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The role of salience in portfolio formation ☆

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Abstract

We analyze the likelihood of a stock being included in an investor's portfolio, utilizing a dataset which holds the information opportunity set constant for each of the over 1000 student investors in our sample. Investors rely on the availability heuristic: salience (the number of stories in the national press about a stock in the month before the portfolios are formed) captures over 50% of the variation in our dependent variable.

JEL classification: G12
Keywords: Behavioral finance; Availability heuristic

1. Introduction

How do investors choose stocks for their portfolios? Why do they prefer some stocks over others? Standard finance theory tells us how investors should form their portfolios. Investors should maximize their utility by optimizing the trade-off between return and risk amongst assets in their investment opportunity set (Markowitz, 1991).

Investors appear to ignore Markowitz's sage advice. The weight of evidence demonstrates that investors do not form their portfolios "optimally". Investors do not diversify their portfolios; they

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Table 1
Major identified by students choosing a portfolio

Course	No. of entrants	% of total
Finance major	437	31%
Accounting major	310	22%
Securities Institute course	171	12%
Non-business major	104	7%
Other business major	97	7%
Law / double degree law	92	7%
Economics major	91	6%
Management major	50	4%
Marketing major	36	3%
Majors unknown	24	2%

hold too few stocks (De Bondt, 1998; Barber and Odean, 2001). Even when their pension funds offer them a range of investments, investors tend not to take up these opportunities (Benartzi and Thaler, 2002). Investors choose what is familiar: they prefer to buy stocks that are geographically and culturally close to them (Grinblatt and Keloharju, 2001; Coval and Moskowitz, 1999). Investors "put all their eggs in one basket" by investing in the companies they work for (Huberman, 2001). Investors trade too often, eating up potential profits in trading costs (Barber and Odean, 2000, 2001, 2002). Even Markowitz is reported to have split his retirement fund between stocks and bonds to avoid regret in the future (Shefrin, 2000, p. 120).

We utilize a unique dataset to provide further evidence of how investors choose stocks for their portfolios. The data allows us to hold the information opportunity set constant for each investor and, as such, provides a strong control for the analysis of the use of information in forming portfolios. We find strong support for the hypothesis that investors utilize the availability heuristic when selecting shares.

We examine a dataset of 1412 portfolios of between five and ten stocks, chosen by investors between August 21 and August 24, 2003. The portfolios were selected by Australian university students in order to enter the BRW National Student Share Portfolio Award 2003.[1] Each investor had the same goal: to maximize his or her absolute return over a twelve-month period.[2] Each entrant paid $10 for each portfolio they entered in the game. Each entrant had an initial endowment of $200,000 from which they could invest in 5 to 10 fully paid shares or trust units (but not options, warrants or futures) listed on the Australian Stock Exchange. Each investor was allowed to enter up to five portfolios. No more than $40,000 could be invested in one stock. Additionally, no trading was allowed after the portfolio was "locked-in" on August 23, 2004. The winner[3] – the student earning the greatest return between August 25, 2003 and August 20, 2004 – received $10,000 in cash.

The investors in our sample might be expected to be relatively more sophisticated than the investing population at large: the sample is dominated by business majors, especially those

[1] The BRW is Australia's leading business magazine. The other national sponsors were the Securities Institute and CPA Australia. The national supporters were Shares, Personal Investor (both magazines dealing with investments) and Aspect Financial. The competition rules may be found in Appendix A.

[2] This goal is therefore subtly different from the standard model we refer to in the first paragraph of this paper (that is, the assumption that investors maximize their utility by optimizing the trade-off between return and risk amongst assets in their investment opportunity set). Accordingly, they may follow different rules to investors in the real world. It is also important to note that students had to maximize total, not risk-adjusted, returns.

[3] The winner was Jeremy Bond, a student from the University of Western Australia.

majoring in Finance and Accounting. The breakdown of the sample by major may be found in Table 1. In general, the finance majors will have taken, or would have been taking, a course using a textbook such as Bodie, Kane and Marcus (2002). Many of the students identifying themselves as accounting majors would also be expected to have a double major with finance or, at a minimum, one finance course in their degree.[4] Perhaps of most importance to our study, as we have noted previously, the information opportunity set is also the same for all investors. The variation in portfolios we observe will therefore capture the cognitive processes and abilities in utilizing the information opportunity set to meet the specific goal of maximizing terminal wealth.

Our study focuses on investors' use of information. Evidence points to investors' decisions being influenced by information that is more readily recalled. Rather than balancing all potential information equally, investors have a propensity to rely on information that might more easily come to mind; such a cognitive process has been labeled the *availability heuristic* (Tversky and Kahneman, 1973). A useful analogy might be that of a student in a library grabbing the first books he finds to complete an assignment rather than conducting a thorough and thoughtful review of the literature. Such behavior confuses salience with substance.

There is empirical support for the notion that investors' behavior is consistent with actions driven by the availability heuristic. Klibanoff, Lamont and Wizman (1998) found that the amount of space devoted to a country on the front page of the New York Times reduces the discount in closed-end-funds of assets from that country. Fehle, Tsyplakov and Zdorovtsov (2003) have found evidence of significant abnormal returns for firms following their advertising during the Super Bowl. More generally, Barber and Odean (2006) find that news about stocks generates higher abnormal trading volume but that more sophisticated investors are less likely to be influenced by news. Intriguingly, Shiller (1987) found that investors were thinking about the Crash of 1929 before the Crash of 1987; perhaps the increasing salience of a market break in the past played a role in the events of 1987? Boyd (2001) argues that investors also use a *recognition heuristic*, choosing "familiar" over "less-familiar" stocks[5] that may be associated with superior returns in "bull" markets.[6] A number of studies have provided empirical evidence that investors choose stocks that are familiar to them (Grinblatt and Keloharju, 2001; Huberman, 2001; Coval and Moskowitz, 1999).

