

Identifying Heuristic Choice Rules in the Swedish Premium Pension Scheme

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We analyze choices of a randomly selected sample of 10,999 citizens in the Swedish premium pension scheme. The aim is to identify the presence of various heuristic choice rules commonly observed in human decision making. Evidence suggests the prevalence of a default bias, the use of a diversification heuristic, extremeness aversion, a home bias, and the use of a 1/n heuristic. In some cases, cognitive simplification or wishful thinking may underlie the use of these heuristics. In other cases, their use seems to be consistent with recommendations provided by the responsible authority.

According to efficient capital markets theory (Fama [1970]), prices of equities and other financial securities reflect all publicly available information. However, investors must have full access to, and be able to accurately process, this information in order to make informed decisions. It is well documented in psychological research that both laypeople and experts may deviate from rational principles of judgment and decision making (see, e.g., Dawes [1997]). Various biases may result from using simplifying heuristics (Gilovich and Griffin [2002]). This is now also becoming recognized in economic research (Mullainathan and Thaler [2001]). In this vein, many authors have noted that the use of heuristics may underlie many phenomena in the stock market, such as herding (Banerjee [1992]; Shiller [2000]; Shleifer [2000]; Shleifer [2000]), disposition effects (Odean [1998]; Weber and Camerer [1998]), underreaction to financial information (Ikenberry, Rankine, and Stice [1996]), and money illusions (Svedsäter, Gamble, and Gärling [2003]).

As laypeople enter financial markets more frequently, their lack of knowledge and experience may exacerbate any existing market inefficiencies. Apart from the consequences for financial markets, irrational decisions may also have economic costs for the individual and for society at large. There is thus both a theoretical and a pragmatic basis for examining financial decision making by non-experts in similar contexts.

In Sweden, the public's tendency to invest in financial assets has increased dramatically over the last two decades. In 2000, this trend was further enhanced when, according to a new government pension scheme, all citizens in paid employment were given the opportunity to allocate part of their pension savings to equity funds and

other risk-bearing securities.¹ We analyze choices by a sample of citizens in the Swedish premium pension scheme to determine the possible presence of various heuristic choice rules common in other areas of human decision making. Whether the use of such heuristics is prevalent in the premium pension scheme has implications for stock market efficiency, and for how best to instruct and inform the participants in the pension scheme.

The next section provides a brief description of the Swedish premium pension scheme. We then describe heuristic choice rules that people may use in their choice of pension funds. A third section reports data analyses, and we finish with a discussion of the results.

The Swedish Premium Pension Scheme

In the fall of 2000, the new premium pension scheme gave 4.4 million Swedish income earners the opportunity to invest part of their state pension savings in equity and interest-bearing funds.² Participants could choose to invest in one to five funds out of a total of 455 (see Table 1). A default alternative, the "premium saving fund," was also offered, and people who did not select any funds themselves had their money automatically invested in this equity fund.³

The funds were presented in a brochure mailed to all eligible citizens. The brochure gave each fund's name and the name of the fund manager, a maximum ten-word description of the fund written by the fund manager, information about fund assets, any fund fees, and the fund's change in value over the last five years. A risk figure was also provided, calculated on the basis of the fund's volatility over the past three years (the standard deviation of percent value changes per year). The risk figures ranged from 0 for some interest funds to 53 for an equity fund investing in the Chinese market, and was accompanied by a symbol referring to one of five risk categories assigned to the fund. In information material accompa-

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Table 1. Funds Available in the Swedish Premium Pension Scheme (455 in total)

Equity Funds						
Sweden Funds		Regional Funds		Country Funds	Industry Funds	Mixed Funds
General (30) ^a		Sweden and other countries (9)		Japan (21)	IT/Communication (15)	Swedish equity and interest-bearing securities (3)
Small companies (6)		Nordic countries (10)		Great Britain (8)	Medical (6)	Swedish and non-Swedish equity and Swedish interest-bearing securities (28)
Index tracking (7)		Europe (36)		Other countries (12)	Other industries (14)	Non-Swedish equity and interest-bearing securities (24)
		Euro zone (9)				
		Europe, small companies (8)				
		Europe, index-tracking (7)				
		North America and USA (26)				
		Asia and the Far East (18)				
		Global (33)				
		New markets (17)				

^aNumber of funds for a given category is shown in parentheses.

nying the brochure, the responsible governmental agency (the Premium Pension Authority, or PPM) also recommended some sensible choices.⁴

For example, the PPM advised all citizens with more than 15 years left before retirement to select only equity funds, unless they were reluctant to see the value of their savings vary over time. The same advice was given to persons willing to take risks (based on the score on a self-administered test), who had 12 to 15 years left to retirement. Those having less than eight years left were advised to select only interest funds. Citizens belonging to none of these categories were advised to mix equity and interest-bearing securities, either by choosing both equity and interest funds or by choosing mixed funds. Participants were also advised to spread investments across different fund managers, industries, and markets, and to choose global funds instead of allocating all resources to specific geographic markets.

Types of Choices and Associated Heuristic-Driven Biases

Participants in the pension scheme were required to make a sequence of choices. First, they had to decide whether to invest in the default fund or in other funds. Second, they had to choose how many (from one to five) funds to invest in. A third choice was which funds to invest in. Here, the most obvious sequence is to first decide what types of funds to select followed by considerations of the specific fund alternatives. Finally, they had to determine what percent should be invested in each fund.

