characterised by lower announcement-period abnormal returns and lower long-run abnormal returns than the under-valued rights issues.

3. Data and Methodology

For the purpose of this research, a very comprehensive dataset has been utilised, which covers the 1975-2007 period for rights issues. The offerings details are hand-collected from various published issues of Extel Takeovers, Offers and New Issues[3]. The accounting, economic, financial and market data is collected from a wide range of databases, such as Datastream and Morningstar. The final sample consists of 2853 issues. For valuation purpose, my sub-sample is reduced to include 879 rights issues that listed over the period (1980-2007) and have available book-to-market ratios. Data on book-to-market ratios (only available from 1980) are mainly collected from Gregory, Tharyan and Christidis (2009) dataset and Datastream. If a firm makes multiple rights issues within a three-year period, then only the first

issue is included (e.g. Chen and Cheng, 2008; and Hertzel and Li, 2010). To calculate the contemporaneous accounting multiples, market and accounting data were collected for all the non-issuing firms listed on the London Stock Exchange (LSE) over the period (1980-2007). The final sample of non-issuers consists of 18545 firms. All the (issuing and non-issuing) firms will be then sorted into 10 industrial groups based on ICB Industry/Datastream Level 2 classification.

The mis-valuation of rights issues is investigated using a methodology developed in Rhodes-Kropf, Robinson and Viswanathan (2005) to estimate a measure of the relative over-valuation of rights issues. Full explanation of the application of model is provided in the appendix. Following Bayless and Chaplinsky (1996) and Helwege and Liang (2004), the market heat is measured based on volume. To define hot and cold periods, the three-month centred moving averages of the number of rights issues are used; the periods with at least three consecutive months that have a moving average issues number exceeding the top quartile of the monthly moving average totals (i.e. 10 rights issues) as high volume issue periods (Hot); those that fall below the bottom third of the monthly moving average totals (i.e. 3 rights issues) are considered low volume issue periods (Cold).[4] The periods falling between these two cut-offs are utilised as normal periods. Then the differences of post-rights stock price behaviour in shorter term and in longer term between the different groups are compared and tested using both t-tests and Wilcoxon signed rank tests.

To inspect the stock performance of rights issues, the short-run and long-run stock returns of issuing firms are estimated. To investigate the short-run abnormal returns around the announcement of rights issues (i.e. short-run cumulative average abnormal returns (CAARs)), a standard event study methodology is used based on the market model to estimate the abnormal returns around the announcement day. To assess the long-run abnormal returns following the announcement of a rights issue, the study adopts event-time (i.e. BHAR methodology) up to 36 months after the issue. To address the cross-correlation and skewness biases in conventional test statistics for BHAR method, skewness adjusted t-statistics based on the hall (1992) adjustment for skewness is used[5].

4. Empirical Findings

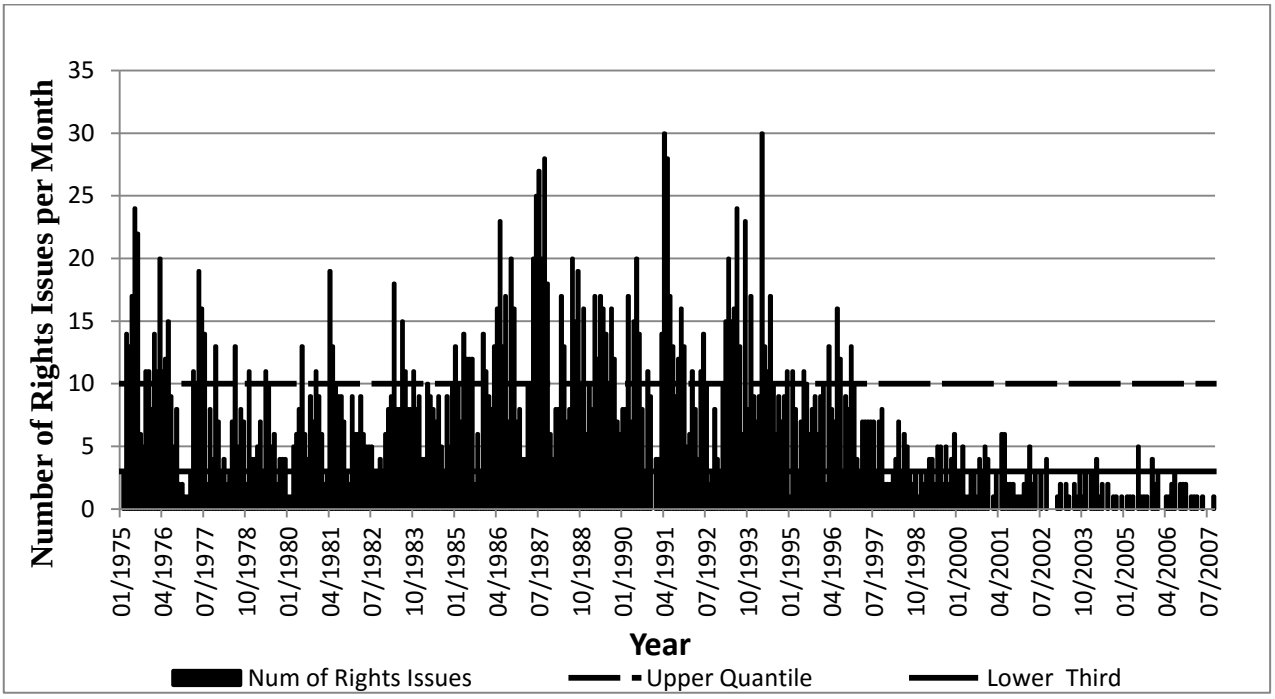
4.1 Rights Issues Activity across Hot, Cold and Normal Markets

