

Fall 2008 Course Offering
Math 490
An Introduction to Mathematical Finance
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Description: In 1997, Robert Merton and Myron Scholes received the Nobel prize for their work on pricing securities derivatives. An example of a securities derivative is European call option, which is a contract that gives the owner the right, but not the obligation, to purchase a specific security (e.g., a particular stock) at a set time for a set price. By trading such an option, an investor can hedge against the risk associated with market volatility. For example, suppose that an investor believes that the price of a certain stock will be high at some time in the future. Rather than purchasing the stock, the investor could instead purchase a call option. Then, the investor can decide whether or not to exercise the option based on the actual stock price.

Pricing securities derivatives emerged as an important concern in the late 1960's and early 1970's when a relaxation in the regulations allowed insurance companies and banks to invest in the derivatives market. At about that time, two economists, Fisher Black and Myron Scholes, developed a mathematically based pricing strategy, which Robert Merton later simplified and expanded. This work had a profound impact on the trading practices in financial markets worldwide. Sadly, Black passed away prior to 1997, and therefore was ineligible to be a co-Nobel prize recipient.

In the course, we will examine a simplified version of this body of work. In particular, we will analyze the multi-period Cox-Ross-Rubenstein (CRR) model and the finite market model using some of the key principles and methodologies that Black, Scholes, and Merton developed to construct their derivatives pricing theory. Despite the fact that these models are very simple, the analysis will illustrate certain essential aspects of their work such as dynamic hedging and the risk neutral probability measure. We will use the analysis of the multi-period CRR model to derive some of the Black-Scholes pricing formulas. Finally, if time permits, we will also use the risk neutral probability to solve certain portfolio optimization problems.

Prerequisites: Math 440, Math 350 or Math 370, and Math 374 with grade of C or better. Specifically, students need to understand the concept of random variable, expected value, and conditional probability. Students also need to be proficient in writing mathematical proofs and comfortable working abstractly with systems of linearly equations.

Registration: Interested students should contact the instructor via email to discuss their preparation and to obtain a permission number, apuha@csusm.edu.