Financial Math Qualifier Topics, Part 2

Representative Texbooks:

- G. Anderson and A. Kercheval, Lectures on Financial Mathematics: Discrete Asset Pricing, Springer, 2010
- Martin Baxter and Andrew Rennie, Financial Calculus, Cambridge Univ. Press, 1996
- R. Grinold and R. Kahn, Active Portfolio Management,2nd ed., McGraw-Hill, 2000
- Tomas Bjork - Arbitrage Theory in Continuous Time-Oxford University Press, USA (4th edition-2020)

Topics for Part 2

Part 2A

1. Vector description of portfolios and the portfolio property for excess returns
2. Betas, specific return, specific risk
3. The market model and factor models of risk
4. Sharpe ratio, efficient frontier, Information ratio, utility functions
5. CAPM, consensus returns
6. Constrained optimization; characteristic portfolios; optimal utility and value added

Part 2B

1. The general finite time, finite state space pricing model for n assets.
2. Three kinds of arbitrage, relations and examples; local arbitrage; Law of One Price
3. self-financing strategies; the fundamental theorems of asset pricing, completeness
4. Martingale measures and derivative pricing formulas
5. Computational examples

6. Forward and futures prices; forward measure

Part 2C

1. Brownian motion, Ito calculus, simple SDEs
2. Radon-Nikodym derivative, change of measure for conditional expectation
3. Moment generating function for a Normal
4. Cameron-Martin-Girsanov Theorem, Martingale representation theorem; Novikov's theorem for exponential martingales
5. Self-financing strategies; the Black-Scholes model
6. Replicating strategies and the martingale pricing formula; general terminal value pricing
7. Pure discount bonds, yields, forward rates
8. Simple forward rate models