Over the time-period (1975-2007), the issuance activity of UK rights issues has substantially fluctuated over time, as shown in Figure 1 and Table 1. Overall, there are 7 cold periods and 13 hot periods spreading over the sample period spreading across the sample period. As displayed, the first hot market lasted for 6 months, starting in March 1975, while the second hot market started in November 1975 and lasted for 8 months. The third hot market started in April 1977 and only lasted for 4 months. Then, there were 5 hot periods spreading over the 1980s, one of which had a long duration of 21 months from February 1988 to November 1989, probably following a period of steady growth during 1987-1988. Over the 1990s, there were 4 hot periods lasting for different spans. Out of these 4 markets, there was a 18-month period of heavy issuing activity over the time span from February 1993 to July 1994, appearing to coincide with the UK economic recovery after early 1990s recession.

Interestingly but not surprisingly, UK rights issues have not undergone any hot issuance periods after 1996 when the LSE relaxed the rules on the maximum size of a placing issue and so the choice of SEO-floatation method has been fully derestricted. Equally interesting, most of the hot issues periods, especially during the late 1970s and early 1990s, synchronised with

periods of UK economic recessions. This might be due to firms' increasing need to raise new capital to satisfy short-needed liquidity, repay their debts and/or strengthen their balance sheets during these economic downturns. In total, approximately 68 percent or £6.76 billion in real terms is raised by 1526 issuing firms, (i.e. approximately 53.5 percent of the sample firms) during periods of hot activity, which comprise only 27 percent of the sample months (i.e. 107 of 396 months).

Figure 1: Normal, Cold and Hot Markets of UK Rights Issues during the Time-Period (1975-2007). Hot markets are at least three contiguous months where the number of issues exceeds 10 (i.e. the upper quartile of a centred three month moving average of the issues number) while Cold markets are at least three contiguous months where the issues number are less than 3 (i.e. bottom third of a centred three month moving average of the issues number).



With respect to the time periods of cold markets, there were 7 cold markets, generally concentrating during the time period from 1997 to 2007 and unsurprisingly following the UK regulatory change in 1996, after which there was a substantial drop in the number of rights issues, as discussed above. Cold markets comprise approximately 25 percent of the sample months (i.e. 98 out of 306), during which a total of £12.05 billon in real terms (i.e. approximately 41.9 percent of total money raised) is raised by 5 percent of the sample firms (i.e. 142 of 2853 firms).[6]

On average, there are about 14 firms that make a rights issue per month during hot periods, compared to 1.4 during cold periods and 6.2 during normal periods. However, in terms of amount of money raised, there is an average of £123 million (in real terms) sold per month during cold periods while only £63.2 million (in real terms) is sold per month during hot periods.

Table 1: UK Right Issues Activity in Normal, Cold and Hot Issuance Markets over the Time-Period (1975- 2007).

The table reports Normal, Cold and Hot market classifications based on ranking of a centred three month moving average of the number of Rights Issues. Hot markets are at least three contiguous months where the number of rights issues exceeds 10 (i.e. the upper quartile of a centred three month moving average of the issues number) while Cold markets are at least three contiguous months where the number of IPOs are less than 3 (i.e. bottom third of a centred three month moving average of the issues number). Amount of money raised in rights issues is measured in 2007 prices using GDP deflator.

Market Cycle	Periods	Duration (in months)	Number of Rights Issues		Amount of Money Raised*	
			Total	Monthly Average	Total(£m)	Monthly Average(£m)
Cold	**11/1976 - 01/1977**	3	4	1.3	48.2	16.1
Cold	**12/1997 - 02/1998**	3	7	2.3	110.5	36.8
Cold	**09/1998 -02/1999**	6	14	2.3	251.4	41.9
Cold	**03/2000 - 09/2000**	7	18	2.6	948.5	135.5
Cold	**12/2000 - 04/2001**	5	8	1.6	100.8	20.2
Cold	**08/2001 -01/2002**	6	9	1.5	608.1	101.4
Cold	**05/2002 -12/2007**	68	82	1.2	9990.8	146.9
Hot	**03/1975 - 08/1975**	6	96	16.0	262.7	43.8
Hot	**11/1975 - 06/1976**	8	102	12.8	425.7	53.2
Hot	**04/1977 - 07/1977**	4	59	14.8	120.6	30.2
Hot	**04/1981 - 06/1981**	3	42	14.0	250.5	83.5
Hot	**02/1983 -07/1983**	6	69	11.5	244.4	40.7
Hot	**01/1985 -06/1985**	6	68	11.3	547.4	91.2
Hot	**02/1986 - 11/1986**	10	140	14.0	566.3	56.6
Hot	**04/1987 -10/1987**	7	148	21.1	518.7	74.1
Hot	**02/1988 - 10/1989**	21	271	12.9	1198.5	57.1
Hot	**02/1990 - 07/1990**	6	81	13.5	346.0	57.7
Hot	**03/1991 - 11/1991**	9	152	16.9	785.4	87.3
Hot	**02/1993 - 07/1994**	18	263	14.6	1265.4	70.3
Hot	**05/1996 - 07/1996**	3	35	11.7	235.1	78.4
Cold	**All Periods**	98	142	1.4	12058.4	123.0
Hot	**All Periods**	107	1526	14.3	6766.5	63.2
Nor.	**All Periods**	191	1185	6.2	9951.9	52.1

