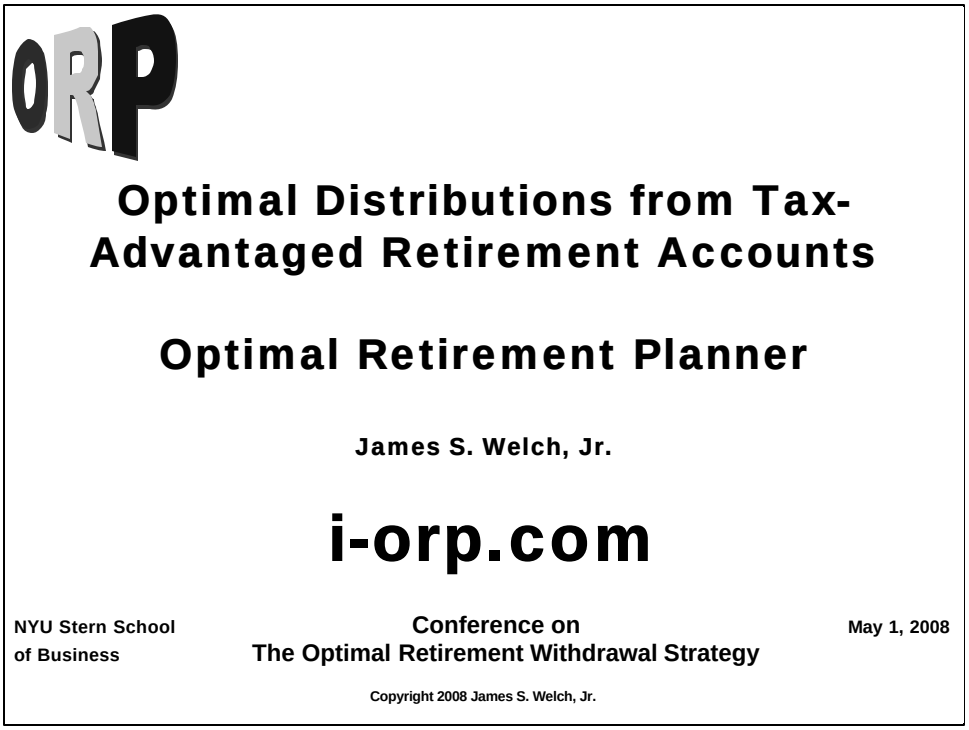


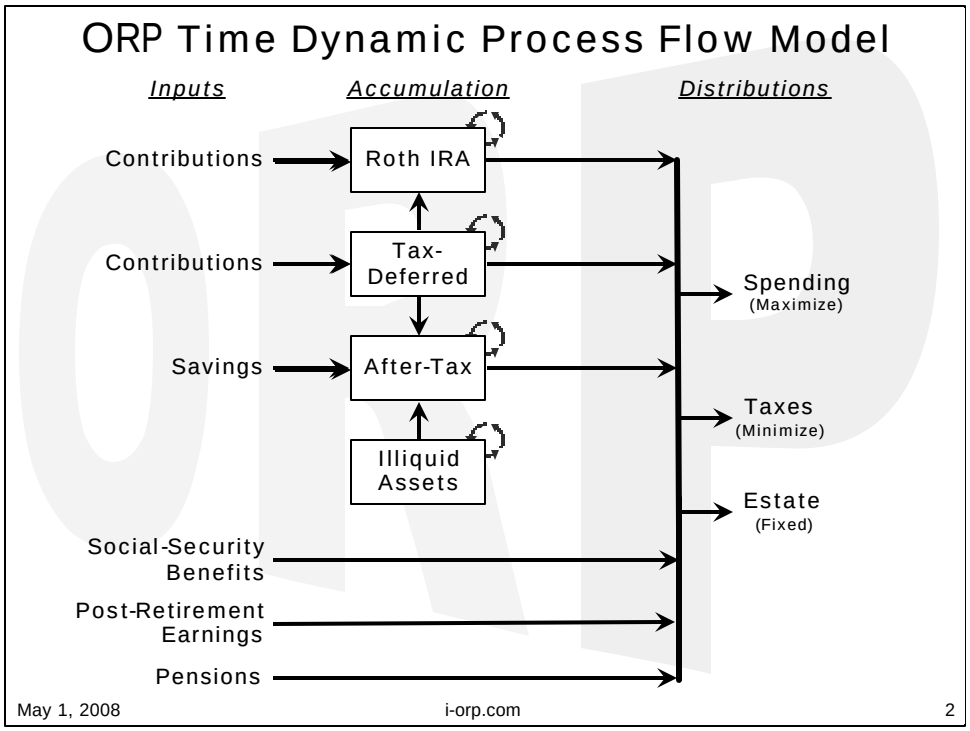
Retirement Planner: Models asset accumulation before retirement and asset distribution during retirement.