We find that the salience of a company, proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003), is the predominant influence in determining the likelihood of inclusion of a company in an investor's portfolio. The more stories there are about a company, the more likely it is to be chosen. As investors become more sophisticated, the role of salience, though still statistically significant, falls.[7]

Investors also have information about the previous returns of the companies they might invest in. Therefore, we analyze the influence of past returns (both in the immediate run-up to the time investors had to choose their portfolio and in the preceding year).[8] Our analysis makes no claims

[4] Unfortunately, the data does not include information on the students' age and gender and, therefore, we were unable to incorporate these variables in our analysis.

[5] In his study, Boyd takes a stock to be recognized when 90% of the participants in his study are aware of the name of the company.

[6] See also Gigerenzer, Todd and the ABC Research Group (1999, p. 41) and Goldstein and Gigerenzer (1999).

[7] This finding is in keeping with Barber and Odean (2006).

[8] We also conducted an analysis of how the volatility of the returns of shares might influence the likelihood of their inclusion in an investor's portfolio. Our preliminary analysis did not find any effect and we did not pursue this issue further (nor do we report the results).

about the role of momentum as a priced-factor in the cross-section of returns of Australian stocks.[9] Rather, we take our lead from the growing body of evidence indicating that investors condition their behavior on past returns. For example, Grinblatt and Keloharju (2000) found that classes of investors appear to follow different trading strategies: in their sample of investors in the Finnish market, domestic investors, particularly households, were found to follow contrarian strategies while foreign investors tended to be momentum traders. The findings from Finland are supported by those of a recent US study which also found that individuals tend to be contrarian (Kaniel et al., 2004).

In the following section, we describe our data and discuss our methodology. We present the results of our analysis in Section 3 of the paper. Section 4 concludes our work.

2. Data and methodology

The dependent variable in our analysis is the likelihood a stock will be included in a portfolio. It is measured as the ratio of the dollar value of all holdings in a particular security held by investors in our sample to the dollar value of all funds invested in all the companies in our sample. Thus, if investors have invested $5 million in the shares of company *x* and the sum of all funds invested is $100 million, the value of the dependent variable is 5%. The intuition behind this metric should, we hope, be relatively clear. Consider a market consisting of 100 shares where the capitalization of each company is equal. If investors are indifferent about which securities form their portfolios, each share would have a 1% chance of being included in an investor's portfolio. Conversely, if we looked at the total holdings of all investors in the market, 1% of their holdings would be in company 1, 1% in company 2, *etc*. The investors in our sample invest a total of over $270 million[10] in 1042 shares. If they were indifferent about which securities to hold, we would expect to see around $260,000 (just under 0.1%) of funds would be invested in each security; that is, the probability of funds being invested in each company would be around 0.1%. More funds being invested in a company reflects an increasing likelihood of funds being invested in that company. We employ Tobit regression, using heteroskedasticity consistent estimators to calculate *p*-values for the estimated coefficients, because the dependent variable can be no less than 0 (and, in theory, no more than 100%).[11]

383 of the 1425 securities listed on the Australian Stock Exchange at the end August 2003[12] were not selected by the investors we study and these securities are excluded from our analysis. The investors in our sample were constrained to choose only fully-paid ordinary shares and listed unit trusts; in addition, rule 3b of the investment competition (detailed in the Appendix to this paper) also stated that investors could not choose suspended stocks. Remarkably, according to the ASX's data, 302 of these 383 stocks had no on-market volume and unchanging closing prices in the month which implies that these securities were effectively suspended throughout August 2003

[9] There has been some debate about this and the weight of evidence appears to suggest that momentum is not priced in the Australian market (Gaunt and Gray, 2003; Demir et al., 2004; Durand et al., 2006a).

[10] Some investors chose not to fully invest the funds available to them.

[11] It has been suggested that another methodology that could have been utilized to address the issues we examine in this paper would be to perform a cross-sectional analysis to test differences among investors rather than using the aggregated portfolio approach we have adopted in this paper. Additionally, rather than using a Tobit analysis, it has been suggested that logit regressions could have been used to capture the likelihood of a particular stock being included in a portfolio. We have not empirically addressed these comments in this paper; we acknowledge that they may prove instructive in future research with this dataset.

[12] Source: http://www.asx.com.au/research/market_info/historical_equity_data.htm#No%20of%20Companies).

Table 2
Summary statistics

	Likelihood of inclusion	Salience	Size
Panel A: Descriptive statistics			
Mean	0.000963	8.304	17.659
Standard deviation	0.000352	1.000	17.345
Maximum	0.025955	200.000	24.825
Minimum	2.96E−05	0.000	13.305
Panel B: Correlations			
Likelihood of inclusion	1	0.728	0.531
Salience		1.000	0.502
Size			1

This table reports summary statistics (Panel A) and correlations (Panel B) for the likelihood a stock will be included in a portfolio (the variable denoted *likelihood of inclusion*). *Likelihood of inclusion* is measured as the ratio of the dollar value of all holdings in a particular security held by investors in our sample to the dollar value of all funds invested in all the companies in our sample; *salience* is proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003) and *size* is the natural log of market capitalization of a company included in the portfolios measured, in dollars at the beginning of August 2003.

and therefore ineligible for selection. Of the remaining 81 stocks, 15 could not be identified and it was doubtful that a further 6 instruments were either a fully-paid share or a unit trust. A large proportion of the remaining 60 equities exhibited low levels of liquidity, suggesting that they may have been suspended for part of August and therefore ineligible for selection. Where we were able to find information about the more liquid of these stocks, we found that during the period when the investors in our sample were selecting stocks trading in these stocks was halted or they were being subsumed in other companies which were selected by investors (and included in the competition). It is possible that we have omitted a small number of securities which the investors in our sample might have chosen but did not do so. Omission of such cases, where the dependent variable would take the value of zero, might have biased our estimates; however, it is likely that any such bias is negligible. Conversely, inclusion of securities which were not eligible for selection might also have biased our estimates.