4.2 Post-Issue Stock Returns across Hot, Cold and Normal Markets

In testing hypothesis H_1, the study investigates how issuing firms in different markets perform post-issue, comparing the short-run cumulative average abnormal returns (CAARs) around the issue announcement and the long run returns up to 36 months post-issue. The results of CAARs, based on market model returns, in normal, cold and hot markets are displayed in Table 2 Panel A. On average, hot market issues show significant CAARs of -2.0 percent, compared to a significant average of -1.2 percent for normal market issues and insignificant average of -0.70 percent for cold market issues. These findings are not compatible with the asymmetric information models, under which a positive association between the issuance

volume and announcement date abnormal returns is expected, as supported in Bayless and Chaplinsky (1996). Rather, the findings provide evidence in support of the view that equity issues might be driven by taking advantage of higher stock-mis-valuations during heavy issuance periods, and so associated with larger price drop upon the issue announcement. However, based on both t-test and Wilcoxon signed rank test as exhibited in Table 2 Panel B insignificant difference are found between the three markets.

Table 2: Descriptive Statistics of the UK Rights Issues in Normal, Cold and Hot Issuance Markets over the time-period (1980-2007).

Panel A reports the size and allocation of announcement period abnormal returns (APARs) for 2853 rights issues across Normal, Cold and Hot issuance markets. APARs are measured by cumulative average abnormal returns (CAAR) over a 3-day event window centred on the announcement day, using market model. Market return is measured by FTSE All-Share index. Panel B reports the results of the pairwise test for difference in the CAARs between the various markets. The t and z are the statistics from a t-test and a wilcoxon rank sum test respectively. The symbols*,** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Market Cycle	Periods	Duration (in months)	Cumulative Ave. Ab. Returns (%)		
			Market Model Adjusted	T-Statistic	Z-statistic
Cold	**All Periods**	**98**	**-0.7**	**-0.576**	**-0.668**
	11/1976 - 01/1977	3	5.8	0.674	0.593
	12/1997 - 02/1998	3	0.6	0.110	0.000
	09/1998 -02/1999	6	-1.1	-0.273	-0.314
	03/2000 - 09/2000	7	0.4	0.055	0.735
	12/2000 - 04/2001	5	-7.6	-1.366	0.090
	08/2001 -01/2002	6	-7.6	-0.825	0.735
	05/2002 -12/2007	68	0.1	0.089	0.915
Hot	**All Periods**	**107**	**-1.2*** **	**-3.445**	**-3.324**
	03/1975 - 08/1975	6	0.6	0.592	0.524
	11/1975 - 06/1976	8	-0.9	-1.543	-1.540
	04/1977 - 07/1977	4	2.9***	15.938	1.826
	04/1981 - 06/1981	3	-2.2	-0.814	-1.069
	02/1983 -07/1983	6	-1.9	-1.372	-1.153
	01/1985 -06/1985	6	-0.4	-0.460	-0.524
	02/1986 - 11/1986	10	-2.4**	-2.135	-1.886
	04/1987 -10/1987	7	-0.3	-0.806	-0.676
	02/1988 - 10/1989	21	-1.4*	-1.925	-1.929
	02/1990 - 07/1990	6	-1.6	-1.058	-0.943
	03/1991 - 11/1991	9	-5.0***	-3.180	-2.073
	02/1993 - 07/1994	18	-0.4	-0.418	-0.370
	05/1996 - 07/1996	3	0	-0.018	0.000
Normal	**All Periods**	**191**	**-2.0*** **	**-3.948**	**-4.306**

Panel B

Market	Market Model	
	t	Z
Hot – Cold	0.36	0.95
Hot – Normal	1.10	1.04
Cold - Normal	1.09	1.76*

In the following sections the long run stock price performance for 2853 rights issues is examined across the different issue markets. Tables 3 and 4 report the results of BHARs based on size control benchmark returns on an equally and value weighted basis. Panel B in the tables reports the findings of difference tests using the t-test and a Wilcoxon rank sum test. Overall, the rights issues launched during hot issuance periods show significantly negative abnormal returns, in contrast to the cold market issues that exhibit positive, though insignificant, abnormal returns over the first two years post-rights. On an equally weighed basis, the BHARs for hot market issues are generally the lowest, decreasing from insignificant -1.5 percent after 6 month to significant -5.2 percent after 12 months. Beyond 12 months, the returns fall to -10.3 percent, -15.9 percent, -21.0 percent and -27.3 percent after 18, 24, 30 and 36 months respectively (in all cases significant at the 1 percent level). For cold market issues, the BHARs (insignificant at the conventional levels) are: -1.28 percent, 28.55 percent, 18.62 percent, 20.97 after 6,12,18 and 24 months, then substantially dropping to -11.80 percent and -19.57 percent after 30 and 36 months respectively. As seen, the BHARs for cold-market issues tend to be highly noisy. The differences between hot market issues and cold market issues are statistically significant only under the t-test over the 12, 18 and 24-month periods. On a value weighted basis, the overall picture of the relative performance of the three markets remains unchanged. As seen, the overall results for BHARs are strongly supporting of the substantial underperformance of hot market issues, while cold market issues show overall insignificant abnormal returns.