Optimal: Signifies that ORP is a Linear Programming Model, using commercial grade optimization software.

Creates an optimal withdrawal plan, scheduling withdrawals from retirement accounts and scheduling IRA to Roth IRA rollovers.

Available on the Internet at i-orp.com.

Transition: First a brief look at the model



ORP is a time-dynamic process flow model.

The **Flow** is dollars.

The **Process** is the storage and distribution of money in 4 asset classes.

Roth IRA: taxes are paid on contributions, no taxes on distribution.

Tax-deferred Account: No taxes are paid on contributions, all distributions are subjected to income taxes.

After-tax Account: No special tax treatment, taxes are paid on returns annually, no taxes on distributions.

Illiquid asset (your house) is an asset that cannot be disposed of in a piece meal fashion.

Time dynamic means that money is moved from one year to the next and increased by the rate of return.

Illiquid assets increase in value at the rate of inflation.

Before retirement-contributions increase the amount in retirement accounts.

After retirement, money comes out of all accounts.

Tax-deferred money can go to spending, be rolled over into the Roth Ira account, or (rarely) be moved to the After-tax account.

`Additional retirement income comes from Social Security benefits, post

ORP Withdrawal Plan

Age	TaxDef	AfterTax	RothIRA	SocSec	RothTrns	Taxes	Spending
65	172	150		48	172	-34	163
66	95	134		50	95	-14	169
67	98	139		51	98	-15	175
68	104	9	31	53		-15	181
69	107		42	55		-16	187
70	111		43	57		-16	194
71	115		45	59		-17	200
72	119		46	61		-18	207
73	123		48	63		-18	215
74	127		49	65		-19	222
75	132		51	68		-20	230
76	136		53	70		-20	238
77	141		55	73		-21	246
78	146		57	75		-22	255
79	151		59	78		-23	264
80	41	200		80	41	-6	273
81	14	203		83	14	-2	283
82	14	210		86	14	-2	293
83	15	217		89	15	-2	303
84	15	225		92	15	-2	313
85	16	96	121	95		-3	324

All dollar amounts are in thousands

May 1, 2008 i-orp.com 3

Heart of ORP: The Withdrawal Plan
Age down the side, distribution sources across the top.

- The three retirement accounts
- Social Security Benefits
- IRA to Roth IRA rollovers.
- Taxes paid
- Amount available for spending.

An activity is moving money out of or into one of these items in a particular year.

The numbers of this report are not as interesting as the overall pattern. The non zero values could be replaced with X's and still retain meaning.

In the 1st 3 years the After-tax account meets all spending needs.
In the first year a significant, partial IRA to Roth IRA rollover is scheduled.
In the 2nd and 3rd years partial IRA to Roth IRA are scheduled..
There was no Roth IRA account in this example before retirement.

From age 68 to 80 the IRA and Roth IRA are drawn down in parallel.

At age 80 the house in Scarsdale sold in favor of taking up residence in Bayview Gardens, Clearwater, FL.
The proceeds from the house sale go into the After-tax account.
From 80-84, the house proceeds meets living expenses.
A portion of the IRA is rolled over into the Roth IRA.
At the end of the plan the last year's income and estate comes from all three accounts.