Although we cannot determine whether the choices were made sequentially or simultaneously, or in which order they were made, we feel justified in assuming

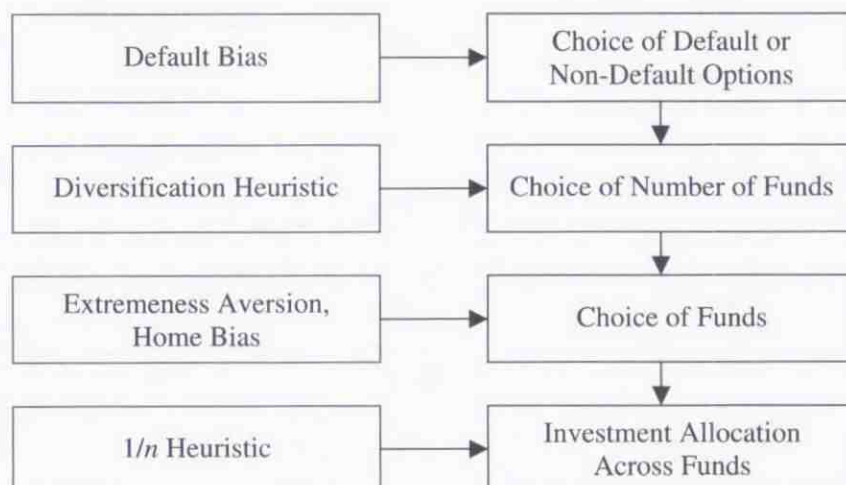
that they are made. We therefore consider each in turn with the aim of proposing hypotheses about how they may be influenced by any of the following well-documented heuristic-driven biases⁵ (see Figure 1): *default bias* (Johnson et al. [1992]), *diversification heuristic* (Read and Loewenstein [1995]), *extremeness aversion* (Simonson and Tversky [1992]), *home bias* (Grubel [1968]; Kilka and Weber [2000]), and *1/n heuristic* (Benartzi and Thaler [2001]). Additionally, given that we have no knowledge of the preferences underlying people's investment choices, and that the accuracy of each choice is an empirical question to be judged according to how the funds perform over the long run, we do not aim to infer whether people are acting rationally.

Default Bias

It has been shown that people tend to have an exaggerated preference for a default option (Johnson et al. [1992]). The associated non-optimal decision that may result from not choosing the otherwise most preferred option has been denoted default bias (Camerer [2000]). A closely related phenomenon, called omission bias, refers to a preference for options that do not require action (Spranca, Minsk, and Baron [1991]). According to norm theory (Kahneman and Miller [1986]), omission bias occurs because individuals anticipate having more regret when they have actively made a choice. Combined with the assumption of loss aversion (losses loom larger than gains) (Kahneman and Tversky [1979]), the utility from joy experienced from an action will be less than the disutility from regret, leading to an increased preference for inaction (Baron and Ritov [1994]).

Although we do not know whether a particular investor normatively should refrain from making a choice, there is reason to believe that a default bias may contribute to a disproportionately large number

FIGURE 1
Types of Choices and Potential Heuristic-Driven Biases in the Premium Pension Scheme



of citizens opting to invest their money in the default fund instead of selecting other funds.

Hypothesis 1: As a consequence of a default bias, a large proportion of the population refrain from making a choice of funds, hence leaving their investments in the default fund.

Diversification Heuristic

When asked to choose many things simultaneously, people tend to display a desire for variety by applying a diversification heuristic leading to more diversity than they subsequently want (Read and Loewenstein [1995]). People may seek variety because they are risk averse and uncertain about their preferences (Kahn and Lehmann [1991]; Simonson [1990]). Thus, they tend to select a bundle of goods that is unlikely to have the lowest utility rather than a bundle that potentially has the highest utility.

Diversification in most investment contexts is considered sensible, and is frequently recommended by private banks and responsible governmental authorities as a risk-reducing strategy. However, people may misinterpret variety for diversification (Shefrin [2000]) and pick many different kinds of funds without sufficient knowledge of what funds are sensible to combine. In such cases, people can fall prey to the manner in which funds are grouped and presented. Since funds are divided into equity, interest, mixed and generation funds, a diversification heuristic, for example, may lead individuals to select one fund from each of those subgroups. This may be a naïve diversification strategy (Benartzi and Thaler [2001]), and individuals may end up compiling fund portfolios with higher risk than they actually prefer, or vice versa.

Hypothesis 2: As a consequence of using a diversification heuristic, people compile more diversified fund portfolios than their risk attitudes would suggest they prefer.

Extremeness Aversion

Extremeness aversion is the tendency to avoid options that appear to be at the extreme point of some relevant continuum (Benartzi and Thaler [2002]; Simonson and Tversky [1992]). Assuming that disadvantages are weighted more heavily than advantages (Tversky and Kahneman [1991]), any intermediate option tends to be favored because it has only small potential disadvantages relative to the other options (Simonson and Tversky [1992]). Particularly when people do not have well-defined preferences, they tend to compromise their decisions in order to avoid or minimize the consequences of a wrong decision (Simonson [1989]).