Table 3: Buy and Hold Abnormal Returns (BHARs) Based on Equally-Weighted Returns of Size Matched Benchmark Portfolios in Normal, Cold and Hot Issuance Markets. Panel A reports the mean buy and hold abnormal returns for returns for 2853 UK issuing firms during the time-period (1975-2007) in Normal, Cold and Hot issuance markets, using equally weighted size benchmark portfolio returns. Boot-t is the skewness adjusted t statistics based on the hall (1992) adjustment for skewness. The p values of Boot-t are calculated from the empirical distribution of the bootstrapped skewness adjusted t-statistic. Panel B reports the results of the pairwise test for difference in returns between the various markets. The t and z are the statistics from a t-test and a wilcoxon rank sum test respectively. The symbols*,** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

Panel A

			Cold Markets			
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-1.28	28.55	18.62	20.97	-11.80	-19.57
Boot-T	-0.26	0.93	0.70	0.82	-0.42	-0.81
P value	0.791	0.353	0.484	0.415	0.674	0.419
			Hot Market			
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-1.5	-5.2	-10.3	-15.9	-21.0	-27.3
Boot-T	-1.9	-3.39***	-5.05***	-6.18***	-5.7***	-7.24***
P value	0.058	0.001	<.0001	<.0001	<.0001	<.0001
			Normal Markets			
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-0.7	-3.9	-11.8	-15.8	-16.4	-21.9
Boot-T	-0.45	-2.04**	-3.56***	-5.46***	-2.09***	-2.84***
P value	0.651	0.041	<.0001	<.0001	0.037	0.005

Panel B

Market		**6-Month**	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Hot - Cold	**t**	0.083	3.461***	3.263***	3.818***	0.9821	0.982
	z	0.370	-0.857	-0.524	-0.262	-0.286	0.088
Hot - Normal	**t**	-0.597	-0.656	0.570	0.024	-0.918	-0.903
	z	1.006	0.853	2.078**	1.130	2.406**	2.426**
Cold –Normal	**t**	-0.156	2.915***	2.910***	3.349***	0.316	0.138
	z	0.573	-0.555	0.316	0.257	0.693	0.958

Table 4: Buy and Hold Abnormal Returns (BHARs) Based on Value-Weighted Returns of Size Matched Benchmark Portfolios in Normal, Cold and Hot Issuance Markets. Panel A reports the mean buy and hold abnormal returns using value weighted size benchmark portfolio returns. Panel B reports the results of the pairwise test for difference in the returns between the various markets.

Panel A

			Cold Markets			
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-0.80	29.4	20.2	22.8	-8.9	-16.6
Boot-T	-0.15	0.95	0.84	0.94	-0.33	-0.74
P value	0.877	0.343	0.402	0.348	0.741	0.457
			Hot Market			
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-1.3	-4.6	-9.4	-14.2	-18.6	-23.5
Boot-T	-1.6	-3.13***	-5.09***	-6.1***	-5.2***	-6.57***
P value	0.109	0.002	<.0001	<.0001	<.0001	<.0001
			Normal Markets			
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-0.3	-3.1	-10.4	-13.9	-14.1	-18.3
Boot-T	-0.19	-1.63	-3.32***	-5.17***	-1.97**	-2.49**
P value	0.851	0.104	0.001	<.0001	0.049	0.013

Panel B

Market		**6-Month**	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Hot - Cold	**t**	0.190	-3.493***	3.375***	3.898***	1.052	0.687
	z	0.559	-0.658	-0.295	-0.019	-0.068	0.219
Hot - Normal	**t**	-0.726	-0.727	0.392	-0.088	-0.922	-0.905
	z	0.788	0.694	1.824*	1.025	2.420***	2.550***
Cold –Normal	**t**	-0.124	2.927***	2.949***	3.384***	0.355	0.103
	z	0.702	-0.433	0.422	0.451	0.873	1.087

4.3 Valuation of Right Issues and Post-Rights Stock Returns

Table 5 presents summary information on the market-to-book ratio (M/B) and the three components of M/B for the sample of rights-issuing firms and for a comparison sample of all the non-issuing firms listed on the London Stock Exchange (LSE). The table shows that the average ratio for issuing firms is significantly positive (0.75), while the average ratio for non-issuing firms is lower (0.66). This is consistent with the hypothesis that firms may time their equity issues to take advantage of stock mis-valuation. High pre-issue market-to-book ratios are also consistent with the evidence that issuing firms experience significant stock price run-ups prior to issuance or relatively good investment opportunities.

Table 5: Firm-Level Decomposition of Market-to-Book Ratios. Panel A reports the decomposition of market-to-book ratios for rights issuing firms and all non-Issuing UK firms over the period 1980 to 2007. The symbols *, **, and *** denote statistical significance at the 10%, 5% and 10% levels, respectively, using a 2-tailed t-test. The p-values in the differences column show the probability values from a wilcoxon rank sum test of the difference being zero.

