



Credit Risk Spreads in Domestic and Foreign Currencies

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Bankruptcy and Creditor rights

Varies very much among countries!

In the USA:

Bankruptcy Reform Act of 1978 has 15 chapters

Liquidation (Chapter 7)

Reorganization (Chapter 11)

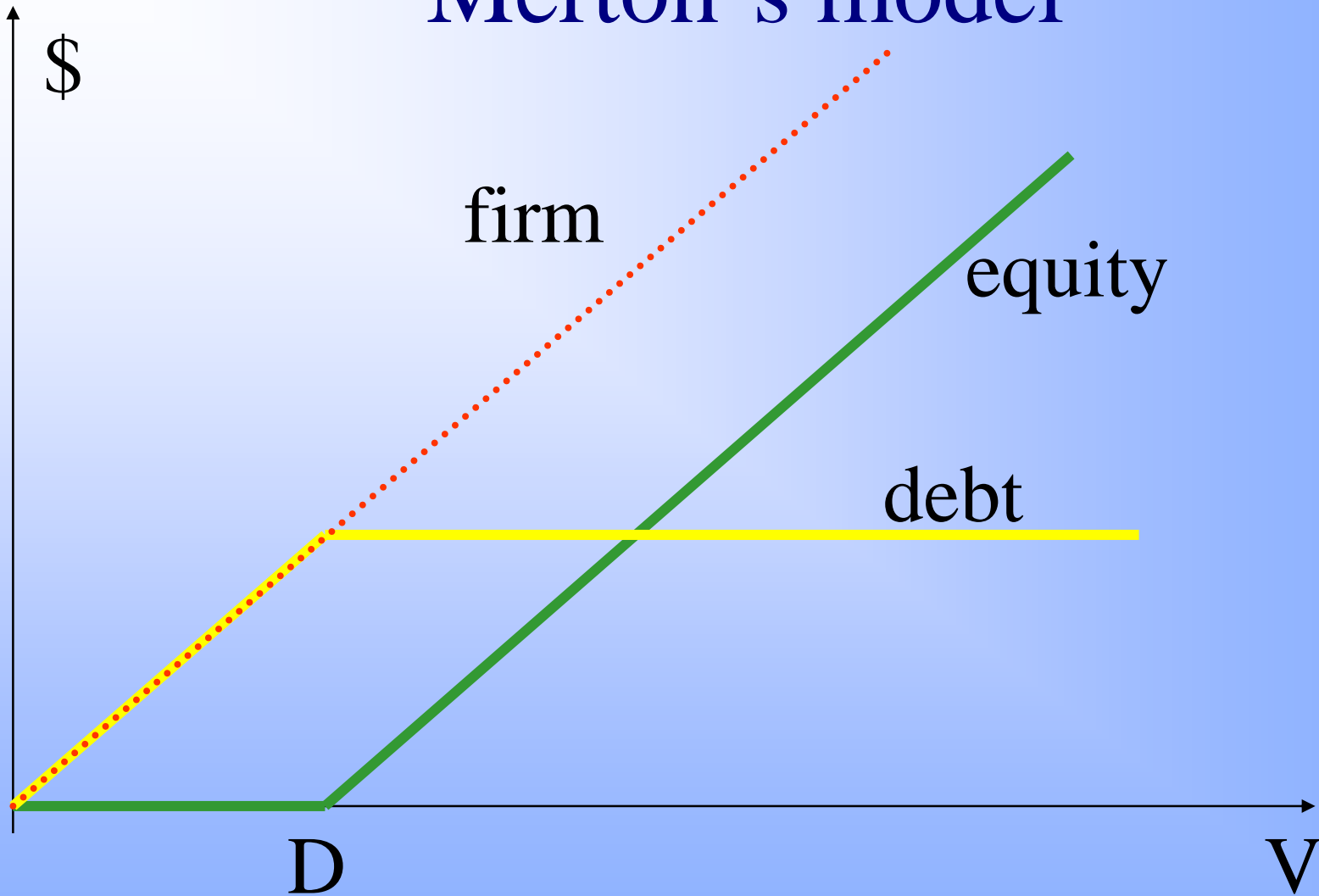
