**Parametric VaR for Options Assignment**

**VaR for Bonds**

1. Consider a portfolio that has a single bond (which we will call BONOA) with a nominal value of $55,000 that pays a semi-annual coupon rate of 5% and has a maturity date of 4 years. The current interest rate is 6.5%, and the next rate change will be in 7 days, determine:

a) The price of the bond

|  |  |  |
| --- | --- | --- |
| **Tiempo** | **Cupon** | **VP** |
| 0.5 | 2750 | 2664.75871 |
| 1 | 2750 | 2582.15962 |
| 1.5 | 2750 | 2502.12085 |
| 2 | 2750 | 2424.56303 |
| 2.5 | 2750 | 2349.40925 |
| 3 | 2750 | 2276.585 |
| 3.5 | 2750 | 2206.01808 |
| 4 | 57750 | 44890.4085 |
|  |  | **$ 61,896.02** |

$61,896

b) The duration as well as the modified duration

A table with numbers and letters

AI-generated content may be incorrect.

# D=3.43 MD=3.22

1. If the volatility of the interest rate of the bond is 0.75%, determine the volatility of the bond 0.1572%
2. Determine the VaR of the bond at 99% confidence

# $225.67

1. What is the VaR timing? Explain

La periocidad del VaR es semanal, ya que el cambio en la tasa ocurre en 7 días.

2. Consider a portfolio that has a single bond (which we will call BONOB) with a nominal value of $13,000 that pays an annual coupon rate of 1% and has a maturity date of 12 years. The current interest rate is 3.5%, and the next rate change will be in 7 days, determine:

a) The price of the bond

A table with numbers and dollar signs

AI-generated content may be incorrect.

9,859.42

1. The duration as well as the modified duration

A table of numbers and symbols

AI-generated content may be incorrect.

D=11.24 MD=10.86

1. The volatility of the bond

# 0.2853%

d) If the volatility of the interest rate of the bond is 0.75%, determine the VaR of the bond at 99% confidence

# $65.25

1. What is the VaR timing? Explain

La periocidad del VaR es semanal, ya que el cambio en la tasa ocurre en 7 días.

1. Use the relationship between the individual VaR and the portfolio VaR to determine the VaR of a portfolio that contains the previously specified BONOA and BONOB. Suppose the correlation between the interest rates of both bonds is 25%. $250.10

1. Use the variance-covariance matrix to determine the VaR of the portfolio at 3.

**VaR for Options**

1. Identify the class notes where we learned the parametric VaR for Options and support yourself on the content for this assignment.
2. Consider that the delta of Options on TLEVISA.CPO is 0.25, which means that, if the price of TLEVISA.CPO increases by $1, the price of each Option increases by 25 cents. TLEVISACPO is currently valuated at $27.03 and has a daily volatility of 2.15%. Use what you learned in 2, to;
   1. Calculate VaR for 3 days at 99% of a portfolio that has 100 Options.

VaR=-58.38

* 1. Find the portfolio delta.

1. Consider delta for Options on BIMBOA is 0.70, which means that, if the price of BIMBOA increases by $1, the price of each Option, it increases by 70 cents. BIMBOA is currently valuated at $33.47 and has a daily volatility of 1.5%.
   1. Calculate VaR for 3 days at 99% of a portfolio that has 250 Options.

VaR=-353.05

* 1. Find the portfolio delta.

1. If the correlation between TLEVISACPO and BIMBOA is 0.18, use the result of 2 (a), 3(a) and the relation between the VaR of a portfolio and the individual VaRs to calculate VaR for a portfolio composed by both instruments (described in 2 and 3).

VaR=-368.06

1. Use the results obtained in 2b), 3b) and the form of VaR estimation, using portfolio deltas, to find the VaR at 99% for 3 days of a portfolio that is composed by the instruments described in 2 and 3
2. The Black and Scholes model allows you to calculate the delta for an Option. Use the information provided in class, using , to determinate the delta of a Call Option and a Put Option with the following characteristics; Spot Price $40, Strike Price $45, Annual Interest Rate of 6%, Annual Volatility of 25% and a maturity of 3 months.

* Long call:
* Short call: -
* Long put:
* Short put:

LC=0.4622 CC=-0.4622 LP=-0.5378 CP=0.5378