









































$$\text{with } d_1 = \frac{Y + K_i - X_i}{\sigma \sqrt{t}} \sqrt{\frac{1}{2} + \frac{1}{2} \sqrt{1 + \frac{2r}{\sigma^2}}}$$

Then,  $G(X_t; Y_t; t; T)$  is equal to:

$$G(X_t; Y_t; t; T) = \frac{1}{\sigma \sqrt{t}} \int_{-\infty}^{\infty} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{1}{2} \left(\frac{Y + K_i - X_i - d_1 \sigma \sqrt{t}}{\sigma \sqrt{t}}\right)^2\right) f(Y) dY$$

Using the fact that  $\int_{-\infty}^{\infty} f(u) \exp(-a + bu) du = \exp\left(-a + \frac{b^2}{1+b^2}\right)$ ; this becomes:

$$G(X_t; Y_t; t; T) = \frac{1}{\sigma \sqrt{t}} \exp\left(-\frac{1}{2} \left(\frac{Y + K_i - X_i}{\sigma \sqrt{t}}\right)^2\right) + \frac{1}{\sigma \sqrt{t}} \exp\left(\frac{1}{2} \left(\frac{Y + K_i - X_i}{\sigma \sqrt{t}}\right)^2\right)$$

and consequently the price of a call is equal to:

$$C(r_t; X_t; Y_t; t; T) = B(r_t; t; T) \left[ \frac{1}{\sigma \sqrt{t}} \exp\left(-\frac{1}{2} \left(\frac{Y + K_i - X_i}{\sigma \sqrt{t}}\right)^2\right) + \frac{1}{\sigma \sqrt{t}} \exp\left(\frac{1}{2} \left(\frac{Y + K_i - X_i}{\sigma \sqrt{t}}\right)^2\right) \right]$$



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## 9. FIGURES AND TABLES

	X	Y	S
®	0.3	0.1	0:189707 (5:033Ei <sup>3</sup> )
-	0.1	0.06	0:039902 (1:97Ei <sup>4</sup> )
¾	0.04	0.03	0:036256 (4:68Ei <sup>4</sup> )

Table 1: Parameters values

(Standard deviation of the estimators are reported in parentheses)