To capture the potential influence of the availability heuristic, we include a variable called "salience" in our regressions. Salience, as we have noted previously, is proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003).[13] We hypothesize that the greater the salience of a company, the more likely it is that the company will be included in an investor's portfolio.[14]

[13] We have not considered other potential measures of salience. For example, it has been suggested that abnormal trading volumes, and whether the stock reached a 52-week high/low during the month before the competition, might also serve as alternative proxies for the salience of the stock; it seems debatable whether they are as unambiguous proxies for salience as the measure we adopt in this analysis. We note, however, that Durand, Juricev and Smith (in press) have used similar metrics as proxies for emotional arousal and disproportionate reaction in the Australian market.

[14] Barber and Odean's (2006) theoretical analysis of attention-based noise traders argues that such traders will be net buyers when news is good but also when news is bad. We also considered if the articles capturing salience convey good news or bad news. In particular, we followed Chan (2003) in categorizing stories associated with positive market-adjusted returns as good news and stories associated with negative returns as bad news. Our analysis did not provide evidence that this categorization influenced the investors' decisions and, therefore, is consistent with Barber and Odean's model. We note, however, that our categorization may be noisy and believe that future research into asymmetric effects of good and bad news and the availability heuristic would be interesting.

Table 3
Investment allocation by market capitalization

Size decile	Proportion of wealth invested in stocks in the size decile
10 (largest)	43.86%
9	14.28%
8	10.21%
7	7.88%
6	5.25%
5	5.10%
4	3.79%
3	3.18%
2	3.62%
1 (smallest)	2.83%

We rank the stocks chosen by their market capitalization at the beginning of August, 2003. The following table indicates the percentage of the total wealth invested in each size decile. For example, 43.86% of total wealth invested was placed in the top 10% of stocks ranked by market capitalization and 2.83% of total wealth was invested in the smallest 10% of stocks ranked by market capitalization.

In considering salience, it is also necessary to control for the size of the firm. Size has been linked to analyst coverage (Hong et al., 2000) and, hence, the diffusion of information to investors. As the summary statistics in Table 2 indicate, the size of a company is strongly correlated with our measure of salience. We include the size of a company, measured by the natural log of its market capitalization (in dollars) at the beginning of August 2003. We include size to provide robustness about our conclusions regarding our salience metric although, as size has been associated with information, it may also serve as another measure for the salience of the company in investors minds. Our analysis will suggest, however, that the effects of salience and size are not confounded: the variables capture different influences on the decision process.

In view of increasing evidence indicating that investors condition their behavior on past returns, we also consider the effect of previous returns on the likelihood of a stock being

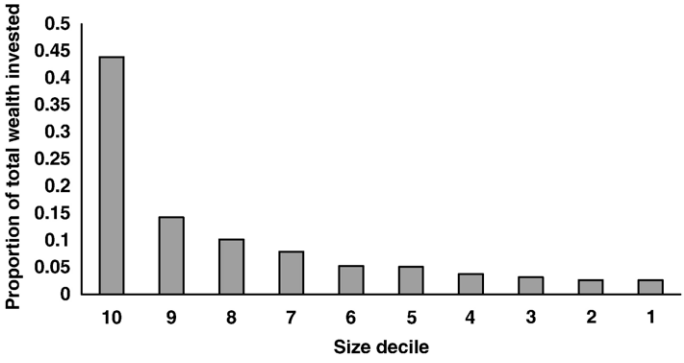

Fig. 1. *Investment allocation by market capitalization*. This figure illustrates the data presented in Table 3. We rank the stocks chosen by their market capitalization at the beginning of August, 2003. The following table indicates the percentage of the total wealth invested in each size decile. For example, 43.86% of total wealth invested was placed in the top 10% of stocks ranked by market capitalization and 2.83% of total wealth was invested in the smallest 10% of stocks ranked by market capitalization, *etc*.

included in a portfolio. We include both absolute returns and returns relative to the market[15] in both the recent and longer-term past. For our short-term returns, we include the absolute return, and the return relative to the market, of each share during the month of August before the date investors could enter their portfolio choices. For longer-term returns, we consider both the absolute return, and the return relative to the market, of each share in the twelve months ending in July. For both the short and longer-term returns on each security, we also incorporate a dummy variable, taking the value of 1 if the return was negative (in the case of absolute returns) or if the share underperformed the market (in the case of relative returns); inclusion of these dummy variables allows us to consider if investors' responses to winners and losers is asymmetric.[16]

3. Analysis

Our first examination of the data is somewhat surprising. The size effect in Australia is particularly pronounced (Brown et al., 1983; Gaunt et al., 2002; Durack et al., 2004; Durand et al., in press) and the entrants in the competition should have been aware of this. Yet, the evidence in Table 3 and Fig. 2 indicates that investors chose larger rather than smaller stocks: we ranked the stocks in our sample (which is, for all practical purposes, the Australian stock market) by their market capitalization and found that 43.86% of the total wealth invested was placed in the stocks from the largest 10% of companies. In other words, investors are eschewing the stocks that might be expected, given the ample evidence in the Australian market, to maximize their wealth (and also their chances of winning the competition). We find it hard to imagine a horse race where the horses choose to take on extra weight; yet, in our sample, investors seem overly keen to volunteer for a handicap. The investors in our sample also appear to favor stocks that are in the news. In Fig. 2 we group the stocks chosen by the investors in our sample into six broad categories[17] from the most salient (where there are more than 90 articles about the firms) to the least salient (where there are no stories about the firms that are chosen) and we depict the ratio of wealth invested in each group to the total market capitalization of stocks in that group. The numbers above the bars in Fig. 2 report the number of stocks in each group. The graph confirms the impression that the investors in our sample preferred to invest in stocks that were most salient: the 21 most salient stocks (that is, the stocks with more than 90 news items) attracted the lion's share of investment (Fig. 1).

Our analysis of the likelihood of a stock being included in an investors' portfolio is presented in Table 4. In this table, and each subsequent table presented in this paper, the estimated regression coefficient is reported with the associated heteroskedasticity-consistent *p*-value in brackets underneath. The separate effects of *salience* and *size* are reported in *equations i* and *ii* respectively. In *equation i*, the effect of salience is positive and statistically significant. The value of adjusted R^2 for *equation i* indicates that just over half the variance in the dependent variable (the likelihood of inclusion in a portfolio) is captured by this model.

