

# Portfolio Optimization

Companies today operate in highly competitive environments characterized by competing goals, numerous sources of uncertainty, large amounts of data, and complex constraints. AIR's Decision Analytics team offers a sophisticated approach to portfolio optimization designed to define, test, and solve difficult business problems. Through consulting services and custom decision engines, AIR brings to the table an unmatched combination of catastrophe modeling expertise, industry experience, and advanced analytics to provide companies with a competitive edge.

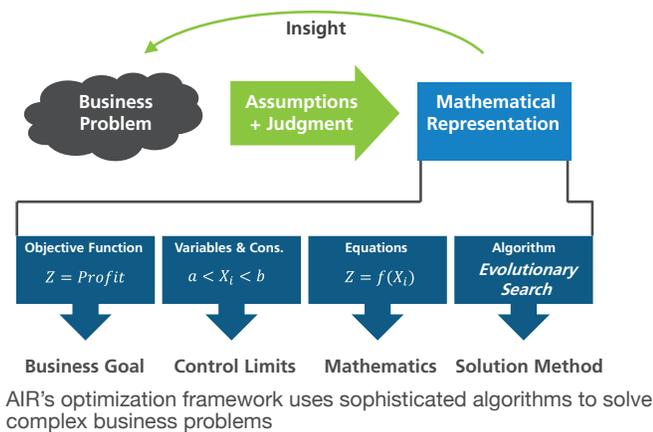


Portfolio management is the process of pursuing business objectives while balancing risk and return. AIR’s customized portfolio optimization solutions provide companies with an analytical framework and repeatable processes that can be used to improve portfolio management—now and in the future.

### Portfolio Optimization Framework

Business problems can be ambiguous and multi-faceted. Formulating them in mathematical terms helps define their qualitative aspects, identify key issues and constraints, and resolve competing objectives.

Portfolio optimization is an ongoing and dynamic process of constant improvement, rather than a snapshot analysis. Evolving markets, regulatory restrictions, and new business objectives need to be continually reassessed and incorporated into the optimization process. An ideal framework must be able to provide actionable solutions that fit current business needs and are flexible enough to promote profitable long-term growth.



**DEFINING BUSINESS OBJECTIVES** The journey is as important as the goal. The process of defining the business problem, creating the optimization framework, and questioning assumptions along the way reveals invaluable information about the business itself. Critical questions will arise and demand answers—questions such as:

- What objective function represents our business goals?
- What are the appropriate risk and return metrics?
- Which variables are under our control and what are their constraints?
- How sensitive are results to uncertainties, or to alternative goals, constraints, and assumptions?
- How does underwriting intuition compare to the optimal results?
- What constraints did we potentially overlook?

### Custom Solutions Achieve Targeted Goals

AIR’s Decision Analytics team works with companies to develop custom solutions that incorporate strategic objectives. This close collaboration between AIR and the client’s risk management, catastrophe modeling, actuarial, and underwriting departments generates the insights necessary to solve complex business problems.

**ENHANCED POLICY SELECTION** Portfolio managers are faced with deciding what policies to underwrite and at what price, where to expand or contract operations, and how to maximize profits while meeting regulatory and investor constraints. AIR’s Decision Analytics team can help your company formulate an underwriting strategy for profitable growth.

**IMPROVED PRICING DECISIONS** The optimal portfolio is often dependent on the level of pricing achieved. Embedding pricing optimization within the overall underwriting strategy can help ensure that risk adjusted return on capital or similar constraints are satisfied.

**OPTIMIZED PARTICIPATION IN RESIDUAL MARKETS** To minimize total underwriting and assessment losses, AIR’s Decision Analytics team can provide guidance on how best to incorporate residual market participation into your risk management and underwriting strategy.



Embedded pricing optimization

**IMPROVED REINSURANCE CONTRACT SELECTION**

**AIR** can help determine the optimal level of participation in reinsurance contracts to maximize profitability and limit risk exposure. The optimization framework is built to evaluate sensitivity to key relationships, contract availability, and capital structure.

**OPTIMIZED ILS INVESTMENTS** **AIR** has unmatched experience with insurance-linked securities and catastrophe bond modeling. The Decision Analytics team can help determine an optimal ILS portfolio and create a trading framework that evaluates buying and selling opportunities based on market prices, new issuances, and changes in available capital.

**Advanced Methods to Evaluate Portfolio Performance**

The solution space that encompasses all possible combinations of policies is immense. **AIR** employs a variety of methods to search for the most appropriate solution and to test alternative assumptions.