Valuation Component		Non-Issuing Firms		Issuing Firms		Wilcoxon (Diff.)
		Mean	N	Mean	N	
Firm-Specific Misv.	$m_{it} - v(\theta_{it};\alpha_{jt})$	-0.08***	18545	0.13***	879	<.0001
Sector-Specific Misv.	$v(\theta_{it};\alpha_{jt}) - v(\theta_{it};\overline{\alpha}_{j})$	-0.06***	18545	-0.01	879	0.0382
Long-Run Sector Misv.	$v(\theta_{it};\overline{\alpha}_{j}) - b_{it}$	0.80***	18545	0.64***	879	<.0001
Market-to-Book	$m_{it} - b_{it}$	0.66***	18545	0.75***	879	0.0033

$m_{it} - v(\theta_{it};\alpha_{jt})$

With respect to the individual components, the results provide strong support for the idea that issuing firms are more overvalued than all non-issuing firms. For the sample of issuing firms, the findings show a significantly positive average firm-specific error of 0.13, while the respective average for the sample of non-issuing firms is a significantly negative of -0.08, which indicates that non-issuing firms are not only found, on average, less overvalued relative to the issuing firms, but further these non-issuing firms are found undervalued. The results show that firm-specific difference between issuers and non-issuers is statistically significant. With regard to time-series sector error, the findings show that both issuers and non-issuers come from sectors that are undervalued, yet the magnitude of this sector undervaluation is approximately three times higher for non-issuing firms (i.e. -0.02 verses -0.06 for issuers and non-issuers respectively). Sector-specific difference between issuers and non-issuers is statistically significant at 5 and 10 levels. With respect to growth opportunities, issuing firms' long-run value to book is significantly positive; indicating that issuing firms might issue equity to fund new investments. However, when compared to the non-issuing firms, issuing firms tend to be with lower growth opportunities (i.e. issuing firms' long-run value to book is 0.64 and significantly indifferent from the respective average of 0.75 for non-issuing firms), which might indicate that firms with low growth prospects might use rights issues as a way of raising new funds when expecting new investment opportunities.

To conclude, the findings appear to appeal with the mis-valuation story. However, this over-valuation of rights issues itself does not necessarily indicate that these issues are behaviourally timed by managers to exploit this over-valuation as stated by the behavioural timing hypothesis. A way to gain more insights into this question is to inspect how the post-issue stock performance of right issues differs between the undervalued and overvalued rights issues because if issuing firms are really behaviourally timed this should be later reflected in a direct relation between stock over-valuation and poor stock performance. In testing this argument, the link between the relative overvaluation of rights issues and post-issue performance is examined. The firm-specific misevaluation component ($m_{it} - v(\theta_{it};\alpha_{jt})$) is used as an indicator of firm mis-valuation, where values greater (less) than zero imply firms are over-valued (under-valued) and the lower quantile is the bottom 30 percent by firm mis-

valuation (relatively under-valued firms) and the upper quantile is the top 30 (relatively over-valued firms).

The study then investigates the short-run price performance using the cumulative average abnormal returns (CAARs) around the issue announcement. Table 6 reports the results of CAARs across the under-valued and over-valued groups. The average value of valuation ratio is 0.748 and -0.453 in the lower and upper quantiles groups respectively (both significantly different from zero at the conventional levels). Based on both t-test and Wilcoxon signed rank test, the degree of this mis-valuation is found to be significantly different between the two groups. On average, undervalued issues sample shows significant CAARs of -2.30 percent, compared to a significant average of -1.79 percent for overvalued issues sample. Insignificant differences, based on the t-test and Wilcoxon signed rank test, are found between the two groups.

Table 6: Descriptive Statistics of the UK Rights Issues by Relative Over-Valuation
The table reports descriptive summary of the firm mis-valuation, the amount of money raised and announcement–period abnormal returns for UK rights issues in the under-valued and over-valued groups. Amount of money raised is measured in 2007 prices using GDP deflator. Announcement period abnormal return is measured by cumulative average abnormal returns (CAAR) over a 3-day event window centred on the announcement day, using market model and market adjusted models. Market return is measured by FTSE All-Share index. The table also reports the results of the pairwise test for difference in the returns between the two samples. The t and z are the statistics from a t-test and a wilcoxon rank sum test respectively. The symbols*,** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

	Num of Rights Issues	Firm Mis-valuation	Market Model Adjusted (%)	Market Return Adjusted (%)	Amount of Money Raised (in 2007 Prices) Total (£b)	Average (£m)
Full Sample	869	0.130***	-1.93***	-2.01***	77.56	89.26***
Under-V RI	260	-0.453***	-2.30***	-2.13***	14.30	55.00***
Over-V RI	262	0.748***	-1.79***	-2.03***	26.10	99.63***
t-test Diff.		-34.58***	-0.51	-0.10		-2.75***
z-test Diff.		-19.77***	0.04	0.25		-4.89***

Overall, these findings are not entirely compatible with the view that equity issues that are believed to be overvalued should be associated with larger price drop upon the issue announcement, as would be expected by behavioural timing hypothesis. However, they do not refute the overvaluation story. Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995) argue that managers time their offerings to exploit their private information about stock overvaluation, but investors under-reaction to the issue announcement and stock mispricing persists at the issue date, so the market re-values the stock over an extended period following the offering, leading to negative abnormal returns in the long-run as stock prices gradually adjust. To test this argument, the question of how the rights issues in the undervalued and overvalued groups will perform in the long-run is studied.

Tables 7 and 8 report the results of BHARs based on size control benchmark returns on an equally and value weighted basis respectively. In general, both undervalued and overvalued rights issues exhibit negative abnormal. The overvalued issues sample outperforms the

undervalued group over the following 18 months post-rights. Beyond 18 months, the overvalued issues sample has lower stock returns.