[15] As we discuss in more detail below, the appropriate model for adjusting returns for risk is still a matter of considerable debate in Australia (Durand et al., 2006b). Therefore, adjusting returns for the market may be the best approximation for risk-adjustment in Australia at the present time.

[16] Not all companies were in the dataset for the entire twelve months and returns are relative to the period they were present. We also considered whether investors were influenced by new entrants to the database (many of which, we surmise, were IPOs). As with our preliminary analysis of volatility (see footnote 8), we did not find a new-entrant effect and we did not pursue this issue further (nor do we report the results).

[17] The data on salience does not lend itself to formation in deciles as does market capitalization. Therefore, we formed the groups based on visual inspection of the data.

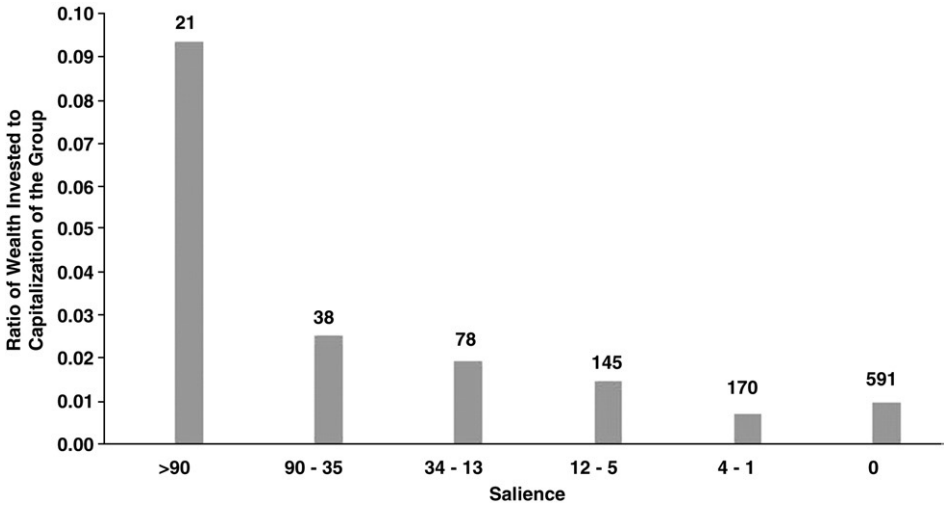

Fig. 2. *Investment allocation by salience*. We rank the stocks into groups formed by *salience* (proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen — July 24, 2003 to August 24, 2003) and, on the vertical axis, indicate the ratio of the total wealth invested in a group to the market capitalization of stocks in that group. The number at the top of each bar indicates the number of companies in each group.

Size, as reported in *equation ii*, also has a positive and statistically significant relationship to the likelihood of inclusion in a portfolio. It should be noted, however, that the value of the adjusted R^2 – 0.252 – suggests that size plays less of a role than salience in explaining the dependent variable. The results of the analysis using both size and salience as explanatory variables are reported in *equation iii*. Both variables are positive and statistically significant. Concerns about collinearity between these variables are unwarranted. We find, however, that the adjusted R^2 for *equation iii* – 0.547 – is only slightly higher than that for *equation i* – 0.502 (where salience is used alone) – but somewhat higher than that for *equation ii* – 0.252 (where size is used alone): it appears that salience explains more of the likelihood of inclusion in a portfolio than does size.

With the benefit of hindsight, it is interesting to note that there were *prima facie* economic benefits to choosing the most salient stocks. Fig. 3 compares the returns (measured as price relatives – $P_{\text{end}}/P_{\text{beginning}}$ – where P_{end} is the share price at the end of the competition – adjusted for dividends and changes in capitalization – and $P_{\text{beginning}}$ the price at the competition's start) for the most salient 20% of stocks chosen (the group denoted "S1" in the figure) and for the 20% least salient stocks (the group denoted "S2"). It is important to note that the returns have not been adjusted for risk. As such, it is consistent with the measure of performance that the entrants in the competition were trying to maximize. We leave open the question as to whether the returns might be different if adjusted for risk using an appropriate asset pricing model as the question of the correct asset pricing model is currently the subject of a heated debate in Australia (Durand et al., 2006a,b).[18] The figure indicates that, with a mean return of around 23%, the most salient equities

[18] Durand, Limkriangkrai and Smith (2006b) discuss evidence on asset pricing in Australia and argue that existing candidates for an appropriate model in Australia (such as an Australian adaptation of Fama and French's (1993) three-factor model) are misspecified. Furthermore, Durand et al. argue that it may be the case that no model captures the returns of *all* Australian stocks.

Table 4
Probability of inclusion in a portfolio — all entrants

	Constant	Salience	Size							Adjusted R^2	SBC	AIC
i.	0.000474[a]	5.86E−05[a]								0.502	−10.276	−10.290
	(0.0000)	(0.0000)										
ii.	−0.007736[a]		0.000493[a]							0.252	−9.845	−9.859
	(0.0000)		(0.0000)									
iii.	−0.003064[a]	4.97E−05[a]	0.000205[a]							0.547	−10.35	−10.365
	(0.0000)	(0.0000)	(0.0000)									
				Absolute momentum								
				August	Positive in August	Positive × August	Preceding year	Positive last year	Positive last year × preceding year			
iv.	−0.00368[a]	5.25E−05[a]	0.000234[a]	−4.78E−12[a]	0.000696	−0.000901	−2.32E−15[a]	0.000267[a]	−2.87E−05	0.578	−10.316	−10.368
	(0.0000)	(0.0000)	(0.0000)	(0.0003)	(0.1928)	(0.1218)	(0.0001)	(0.0083)	(0.7625)			
				Relative momentum								
				August relative to market	Greater than market in August	Greater than market × August relative to market	Preceding year relative to market	Greater than market last year	Greater than market last year × preceding year relative to market			
v.	−0.00379[a]	5.22E−05[a]	0.000244[a]	−5.41E−12[a]	−0.000457[a]	−0.003138[a]	−1.69E−15[b]	0.000242[b]	−0.000173	0.584	−10.328	−10.380
	(0.0000)	(0.0000)	(0.0000)	(0.0002)	(0.0000)	(0.0059)	(0.0111)	(0.0170)	(0.3553)			