Bankruptcy and Credit Rights

liquidation - all assets will be distributed

reorganization - a new corporate entity will result

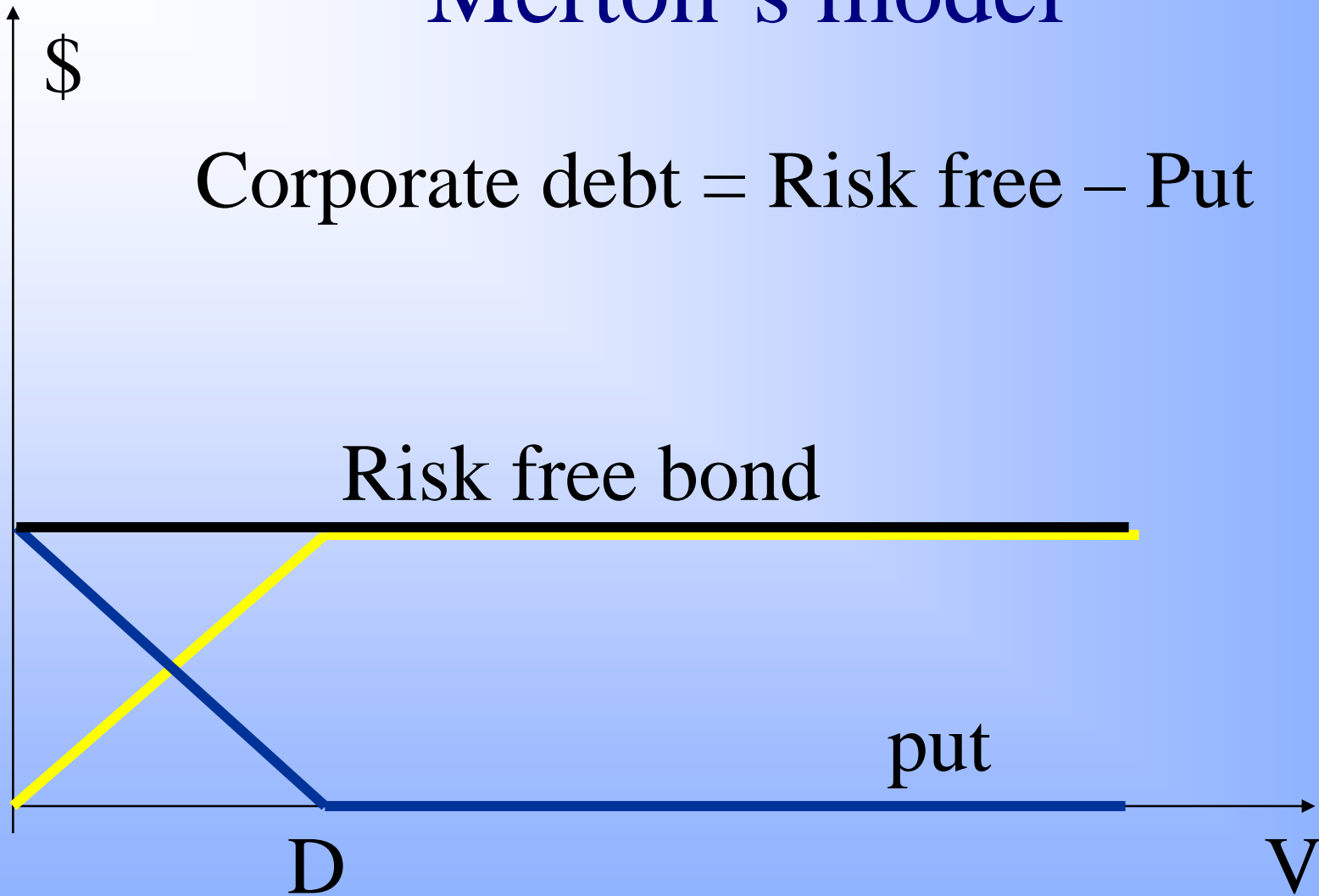
a company that files for protection becomes a debtor in possession and continues to operate under the supervision of the court