Extremeness aversion may also arise simply because the decision criteria are not well-defined (Simonson [1989]). In the context of the premium pension scheme, extremeness aversion may make people avoid funds with extremely low and extremely high risk figures.

Hypothesis 3: Funds with a risk figure in the intermediate region are overrepresented in people's choices, while those in both of the extreme regions are underrepresented.

Home Bias

A home bias implies that individuals hold too little of their wealth in foreign assets (Lewis [1999]). Equity portfolio holdings generally reveal a strong dominance of domestic stocks (Grubel [1968]; Tesar and Werner [1995]). French and Poterba [1991] found that U.S. investors hold 93.8% of their equity portfolio in domestic stocks, Japanese investors hold 98.1%, and U.K. investors hold 82%. Equity and fund managers tend to invest more money in local and domestic firms as well, indicating that experienced professional investors also have a preference toward the familiar (Coval and Moskowitz [1999]).

An explanation of betting on the familiar is implied by the results of Heath and Tversky [1991], which show that when people are knowledgeable they also feel more confident and are more likely to make bets. Kilka and Weber [2000] extend this hypothesis to financial decision making by arguing that one reason for a home bias is that people feel more confident about domestic stocks than foreign stocks, and when feeling more confident they also expect higher returns on their investments.

A home bias may also represent an illusory belief that one has access to superior information and therefore the ability to buy and sell securities at the right time. However, access to superior information implies recognizing selling *and* buying opportunities, so this does not explain why investors are more inclined to buy and hold familiar stocks than to sell them (Huberman [2001]).

Yet another explanation for a home bias is simply a tendency to be optimistic toward things that people feel an affinity for (Huberman [2001]). This has been demonstrated in a number of areas, from sport fans' betting in favor of the teams they support, to voters who assign a higher probability to their own party winning the election (e.g., Babad [1991]; Bar-Hillel and Budescu [1995]).

Hypothesis 4: Given that familiarity implies a higher confidence, and that this confidence is positively correlated with expectations of positive returns, funds investing predominantly in Swedish equities are overrepresented in people's choices.

1/n Heuristic

Using the 1/*n* heuristic in retirement saving plans implies dividing the contributions evenly across the *n* investment instruments offered (Benartzi and Thaler [2001]). As a result, the composition of fund portfolios is determined by the selection of funds offered. In plans dominated by equity funds, choices are dominated by equity funds, and in plans dominated by interest funds, choices are dominated by interest funds.

Benartzi and Thaler's [2001] research involved pension schemes that typically included no more than five different funds to choose from. Since the premium pension scheme we study here permits selecting a maximum of five funds out of a total of 455, the 1/*n* heuristic is not directly transferable. Still, using this heuristic may lead people to divide their investment evenly across each of the *n* chosen funds, and assign greater or less weight to each fund than they would actually prefer.

Hypothesis 5: People divide their investment evenly across the *n* (> 1) funds they choose.

Data Analysis

Data for a sample of 10,999 randomly selected individuals were obtained from the Swedish National Social Insurance Board. Information is available about each individual's sex, age, place of residence, total amount invested (in SEK), selected funds, and percentage of the total amount allocated to each fund. The total amount each individual could invest varied between SEK 174 and SEK 26,202. Thirty-nine individuals were excluded from the analyses because their choices of funds were missing in the data. The same combination of funds managed by the labor union was selected by sixty-seven individuals who were also excluded.

Comparing the remaining sample to the population of all citizens eligible for the pension scheme showed it did not differ with respect to age ($M = 42.0$ versus 42.1 years), $t(10892) = -0.79$; sex (48.7% women), $\chi^2(1, N = 10,893) = 0.25$; or total amount invested ($M = \text{SEK } 12,619.4$ versus $\text{SEK } 12,633.1$), $t(10892) = -0.21$.

Choice of Funds Versus the Default Option

Of the total sample, 7,309 individuals (67.1%) chose the offered funds, and 3,584 (32.9%) chose the default option. This result is not inconsistent with Hypothesis 1, which predicts a bias toward choosing the default option. However, there is no objective benchmark against which this frequency can be evaluated.

Since one reason to choose the default option may be to avoid regret (Kahneman and Miller [1986]), it is conceivable that having a larger amount to invest would make investors more inclined to select the default option. A logistic regression analysis with three independent variables shows that individuals' willingness to choose funds was increased by 1) having a larger amount to invest (parameter estimate (PE) = 0.00008; $p < 0.01$), 2) being young (PE = -0.054; $p < 0.01$), and 3) being a woman (PE = -0.153; $p < 0.01$). Thus, the results suggest the relationship is actually the reverse.

Although it contradicts the prediction of regret avoidance, this outcome is reasonable given that people may consider it more worthwhile to familiarize themselves with the fund options when the stakes are raised. The proportion of people who choose the default option has continuously increased over the years following the introduction of the scheme, from 33% in 2000 to 82.4% in 2001, 85.9% in 2002, and finally 91.6% in 2003 (PPM [2003a]). This fact does not seem to support the idea that the default bias is mainly a result of regret avoidance, but instead points toward other reasons.

