



**JACOBS LEVY EQUITY  
MANAGEMENT CENTER**  
FOR QUANTITATIVE FINANCIAL RESEARCH

# Guided Choice as Proof of Concept

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## Background

- In 1999 Sherrie Grabot, CEO of GuidedChoice told me of her strategy for entering the 401(k) advisory industry using a different business model than anyone else used then.
- I expressed great interest, gave her a copy of *Individual Versus Institutional Investing* (Markowitz 1991).
- I explained that it outlined a “Game of Life” computer simulation that included a family’s health, housing, educational achievements and plans, skill sets, social security, insurance, etc., in addition to investment decisions.
- I did not propose that GuidedChoice create a complete Game-of- Life model.
- Rather I proposed it as an ideal, a North Star, towards which we would direct our model-building, starting with our immediate objective of helping investors save for their retirement.

## -Computer Assisted Portfolio Selection: Theory & Practice

- written for this occasion
- includes general information about the history and operations of GuidedChoice
- discusses three technical questions worked out by the GuidedChoice R&D team
  - needed in the development of GuidedChoice's two products

GuidedSavings

GuidedSpending

- needed for the future development of  
The Game-of-Life

-Topics appeared in sections titled

Database design

Utility functions

Principal Components Analysis (PCA)

- General reason for struggling with such issues
  - The devil is in the details
  - Huge projects invite huge disasters
  - Do not start vast projects with half-vast ideas

## Database design

Used the EAS-E (Entity, Attribute, Set and Event)  
view of system description

An extract from the actual GuidedChoice EAS  
specification follows by way of illustration

# Exhibit 1 GuidedChoice EAS Table (Extract)

ENT TYPE	ATTR	OWNS	Data/Memb TYPE	PREC (*)	COMMENT
Person	Person_id		ID		
	First_name		Text	32	
	Last_name		Text	32	
	Middle_initial		Char	1	
	Birth_date		Date		<Today
	Soc_sec_num		Char	11	
	Gender		Char	1	.=MF
	Contact_info		Contact_info_id		
	Country_of_legal_residence		Text	32	
	Marital_status		Char	1	YN
	Why_in_DB		Char	1	.=PSB(Partcpnt, Spouse,both)
	Other_income		Number		Not in Account's Person_comps
	Total_income		Number		
	Retirement_age		Integer		
	Ret_income_goal_DorP		Char	1	D P
	AT_ret_income_goal		Number		
	Spouse		person_id		Person
	Expenses_worksheet		Expenses_worksheet_id		
	Nr_dependents		Integer	2	
	Sign_ons		Authorization_memo		>=1 source doc says this is set?
	Dependents		Dependant		?should this be hooked onto marriage?
	GC_accounts		Account		
	Portfolios		Portfolio		
	Positions		Position		.= positions in all of Person's portfolios
	Pensions		Pension		
	Planned_disbursements		Planned_disbursement		

	Non_GC_plans	Non_GC_plan	Plans of Person rprsntng spouse go here
Dependent			
Dependent_id	ID		
Participant	Person_id		
Dependent_name	Text	32	
Dependent_birthdate	Date		>=Today
Dependent_gender	Char	1	.=M F
Planned_disbursement			Person
Planned_disbursement_id	ID		
Participant	Person_id		
Dependent	Dependent_		.=0 if not for college
Disbursement_period	Char		.=M Q S Y
Disbursement_amt	Number		
Inflation_adjust_amt	Char	1	YN
Start_date	Date		
End_date	Date		>=Start_date
Disbursement_type	Integer		
Disbursement_name	Text	128	
Account			
Account_id	ID		
Participant	Person_id		
Plan	Plan_id		
Sponsor	Sponsor_id		
Contact_info	Contact_info_id		
Tax_state	Text	32	1 of 2 !=""
Spouse	Spouse_id		
Employee_status	Enum		1 Active 2 Hardship 3 Terminated
Eligibility_date	Date		