Observations:

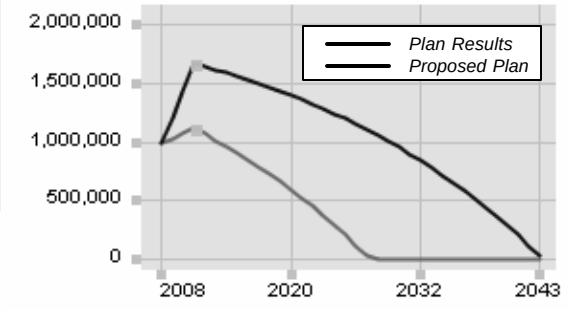
- During ages 66-79 income is taxed in the 15% tax bracket
- After 79 income is taxed in the 10% tax bracket.
- Withdrawals from the Tax-deferred account are made every year of the plan.
- The illiquid asset, the house, has a big impact on the plan.

Transition: How does this compare to conventional calculators?

Conventional Calculators

- Given:
  - **Age**
  - **Account Balances**
  - **Retirement Age**
  - ***Desired Retirement Spending***
- Compute:
  - **When the money runs out?**
- Example:

AARP Retirement Calculator Results



May 1, 2008 4

Answer: it beats me.

A brief sampling of the Internet seems to indicate that there more retirement calculators out there than porn sites.

Conventional retirement calculators: input age, assets, retirement age and the big wish, Desired Retirement Spending.

Calculator computes the age at which your assets run out and you become a burden to your heirs (green line).

AARP example includes advice about fixing that problem (blue line)..

Irony: AARP wants you to fix your problem by investing more. But the R in AARP is for retired. You are already retired. Additional savings are not an option. AARP should be helping you maximize your withdrawals, not lamenting the lack there of.

Transition: ORP is not your mother's retirement calculator.

ORP Reverses the Process

- **Given:**
  - **Age**
  - **Account balances**
  - **Retirement Age**
  - ***Estate***
  - ***Life Expectancy***
- **Compute:**
  - The maximum amount of money available for spending over the term of the plan.
- **Example:**

Base Scenario	
Annual After-tax Spending (in today's dollars):	**$137,700**
Assets at Retirement:	**$2,297,700**
Total Plan Value:	**$4,936,600**

May 1, 2008 i-orp.com 5

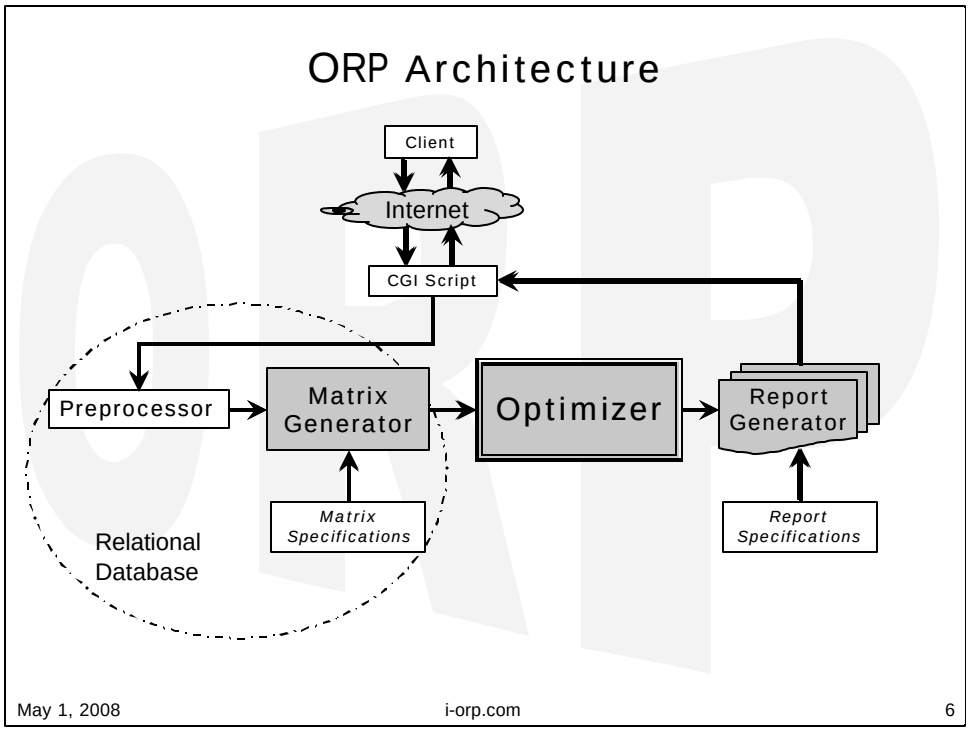
Same input as conventional calculator except the wish is replaced by desired estate and term of the plan