This table reports analyses of the investment choices of 1412 investors choosing a portfolio of between five and ten stocks between August 21 and August 24, 2003. The dependent variable in our analysis is the likelihood a stock will be included in a portfolio. It is measured as the ratio of the dollar value of all holdings in a particular security held by investors in our sample to the dollar value of all funds invested in all the companies in our sample. *Salience* is proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003). *Size* is the natural log of market capitalization of a company included in the portfolios measured in dollars at the beginning of August 2003. We also consider the effect of momentum on the investment choices. *August* is the absolute return, and *August relative to market* is the return relative to the market, of each share during August before the date investors could enter their portfolio choices. *Preceding year* is the absolute return, and *preceding year relative to market* is the return relative to the market, of each share in the twelve months ending in July 2003. For both the short and longer-term returns on each security, we also incorporate a dummy variable, taking the value of 1 if the return was negative (in the case of absolute returns) or if the share underperformed the market (in the case of relative returns). Interactions between variables capturing the effect of momentum and the dummy variables are also included and are identified by the multiplication sign (×) between the variable names. Heteroskedasticity consistent *p*-values are reported in brackets beneath each estimated regression coefficient. SBC and AIC refer to Schwarz' Bayesian Criterion and Akaike's Information Criterion respectively.

[a] Denotes that the coefficient is significant at the 1% level (two-tailed test).

[b] Denotes that the coefficient is significant at the 5% level (two-tailed test).

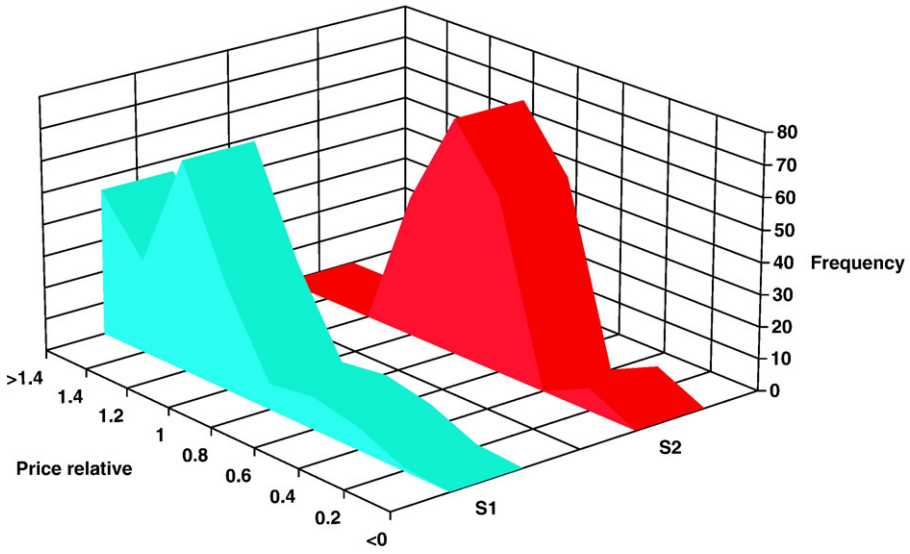

Fig. 3. *Returns of the most salient (S1) and least salient (S2) equities*. We ranked the stocks chosen by the investors by the variable *salience* (proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen — July 24, 2003 to August 24, 2003. This figure illustrates the returns to the stocks in our sample ranked in the top 20% by *salience* – denoted "S1" – and those in the bottom 20% — the group denoted "S2". *Price relative* is the price of the stock at the end of the competition divided by the price of the stock at the beginning of the competition (where the final share price has been adjusted for dividends and changes in capitalization).

outperformed the least salient equities (which had a mean return of −37%); this is confirmed by a Mann–Whitney test ($Z=-14.062$) which confirms that the difference between returns is statistically significant. We leave it as an open question as to what might have driven the different returns. It may simply have been exposure to different sources of priced risk. Additionally, the result is also in keeping with Durand, Juricev and Smith (in press) who have argued that emotional arousal has a positive association with returns in the Australian market: emotional arousal would be greatest for the most salient stocks.

We also examine the effects of short and long-term momentum in Table 4. *Equation iv* reports the analysis using absolute returns and *equation v* reports our analysis using returns relative to the market. The adjusted R^2 values for both equations – 0.578 and 0.5847 respectively – indicate that the models do a slightly better job of explaining the dependent variables than *equation iii* but that the improvement is marginal. In addition, the values for Schwarz' Bayesian Criteria (SBC) and Akaike's Information Criteria (AIC) we report also lead us to conclude that *equations iv* and *v* are better models of the likelihood a stock will be included in a portfolio. While it would be tempting to draw inferences on the basis of these statistics we are reluctant to do so. The analysis of sub-groups of investors (which we discuss in the following paragraph) and further analysis of abnormal salience rather than salience (which follows after the analysis of the sub-groups) indicated that our findings on momentum were both very sensitive to the research design and difficult to interpret. Therefore, although we include the momentum variables in the tables, we do not discuss the results nor do we draw any inferences from them.