One reason may be unfavorable market sentiment over the last three years, which may reduce the general interest in making investments in financial securities. Another may be that citizens who have joined the scheme later than 2000 only recently entered the job market (the average age for new participants dropped from 42 in 2000 to 31 in 2002, and 25 in 2002 and 2003). Therefore, they have only a small amount to invest (on average, SEK 1,359 in 2001, SEK 1,105 in 2002, and SEK 1,109 in 2003, compared to SEK 12,700 in 2000, which included contributions paid for during 1995-1998) (PPM [2003a]). The frequency of individuals resorting to the default option may thus be inflated simply because involvement is low when the amount of money being invested is relatively small.

Choice of Number of Funds

Among the individuals who selected funds, choosing five funds proved the most popular choice, and two funds was the least popular choice (Table 2). The proportion of equity funds chosen increased and the proportion of mixed funds decreased the more funds that were chosen. This is reflected in the fund portfolios' average risk, which increases with the number of funds chosen. Regardless of the number chosen, however, it seems to be typical to diversify as much as possible with regard to fund categories (Table 3) and fund managers (Table 4).

The results are consistent with the notion that people use a diversification heuristic when selecting funds, as predicted by Hypothesis 2. It is difficult,

Table 2. *Average Risk Figures of Fund Portfolios and Percentages of Types of Funds Chosen*

	1 Chosen Fund (n = 1,072)	2 Chosen Funds (n = 945)	3 Chosen Funds (n = 1,492)	4 Chosen Funds (n = 1,516)	5 Chosen Funds (n = 2,284)
Average risk figure ^a	19.6	20.0	20.3	21.6	22.2
Equity Funds (%)	33	70	74	82	86
Mixed Funds (%)	13	11	8	7	5
Generation Funds (%)	52	17	15	8	6
Interest Funds (%)	2	2	2	2	2

^aOnly funds that had existed for at least three years were given a risk figure in the fund brochure. These figures were estimated for the complete set of funds before the means were calculated.

Table 3. *Distribution of Choices Across Fund Categories*

	2 Chosen Funds (n = 945)	3 Chosen Funds (n = 1,492)	4 Chosen Funds (n = 1,516)	5 Chosen Funds (n = 2,284)
Mean number of Fund Categories ^a	1.9	2.8	3.6	4.5
1 Category (%)	15	3	1	1
2 Categories (%)	86	15	5	2
3 Categories (%)		82	25	7
4 Categories (%)			70	31
5 Categories (%)				61

^aTotal number is twenty-one. Interest funds, mixed funds, and generation funds are treated as separate single categories.

Table 4. *Distribution of Choices Across Fund Managers*

	2 Chosen Funds (n = 945)	3 Chosen Funds (n = 1,492)	4 Chosen Funds (n = 1,516)	5 Chosen Funds (n = 2,284)
Mean number of Fund Managers ^a	1.6	2.3	3.1	4.0
1 Fund Manager (%)	44	20	7	3
2 Fund Managers (%)	56	35	21	9
3 Fund Managers (%)		45	32	15
4 Fund Managers (%)			41	33
5 Fund Managers (%)				40

^aTotal number is sixty-six.

however, to ascertain how much diversification is a consequence of this heuristic and how much is attributable to advice given by the PPM, private banks, or financial institutions.

To assess whether the chosen diversification resulted in suboptimal investment strategies, the choices of combinations of generation funds were analyzed more closely. The purpose of generation funds is to relieve people of having to adjust their fund portfolios from equity to interest-bearing securities as retirement nears (which is recommended). This adjustment is instead taken care of by the fund manager, so there is no obvious reason why generation funds should be combined with equity funds, as this would not eliminate the need for an active portfolio adjustment.

Consequently, generation funds are most frequently selected by individuals who choose only one fund (see Table 2). But some individuals combine generation funds with other types of funds. A possi-

ble explanation is that the diversification heuristic leads those individuals to seek out as much variety as possible between equity, mixed, and generation funds. The results reveal that among people selecting five funds and including at least one generation fund, 35% chose to combine it with both equity and mixed funds. The corresponding figure for those who selected four funds was 30%. The demand for interest funds in the fall of 2000 was so low that not even people who resorted to the diversification heuristic chose them. This may be due to the extremely optimistic market sentiments that prevailed in the late 1990s, which diverted attention away from interest-bearing funds to more risky fund alternatives.⁶

Another indication of naïve diversification is that many individuals combine mixed funds with pure equity funds, pure interest-bearing funds, or both. Unless a rather sophisticated investment strategy is adopted where the weight of risky versus non-risky securities is

dynamically and continuously adjusted, the rationale for such combinations is not obvious.

Choice of Funds with Respect to Risk

If funds with extremely high and extremely low risk figures were chosen less frequently than other funds, this would indicate that people are extremeness averse (in accordance with Hypothesis 3). In order to examine to what extent people avoid funds with extreme risk figures, we compared the risk figures for those chosen with the risk figures for those available (see Figure 2).⁷

A comparison of the graphs confirms that people tend to avoid funds with extreme risk figures.