ORP maximizes the total amount of money available for spending (Total Plan Value)

ORP computes the maximum annual spending, after taxes, in today's dollars.

Assets at retirement can be used to compute the spending percentage, 6.5% in the example.

Transition: A peek behind the curtain.



ORP's is an Internet application:

ORP was originally developed to demonstrate implementating a computationally intensive process for the retail market.

The action begins with the client submitting your parameter form, which is sent into the internet and arrives at the ORP server in the basement of a building in Montgomery Industrial Park, Silver Spring, MD.

The Common Gateway Interface fields the parameters and puts them into a flat file.

An instance of a relation database, containing the model description, is generated.

The parameter file is evaluated by the preprocessor and a collection of matrix ready tables are stored in the database.

The Preprocessor contains the business rules of ORP.

The matrix generator uses the matrix description and the data tables to generate the LP matrix.

The matrix is a flat file in MPS3 format. It is an explicit representation of the LP matrix.

The optimizer solves the model and creates a solution file containing the activity level of every variable in the model.

The report generator uses the solution file to generate the formal reports and sends them to the CGI script.

The CGI script wraps the reports in HTML and forwards on to the client.

The size of the boxes here are indicative of the size of the components. The optimizer is 270K bytes.

The Matrix Generator and Optimizer are off the shelf software developed for other applications.

The rest of the system is unique to ORP.

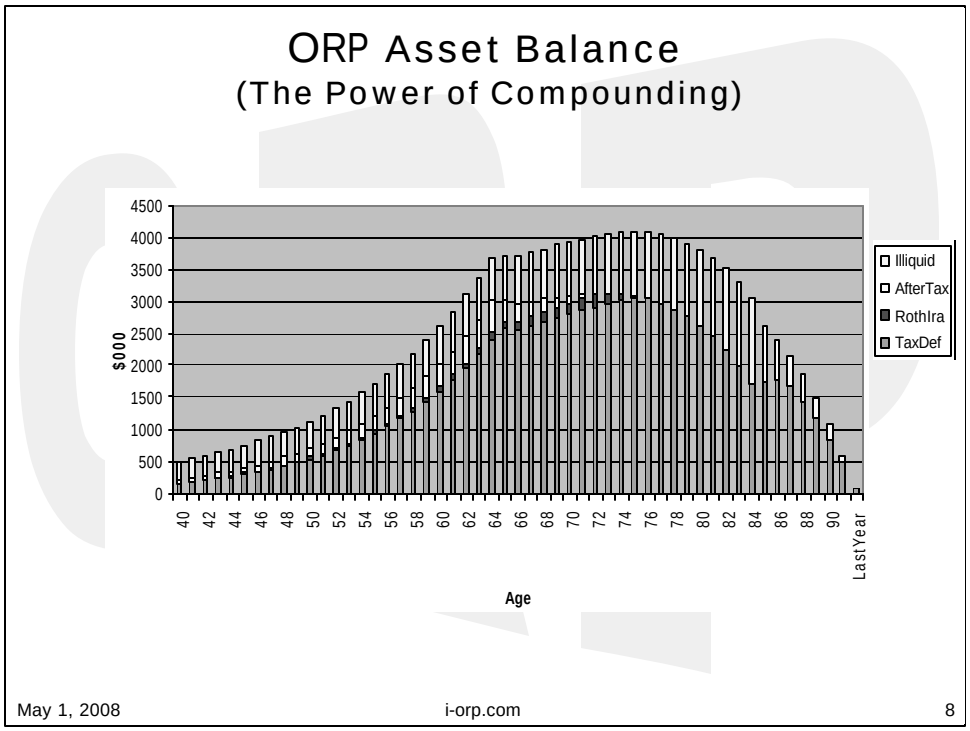
Finale: ORP is an Internet application available to anyone who can correctly type i-orp.com.