We continue our analysis by examining the decisions of two sub-groups of investors: the ingénues (Table 5) and the streetwise (Table 6). Given that the objective of the exercise was to maximize wealth over the life of the competition, choosing only one portfolio with the maximum

Table 5
Probability of inclusion in a portfolio — the ingénues

	Constant	Salience	Size							Adjusted R^2	SBC	AIC
i.	−0.000783[a]	8.40E−05[a]								0.499	−4.404	−4.419
	(0.0000)	(0.0000)										
ii.	−0.018122[a]		0.001001[a]							0.350	−4.321	−4.336
	(0.0000)		(0.0000)									
iii.	−0.01003[a]	6.13E−05[a]	0.000533[a]							0.582	−4.554	−4.573
	(0.0000)	(0.0000)	(0.0000)									
				Absolute momentum								
				August	Positive in August	Positive× August	Preceding year	Positive last year	Positive last year× preceding year			
iv.	−0.004545[a]	6.72E−05[a]	0.000258[a]	−1.01E−07	0.000365	−0.000631	−4.39E−15[a]	0.000178	−3.76E−05	0.578	−4.560	−4.612
	(0.0000)	(0.0000)	(0.0000)	(0.532)	(0.7806)	(0.6543)	(0.0009)	(0.2602)	(0.8376)			
				Relative momentum								
				August relative to market	Greater than market in August	Greater than market× August relative to market	Preceding year relative to market	Greater than market last year	Greater than market last year× preceding year relative to market			
v.	−0.004786[a]	6.68E−05[a]	0.000275[a]	−1.03E−07	−0.000478[b]	−0.002058	−3.99E−15[a]	0.00022	−2.72E−04	0.584	−4.573	−4.625
	(0.0000)	(0.0000)	(0.0000)	(0.5205)	(0.0218)	(0.3157)	(0.0007)	(0.1970)	(0.4459)			

This table reports analyses of the investment choices of the 235 ingénues who choose *one* portfolio of *ten* stocks between August 21 and August 24, 2003. The dependent variable in our analysis is the likelihood a stock will be included in a portfolio. It is measured as the ratio of the dollar value of all holdings in a particular security held by investors in our sample to the dollar value of all funds invested in all the companies in our sample. *Salience* is proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003). *Size* is the natural log of market capitalization of a company included in the portfolios measured in dollars at the beginning of August 2003. We also consider the effect of momentum on the investment choices. *August* is the absolute return, and *August relative to market* is the return relative to the market, of each share during August before the date investors could enter their portfolio choices. *Preceding year* is the absolute return, and *preceding year relative to market* is the return relative to the market, of each share in the twelve months ending in July 2003. For both the short and longer-term returns on each security, we also incorporate a dummy variable, taking the value of 1 if the return was negative (in the case of absolute returns) or if the share underperformed the market (in the case of relative returns). Interactions between variables capturing the effect of momentum and the dummy variables are also included and are identified by the multiplication sign (×) between the variable names. Heteroskedasticity consistent *p*-values are reported in brackets beneath each estimated regression coefficient. SBC and AIC refer to Schwarz' Bayesian Criterion and Akaike's Information Criterion respectively.

[a] Denotes that the coefficient is significant at the 1% level (two-tailed test).

[b] Denotes that the coefficient is significant at the 5% level (two-tailed test).

Table 6
Probability of inclusion in a portfolio — the streetwise

	Constant	Salience	Size							Adjusted R^2	SBC	AIC
i.	−0.006538[a]	7.18E−05[a]								0.096	−0.802	−0.816
	(0.0000)	(0.0000)										
ii.	−0.02153[a]		0.000873[a]							0.075	−0.794	−0.809
	(0.0000)		(0.000)									
iii.	−0.014336[a]	5.31E−05[a]	0.000454[a]							0.122	−0.809	−0.828
	(0.0000)	(0.0000)	(0.0051)									
				Absolute momentum								
				August	Positive in August	Positive × August	Preceding year	Positive last year	Positive last year × preceding year			
iv.	−0.015007[a]	5.84E−05[a]	0.000505[a]	−1.35E−09[a]	0.001715	−0.002293	9.94E−14[a]	−0.000265	1.53E−04	0.135	−0.789	−0.841
	(0.0000)	(0.0000)	(0.0063)	(0.0038)	(0.7969)	(0.7421)	(0.0000)	(0.6987)	(0.8802)			
				Relative momentum								
				August relative to market	Greater than market in August	Greater than market × August relative to market	Preceding year relative to market	Greater than market last year	Greater than market last year × preceding year relative to market			
v.	−0.015544[a]	5.62E−05[a]	0.000558[a]	1.14E−09[a]	−0.002013[b]	−0.016172	1.05E−13[a]	−0.000413	0.00151	0.139	−0.795	−0.847
	(0.0000)	(0.0000)	(0.0028)	(0.0026)	(0.0241)	(0.1453)	(0.0000)	(0.5319)	(0.3403)			

This table reports analyses of the investment choices of the 54 streetwise investors who choose *five* portfolios of *five* stocks between August 21 and August 24, 2003. For each streetwise investor, we analyse the portfolio with the lowest return of five portfolios chosen. The dependent variable in our analysis is the likelihood a stock will be included in a portfolio. It is measured as the ratio of the dollar value of all holdings in a particular security held by investors in our sample to the dollar value of all funds invested in all the companies in our sample. *Salience* is proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003). *Size* is the natural log of market capitalization of a company included in the portfolios measured in dollars at the beginning of August 2003. We also consider the effect of momentum on the investment choices. *August* is the absolute return, and *August relative to market* is the return relative to the market, of each share during August before the date investors could enter their portfolio choices. *Preceding year* is the absolute return, and *preceding year relative to market* is the return relative to the market, of each share in the twelve months ending in July 2003. For both the short and longer-term returns on each security, we also incorporate a dummy variable, taking the value of 1 if the return was negative (in the case of absolute returns) or if the share underperformed the market (in the case of relative returns). Interactions between variables capturing the effect of momentum and the dummy variables are also included and are identified by the multiplication sign (×) between the variable names. Heteroskedasticity consistent *p*-values are reported in brackets beneath each estimated regression coefficient. SBC and AIC refer to Schwarz' Bayesian Criterion and Akaike's Information Criterion respectively.

[a] Denotes that the coefficient is significant at the 1% level (two-tailed test).

