PORTFOLIO OPTIMIZATION AND THE 401-K DECISION

Jan Serrano
Francis Marion University

As Defined Contribution plans at U.S. companies have overtaken traditional defined benefit pension arrangements, the burden of retirement planning and portfolio selection has fallen squarely on the shoulders of U.S. workers. Unfortunately, many employees do not learn enough about their retirement portfolios to make good investment decisions. Instead, they do what is easiest, which is often nothing at all. Or they simply split their retirement contribution evenly across each of the investment options available in their plan. As financial planners and investment professionals are increasingly called upon to help people make these kinds of decisions, it is imperative that they be able to identify the positive and negative attributes of each alternative, but also to assess how those choices fit within the individual's investment constraints and the economic environment at hand. While recent technological advances have opened the door to worlds of new portfolio selection techniques, planners must still critically evaluate input and output from these models to assure meaningful and appropriate portfolio design.

June Branch, an employee for a regional manufacturing firm, was unsure about what options to select in her 401-K when she joined the company in 2006. She selected one of the new life cycle fund options with a target date nearest to her planned retirement. Investment representatives are coming in two weeks to talk to employees and she wonders if some other combination of investment choices would be more appropriate.

INVESTMENT QUANDARY

"Hey June, are you meeting with our 401-K representative next week? I am going to see about changing my allocation. Looks like the market took a real beating last quarter!" "Really, Sam, what's an allocation? How do you keep up with all of that stuff?" "Well, I really don't look at it too much," Sam replied. "I just happened to open my statement last night and it didn't look good. You know they don't tell you which one to pick, you've got to do that yourself." Sam moved another part down the assembly line. June thought about it for a moment. She had never talked to the 401-K representative since she was hired. "I don't mean to be nosey, Sam, but how do you know which of those funds is the best? Which ones did you pick?" "I just divided mine equally over all of the funds. Maybe one of them

will do alright." "I don't know why you want to put your money in that risky stock market Sam." Jimmy Hester chimed in, "My account never goes down because I have all of my retirement invested in the money market fund. You people are crazy putting your money in that stock market!" "Young punk," Sam thought to himself.

October, 2011 June Branch sat down at her desk to open the mail. "Wow, down 15.6% this quarter!" It was her quarterly statement for her 401-K. "Sam was right. This looks like 2008! I should have changed my investments, but I don't know what I'm doing!" She threw her hands up and collapsed into her chair. "I need to call my brother. He has a fellow that helps him with that sort of thing."

June had worked in quality control at a regional manufacturing firm since 2006. Like most U.S. companies, June's employer offered employees a defined contribution plan rather than a traditional pension. The company matched their contributions dollar for dollar up to a certain limit, but the employees were responsible for selecting the investments themselves from a list of available options. When she initially made her investment choices, June did not know which of the 15 funds to select, so she just picked the "Target Retirement 2030" fund because she would turn 65 in 2033. The last few years had flown by and she had not had the time or the inclination to research the other options or change her selections. Although June's contribution was payroll deducted every month, she just did not feel as though she was making much progress. Her latest statement indicated a loss of 2% over the last 5 years. "At that rate," she thought, "I'll never be able to retire." "One of these funds averaged almost 10% over the last three years. Maybe I should put it all in that fund instead."

In their early fifties, June and her husband Ralph had put two children through college and cared for their elderly parents. While these commitments had put a strain on their finances for many years during which they made little or no contributions to their retirement savings, the couple could now focus on planning for their retirement. June dug around in her desk drawer and came up with the file marked 401-K. There was the initial packet that she had received when she signed on. It contained a description of the different funds that employees could choose from, information on fund performance, and portfolio characteristics. It also included a short risk tolerance quiz. Supposedly her risk tolerance was "moderate". As she looked over the questions, she had to chuckle. "What is the minimum loss you would be willing to tolerate in your portfolio?" She had checked a loss of 10%. She stopped looking at her statements after her funds lost 14% in the third quarter of 2008 and 22% in the fourth quarter of that year. The unopened envelopes jutted from all sides of the file. She had only recently begun to look at her statements again as the economy gradually seemed to improve.