On an equally weighted basis, the BHARs for overvalued issues sample show significantly positive abnormal returns of 6.18 percent after 6 months (significant at 10 percent level). Beyond 6 months, the BHARs deteriorate from marginally negative returns of -1.29 percent after 12 months to marginally significant -9.83 percent, -13.36 percent, -20.61 percent and -24.42 percent after 18, 24, 30 and 36 months respectively. In contrast, the undervalued group shows significant negative abnormal returns of -5.49 percent after 6 months, then slightly decreasing to insignificant -6.96 percent in the following 12 month. Over the second year, the BHARs decrease to significant -11.19 percent and -12.28 percent after 18 and 24 months respectively. After three years, the undervalued sample still exhibits negative, but insignificant, returns of -12.11 percent and -13.12 percent after 30 and 36 months respectively. Based on the t-tests and wilcoxon rank sum test, the differences between the undervalued and overvalued samples are found significant only at a 6-month horizon and insignificant afterwards. When returns are value-weighted, the overall conclusions remain unchanged, but decrease in absolute terms, which is consistent with prior evidence that the negative abnormal performance seems mainly concentrated in smaller firms (e.g. Fama and French, 1992, 1997). Taken as a whole, the overvalued rights issues exhibit poorer abnormal returns over longer horizons, supporting the idea that investors might re-value the stock over an extended period following the offering, leading to delayed negative post-offering abnormal returns when stock prices gradually adjust (e.g. Loughran and Ritter, 1995; and Spiess and Affleck-Graves, 1995).

Table 7: Buy and Hold Abnormal Returns Based on Equally Weighted Returns of Size Matched Benchmark Portfolios for Under-valued and Over-valued Rights Issues Samples. The table reports the mean buy and hold abnormal returns (BHAR) for rights-issuing firms by relative over-valuation, using equally weighted size benchmark portfolio returns. Boot-t is the skewness adjusted t statistics based on the hall (1992) adjustment for skewness. The p values of Boot-t are calculated from the empirical distribution of the bootstrapped skewness adjusted t-statistic. The table also reports the results of the pairwise test for difference in the returns between the two samples. The t and z are the statistics from a t-test and a wilcoxon rank sum test respectively. The symbols*,** and *** denote statistical significance at the 10%, 5% and 1% levels, respectively, for the two-tailed hypothesis test that the coefficient equals zero.

	Lower Quantile (Under-valued Sample)					
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	-5.49	-6.96	-11.19	-12.28	-12.11	-13.12
Boot-T	-2.83***	-1.45	-2.63***	2.03**	-0.71	-1.05
P value	0.005	0.146	0.009	0.043	0.479	0.292
	Upper Quantile (Over-valued Sample)					
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	6.18	-1.29	-9.83	-13.36	-20.61	-24.42
Boot-T	1.93**	-0.27	-1.70*	-1.84**	-1.92*	-1.80*
P value	0.054	0.787	0.089	0.066	0.054	0.072
t-test Diff.	-2.804***	-1.111	-0.240	0.151	0.749	0.940
z-test Diff.	-1.852*	-0.636	0.141	0.500	0.417	0.440

Table 8: Buy and Hold Abnormal Returns Based on Value Weighted Returns of Size Matched Benchmark Portfolios for Under-valued and Over-valued Rights Issues Samples.

The table reports the mean buy and hold abnormal returns for rights-issuing firms by relative over-valuation, using value weighted size benchmark portfolio returns.

	Lower Quantile (Under-valued Sample)					
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%) (%)	-4.83	-5.53	-9.51	-9.96	-9.04	-8.58
Boot-T	-2.39**	-1.21	-2.22**	-1.77*	-0.55	-0.67
P value	0.017	0.226	0.027	0.077	0.585	0.504
	Upper Quantile (Over-valued Sample)					
	6-Month	**12-Month**	**18-Month**	**24-Month**	**30-Month**	**36-Month**
Mean (%)	6.15	-1.14	-9.57	-12.84	-20.04	-22.99
Boot-T	1.88*	-0.23	-1.70*	-1.83*	-1.88*	-1.70*
P value	0.06	0.817	0.088	0.068	0.061	0.088
t-test Diff.	-2.641**	-0.861	0.011	0.406	0.973	1.203
z-test Diff.	-1.615*	-0.383	0.311	0.705	0.652	0.702

5. Summary and Conclusions

To argue that managers deliberately time their offerings to take advantage of these mis-valuations so that the stocks perform poorly following the issue, an evidence of a direct association between the rights (mis)valuations and stock price underperformance is needed. One empirical way to test this argument is to investigate and compare the post-issue stock performance of rights issues across cold, hot and normal issuance markets. With respect to the short-run returns, the findings from CAARs exhibit significant returns of -2.0 percent for hot markets, compared to a significant -1.2 percent and insignificant -.70 percent for normal and cold market issues respectively. When coming to the long-run abnormal returns, an evidence in support of the behavioural timing hypothesis is found, robust to the used measurement method and benchmark return. Difference tests of the long-run underperformance between the two groups furthermore provide significant findings.

Another approach to test the behavioural timing hypothesis is to inspect the relative overvaluation of rights issues and how it affects the post-rights stock performance. Applying a methodology developed in Rhodes-Kropf, Robinson and Viswanathan (2005), the findings exhibit compelling evidence in support of significant over-valuation of rights-issuing firms relative to non-issuing firms. The findings drawn based on examining the post-rights stock performance for undervalued and overvalued rights groups provide compelling, but not robust, evidence of a direct link between the mis-valuation of rights issues and the long-run under-performance.