[b] Denotes that the coefficient is significant at the 5% level (two-tailed test).

number of ten stocks is a less than optimal strategy. Diversification is unwise when absolute returns over a short time horizon are required; we denote investors choosing only one portfolio of ten stocks as the ingénues. In contrast, we denote the investors who choose five portfolios with the minimum number of stocks as the "streetwise". The streetwise investors are taking the maximum number of opportunities to "go for it". The streetwise are taking bigger risks, with the potential, perhaps, of extra returns, in each portfolio, but they are hedging their bets by betting as many times as possible. At an entry fee of $10 a portfolio, the streetwise were clearly willing to back their belief in their skills with cash. We believe that the behavior of the streetwise is consistent with investors who might better comprehend the optimal investment strategy for the investment exercise we are studying. For the streetwise, we report only the portfolio which eventually generated the lowest absolute return. We analyzed the data for the remaining four portfolios, and a combination of all five portfolios chosen by the streetwise and find that our inferences concerning salience and size are robust to these variations; however, our findings on momentum were sensitive to which portfolio we analyzed and we discuss that further below. In contrast to the streetwise, the ingénues would seem our best attempt at isolating investors who, for want of a better description, are clueless. There are 235 ingénues and 54 streetwise investors in our sample.

We find that in both Tables 5 (the ingénues) and 6 (the streetwise), *equations i* and *ii* find a role for salience and size that is consistent with our analysis of all investors reported in Table 4; therefore, we can conclude that salience takes the lion's share of influence in determining the likelihood of inclusion in a portfolio. The value of adjusted R^2 for the streetwise (Table 6, *equations i* and *iii*) is markedly lower than that for the comparable analyses for the overall sample and the ingénues. The cohort of investors we expect to be most skilled seems less susceptible to salience; increasing skill appears to be associated with lower reliance on the availability heuristic.

Tables 5 and 6 also show that the ingénues and the streetwise are also affected by previous returns, both in comparison with each other as well as with the entire sample of investors. As with the analysis of all investors, reported in Table 4, any effect of the momentum variables is marginal. In further unreported analysis we found that the results for momentum for the streetwise were very sensitive to the portfolio we examined and, as we have discussed previously, although inclusion of momentum results in better equations, we believe that any conclusions that we might draw would be speculative.

If investors are driven by the availability heuristic, as we have argued, their decisions are influenced by information that is more readily recalled. Our preceding analysis has assumed that all information is equal: a company which had ten stories about it is assumed to be more salient to investors than a company with only five stories. However, some companies, for example, large firms such as BHP Billiton, simply generate more news. Our analyses have included the size of companies to control for investors simply recognizing firms. It may be the case that an abnormal volume of news results in a firm being more, or less, salient with investors.

Our analyses using abnormal salience rather than salience are reported in Table 7. Abnormal salience is salience (that is, the number of stories in the national press about that company in the month before portfolios had to be chosen — July 24, 2003 to August 24, 2003) less the average number of citations each month in the preceding year (that is, July 24, 2002 to July 23, 2003). A positive number indicates that the firm is attracting more media attention than average and a negative figure *vice versa*. Panel A of Table 7 reports the Tobit regressions for all entrants (*equation i*) and for the ingénues (*equation ii*) using absolute momentum to control for any potential conditioning on past returns. We were unable to produce this regression for the streetwise due to a near-singular matrix. Panel B of Table 7 reports the regressions for the entire sample, ingénues and the streetwise using relative momentum.

Table 7
The effect of abnormal salience

Panel A: Equations using absolute momentum

		Constant	Abnormal salience	Size	*Absolute momentum*						Adjusted R^2	SBC	AIC
					August	Positive in August	Positive × August	Preceding year	Positive last year	Positive last year × preceding year			
i.	All entrants	−0.009382[a]	9.79E−06	0.000569[a]	−1.06E−11[a]	0.001359[b]	−0.001429	−2.45E−16	0.000539[a]	−1.06E−11	0.272	−9.764	−9.816
		(0.0000)	(0.2586)	(0.0000)	(0.0000)	(0.0499)	(0.0589)	(0.7687)	(0.0005)	(0.5893)			
ii.	Ingénues	−0.010607[a]	2.70E−06	0.000649[a]	2.37E−07	−2.84E−15[a]	−6.24E−05	−2.09E−09	3.65E−08[a]	−4.13E−05	0.241	−4.234	−4.286
		(0.0000)	(0.9044)	(0.0000)	(0.7406)	(0.0000)	(0.8555)	(0.9369)	(0.0000)	(0.8493)			

Panel B: Equations using relative momentum

		Constant	Abnormal salience	Size	*Relative Momentum*								
					August relative to market	Greater than market in August	Greater than market × August relative to market	Preceding year relative to market	Greater than market last year	Greater than market last year × preceding year relative to market			
iii.	All entrants	−0.009585[a]	1.02E−05	0.000579[a]	−1.17E−11[a]	−0.000415[a]	−0.004816[a]	8.14E−16	0.000642[a]	−0.000166	0.288	−9.782	−9.834
		(0.0000)	(0.2262)	(0.0000)	(0.0000)	(0.0063)	(0.0040)	(0.4451)	(0.0001)	(0.2943)			
iv.	Ingénues	−0.011101[a]	−6.02E−06	0.000662[a]	−2.02E−09	3.06E−08[a]	0.000444	−1.65E−15[a]	0.00037	−4.00E−05	0.249	−4.259	−4.311
		(0.0000)	(0.7886)	(0.0000)	(0.9358)	(0.0087)	(0.1553)	(0.0043)	(0.0641)	(0.8485)			
v.	Streetwise	−0.012935[a]	−1.15E−05	0.000499[a]	−0.028023[a]	9.01E−08[a]	0.039172[a]	1.00E−13[a]	−0.001407[b]	0.001142	0.146	−1.002	−1.054
		(0.0000)	(0.8890)	(0.0016)	(0.0026)	(0.0000)	(0.0000)	(0.0000)	(0.0153)	(0.1539)			

