

# Option Pricing: a probabilistic approach

Arthur Mendes Alves; Prof. dr. Adriano De Cezaro  
Universidade Federal de Rio Grande; Instituto de Matemática, Estatística e Física  
Avenida Itália, km 8, Bairro Carreiros, 96201-900, Rio Grande, RS, Brazil  
arthur\_six@hotmail.com, adrianocezaro@furg.br

October 01, 2014

This paper concerns the study of option pricing by modelling a discrete-time process, which will lead us to an specific binomial model created by John C. Cox, Stephen Ross e Mark Rubinstein in 1979 (*CRR model*, see [3]). The good definition of a binomial model depends on some factors such as: arbitrage-free complete market and risk-neutral measure. The assumptions above will be explained through selected topics of the Probability Theory and Martingales, characterizing a stochastic process in discrete-time situations as well.

Another aspect of this work is related to binomial approximations. Following a sequence of discrete-time models in which the continuous-time price process are approximated by discrete-time stochastic process, our intention is examining the properties of a sequence of CRR models as well as distribution convergence to obtain the celebrated Black-Scholes formula.

**Keywords:** risk-neutral measure, CRR model, complete markets, binomial approximations.

## References

- [1] Kiesel, R., and Bingham, N.H., *Risk-Neutral Valuation - Pricing and Hedging of Financial Derivatives*, Springer, London - uk, 2004.
- [2] Williams, M., *Fundamentals of the Options Market*, The McGraw-Hill Companies, Inc., New York - US, 2001.
- [3] Cox, John C.; Ross, Stephen A., and Rubinstein, M., *Option Pricing: A simplified approach*, Journal of Financial Economics - North-Holland Publishing Company, Berkeley - US, 1979.
- [4] James, Barry R., *Probabilidade: um curso em nível intermediário*, Projeto Euclides - IMPA, Rio de Janeiro - RJ - Brasil, 2011.