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~~10~~ Facts I Have Learned
About 401(k) Plans

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The Adequacy of Choices Offered by
401(k) Plans

The Performance of Funds Offered by
401(k) Plans

The Impact of Mutual-Fund Family
Membership On Investor Risk

Background On Private Retirement Market

12.9 Trillion dollars in assets in the retirement market

64% in company pension plans

25% defined contribution (401K, 305B)

39% defined benefit

Remaining balance is primarily IRAs

More than 1/3 of workers covered by 401K plans

60% of these workers have no other financial assets other than a bank account.

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There are a lot of topics:

- Are private and public pensions adequate – do people save enough?
- Risk shifting defined benefit vs. defined contribution
- Role of government in monitoring and insuring
- Do participants behave rationally?
- Do participants behave wisely (or optimally)?
- Do companies offer participants adequate choices?
- Do companies offer participants the “right” choices?

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There has been a large amount of research on how participants behave.

Examples:

- Participants don't invest enough
- Many participants rarely change their allocations
- 1/N rule
- Overinvestment in company stock

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Surprisingly, there has been almost no research on the actions of plan administrators on the choices given to plan participants.

The action of a participant is a result of two decisions: the choice the participant is offered and how he or she allocates among these choices.

This is the first set of research to examine the appropriateness of the choices given to the participant: an examination of the decisions of the plan administrators rather than the participant.

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Concentrate on 401K Plans:

Employer delineates a set of investment choices from among which an participant can invest contributions.

Contributions are from before-tax income.

Returns and contributions are not taxed until withdrawal.

Usually, the employer puts in funds that are tied to the participant's contributions – company stock may be part of plan.

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12 Lessons from this Research:

- Most plans do not offer enough *or* the appropriate mix of options to participants
- Company stock does not affect the adequacy of options
- Plans tend to have increased risk because they tend to select funds from 1 or 2 families
- Given the type of funds offered, administrators tend to pick better than random funds, but much of the difference is due to lower expense ratios. Don't do as well as index funds
- Funds that were added did better *before* they were added but not better after they were added
- Funds that were dropped did worse before they were dropped and no better after they were dropped

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12 Lessons from this Research cont'd:

- Plan administrators who outperformed others in the past have a tendency to outperform in the future
- Participants' contributions, transfers, and return all have about the same effect on change in investment proportions
- Participant changes in allocation exaggerate the change due to return
- Participants don't like the less familiar
- Participants are naïve at best in allocating assets
- Participants hold large amounts of company stock

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1. Do plans offer enough or the right mix of options to participants?

Does adding index funds as suggested by the literature of financial economics or an ICDI category index of mutual funds to the mix of offerings shift the efficient frontier by an amount which is statistically significant?

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A. Data

Moody's survey of pension plans:

Select 401(k) plans that offer only mutual funds with or without money market accounts, GICs, stable value funds and company stock – 680 plans

417 of these had mutual funds with at least 5 years of data.

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The Adequacy of Plan Offerings

To judge adequacy, we need to look beyond risk to the combination of risk and return.

Do the plans offered to participants span the 8 RB indexes which explain returns?

Excess Return on each RB index =

$a + \beta_i$ excess return on fund i offered.

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Research-Based Indexes

Index funds – after expense ratios

Small-growth, large growth, small value, large value

General bonds, high-yield bonds

International stocks, international bonds, together 75% offer

Eleven ICDI classifications of mutual funds (e.g. growth and income, international stocks)

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Sufficiency of Plan Investment Choices In Spanning 8 RB Indexes

(Short Sales Not Allowed)

Number of Investment Choices in Plan	<u>Number</u>	<u>Not Sufficient</u>
6 or less	233	53%
7 to 12	164	43%
Over 12	20	15%
Total	417	47%

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2. Is adding company stock bad *per se*?

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Company Stock

- Including company stock, assuming 1/n rule: variance up by 3.17 or 19% (t-value 3.6)
- Sharpe ratio up from 2.40 to 2.55, but increase comes from added security. If add random fund rather than company stock, Sharpe ratio stays at 2.5.
- Company stock virtually no effect under 1/n rule.
- Spanning – no effect. Plans that didn't span before still don't span.

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- Plans tend to have more risk because they choose funds from 1 or 2 families.

Standard deviation not higher.

Correlation coefficients are higher.

Correlation between two funds of any type within families is higher than correlation of two similar funds across families.

Can make a difference of 52 to 70 bp per year.

Almost 50% of plans select all funds from within one family; families that do have lower Sharpe ratios.

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Sample.

11-K filing, 401(k) Plans 1994-2003

401(k) Plan Sample

Number of 401(k) Plans	43
Number of Plan Years	289
Number of Fund Families Held	40
Number of Unique Funds Held	141
Number of Funds Initially Held ^a	116
Number of Funds Added	215
Number of Funds Deleted	45

^a The total number of funds held by the 43 sample plans in the first year each plan enters our sample

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Methodology

A. Alpha

$$R_{it} - R_{rt} = a_i + \beta_{ij} \cdot I_{jt} + e_{it}$$

Stock Funds: S&P 500, Fama French Small-Large and high minus low, Lehman Gov/Credit, and MSCI Europe

Bond Funds: Lehman Gov/Credit, Lehman Mortgage-Backed, Credit Suisse High-Yield Index, Salomon non-dollar World Gov. Bond Index

International: S&P 500 and the three MSCI Indexes (Europe, Pacific, and Emerging Markets)

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- Differential Alpha

Mutual funds, in general, have negative alpha. We took the alpha for each mutual fund minus the average alpha for funds of the same general size from the same ICDI category.