Endnotes

[1]Rights issues have been the predominant issuance method of SEOs in the UK until the UK regulatory change in 1996. In this change, the LSE relaxed the rules on the maximum size of a placing and so the choice of SEO-floatation method is fully derestricted, which substantially affected the number of subsequent UK rights issues. However, studying the rights issues provides a basis for studying and assessing other international markets that still heavily use rights issues as a form of rising new capital, in addition to proving an opportunity to assess the robustness of the finding on the motives of timing the new issues.

[2]There is only one unpublished study conducted by Michailides (2000) that investigated the post-rights stock performance across hot, cold and normal issue markets.

[3]The data is crossed with Rights Issues Diary files available on Thomson Reuters Datastream for the years (1975-1998) and London Stock Exchange's (LSE) website for the years (1998-2007).

[4] The bottom third of the sample for cold months rather than the bottom quartile is included because the bottom quartile includes a number of months with zero offerings, which results in a small sample

[5] Hall's (1992) adjustment is shown to perform better in situations of large skewness and small sample, which will suit the small size of my sub-samples that are used in behavioural timing tests. Hall's (1992) t-statistic is estimated using STATA's user-written command, available at http://ideas.repec.org/c/boc/bocode/s456933.html

[6]As it can be obviously noted in Table 1, the amount of money raised during cold markets is substantially higher for those of hot and normal markets (i.e. approximately 1.8 and 1.2 times higher than hot and normal periods respectively). Actually, this will not be puzzling when noting that out of this £12.05 billion there is £9.99 billion is raised over the last cold market over the period (05/2002 - 12/2007) within which a large number of massive rights issues were launched, such as Xstrata plc (£2.99 billion in 2006 and £.93 billion in 2003), Prudential plc (£1.04 billion in 2004).

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Appendix

To inspect the valuation of rights issues, the study applies a methodology developed in Rhodes-Kropf, Robinson and Viswanathan (2005, hereafter R-KRV) of decomposing market-to-book ratios into mis-valuation and growth options components. The behavioural timing hypothesis argues that firms tend to time their offerings when firm market value (M) exceeds its true value (V), while the economic and business conditions hypothesis attributes the issuance decision to the investment opportunities that will be reflected in a higher true value-to-book ratio (V/B). Accordingly, M/B ratio can be decomposed into mis-valuation (M/V) and growth option (V/B) components as follows:

$$M/B \equiv M/V \times V/B$$

Which can be rewritten in log form as

$$m\text{-}b \equiv (m\text{-}v) + (v\text{-}b)$$

Where m is market value, b is book value, v is some measure of fundamental or true value, and lower-case letters indicate logarithms of the respective variables standard units. Such that, the market-to-book ratio, ln(M/B), can be decomposed into: a measure of price to fundamentals, ln(M/V), and a measure of fundamentals to book value, ln(V/B). If markets perfectly estimate the future growth opportunities, discount rates, and cash flows, then the measure of mispricing, (m – v), should be zero. In contrast, the term (m–v) will capture the mis-valuation component of the market-to-book ratio if markets imperfectly estimate these variables.

In the R-KRV framework, a measure of true or fundamental value is estimated as the predicted value from a series of simple OLS regressions, estimated by year and industry. In detail, a measure of true value (v) for each firm i in industry j at time t will be expressed as a linear function of firm-specific accounting information (θ_{it}), and a vector of corresponding accounting multiples (α). As described below, the R-KRV methodology employs both a vector of contemporaneous time-t accounting multiples, α_{jt}, and a vector of long-run accounting multiples, α_j. Thus, the market-to-book ratio for firm i at time t can be further decomposed as displayed as follows

$$m_{it} - b_{it} = \underbrace{\underbrace{m_{it} - v(\theta_{it};\alpha_{jt})}_{firm} + \underbrace{v(\theta_{it};\alpha_{jt}) - v(\theta_{it};\alpha_j)}_{sector}}_{total} + \underbrace{v(\theta_{it};\alpha_j) - b_{it}}_{long-run}$$

Where the first two terms on the right hand side of the above-mentioned equation collectively referred to as total error, capture the mis-valuation component of the market-to-book ratio. The first term, $m_{it} - v(\theta_{it};\alpha_{jt})$, referred to as firm-specific error, measures the market value deviations from fundamental value estimated by firm accounting data (θ_{it}) and contemporaneous sector accounting multiple (α_{jt}). The second term, $v(\theta_{it};\alpha_{jt}) - v(\theta_{it};\alpha_j)$, referred to as time-series sector error, measures the difference in estimated fundamental value when contemporaneous sector accounting multiples at time t (α_{jt}) differ from long-run sector

multiples (α_j). This difference reflects the extent to which the whole sector (or, possibly, the entire market) may be mis-valued at time t. The third term, $v(\theta_{it};\alpha_j) - b_{it}$, is the sector average long-run value-to-book, measuring the difference between firm value implied by the vector of long-run sector multiples and book value. This measure can be interpreted as the investment opportunity component of the market-to-book ratio. Rhodes-Kropf, Robinson and Viswanathan (2005) use three different models to estimate $v(\theta_{it};\alpha_{jt})$ and $v(\theta_{it};\alpha_j)$. These models differ only with respect to the accounting variables that are included in the accounting information vector (θ_{it}). The following section will briefly review these models. A detailed discussion of the three models is presented in R-KRV (2005).