June made up her mind. "I need some help," she thought. She called her brother Danny who recommended a financial planner that he used. "His name is Bob Cartwright, Sis, and he is really nice. I think he can help you out." June met with Bob on Thursday. She gave him all of the information on the investment options in the plan that she had printed off of the investment company website and the risk tolerance analysis that she had filled out. After some discussion, Bob set up a follow-up appointment with June for Monday afternoon to

explain her investment options more thoroughly and make some suggestions before she had to meet with the 401-K representatives next week.

As Bob Cartwright's new assistant, you have been asked to evaluate the different investment alternatives available to June and her choice of the Target 2030 fund. Bob hired you out of college because of your degree in Finance and your knowledge of optimization and linear programming techniques. Bob wants the report on his desk by Friday afternoon.

APPENDIX

TABLE 1
401-K Investment Alternatives
Fund Performance Measures (%) (data thru 9/30/2011)

Description	3Yr Avg	5Yr Avg	5Yr Alpha	5Yr Sharpe	5Yr Treynor	5Yr ASD
Target 2010	4.17	.87	.14	-.05	-.87	15.23
Target 2020	2.66	-.82	.02	-.13	-2.51	17.81
Target 2030	.88	-2.1	-.06	-.19	-3.51	19.57
Target 2040	-.25	-2.8	-.12	-.22	-4.1	20.1
Int'l Equity Large Cap	.51	-.66	.09	-0.1	-2.09	21.43
Large Blend	.93	-.3	.09	-0.1	-1.83	19.11
Real Estate	.34	-1.9	.23	-.11	-2.37	32.33
Large Growth	6.99	3.83	.44	.11	2.23	20.12
Equity Income	3.14	.5	.09	-.08	-1.48	13.61
Growth and Income	-.09	-2.0	-.04	-.18	-3.34	20.16
Intermediate Term Bond	9.56	7.54	.61	1.37	81.86	4.35
Mid Growth	5.17	5.02	.56	.16	3.14	21.54
Mid Cap Blend	.11	-2.2	-.02	-.17	-3.28	22.27
Money Market	.23	1.77	.15	.33		.6
S&P 500 Index	1.05	-1.3	-.01	-.16	-2.9	18.3

TABLE 2
401-K Investment Alternatives
Fund Returns and Ratings (data thru 9/30/2011)

Description	Mgr Yrs	Star* Rating	3 Yr** Risk Rating	3 Yr*** Return Rating	YTD 2011	2010	2009	2008	2007	2006
Target 2010	6.08	2	D	E	-5.54	12.43	29.66	-32.71	6.02	14.3
Target 2020	6.08	2	C	E	-8.86	13.28	32.3	-38.06	5.45	16.59
Target 2030	6.08	2	D	E	-12.3	13.29	32.92	-40.78	5.87	18.05
Target 2040	6.08	2	D	E	-14.2	12.94	31.91	-41.22	6	18.17
Int'l Equity Large Cap	27.5	4	E	E	-17.3	9.4	39.1	-40.53	18.96	21.87
Large Blend	27.2	3	E	E	-11.8	14.05	33.36	-39.7	13.55	19.24
Real Estate	20.3	4	E	E	-7.2	27.14	32.5	-34.4	-19.19	37.13
Large Growth	43.8	5	E	E	-8.29	18.51	47.11	-41.01	23.08	2.64
Equity Income	12.4	3	A	A	-9.25	12.39	23.51	-24.78	3.26	12.53
Growth and Income	2.75	2	B	C	-11.8	12.01	38.79	-43.83	10.73	10.34
Intermediate Term Bond	24.4	5	A	C	1.71	8.56	13.55	4.55	8.81	3.74
Mid Growth	19.8	4	A	C	-11.6	26.46	33.25	-28.29	12.73	8.81
Mid Cap Blend	8.75	2	C	D	-21.1	25.47	38.01	-41.73	3.76	16.37
Money Market	4.79	3	D	D	0	.01	.27	2.39	5	4.76
S&P 500 Index	15.5	3	B	B	-8.95	14.94	26.22	-37.03	5.41	15.6