Thank you for your attention.

Example

- Married Couple, ages 60 and 57.
- Tax-deferred Accounts: $500K and $400K.
- After Tax-tax Account: $300K.
- Illiquid Asset (Home) $600K, sell at age 80.
- Social Security: $24K annually each.
- Asset Returns: 7%.
- Inflation: 3.5%.
- Retirement age: 65.
- Life Expectency: 85.
- Estate: $10K.

In the interests of full disclosure: Parameter for demonstration example.



Asset Balance Report, here in graphical form, shows the assets accumulated in each year of the plan.

Fixed on the left is the current age and assets.

Fixed on the right is the ending age and estate amount.

Demonstrates the power or saving plus compounding.

Shows that accumulation does not end at age 65 retirement.

Consumption of assets begins in mid 70's

Distribution is done in a controlled manner to the end of the plan.

INCOME BY FEDERAL TAX BRACKET

Age	NoTax	10	15	25
65	30	18	85	81
66	31	19	88	0
67	32	19	91	0
68	34	20	95	0
69	35	21	98	0
70	36	21	102	0
71	38	22	105	0
72	39	23	109	0
73	40	24	113	0
74	42	24	117	0
75	43	25	121	0
76	45	26	125	0
77	46	27	129	0
78	48	28	134	0
79	50	29	139	0
80	51	30	27	0
81	53	31	0	0
82	55	32	0	0
83	57	33	0	0
84	59	34	0	0
85	61	36	0	0

Shows the amount of money taxed in each progressive tax bracket in each year.

The large IRA to Roth IRA in age 65 indicates the ORP found economic advantage to paying the extra tax in the first year.

Distributions in Perspective

Age	Total	TaxDef	AfterTax	RothIRA	SocSec	RothTrns	Taxes	Spending	Drawdown	Note
64	2,297									
65	2,292	172	150	0	48	172	-34	163	6.5%	163
66	2,275	95	134	0	50	95	-14	169	5.8%	169
67	2,252	98	139	0	51	98	-15	175	6.1%	175
68	2,224	104	9	31	53	0	-15	181	6.4%	181
69	2,189	107	0	42	55	0	-16	187	6.7%	187
70	2,146	111	0	43	57	0	-16	194	7.0%	194
71	2,094	115	0	45	59	0	-17	200	7.5%	200
72	2,033	119	0	46	61	0	-18	207	7.9%	207
73	1,962	123	0	48	63	0	-18	215	8.4%	215
74	1,879	127	0	49	65	0	-19	222	9.0%	222
75	1,785	132	0	51	68	0	-20	230	9.7%	230
76	1,677	136	0	53	70	0	-20	238	10.6%	238
77	1,556	141	0	55	73	0	-21	246	11.7%	246
78	1,419	146	0	57	75	0	-22	255	13.0%	255
79	1,267	151	0	59	78	0	-23	264	14.8%	264
80	955	41	200	0	80	41	-6	273	15.8%	273
81	800	14	203	0	83	14	-2	283	21.3%	283
82	630	14	210	0	86	14	-2	293	26.3%	293
83	445	15	217	0	89	15	-2	303	34.4%	303
84	243	15	225	0	92	15	-2	313	50.6%	313
85	24	16	96	121	95	0	-3	324	95.9%	324

May 1, 2008 i-orp.com 10

This is a composite spreadsheet of the asset balance and withdrawal reports.

The 2nd column is the total assets in the plan for each year.