Model 1: Market Value and Book Value

The first RKRV model includes only book value (B) as the regressor, $M_t = \alpha_{0t} + \alpha_{1t} B_t$ and is estimated using the following equation:

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \varepsilon_{it}$$

To identify the contemporaneous accounting multiples α_{jt}, each year issuing firms are grouped into industries and annual, cross-sectional regressions for each industry are run to generate estimated industry accounting multiples for each year t, $\hat{\alpha}_{jt}$. The estimated value of $v(\theta_{it};\alpha_{jt})$ is the fitted value from the previous equation

$$v(B_{it};\hat{\alpha}_{0jt},\hat{\alpha}_{1jt}) = \hat{\alpha}_{0jt} + \hat{\alpha}_{1jt} b_{it}$$

To calculate the long-term sector multiples (α_j), the $\hat{\alpha}_{jt}$'s from the annual regressions are averaged over time: $\overline{\alpha}_j = 1/T \sum_t \alpha_{jt}$ for all α_k, where k=0, 1. The estimate of $v(\theta_{it};\alpha_j)$ is then the fitted value of $m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \varepsilon_{it}$ using the $\overline{\alpha}_j$'s:

$$v(B_{it},\overline{\alpha}_{0j},\overline{\alpha}_{1j}) = \overline{\alpha}_{0j} + \overline{\alpha}_{1j} b_{it}$$

Model 2: Market Value, Book Value and Net Income

The second model includes net income (NI) and book value (B), $M_t = \alpha_{0t} + \alpha_{1t} B_t + \alpha_{2t} NI_t$ and is estimated using the following equation:

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} \ln(NI)^+_{it} + \alpha_{3jt} I_{(<0)} \ln(NI)^+_{it} + \varepsilon_{it}$$

Where (NI^+) stands for the absolute value of net income and $I_{(<0)}$ ln(NI)$_{it}$ < (0) is an indicator function for negative net income observations to accommodate for the fact that net income is sometimes negative.

To calculate the long-term sector multiples (α_j), the $\hat{\alpha}_{jt}$'s from the annual regressions are averaged over time: $\overline{\alpha}_j = 1/T \sum_t \alpha_{jt}$ for all α_k, where k=0, 1, 2, 3. The estimate of $v(\theta_{it};\alpha_j)$ is then the fitted value of the previous equation using the $\overline{\alpha}_j$'s:

$$v(b_{it}, NI_{it}; \overline{\alpha}_{0j}, \overline{\alpha}_{1j}, \overline{\alpha}_{2j}, \overline{\alpha}_{3j}) = \overline{\alpha}_{0j} + \overline{\alpha}_{1j} b_{it} + \overline{\alpha}_{2j} \ln(NI)^{+}_{it} + \overline{\alpha}_{3j} I_{(<0)} \ln(NI)^{+}_{it}$$

Model 3: Market Value, Book Value, Net Income and Leverage

In the third model, book value (B), net income (NI) and market leverage ratio (LEV) are included in the accounting information vector θ_{it}, $M_t = \alpha_{0jt} + \alpha_{1t} B_t + \alpha_{2t} NI_t + \alpha_{4t} LEV_t$ and is estimated using the following equation:

$$m_{it} = \alpha_{0jt} + \alpha_{1jt} b_{it} + \alpha_{2jt} \ln(NI)^{+}_{it} + \alpha_{3jt} I_{(<0)} \ln(NI)^{+}_{it} + \alpha_{4jt} LEV_{it} + \varepsilon_{it}$$

Where (LEV) denotes the leverage ratio, accounting for the fact that there are within-industry differences in leverage that could potentially their costs of capital and cause them to differ from industry average M/B ratios.

To identify the contemporaneous accounting multiples α_{jt}, firms are categorised every year to their industrial groups and annual, cross-sectional regressions for each industry are performed to generate estimated industry accounting multiples for each year t, $\hat{\alpha}_{jt}$. The estimated value of $v(\theta_{it}; \alpha_{jt})$ is the fitted value the pervious equation.

$$\begin{aligned} &v(b_{it}, NI_{it}, LEV_{it}; \hat{\alpha}_{0jt}, \hat{\alpha}_{1jt}, \hat{\alpha}_{2jt}, \hat{\alpha}_{3jt}, \hat{\alpha}_{4jt}) \\ &= \hat{\alpha}_{0jt} + \hat{\alpha}_{1jt} b_{it} + \hat{\alpha}_{2jt} \ln(NI)^{+}_{it} + \hat{\alpha}_{3jt} I_{(<0)} \ln(NI)^{+}_{it} + \hat{\alpha}_{4jt} LEV_{it} \end{aligned}$$

To calculate the long-term sector multiples (α_j), the $\hat{\alpha}_{jt}$'s from the annual regressions are averaged over time: $\overline{\alpha}_j = 1/T \sum_t \alpha_{jt}$ for all α_k, where k=0, 1, 2, 3 and 4. The estimate of $v(\theta_{it}; \alpha_j)$ is then the fitted value using the $\overline{\alpha}_j$'s:

$$\begin{aligned} &v(b_{it}, NI_{it}, LEV_{it}; \overline{\alpha}_{0j}, \overline{\alpha}_{1j}, \overline{\alpha}_{2j}, \overline{\alpha}_{3j}, \overline{\alpha}_{4j}) \\ &= \overline{\alpha}_{0j} + \overline{\alpha}_{1j} b_{it} + \overline{\alpha}_{2j} \ln(NI)^{+}_{it} + \overline{\alpha}_{3j} I_{(<0)} \ln(NI)^{+}_{it} + \overline{\alpha}_{4j} LEV_{it} \end{aligned}$$