Calculation of standard deviations reveals that, with respect to the risk figures, the distribution of fund choices is narrower than the distribution of available funds (see Table 5). We applied Cochran's test of homogeneity of variances, where the largest variance among the set of samples is always that of the funds available.⁸ Although the sample distributions of the chosen funds in all cases are significantly different from the distribution of available funds at $p = 0.01$, note that the more funds people selected, the less narrow was the distribution of risk figures. Hence, when

FIGURE 2
Distribution of Risk Figures for Funds Available ($N = 180$) (left graph)
Total Number of Fund Choices ($N = 10,830$) (right graph)

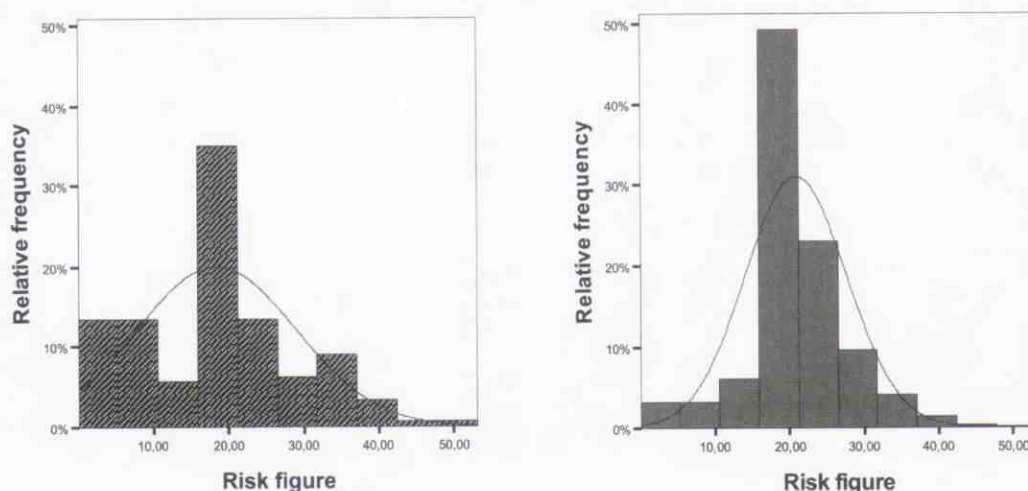


Table 5. Mean Risk Figures and Associated Distribution Statistics

Fund	n	Mean	Std	Skewness	Kurtosis	Cochran's test
Funds Available	180	18.38	10.60	0.28	-0.06	—
One Fund Chosen:						
Fund A	335	16.19	6.94	0.40	1.36	$C = 0.604, p < 0.05$
Two Funds Chosen:						
Fund A	355	20.16	6.60	-0.42	0.75	$C = 0.638, p < 0.01$
Fund B	226	19.98	6.62	0.12	1.92	
Three Funds Chosen:						
Fund A	757	20.60	5.99	-0.52	1.47	$C = 0.617, p < 0.01$
Fund B	489	19.38	6.88	0.16	2.36	
Fund C	462	19.56	6.86	-0.27	1.63	
Four Funds Chosen:						
Fund A	855	22.18	5.37	-0.22	2.82	$C = 0.614, p < 0.01$
Fund B	609	20.72	7.32	0.38	1.79	
Fund C	567	21.09	6.92	0.52	2.99	
Fund D	603	20.54	7.03	0.53	1.26	
Five Funds Chosen:						
Fund A	1287	22.48	5.54	-0.10	2.79	$C = 0.608, p < 0.01$
Fund B	1106	20.91	6.84	0.30	2.87	
Fund C	1032	21.02	7.32	0.38	1.68	
Fund D	1062	21.49	7.70	0.56	2.31	
Fund E	1085	20.87	6.82	0.35	2.21	

Note: Cochran's test of homogeneity of variances compares the average variance of funds chosen with the variance of funds available.

choosing more funds, people are more inclined to choose more extreme alternatives.

Choice of Funds Investing in Specific Regions

Hypothesis 4 predicts that choices will be biased toward funds that hold primarily Swedish securities. Table 6 shows that this is true. The proportion of chosen funds investing only or predominantly in Sweden is larger than the availability of such funds. For all other equity funds that hold investments in specific regions, the relationship between funds available and choices of funds is the reverse. Thus, people's choices are governed by a home bias when the availability of funds is controlled for. A χ^2 -test substantiated the difference in distributions between people's actual choices of funds investing in specific regions, and the choices to be expected considering the availability of such funds, $\chi^2(4, N = 10,557) = 8,093.25, p < 0.001$.

Allocation of Investment to Chosen Funds

As predicted by Hypothesis 5, by far the most popular investment allocation is to divide the total evenly across the n chosen funds in accordance with the $1/n$ heuristic (see Table 7). This is the case regardless of how many funds are chosen, except that people choosing three funds ($n = 1,492$) only approximated an even division (50%-25%-25%, 40%-30%-30%, or 34%-33%-33%). Because these divisions are unlikely to represent underlying preferences, the even weight assigned to each alternative implies a suboptimal allocation.

Table 6. Choices of Equity Funds Investing in Specific Regions (%)

	Funds Available ($n = 195$)	Funds Chosen ($n = 10,557$)
Sweden	22	43
Sweden and other countries ^a	5	19
Europe	40	24
North America	13	9
Asia	20	6

^aAt least 50% Swedish equity.