**AIR**'s toolkit includes evolution strategies, simulated annealing, steepest gradient "hill climbing", and linear programming algorithms. Some of the more commonly used methods, such as policy ranking and steepest gradient, are order-dependent and impose restrictions that decrease the likelihood of finding the optimum solution or finding multiple well-performing local optimums. The stochastic search algorithms used by **AIR** overcome these restrictions.

While most problems are nonlinear, linear transformations can be used to quickly find solutions that serve as the starting point for more advanced algorithms. The fast feedback of these systems provides the speed and flexibility to test uncertainties in key parameters and model alternate "what-if" scenarios to explore the sensitivity of decision strategies to alternative business goals and constraints.

While many companies currently explore optimization initiatives, **AIR** is uniquely positioned to combine the advanced analytics, insurance expertise, and comprehensive understanding of catastrophe risk needed to take your approach to the next level.

**The Efficient Frontier Illustrates Risk-Return Trade-Offs**

Comparing your current underwriting strategy to the efficient frontier can help answer numerous questions, including:

- How far am I away from the optimum? How much business can I write at my current capital level?
- What is my current ratio of return-to-risk? What could it be?
- Is the change in return for a change in risk worth expanding or reducing business?
- What gains can be realized from writing more business and should I raise capital or purchase more reinsurance to get there?
- How do my conclusions change based on alternative risk and return metrics?

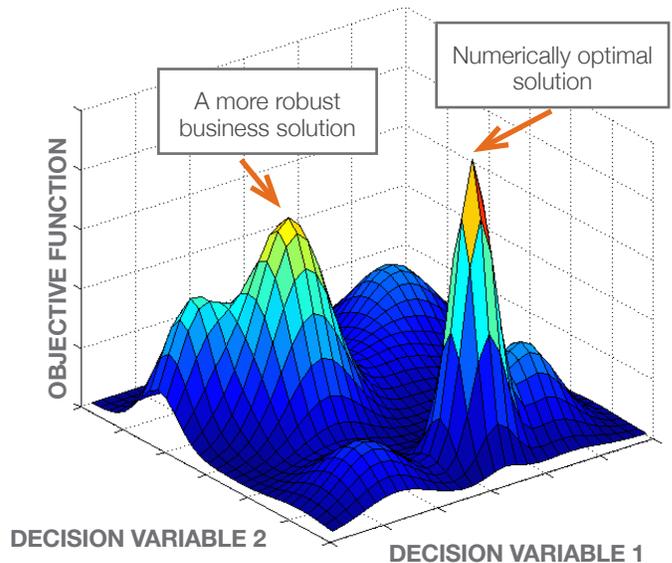


The efficient frontier plots the set of optimal portfolios that offer the highest expected return for a given amount of risk

## Decision Maps Offer Insight on Alternative Solutions

Due to business constraints, numerically optimal solutions may not be feasible in practice. To find additional well-performing solutions, AIR creates a decision map to illustrate the solution landscape, allowing decision-makers to compare a diverse range of underwriting strategies.

Decision maps show the path to the numerically optimal solution, but also offer insight into alternatives that may be easier to implement or have less uncertainty. Decision maps also show whether the landscape surrounding a solution is steep or flat, which gives an indication of the solution's robustness to changes in the business environment.



AIR's decision maps allow companies to compare different underwriting strategies

## Highlights

- Designed to accommodate sensitivity in company objectives, business constraints, and modeled losses
- Combines catastrophe modeling expertise, industry experience, and advanced analytics to improve decision making and provide implementable solutions
- Offers a full range of custom solutions to help companies choose the most appropriate strategy
- Features scalability to grow as a company's business grows
- Enhances decision making by incorporating catastrophe model output, exposure management, reinsurance costs, investment income and non-catastrophe expenses

## ABOUT AIR WORLDWIDE

AIR Worldwide (AIR) provides risk modeling solutions that make individuals, businesses, and society more resilient to extreme events. In 1987, AIR Worldwide founded the catastrophe modeling industry and today models the risk from natural catastrophes, terrorism, pandemics, casualty catastrophes, and cyber attacks, globally. Insurance, reinsurance, financial, corporate, and government clients rely on AIR's advanced science, software, and consulting services for catastrophe risk management, insurance-linked securities, site-specific engineering analyses, and agricultural risk management. AIR Worldwide, a Verisk ([Nasdaq:VRSK](https://www.nasdaq.com/symbol/vrsk)) business, is headquartered in Boston with additional offices in North America, Europe, and Asia. For more information, please visit [www.air-worldwide.com](http://www.air-worldwide.com).