* Morningstar 5 star rating system

TABLE 3

401-K Investment Alternatives

Fund Style Characteristics (% of Portfolio) (data thru 9/30/2011)

Description	Stock	Bond	Cash & Other	Non-US Stock	Non-US Bond	Large	Mid	Small	Value	Blend	Growth
Target 2010	42	52	6	16	17	30	8	2	15	13	13
Target 2020	57	37	6	21	16	39	12	4	20	17	18
Target 2030	75	20	5	27	11	51	16	5	26	22	25
Target 2040	87	10	4	29	5	59	19	6	30	24	30
Int'l Equity Large Cap	92	0	8	92	0	83	4	0	22	28	38
Large Blend	96	0	4	22	0	82	14	1	27	35	33
Real Estate	97	0	3	1	0	42	39	13	12	53	29
Large Growth	100	0	0	15	0	63	27	2	2	14	76
Equity Income	67	29	4	5	3	61	4	0	26	25	13
Growth and Income	98	0	2	8	0	83	13	0	26	25	46
Intermediate Term Bond	0	88	11	0	15						
Mid Growth	87	0	13	16	0	1	50	34	14	27	45
Mid Cap Blend	94	0	6	11	0	35	56	3	27	26	41
Money Market	0	3	97	0	3						
S&P 500 Index	98	0	2	0	0	86	12	0	35	34	30

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TABLE 4
Data for Optimization Exercise (09/30/2011) (Steele Mutual Fund Pro Plus)