Table 7. Investment Allocation Across Funds (%)

	2 Chosen Funds ($n = 945$)	3 Chosen Funds ($n = 1,492$)	4 Chosen Funds ($n = 1,516$)	5 Chosen Funds ($n = 2,284$)
Equal split	74	—	35	40
Approximation of equal split ^a	—	59	—	—
Second Most Popular Allocation ^b	10	11	12	9

^aFor choices of three funds, 50%-25%-25%; 40%-30%-30%; or 34%-33%-33%.

^bFor choices of two funds, 75%-25%, for choices of three funds, 40%-40%-20%, for choices of four funds, 40%-20%-20%-20%, and for choices of five funds, 30%-20%-20%-20%-10%.

Discussion

When a choice is complex, people frequently resort to using heuristic choice rules. In many circumstances this leads to biases. Yet, when there is time pressure, or when other factors make choices difficult, the use of heuristic choice rules may be adaptive (Gigerenzer et al. [1999]; Payne, Bettman, and Johnson [1993]).

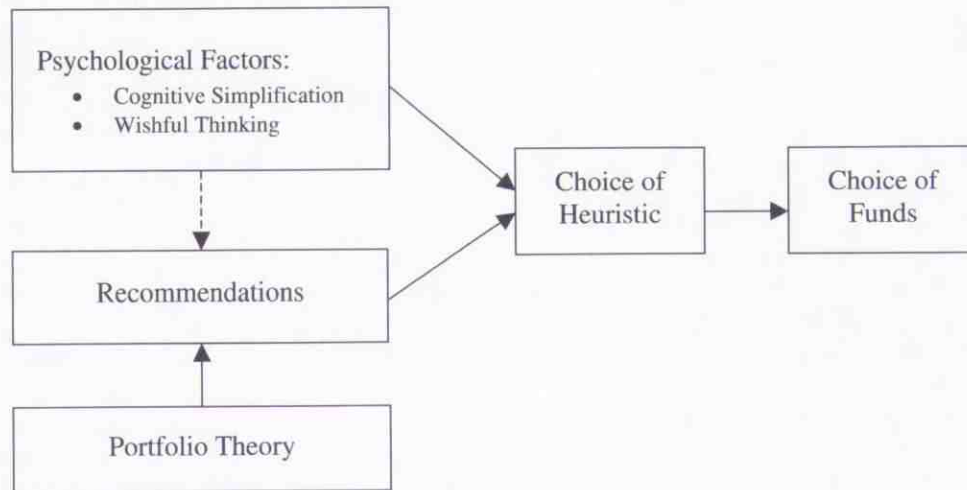
In choosing funds in the newly introduced Swedish premium pension scheme, we argue that people's choices are driven by a number of heuristics. Psychological factors such as cognitive simplification and wishful thinking, as well as recommendations provided by the Premium Pension Authority (PPM) or other agents, may underlie the use of these heuristics (see Figure 3). It is not conclusive whether the citizens used the choice heuristics because they followed recommendations or for other reasons. We address this question next, but the results do not disconfirm our hypotheses that several known choice heuristics are used. Some of these heuristics clearly lead to biases that would be desirable to avoid.

As we have noted, the high percentage of pension plan participants choosing the default option may not only reflect a default bias, but also low involvement and unwillingness to invest effort. In any case, the bias is undesirable and needs to be counteracted. A simple recommendation would be to exclude a default option or designate the default option as an interest fund. This should be combined with attempts to make the choices easier, for example, by reducing the number of funds.

The extensive diversification across fund categories and fund managers may be a consequence of two main factors. One is the PPM's or other authority's advice to diversify. Another factor may be people's tendency to choose as diverse a bundle of goods as possible when selecting many things at the same time (Read and Loewenstein [1995]; Simonson [1990]). We have previously argued that risk diversification may be sought simply because it is recommended by fund managers and authorities. However, each participant needs to determine whether such an investment strategy matches his or her own individual risk preferences.

For example, investors willing to take on some risk may end up diversifying their investments more than is

FIGURE 3
Factors Influencing Heuristic Choices of Funds



necessary or desirable for them. Given that people are not fully aware of how to combine different funds, and they do not have knowledge of the financial consequences of various fund combinations, their choices may not correspond to their underlying risk attitudes. However, the effect of a diversification heuristic may be counteracted by extremeness aversion and by the home bias, since both these heuristic-driven biases promote concentration rather than diversification.

Because people avoid funds with extreme risk figures, adding more such funds would increase the popularity of the previously most extremely risky funds, and removing funds with extreme risk figures would decrease the popularity of the riskiest funds. An important implication of this finding is that the description of funds and their associated risk figures are crucial for how people choose.

The choices furthermore reveal a strong bias toward funds that hold investments in Swedish securities. The reason for this home bias may be an overly optimistic expectation of returns as a consequence of higher confidence (Kilka and Weber [2000]). However, it may also originate from people's desire to promote domestic economic growth, or simply as a consequence of more intense marketing of domestic funds. The latter factor may be worth considering by authorities when evaluating the supply of funds that financial institutions provide. In addition, citizens should be better informed about the character and opportunity of investments in more novel securities, particularly those related to global markets.