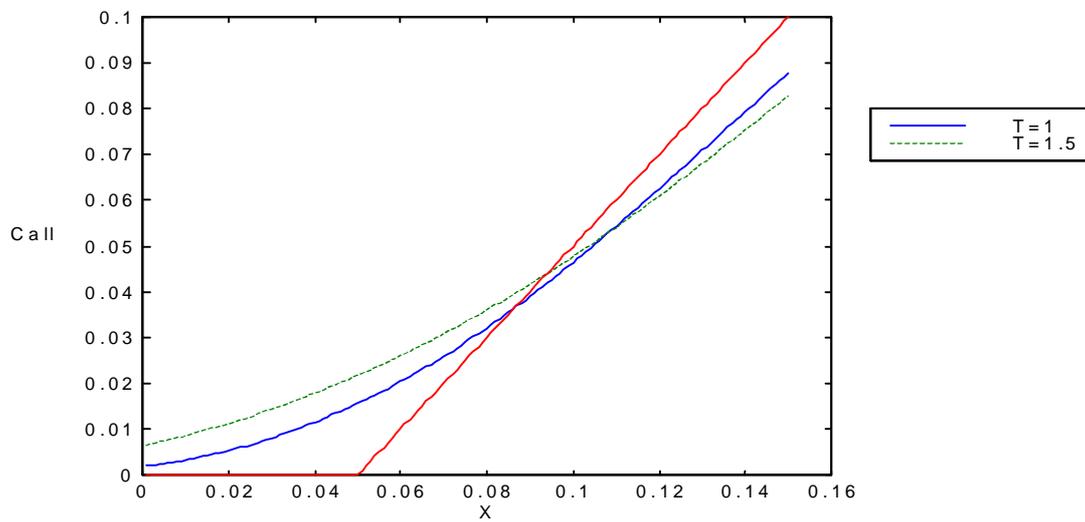


Figure 9.1: Value of a Call with respect to X

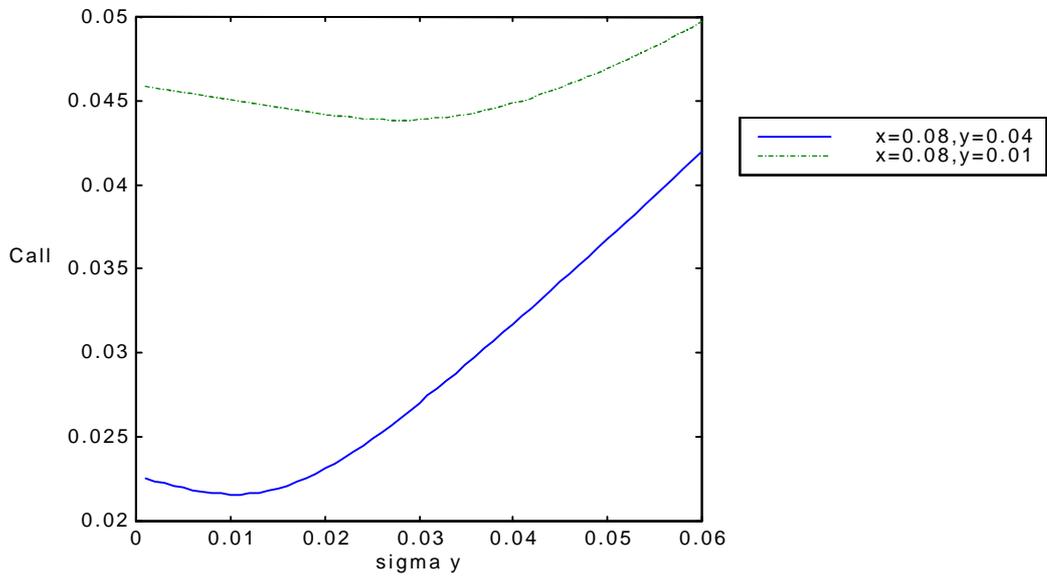


Figure 9.2: Value of a call with respect to  $\frac{3}{4}\gamma$

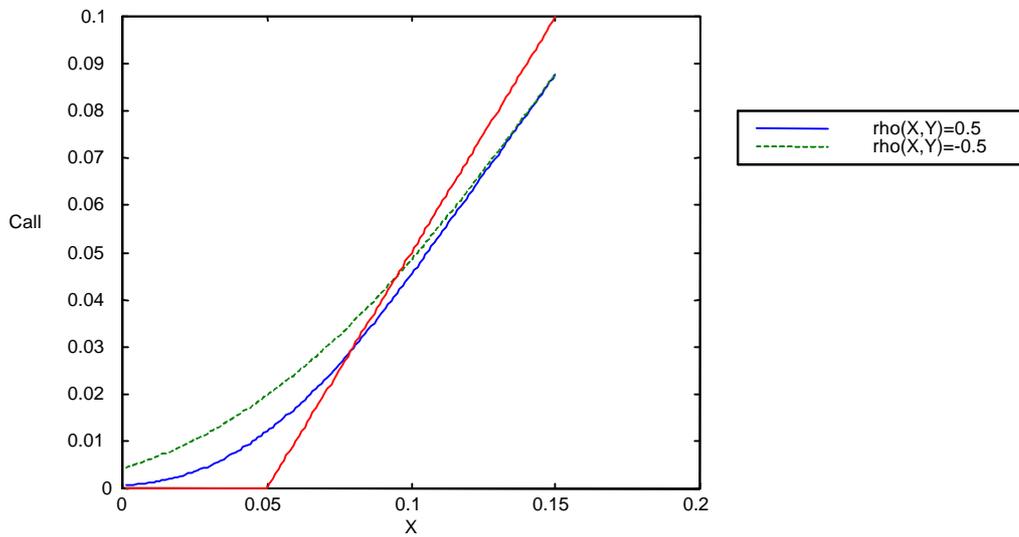


Figure 9.3: Value of a Call with respect to X

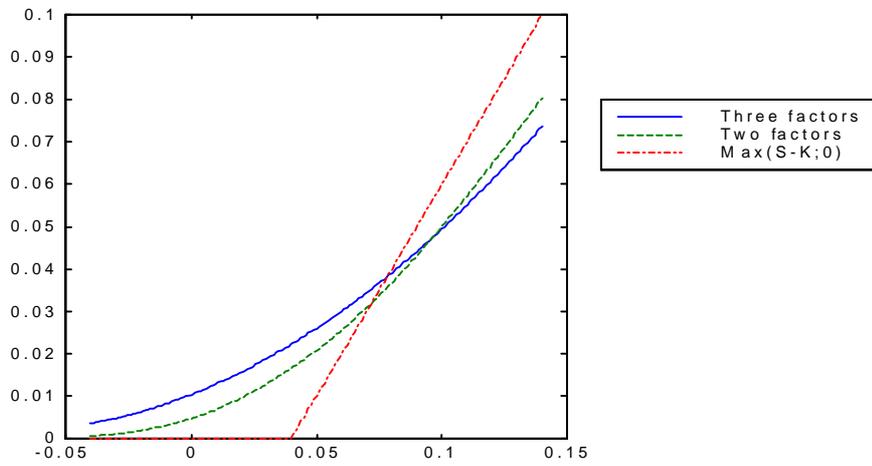


Figure 9.4: Value of a Call on spread with respect to the spread ( $X$  varies,  $Y = 0.06$ ,  $K = 0.04$ )

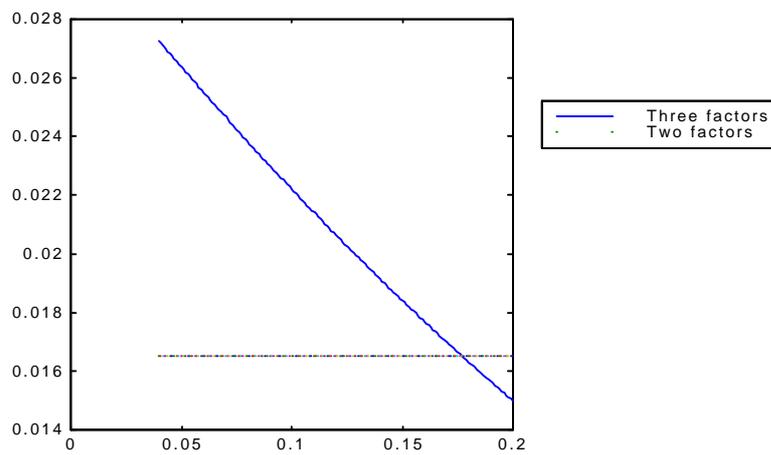


Figure 9.5: Value of a call with respect to  $X$  (with  $X_j$ ,  $Y = 0.04$ ,  $K = 0.04$ )