

Modelling LP : An Investment Problem



An Investment Problem: Retirement Planning Services, Inc.

A client wishes to invest \$750,000 in the following bonds.

Company Return Maturity R	Years to			
	ating			
Acme Chemical 8.65% 11 1-Ex	xcellent			
DynaStar 9.50% 10 3-	Good			
Eagle Vision 10.00% 6 4	-Fair			
Micro Modeling 8.75% 10 1-Ex	xcellent			
OptiPro 9.25% 7 3-	Good			
Sabre Systems9.00%132-Ver	ry Good			

Investment Restrictions

- No more than 25% can be invested in any single company.
- At least 50% should be invested in long-term bonds (maturing in 10+ years).
- No more than 35% can be invested in DynaStar, Eagle Vision, and OptiPro.



Defining the Decision Variables

 X_1 = amount of money to invest in Acme Chemical X_2 = amount of money to invest in DynaStar X_3 = amount of money to invest in Eagle Vision X_4 = amount of money to invest in MicroModeling X_5 = amount of money to invest in OptiPro X_6 = amount of money to invest in Sabre Systems



Defining the Objective Function

Maximize the total annual investment return:

MAX: $.0865X_1 + .095X_2 + .10X_3 + .0875X_4 + .0925X_5 + .09X_6$



Defining the Constraints

Total amount is invested

 $X_1 + X_2 + X_3 + X_4 + X_5 + X_6 = 750,000$

- No more than 25% in any one investment
 X_i <= 187,500, for all *i*
- 50% long term investment restriction. $X_1 + X_2 + X_4 + X_6 >= 375,000$
- 35% Restriction on DynaStar, Eagle Vision, and OptiPro. $X_2 + X_3 + X_5 \le 262,500$
- Nonnegativity conditions
 X_i >= 0 for all *i*



Implementing the Model

		Retirement Planning Services, Inc.					
	Amount	Maximum		Years to	10+ years?		Good or worse?
Bond	Invested	25,0%	Return	Maturity	(1-yes, 0-no)	Rating	(1-yes, 0-no)
ACME Chemical	\$187.500	\$187.500	8,65%	11	1	1-Excellent	0
DynaStar	\$75.000	\$187.500	9,50%	10	1	3-Good	1
Eagle Vision	\$187.500	\$187.500	10,00%	6	0	4-Fair	1
MicroModeling	\$187.500	\$187.500	8,75%	10	1	1-Excellent	0
OptiPro	\$0	\$187.500	9,25%	7	0	3-Good	1
Sabre Systems	\$187.500	\$187.500	9,00%	13	1	2-Very Good	0
Total Invested:	\$825.000	Total:	\$75.375	Total:	\$637.500	Total:	\$262.500
Total Available:	\$750.000			Required:	\$375.000	Allowed:	\$262.500