Due to the use of the $1/n$ heuristic, having the opportunity to invest in as many as five different funds may promote an even distribution of the investments over the funds available, preventing popular funds from receiving a disproportionately large part of the invested amount. However, choosing three funds seems to evoke

a different way of thinking about the selected funds. In this case, people probably decide first which fund is the most attractive, and then invest more in that fund. Still, it is unlikely that any of these allocations reflect people's true preferences, which instead may be shaped by the way their investment can be most readily divided.

Implications

Since the emergence of contribution-based retirement saving plans, investing in the stock market has become a general trend in the industrialized world, and it is important to acknowledge the potential effect the subsequent massive influx of novice investors can have on the stock market. One implication of our observed use of heuristic choice rules in the Swedish premium pension scheme is that the manner in which funds are grouped and presented in the fund brochure may bias investment choices. The level and type of information presented for each fund is likewise likely to influence people's choices, and as long as this information varies between fund alternatives, it may provide inadequate signals regarding their respective track record and attractiveness.

As the total amount to be invested in the coming decades will gradually increase, such biases will increasingly have an impact on financial markets in general. It is important to further investigate the heuristic-driven biases characterizing novice investors' financial decision making to understand what countermeasures to take.

Acknowledgments

This research was financially supported by grant K2001-0306 from the Bank of Sweden Tercentenary Foundation. The authors thank George Loewenstein

for comments on an earlier version of this article. The second and third authors are affiliated with the Centre for Consumer Science at Göteborg University and Chalmers University of Technology, Göteborg (www.cfk.gu.se).

Notes

1. The total amount invested at that time was SEK 50 billion (SEK 1 is approximately U.S. \$0.12), including contributions paid for during 1995–1998.
2. The scheme was created only for citizens born after 1953. Eligible citizens can invest 2.5% of their income per year (or a maximum of SEK 7,500 (U.S. \$900)) in equity funds, which are comprised of at least 75% company stock. Other alternatives are interest funds (interest-bearing securities), mixed funds (a mix of equity and interest-bearing securities), and "generation" funds. A generation fund is designed for citizens who are closer to retirement age, and consists of both equity and interest-bearing securities. The fund manager gradually reduces the proportion invested in equity as the pension age approaches.
3. The management of the premium saving fund, which contains 85% equity and 15% interest-bearing securities, is said to be characterized by stability and limited risk-taking.
4. In a survey (SIFO [2000]), 45% of the respondents reported they had studied the material rather or very carefully. Of those, 35% claimed they found the information useful or very useful.
5. Our aim is to identify heuristics defined as simplifying choice rules (Gigerenzer et al. [1999]), regardless of whether they lead to biases.
6. The proportion of interest funds among people's fund choices has continually increased in subsequent years, from 2% in 2000, to 8% in 2001, 9% in 2002, and 26% in 2003 (PPM [2003b]).
7. Only funds that had existed for at least three years were given a risk figure in the brochure. Our analysis only included these funds (180 of 455). The results, however, did not change when we estimated risk figures for the complete set of funds and performed the same analysis as reported.