Eligibility_match	Char	1	YN
Eligibility_pension	Char	1	YN
Years_service	Integer		
Highly_compensated	Char	1	YN
Hire_date	Date		<=Today
GC_advice_accepted	Char	1	YN
Start_advice_date	Date		
End_advice_date	Date		
Eligibility_profit_share	Char	1	YN
Phone_access	Char	1	YN
Annual_salary	Number		
Pretax_earnings	Number		
Posttax_earnings	Number		
Last_use	Date		<=Today
RK_update_date	Date		
Accepted_case	GC_case_id		
Date_case_accepted	Date		
Base_case	GC_case_id		
Initial_advice	GC_case_id		
Modified_advice	GC_case_id		
Next_case	GC_case_id		
Last_session	Session_id		
OK_rcvd_prime_bnf_NE_spouse	Char	1	YN OK received for prime beneficiary not spouse
Beneficiaries	Beneficiary		
Portfolios	Portfolio		
Person_Comp_types	Person_Comp_type		
Contrib_spec_PorD	Char	1	P D If Plan permits either P (%) or D (\$)
Current_contribs	Contrib_instruction		
BT_contrib_allocs	Contrib_allocation		
AT_contrib_allocs	Contrib_allocation		
PS_contrib_allocs	Contrib_allocation		
Archived_cases	GC_case		

## Portfolio

Portfolio_id	ID		
Participant	Person_id		
Account	Account_id		NULL if not owned by GC_Account
Tax_type	Investment_tax_type_id		Enum in EJB; Entity in Administrator
Portfolio_name	Text	128	
Accum_AT_contrib	Number		
Monthly_planned_contrib_dlr	Number		
Inflation_adjust_contrib	Char	1	YN
Positions	Position		
AC_exposures	Exposure		

## Position

Position_id	ID		
Security	Security_id		
Portfolio	Portfolio_id		
Person	Person_id		
Security_type	Security_type	32	Must be on security type list
Tax_type	Enum		
Quantity	Number		Shares or face value
Valuation_method	Enum		Mkt price, user price, user total
User_supplied_price	Number		
Date_of_user_info	Date		
Total_value	Number		
Restricted_for_participant	Char	1	YN Company requirement
Date_unrestricted	Date		
Total_cost_basis	Number		

Originally developed as part of  
SIMSCRIPT (I): A simulation Programming Language

SIMSCRIPT II, “Applicable to database as well as  
simulated systems”

Used for a great variety of complex dynamic systems

Markowitz, H.M. (1963) SIMSCRIPT in Encyclopedia of  
Computer Science and Technology, Vol. 13, Marcel Dekker. Inc.  
New York and Basel

Cited Markowitz articles reproduced in

Markowitz, H.M. (2010) Selected Works, World Scientific.

Can be used as a planning tool even when programs are not written in SIMSCRIPT.

Jacobs, Bruce I., Kenneth N. Levy, and Harry M. Markowitz (2004) *Financial Market Simulation*, Journal of Portfolio Management (30<sup>th</sup> Anniversary) pp. 142-152.

## In GuidedChoice

Helped planning process

Helped align plan and implementation

Helps document system for new employees  
and maintenance

## Utility Functions

Define that which is to be sought.

A great model and a faulty utility function is like having a great car and then driving off in the wrong direction.

# Principal Components Analysis (PCA)

“Autocorrelated Pearson Type IV PC distributions”

Need to attract others to make substantial further progress towards a Game of Life “decision support system”

My plan:

I’m writing a book

Markowitz, H.M., K. A. Blay (2013) “Risk-Return Analysis: The Theory and Practice of Rational Investing.” McGraw-Hill



Four volumes expand on, bring up-to-date Chapters 10, 11, 12 and 13 of Markowitz (1959).

