Financial Portfolio

There are a number of techniques for creating ``optimal'' portfolios. The optimality of a portfolio depends heavily on the model used for defining risk and other aspects of financial instruments. Here is a particularly simple model that is amenable to linear programming techniques. Consider a mortgage team with $100,000,000 to finance various investments. There are five categories of loans, each with an associated return and risk (1-10, 1 best):

Loan/investment	Return (%)	Risk
First mortgages	9	3
Second mortgages	12	6
Personal loans	15	8
Commercial loans	8	2
Government securities	6	1

Any uninvested money goes into a savings account with no risk and 3% return. The goal for the mortgage team is to allocate the money to the categories so as to:
(a) Maximize the average return per dollar
(b) Have an average risk of no more than 5 (all averages and fractions taken over the invested money (not over the saving account)).
(c) Invest at least 20% in commercial loans
(d) The amount in second mortgages and personal loans combined should be no higher than the amount in first mortgages.

Related link for Financial Portfolio Optimization:
http://riot.ieor.berkeley.edu/~portfoli/portfolio/mainportfolio.html

Discussion
Optimal portfolios do not just happen: they must be calculated, and there is a constant interplay between models and solvability. Linear programming models provide great modeling power with a great limit: the handling of risk must be done in a linear fashion (like our Risk factors here). Other models you will see in finance will look at the co-variance of returns between investments, a fundamentally nonlinear effect. This can give rise to nonlinear models like those that try to minimize variance subject to return requirements. It is very difficult to embed idiosyncratic constraints (like (c) and (d) here) in such models.