	Int'l Equity	Lg Blend	Real Estate	Lg Grth	Eqty Inc	Grth Inc	Interm Bond	Mid Grth	Mid Blnd	MM	S&P 500
Percent Invested											
2011 Return	-.173	-.118	-.072	-.083	-.093	-.118	.017	-.116	-.211	.000	-.090
2010 Return	.094	.141	.271	.185	0.124	.120	.086	.265	0.255	.000	.149
2009 Return	.391	.334	.325	.471	.235	.388	.136	.333	0.380	.003	.262
2008 Return	-.405	-.397	-.344	-.410	-.248	-.438	.046	-.283	-.417	.024	-.370
2007 Return	.190	.136	-.192	.231	.033	.107	.088	.127	.038	.050	.054
2006 Return	.219	.192	.371	.026	.125	.103	.037	.088	.164	.048	.156
2005 Return	.211	.117	.149	.072	.078	.082	.026	.171	.117	.030	.047
2004 Return	.197	.139	.385	.077	.118	.107	.049	.228	.293	.010	.107
2003 Return	.329	.320	.381	.386	.222	.263	.053	.387	.660	.008	.286
2002 Return	-.136	-.173	.028	-.199	-.083	-.178	.099	-.078	.014	.016	-.223
2001 Return	-.122	-.096	.057	-.131	-.022	-.104	.092	.096	-.083	.040	-.121
2000 Return	-.178	.043	.266	-.122	.202	-.056	.118	.171	.103	.062	-.092
1999 Return	.570	.246	.027	.372	.100	.183	-.005	.115	0.383	.049	.209
1998 Return	.155	.167	-.181	.273	.170	.212	.095	.067	-.327	.052	.284
1997 Return	.092	.267	.212	.146	.241	.274	.099	.184	-.295	.054	.331
1996 Return	.186	.200	.385	.288	.156	.197	.045	.181	.217	.052	.227
1995 Return	.129	.342	.111	.261	.326	.301	.194	.178	.309	.058	.370
Weights = 1	1	1	1	1	1	1	1	1	1	1	1
%Stocks	.42	.75	.92	.97	.67	0.98	0	.87	.94	0	.98
%Bonds	.52	.2	0	0	0.29	0	0.88	0	0	0.03	0
%Cash	.06	.05	.08	.03	.04	.02	.11	.13	.06	0.97	.02
%NonUS Stocks	.16	.27	.92	.01	.05	.08	0	.16	.11	0	0
%NonUS Bonds	.17	.11	0	0	.03	0	.15	0	0	.03	0
%Basic Materials	.07	.10	.00	.03	.01	.04	.00	.11	.13	.00	.03
%Consumer Cycical	.11	.10	.03	.07	.05	.11	.00	.12	.18	.00	.09
%Financial Svcs	.18	.10	.00	.05	.16	.13	.00	.08	.23	.00	.13
%Real Estate	.01	.01	.93	.00	.00	.00	.00	.02	.00	.00	.02
%Consumer Defensive	.09	.06	.00	.00	.07	.09	.00	.06	.00	.00	.12
%Healthcare	.09	.10	.00	.17	.07	.14	.00	.04	.06	.00	.11
%Utilities	.02	.03	.00	.00	.03	.03	.00	.00	.03	.00	.04
%Comm. Svc	.09	.05	.00	.01	.04	.03	.00	.00	.00	.00	.04
%Energy	.06	.13	.00	.10	.09	.12	.00	.07	.12	.00	.12
%Industrials	.11	.15	.01	.09	.06	.12	.00	.24	.06	.00	.12
%Tech	.08	.12	.00	.46	.06	.17	.00	.12	.13	.00	.17
% Large Cap	.3	.51	.83	.42	.61	.83	0	.01	.35	0	.86
% Mid Cap	.08	.16	.04	.39	.04	.13	0	.5	.56	0	.12
% Small Cap	.02	.05	0	.13	0	0	0	.34	.03	0	0
% Value	.15	.26	.22	.12	.26	.26	0	.14	.27	0	.35
% Blend	.13	.22	.28	.53	.25	.25	0	.27	.26	0	.34
% Growth	.13	.25	.38	.29	.13	.46	0	.45	.41	0	.3

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EXHIBIT 1

Selected Interest Rates (1953 to Present)
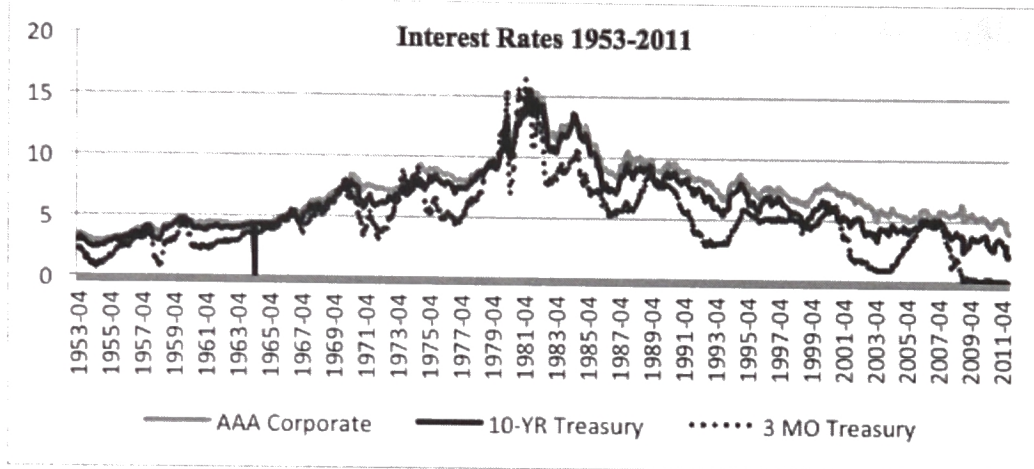
(Board of Governors of the Federal Reserve System (2011))

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