Results matter!

Yield Optimization

Keywords: analytic geometry, quadratic equation, systems of equations, equation of a circle

When making investment decisions, it is not enough to rely on simple linear models — the market is dynamic and full of uncertainty. Building an optimal investment portfolio therefore requires an approach that takes into account not only the expected return, but also the risk and other constraints, such as available financial resources or diversification requirements. The returns of individual assets cannot be determined precisely in advance — their behavior is influenced by many factors, which is why models based on quadratic functions are needed. This approach — now known as modern portfolio theory — laid the foundation for a new perspective on investing. For their fundamental contributions to this field, Harry Markowitz, William Sharpe, and Merton Miller were awarded the Nobel Prize in 1990.

These problems thus lead to so-called quadratic programming tasks, a branch of mathematical optimization that focuses on finding extrema (typically minima or maxima) of a quadratic function over a set of points defined by linear equations and inequalities.

The Influencer's Path to Success

An aspiring influencer hopes to grow their follower count on Instagram and TikTok through post promotion and paid advertising. According to available data, investing 10,000 CZK in Instagram promotion is expected to gain 1,000 new followers, and the same investment in TikTok ads is expected to bring in 1,000 new followers on that platform. Thanks to a special offer, the influencer can spend at most 20,000 CZK on Instagram promotion and 10,000 CZK on TikTok advertising.

Exercise 1. How much should the influencer spend on promotion and advertising on each social media platform in order to come as close as possible to gaining 3,000 followers on Instagram and 2,000 followers on TikTok?

Exercise 2. How does the solution to Exercise 1 change if the target is 1,000 followers on Instagram and 3,000 on TikTok?