**Financial Portfolio Optimization — Blair & Rosen, Inc**

# DATA

**DESCRIPTION INTERNET FUND BLUE CHIP FUND TOTAL AVAILABLE**

|  |  |  |  |
| --- | --- | --- | --- |
| **Investment Limit ($)** | 35,000 | - | 50,000 |
| **Projected Annual Return** | 12% | 9% | **-** |
| **Risk Rating per $1,000** | 6 | 4 | **-** |
| **Risk Tolerance** | **-** | **-** | 240 |

𝐿𝑒𝑡

𝑭𝒖𝒏𝒅𝒔 = {𝐼𝑛𝑡𝑒𝑟𝑛𝑒𝑡, 𝐵𝑙𝑢𝑒𝐶ℎ𝑖𝑝} 𝑟𝑒𝑝𝑟𝑒𝑠𝑒𝑛𝑡 𝑡ℎ𝑒 𝑠𝑒𝑡 𝑜𝑓 𝑖𝑛𝑣𝑒𝑠𝑡𝑚𝑒𝑛𝑡 𝑓𝑢𝑛𝑑𝑠.

𝒓𝒆𝒕𝒖𝒓𝒊 = 𝐸𝑥𝑝𝑒𝑐𝑡𝑒𝑑 𝑎𝑛𝑛𝑢𝑎𝑙 𝑟𝑒𝑡𝑢𝑟𝑛 𝑎𝑠 𝑎 𝑝𝑒𝑟𝑐𝑒𝑛𝑡𝑎𝑔𝑒 𝑓𝑜𝑟 𝑓𝑢𝑛𝑑 𝑖, 𝑖 ∈ 𝑭𝒖𝒏𝒅𝒔

𝒎𝒂𝒙𝑰𝒏𝒗𝒆𝒔𝒕𝒊 = 𝑀𝑎𝑥𝑖𝑚𝑢𝑚 𝑎𝑙𝑙𝑜𝑤𝑒𝑑 𝑖𝑛𝑣𝑒𝑠𝑡𝑚𝑒𝑛𝑡 𝑓𝑜𝑟 𝑓𝑢𝑛𝑑 𝑖, 𝑖 ∈ 𝑭𝒖𝒏𝒅𝒔

𝒓𝒊𝒔𝒌𝒊 = 𝑅𝑖𝑠𝑘 𝑟𝑎𝑡𝑖𝑛𝑔 𝑝𝑒𝑟 $1,000 𝑖𝑛𝑣𝑒𝑠𝑡𝑒𝑑 𝑓𝑜𝑟 𝑓𝑢𝑛𝑑 𝑖, 𝑖 ∈ 𝑭𝒖𝒏𝒅𝒔  
 𝒕𝒐𝒕𝒂𝒍𝑭𝒖𝒏𝒅𝒔 = 𝑇𝑜𝑡𝑎𝑙 𝑎𝑚𝑜𝑢𝑛𝑡 𝑜𝑓 𝑎𝑣𝑎𝑖𝑙𝑎𝑏𝑙𝑒 𝑐𝑎𝑝𝑖𝑡𝑎𝑙 𝑓𝑜𝑟 𝑖𝑛𝑣𝑒𝑠𝑡𝑚𝑒𝑛𝑡 𝑓𝑢𝑛𝑑𝑠 𝑖, 𝑖 ∈ 𝑭𝒖𝒏𝒅𝒔 𝒓𝒊𝒔𝒌𝑳𝒊𝒎𝒊𝒕 = 𝑀𝑎𝑥𝑖𝑚𝑢𝑚 𝑎𝑙𝑙𝑜𝑤𝑎𝑏𝑙𝑒 𝑟𝑖𝑠𝑘 𝑝𝑜𝑖𝑛𝑡𝑠 𝑓𝑜𝑟 𝑎𝑙𝑙 𝑓𝑢𝑛𝑑𝑠 𝑐𝑜𝑚𝑏𝑖𝑛𝑒𝑑 𝑓𝑢𝑛𝑑 𝑖, 𝑖 ∈ 𝑭𝒖𝒏𝒅𝒔

# Objective in Words

**Decide**: how to allocate funds to the Internet and Blue-Chip investments for each period, with the following considerations:

1. **Internet Fund Allocation**: The amount to invest in the Internet fund for each period.
2. **Blue Chip Fund Allocation**: The amount to invest in the Blue-Chip fund for each period.