Volume I (like Chapter 10)

Single period, known odds (in print)

Volume II (like Chapter 11)

Many period, known odds

(Includes Game of Life.) Due at McGraw-Hill 3/31/2015

Volume III (like Chapter 12)

Uncertainty. Due at McGraw-Hill 3/31/2017

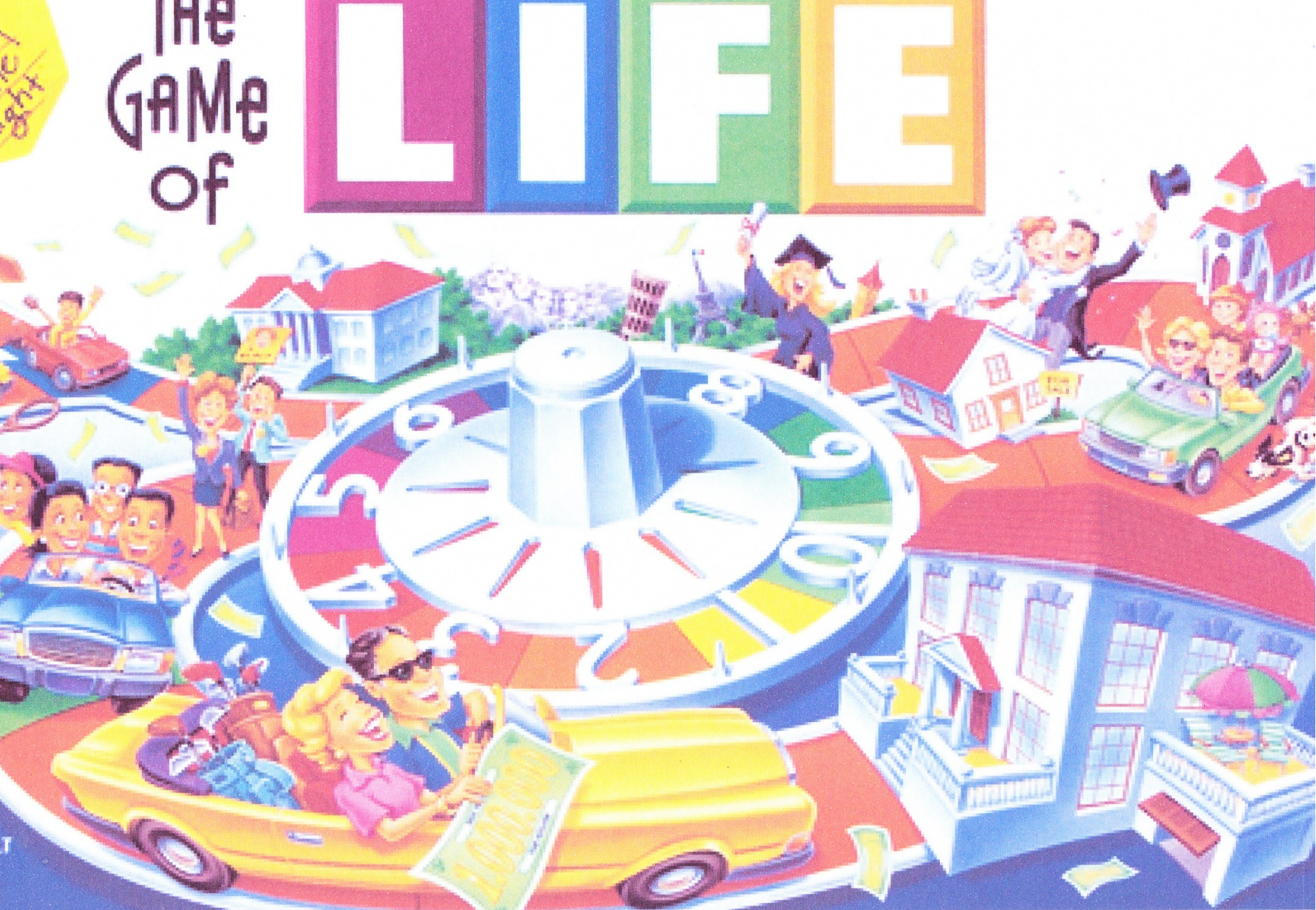
Volume IV (like Chapter 13)

Further application considerations. Due at McGraw-Hill 3/31/2019

So far so good

Making progress on Volume II

If I do complete all four volumes it will be largely due to Mrs. Markowitz's dinners of lots of vegetables and a bit of fish.



1000 Ways to Play