$$C = \frac{\sigma_j^2 \text{largest}}{\sum_{j=1}^p \sigma_j^2}$$

References

- Babad, E., and K. Yosi. "Wishful Thinking—Against All Odds." *Journal of Applied Social Psychology*, 21, (1991), pp. 1921–1938.
- Banerjee, A.V. "A Simple Model of Herd Behavior." *Quarterly Journal of Economics*, 107, (1992), pp. 797–807.
- Bar-Hillel, M., and D. Budescu. "The Elusive Wishful Thinking." *Thinking and Reasoning*, 1, (1995), pp. 71–103.
- Baron, J., and I. Ritov. "Reference Points and Omission Bias." *Organizational Behavior and Human Decision Processes*, 59, (1994), pp. 475–498.
- Benartzi, S., and R.H. Thaler. "Naïve Diversification Strategies in Defined Contribution Plans." *American Economic Review*, 91, (2001), pp. 79–99.
- Benartzi, S., and R.H. Thaler. "How Much is Investor Autonomy Worth?" *Journal of Finance*, 57, (2002), pp. 1593–1616.
- Camerer, C.F. "Prospect Theory in the Wild: Evidence from the Field." In D. Kahneman and A. Tversky, eds., *Choices, Values, and Frames*. Cambridge: Cambridge University Press, (2000), pp. 288–300.
- Coval, J.D., and T.J. Moskowitz. "Home Bias at Home: Local Equity Preference in Domestic Portfolios." *Journal of Finance*, 54, (1999), pp. 1–39.
- Dawes, R.M. "Behavioral Decision Making, Judgment, and Inference." In D. Gilbert, S. Fiske, and G. Lindzey, eds., *The Handbook of Social Psychology*. Boston: McGraw-Hill, (1997), pp. 497–548.
- Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance*, 25, (1970), pp. 383–417.
- French, K.R., and J.M. Poterba. "Investor Diversification and International Equity Markets." *American Economic Review, Papers and Proceedings*, 81, (1991), pp. 222–226.
- Gigerenzer, G., P.M. Todd, and the ABC Research Group. *Simple Heuristics that Make Us Smart*. New York: Oxford University Press, 1999.
- Gilovich, T., and D. Griffin. "Heuristics and Biases: Then and Now." In T. Gilovich, D. Griffin, and D. Kahneman, eds., *Heuristics and Biases: The Psychology of Intuitive Judgment*. Cambridge: Cambridge University Press, (2002), pp. 1–18.
- Grubel, H. "Internationally Diversified Portfolios." *American Economic Review*, 58, (1968), pp. 1299–1314.
- Heath, C., and A. Tversky. "Preference and Belief: Ambiguity and Competence in Choice Under Uncertainty." *Journal of Risk and Uncertainty*, 28, (1991), pp. 4–28.
- Huberman, G. "Familiarity Breeds Investment." *Review of Financial Studies*, 14, 2001, pp. 659–680.
- Ikenberry, D.L., G. Rankine, and E.K. Stice. "What Do Stock Splits Really Signal?" *Journal of Financial and Quantitative Analysis*, 31, (1996), pp. 299–317.
- Johnson, E.J., J. Hershey, J. Meszaros, and H. Kuhnreuther. "Framing, Probability Distortions, and Insurance Decisions." *Journal of Risk and Uncertainty*, 7, (1992), pp. 35–51.
- Kahn, B., and D.R. Lehmann. "Modelling Choice Among Assortments." *Journal of Retailing*, 3, 1991, pp. 274–298.
- Kahneman, D., and D.T. Miller. "Norm Theory: Comparing Reality to its Alternatives." *Psychological Review*, 93, (1986), pp. 136–153.
- Kahneman, D., and A. Tversky. "Prospect Theory: An Analysis of Decision Under Risk." *Econometrica*, 47, (1979), pp. 263–291.
- Kahneman, D., and A. Tversky. "Choices, Values and Frames." *American Psychologist*, 39, (1984), pp. 341–350.
- Kilka, M., and M. Weber. "Home Bias in International Stock Return Expectation." *Journal of Psychology and Financial Markets*, 1, (2000), pp. 176–189.
- Lewis, K.K. "Trying to Explain Home Bias in Equity and Consumption." *Journal of Economic Literature*, 37, (1999), pp. 571–608.
- Mullainathan, S., and R.H. Thaler. "Behavioral Economics." In N.J. Smelser and P.B. Baltes, eds., *International Encyclopedia of the Social and Behavioral Sciences*. Amsterdam: Elsevier, 2001.
- Odean, T. "Are Investors Reluctant to Realize their Losses?" *Journal of Finance*, 53, (1998), pp. 1775–1798.
- Payne, J., J. Bettman and E. Johnson. *A Normative Adaptive Decision Maker*. Cambridge: Cambridge University Press, 1993.
- PPM (2003a). *Statistik om Premiepensionsvalen*. Retrieved June 10, 2003, from <http://ppm.nu/>
- PPM (2003b). *Ökad Andel Till Räntefonder i Premiepensionsvalet*. Retrieved June 10, 2003, from <http://ppm.nu/>
- Read, D., and G. Loewenstein. "Diversification Bias: Explaining the Discrepancy in Variety Seeking Between Combined and Separated Choices." *Journal of Experimental Psychology: Applied*, 1, (1995), pp. 34–49.

- Shefrin, H. *Beyond Greed and Fear: Understanding Behavioral Finance and the Psychology of Investing*. Boston: Harvard Business School Press, 2000.
- Shiller, R.J. *Irrational Exuberance*. Princeton: Princeton University Press, 2000.
- Shleifer, A. *Inefficient Markets*. Oxford: Oxford University Press, 2000.
- SIFO (2000). *Eftervälsundersökning Avseende Premiépensionsvalet*. Retrieved June 10, 2003, from <http://www.opinion.sifo.se/html/publicerade/2000/pdf/6205430.pdf>.
- Simonson, I. "Choice Based on Reasons: The Case of Attraction and Compromise Effects." *Journal of Consumer Research*, 16, (1989), pp. 158–173.
- Simonson, I. "The Effect of Purchase Quantity and Timing on Variety-Seeking Behavior." *Journal of Marketing Research*, 28, (1990), pp. 150–162.
- Simonson, I., and A. Tversky. "Choice in Context: Tradeoff Contrast and Extremeness Aversion." *Journal of Marketing Research*, 29, (1992), pp. 281–295.
- Spranca, M.D., E. Minsk, and J. Baron. "Omission and Commission in Judgment and Choice." *Journal of Experimental Social Psychology*, 27, (1991), pp. 76–105.
- Svedsäter, H., A. Gamble, and T. Gärling. *Money Illusions in Financial Decision Making: The Influence of Nominal Trading Prices on Perceptions of Real Share Value*. Working paper, 2003.
- Tesar, L.L., and I.M. Werner. "Home Bias and High Turnover." *Journal of International Money and Finance*, 14, (1995), pp. 467–492.
- Tversky, A. And D. Kahneman. "Loss Aversion in Riskless Choice: A Reference Dependent Model." *Quarterly Journal of Economics*, 106, (1991), pp. 1039–1061.
- Weber, M., and C.F. Camerer. "The Disposition Effect in Securities Trading: An Experimental Analysis." *Journal of Economic Behavior and Organization*, 33, (1998), pp. 167–184.

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