R Package Development

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Contents

Chapter 1

Introduction

1.1 Abstract

This is the brief of my STAT0035 Project, topic "R Package Development".

1.2 Literature Review

Chapter 2

Methodology

2.1 Cox, Ross & Rubinstein Binomial Lattice Model

The Cox, Ross, Rubinstein (CRR) Binomial Model was introduced by

2.2 Phelim Boyle Trinomial Lattice Model

Extending the Binomial model, the Trinomial Lattice model was introduced by Phelim Boyle in 1988 [1].

```
Trinomial <- function(K, S, u, r, t, n, sigma = 0,
    type = "call",
    style = "European",
    all = FALSE,
    plot = FALSE) {

# Restrict u != 1

dt <- T/n
M <- exp(r * dt)
V <- M^2 * (exp(sigma^2 * dt) - 1)
p1 <- ((V + M^2 - M) * u - (M - 1)) / ((u - 1) * (u^2 - 1))
p3 <- (u^2 * (V + M^2 - M) - u^3 * (M - 1)) / ((u - 1) * (u^2 - 1))
p2 <- 1 - p1 - p3

price_tree <- Trinomial.tree(S, u, n)
Sn <- price_tree[n + 1, ]

if (type == "call") {
fn <- sapply(Sn, function(x) {max(x - K, 0)})
} else if (type == "put") {
fn <- sapply(Sn, function(x) {max(K - x, 0)})
}

price <- Trinomial.rnv(fn, p1, p2, p3, r, n, dt, K, S = price_tree, type =
type, style = style)

```

```
if (all) {
list(
"price" = price,
"p" = c(p1, p2, p3),
"price_tree" = price_tree
)
} else {
price
}
}
```

Bibliography

[1] P. P. Boyle, "A lattice framework for option pricing with two state variables," *Journal of Financial and Quantitative Analysis*, vol. 23, 3 1988.