**so that,** overall **profit is maximized**:

|  |  |
| --- | --- |
| Profit = (Return from the Internet fund + Return from the Blue-Chip fund) - (Risk-related | |
| costs of the investments) |  |

**Subject to the following Constraints:**

**Constraints:**

* The total amount invested across both funds must be at or below $50,000.
* Investment in the Internet fund must not cross $35,000.
* Total risk of rating of the portfolio must be 240 risk points or less
* Non-negativity Constraint

# Decision Variables

* 𝐿𝑒𝑡 𝑥𝑖𝑛𝑡𝑒𝑟𝑛𝑡 𝑟𝑒𝑝𝑟𝑒𝑠𝑒𝑛𝑡 𝑡ℎ𝑒 𝑑𝑜𝑙𝑙𝑎𝑟 𝑎𝑚𝑜𝑢𝑛𝑡 𝑖𝑛𝑣𝑒𝑠𝑡𝑒𝑑 𝑖𝑛 𝑡ℎ𝑒 𝐼𝑛𝑡𝑒𝑟𝑛𝑒𝑡 𝑓𝑢𝑛𝑑.
* 𝐿𝑒𝑡 𝑥𝐵𝑙𝑢𝑒𝐶ℎ𝑖𝑝 𝑟𝑒𝑝𝑟𝑒𝑠𝑒𝑛𝑡 𝑡ℎ𝑒 𝑑𝑜𝑙𝑙𝑎𝑟 𝑎𝑚𝑜𝑢𝑛𝑡 𝑖𝑛𝑣𝑒𝑠𝑡𝑒𝑑 𝑖𝑛 𝑡ℎ𝑒 𝐵𝑙𝑢𝑒 𝐶ℎ𝑖𝑝 𝑓𝑢𝑛𝑑.

**Algebraic Formulation:**

**Objective (Profit Maximization):**

|  |  |
| --- | --- |
| max | 𝑖 ∈ 𝐹𝑢𝑛𝑑 𝑟𝑒𝑡𝑢𝑟𝑛𝑖 ⋅ 𝑥𝑖 |

**Subject to the following constraints:**

1.𝑇𝑜𝑡𝑎𝑙 𝐼𝑛𝑣𝑒𝑠𝑡𝑚𝑒𝑛𝑡 𝐶𝑜𝑛𝑠𝑡𝑟𝑎𝑖𝑛𝑡 (𝑅𝑖𝑠𝑘 ― 𝑏𝑎𝑠𝑒𝑑) :

|  |
| --- |
| 𝑖 ∈ 𝐹𝑢𝑛𝑑𝑠 𝑟𝑖𝑠𝑘𝑖 ⋅ 𝑥𝑖 ≤ 50,000 |

1. 𝐿𝑖𝑚𝑖𝑡 𝑜𝑛 𝐼𝑛𝑣𝑒𝑠𝑡𝑚𝑒𝑛𝑡 𝑖𝑛 𝑡ℎ𝑒 𝐼𝑛𝑡𝑒𝑟𝑛𝑒𝑡 𝐹𝑢𝑛𝑑:

|  |  |
| --- | --- |
| 𝑥𝐼𝑛𝑡𝑒𝑟𝑛𝑒𝑡 | ≤ 35,000 |

𝑥𝑖

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1111111111111

|  |
| --- |
| ≤ 240 |

1. 𝑅𝑖𝑠𝑘 𝑅𝑎𝑡𝑖𝑛𝑔 𝐿𝑖𝑚𝑖𝑡: 𝑖 ∈ 𝐹𝑢𝑛𝑑𝑠 𝑟𝑖𝑠𝑘𝑖𝑥𝑖 ∗

1000

1. *(Non - negativity Constraint):*

𝑥𝐼𝑛𝑡𝑒𝑟𝑛𝑒𝑡 ≥ 0

𝑥𝐵𝑙𝑢𝑒𝐶ℎ𝑖𝑝 ≥ 0

𝑥𝑖, ≥ 0

# Implementation

|  |  |
| --- | --- |
| An implementation and solution of the model using Python, AMPL,Excel Solver is below : | |
| <https://drive.google.com/drive/folders/11v68JRr44gT1mBGnoi5BVZaENfcAubPQ> |  |

# Results

The best recommendation for Blair & Rosen, Inc. is to advise their client to allocate **$20,000 to the Internet Fund** and **$30,000 to the Blue-Chip** Fund, which will yield the **highest possible return of $5,100   
  
  
  
Conclusion:**

* The portfolio allocation of $20,000 in the Internet fund and $30,000 in the Blue-Chip fund is the optimal solution for maximizing the client’s return while staying within the specified risk of 240 and the investment limit of $50,000.
* The client can expect an annual return of $5,100 from this portfolio. This is the best possible outcome given the restrictions, balancing a higher return from the riskier Internet fund with the stability and lower risk of the Blue-Chip fund**.**

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| Transcript link: https://chatgpt.com/share/6752a11d-8564-8000-9b8d- | |
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