To get alpha on a plan we use two alternative weightings of funds held:

1. Equal weight on each mutual fund
2. Weight by participants' holdings

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Given the type of fund offered, administrators tend to pick better than random funds, but much of the difference is due to lower expense ratios. They do worse than selecting index funds.

Performance 1-Year α

	<u>Equal Wts.</u>		<u>Participant Wts.</u>	
	<u>Alpha</u>	<u>Diff. α</u>	<u>Alpha</u>	<u>Diff. α</u>
Average	-0.080	0.035	-0.093	0.041
P-Value	0.000	0.040	0.000	0.030
# Pos.	9	29	4	33

Fee difference .019

Performance 3-Year a

43 Plans, with an average of 6.7 years per plan

	Equal Wts.		Participant Wts.	
	Alpha	Diff. a	Alpha	Diff. a
Average	-0.026	0.043	-0.043	0.037
P-Value	0.160	0.010	0.030	0.040
# Pos.	18	30	13	32

Fee difference .019

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5. Funds that were added did better *before* they were added and not better *after* they were added.

6. Funds that were dropped did worse before they were dropped and no worse after they were dropped.

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Before Action Diff. Alpha

	1-Year
Added (200)	0.000
Dropped (44)	- 0.112
Difference	0.112
P-value	0.020

After Action Diff. Alpha

	1-Year
Added (214)	0.004
Dropped (43)	0.087
Difference	- 0.083
P-value	0.207

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Plans That Changed All Funds In A Given Year

1 Year Before Action

	alpha	Diff alpha	XXX
Added	-0.065	- 0.003	0.325
Dropped	-0.212	- 0.110	.283
Difference	0.147	0.107	.042
P-value	0.041	0.063	0.181

1 Year After Action

	alpha	Diff alpha	XXX
Added	-0.222	-0.103	0.393
Dropped	-0.090	0.043	0.479
Difference	-0.132	-0.146	-0.056
P-value	0.262	0.194	0.194

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Added Funds and Past Performance Of Investment Objectives

Average of Past a of Objective Added	-0.048
Average Past a of All Objectives	-0.066
Difference	0.018
P-value	0.000

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8. Plan administrators who
outperform in the past have a tendency
to outperform in the future.

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Past Performance Quartiles

Future Performance Quartiles

		1	2	3	4
Lowest	1	0.338	0.215	0.235	0.162
	2	0.203	0.297	0.216	0.284
	3	0.162	0.203	0.418	0.216
Highest	4	0.254	0.254	0.197	0.296

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Past Performance Quartiles

Average Future Differential Alpha

1 (lowest)	-0.024
2	0.040
3	0.063
4 (highest)	0.061

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Performance and Plan Characteristics

- Dollar size
- Number of choices
- Changes in choices
- New cash flow
- Presence of money market

No relationships.

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Return, participant contributions,
and transfers all have about the
same effect on change in weights.

What causes change in the percentages
participant place in each choice they are
offered?

- Return 4.5%
 - Contribution 4.6%
- and transfer

Transfer approximately twice as important as
contributions

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9. Participants' change in allocation exaggerates the change in weight due to return.

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Direction of Change

	?X Return > 0	?X Return < 0
	_____	_____
?X Contributions & Transfers > 0	541	381
?X Contributions & Transfers < 0	245	476

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Change in weight due to contributions and transfers equals $\alpha + \beta$ change due to return.

β is positive for 31 out of 41 plans.

$$\beta = 0.57$$

$$R^2 = 0.17$$

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10. Participants don't like the less familiar

How do investors react to new options how do they allocate contributions and transfers?

Normalize so that 100% would be the average amount in any fund.

Overall 83% - only 28% of cases more than average

New category of fund - 58%

Old Category - 92%

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11. Participants are naïve at best in allocating assets

Employ two criteria

- Alpha = relevant if plan is part of a larger portfolio
- Sharpe ratio – Plan is the bulk of investors holdings

Benchmarks

- $\frac{1}{n}$ in each option
- $\frac{1}{n}$ in each investments category. Equal within category
- Look at past performance – $\frac{1}{n}$ in top half of choices ranked by $\frac{\alpha_i}{\sigma_{ei}^2}$

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Panel B: Alphas Part 1 : With Company Stock

Portfolio selection Rule	Alpha	Statistic of Naïve Rule minus Participant weights rule alpha	Number of Plans where Naïve Rule outperforms Participant Weights Rule (Total 38 plans)
Participant Weights	-0.078		
1/N in each investment choice	-0.022	1.54	22
1/N in top half of Past Performance	0.071	2.01	23
1/N in each category	-0.001	1.63	20

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Panel B: Alphas
Part 2: Excluding Company Stock

Porfolio selection Rule	Alpha	Statistic of Naïve Rule minus Participant weights rule alpha	Number of Plans where Naïve Rule outperforms Participant Weights Rule (Total 38 plans)
Participant Weights	-0.108		
1/N in each investment choice	-0.093	1.02	21
1/N in top half of Past Performance	-0.061	2.37	26
1/N in each category	-0.083	1.47	24

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The effect of company contribution in the form of company stock

- 14 plans contribution in company stock
- 22 plans across categories
- 5 plans mixture of 1 and 2 over time

If all in company stock 2.76 average amount in all accounts if not 1.31

Even in plans where the entire contribution was in the form of company stock participants added (contributions and transfers) to company stock.

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