Column 10: The each year's drawdown = Tax-Def drawdown + After-Tax drawdown + Roth IRA drawdown

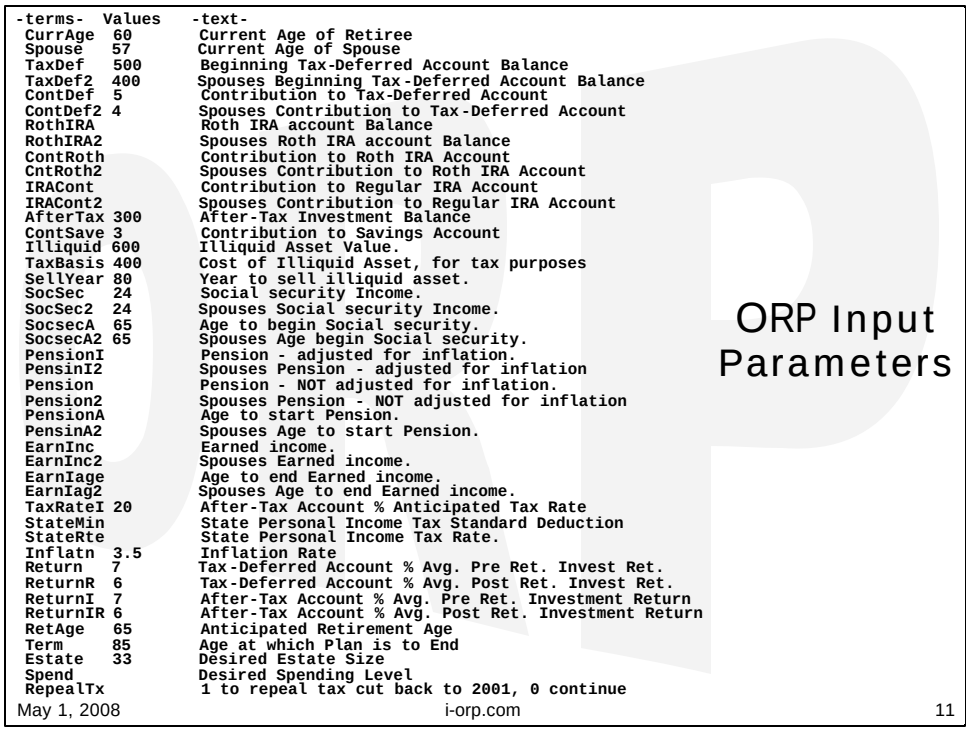
Drawdown % = This year's drawdown/(Last Year's Ending Balance)

At age 80. switch to living off proceeds of sale of illiquid asset. Tax is on 80% of Social Security benefits.

Age 85 Only the estate is left.

Column 11 -Note: Initial withdrawal * inflation of 3.5%, compounded. Compare to ORP's Spending column

Column 3-9 are taken from the Withdrawal Report.



ORP Parameters for the demonstration model.

Linear Program

- Constraints
  - **For *i* = *m*; *m* < *n***

$$\sum_{j=1}^{n} a_{ij} x_j = b_i$$

- Objective Function
  - **Maximize f, subject to constraints**

$$f = \sum_{j=1}^{n} c_j x_j$$

May 1, 2008 i-orp.com 12

Definition of a Linear Programming Model.

A set of m equations defined over n variable each with a constant coefficient.

Since there are more variable than equations there are many solutions to this system.

A f function that assigns a cost or profit to each variable.

Find the solution to the equations that maximizes f.

The Author

PHOTO HERE

James S. Welch, Jr. has been a full time, professional computer programmer since he started on UNIVAC I in 1954. He concentrates on special purpose database management system development, large database accounting applications, and large scale mathematical programming systems. He developed the Optimal Retirement Planner (ORP), a linear programming (LP) based retirement calculator. ORP demonstrates a computationally intensive application composed mostly of commercial mathematical software can be available to the retail market over the Internet (i-orp.com). ORP has developed a cult following of users who find it useful for the strategic planning of optimal asset distribution during retirement.

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