This table repeats analyses reported previously for the 1412 investors choosing a portfolio of between five and ten stocks between August 21 and August 24, 2003 (denoted "all entrants") and subsets of ingénues (who choose *one* portfolio of *ten* stocks) and the streetwise (who choose *five* portfolios of *five* stocks). The dependent variable in our analysis is the likelihood a stock will be included in a portfolio. It is measured as the ratio of the dollar value of all holdings in a particular security held by investors in our sample to the dollar value of all funds invested in all the companies in our sample. In contrast to the other tables in this paper which have included *Salience* as a dependent variable, these equations utilize *abnormal salience*. *Abnormal salience* is proxied by the number of stories in the national press about that company in the month before portfolios had to be chosen (July 24, 2003 to August 24, 2003) *less* the average number of stories per month in the twelve months to July 23, 2003. *Size* is the natural log of market capitalization of a company included in the portfolios measured in dollars at the beginning of August 2003. We also consider the effect of momentum on the investment choices. *August* is the absolute return, and *August relative to market* is the return relative to the market, of each share during August before the date investors could enter their portfolio choices. *Preceding year* is the absolute return, and *preceding year relative to market* is the return relative to the market, of each share in the twelve months ending in July 2003. For both the short and longer-term returns on each security, we also incorporate a dummy variable, taking the value of 1 if the return was negative (in the case of absolute returns) or if the share underperformed the market (in the case of relative returns). Interactions between variables capturing the effect of momentum and the dummy variables are also included and are identified by the multiplication sign (×) between the variable names. Heteroskedasticity consistent *p*-values are reported in brackets beneath each estimated regression coefficient. SBC and AIC refer to Schwarz Bayesian Criterion and Akaike's Information Criterion respectively.

[a] Denotes that the coefficient is significant at the 1% level (two-tailed test).

[b] Denotes that the coefficient is significant at the 5% level (two-tailed test).

Table 7 indicates that abnormal salience is not statistically significant in any of the equations we report. Therefore, it is not the change in coverage that grabs investors' attention. Rather, it appears that it is the level of attention that determines investors' reliance on the availability heuristic. Using abnormal salience, rather than salience, does not change our inferences on the effect of size on the likelihood of inclusion in a portfolio.

4. Conclusion

Our dataset of students entering the BRW National Student Share Portfolio Award 2003 provides a unique opportunity to study the investment decisions of a large number of investors. Given the majors of the students we observe, we expect them to be relatively well-informed about markets and investment strategies.

Our study holds the information opportunity set constant for each investor and, as such, provides a strong control for the analysis of the use of information in forming portfolios. We believe that we have found strong evidence consistent with investors relying on the availability heuristic in forming their portfolios. We find that the more news items there are about the stock, the more likely it is to be included in an investor's portfolio. Indeed, over 50% of the variation in the likelihood of a stock being included in an investors portfolio is explained by our proxy for the availability of information, salience.

As investors become "savvier", their propensity to utilize the availability heuristic in the cognitive process of forming portfolios diminishes. The explanatory power of salience in capturing the likelihood of being included in an investor's portfolio is lower, as measured by the value of the adjusted R^2, for our sample of streetwise investors when compared to the ingénues in our sample. We also considered a measure of abnormal salience and found that was insignificant in our analyses; we therefore concluded that it is the level of attention that determines investors' reliance on the availability heuristic, rather than the change in coverage, that grabs investors' attention.

Appendix A. Competition rules

1. You have a theoretical $200,000 to invest in your share portfolio. Any amount not invested will be held in a "cash" account and included in your portfolio value.

2. Each portfolio must contain between 5 and 10 Fully Paid Ordinary shares (FPO's) or Trust Units listed on the Australian stock exchange (ASX).

3a. Options, warrants and futures are excluded from this Award; only ASX fully paid ordinary shares and trust units may be purchased. Suspended stocks are also excluded from the award.

3b. *Stocks suspended at the lock-in date are excluded from the award. If a company is suspended during the course of the award, its value will be marked to zero while suspended. If subsequently reinstated on the ASX during the award, the stock will be reinstated to the award.*

4. You can set up your portfolio at any time during the "entry window" of August 21, 2003 to August 24, 2003. You can change your portfolio at any time during the entry window. Your portfolio is automatically locked-in at midnight, Sunday August 24, 2003. No changes can be made after this date.

5. You can enter up to 5 different portfolios (you can use this feature to experiment with different portfolio styles, *e.g.* a "growth" portfolio *vs.* a "defensive" portfolio).

6. No more than 20% ($40,000) of your portfolio can be invested in any one stock.

7a. The value of your portfolio will be based on the last traded price of your shares at close of market each day plus any uninvested funds in your "cash" account. Dividends are not included in the calculation of portfolio value.

7b. The initial purchase price for each company in a portfolio will be the last traded price on the day following the lock-in day, *i.e.* Monday August 25, 2003. The number of shares/units purchased will be calculated by dividing the budget amount you have allocated for the share purchase, divided by the last traded price on the day following the lock-in day. Any part shares will always be rounded down, with the part value returned to the cash account. (*e.g.* 240.8 shares will be rounded to 240 shares).

8. Dividends and bonus shares

- Any dividends declared will not be counted towards the value of your portfolio.
- It is your responsibility to notify Student Services Australia if a company releases bonus shares.

9. Takeover and reconstructions

- If there is a 'full' or 'partial' takeover bid of a company within your portfolio, it is your responsibility to notify Student Services Australia. You will not be able to choose which offer made to real shareholders in the market you wish to take up.
- The Award Coordinator has sole discretion to determine what, if any, compensation will be provided to a participant holding stock in a company which is taken over.
- A company may change or re-organize its share issue so that there is a "split" or "reverse split" (consolidation). When a split occurs the quantity of shares offered increases, and when a reverse split occurs the quantity of shares offered decreases. In the instance of a share split or reverse share split, you are obliged to notify Student Services Australia.
- The Award Coordinator has sole discretion to determine if participants holding stock in a company which has a split will receive the same terms of that share split as shareholders in the real market. The Award Coordinator has sole discretion to adjust a share split or reverse share split accordingly without notification.

10. Trading halts and delisting

- If there is a trading halt on a share within your portfolio, the last market price before the trading halt will be used for final valuation purposes.
- If shareholders in the real market receive no compensation for a company that has delisted, you will also receive no compensation. It is within the Award Coordinator's sole discretion to decide the appropriate course of action in each individual case.

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