

# A Linear Algebra Primer for Financial Engineering: Covariance Matrices, Eigenvectors, OLS, and more (Financial Engineering Advanced Background Series)

Dan Stefanica



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This book covers linear algebra methods for financial engineering applications from a numerical point of view. The book contains many such applications, as well as pseudocodes, numerical examples, and questions often asked in interviews for quantitative positions.

#### **Financial Applications**

- The Arrow—Debreu one period market model
- One period index options arbitrage
- Covariance and correlation matrix estimation from time series data
- Ordinary least squares for implied volatility computation
- Minimum variance portfolios and maximum return portfolios
- Value at Risk and portfolio VaR

#### **Linear Algebra Topics**

- LU and Cholesky decompositions and linear solvers
- Optimal solvers for tridiagonal symmetric positive matrices
- Ordinary least squares and linear regression
- Linear Transformation Property
- Efficient cubic spline interpolation
- Multivariate normal random variables

The book is written in a similar spirit as the best selling ``A Primer for the Mathematics of Financial Engineering" by the same author, and should accordingly be useful to a similarly large audience:

• Prospective students for financial engineering or mathematical finance programs will be able to self-study material that will prove very important in their future studies

• Finance practitioners will find mathematical underpinnings for many methods used in practice, furthering the ability to expand upon these methods

• Academics teaching financial engineering courses will be able to use this book as textbook, or as reference book for numerical linear algebra methods with financial applications.

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