Merton's model

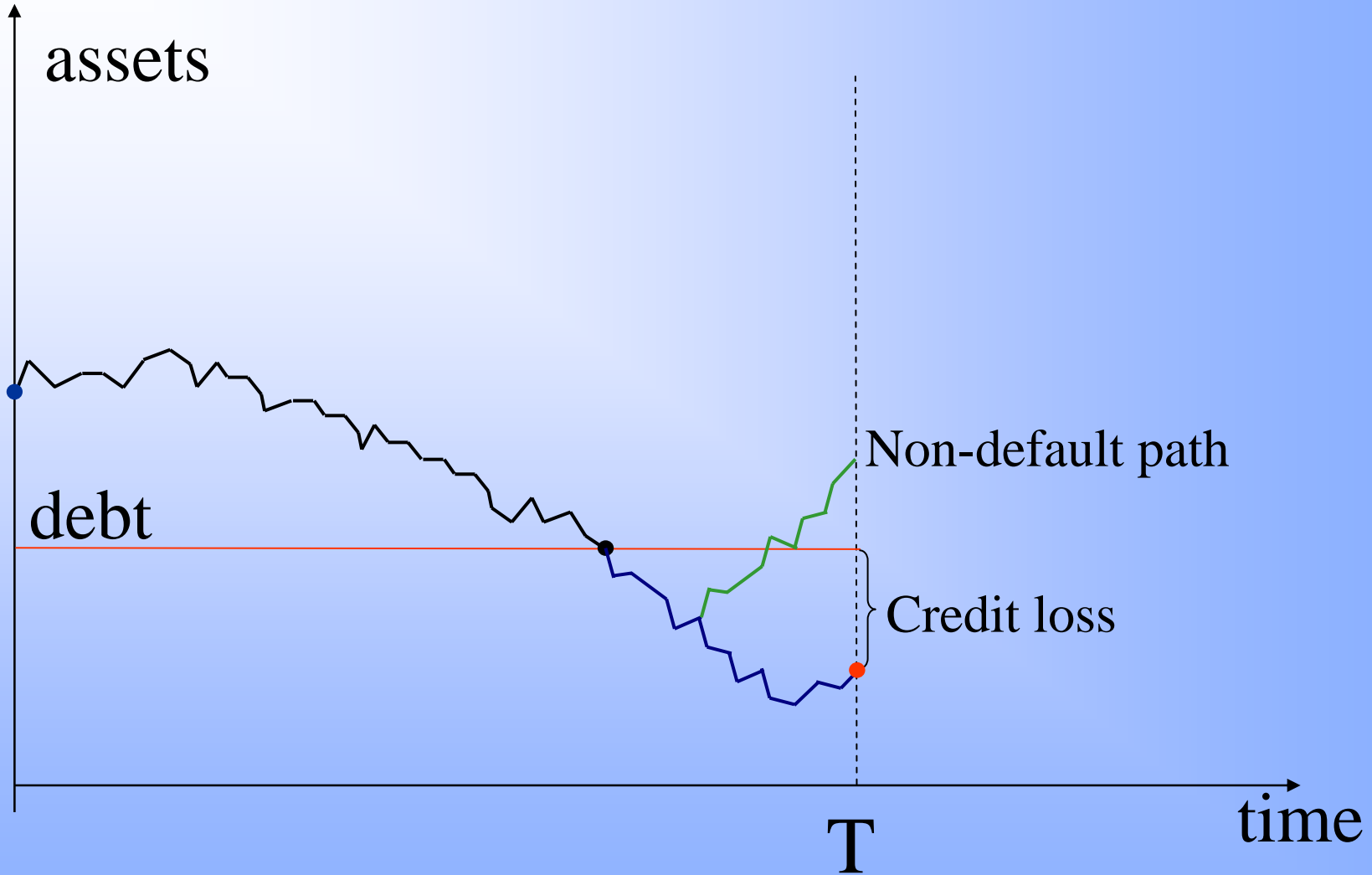


Merton's model

$$\text{Corporate debt} = \text{Risk free} - \text{Put}$$



Modern Approach to Credit Risk



Notations

V – value of assets

T – time to maturity

r – risk free (domestic) interest rate

σ – volatility of assets

F – face value of the debt

B – value of the bond (the amount raised)

Spread in domestic currency

$$B = Fe^{-rT} - Put$$

$$B = Fe^{-rT} - \left(Fe^{-rT} \cdot N(-d_2) - V \cdot N(-d_1) \right)$$

$$Fe^{-(r+s)T} = V \cdot N(-d_1) + Fe^{-rT} \cdot N(d_2)$$

$$r + s = -\frac{1}{T} \ln\left(\frac{B}{F}\right) = r - \frac{1}{T} \ln\left(\frac{V}{Fe^{-rT}} N(-d_1) + N(d_2)\right)$$

$$s = -\frac{1}{T} \ln\left(\frac{V}{Fe^{-rT}} N(-d_1) + N(d_2)\right)$$

Spread in Local currency

A numerical example:

Assume: $V=100$, $B=70$, $r=5\%$, $T=5y$, $\sigma=20\%$

Under these parameters we get:

$$F=98.27$$

$$s=178\text{bps}$$

$$N(-d_2)=35.4\%$$

$$P=6.53$$

Spread in foreign currency

As an alternative we can consider raising the same amount B by issuing a debt denominated in foreign currency.

In this case the same general model works, but one need to update the face amount, volatility and the interest rate.

Spread in foreign currency

$$\sigma_E^2 = \sigma^2 + \sigma_X^2 - 2\sigma\sigma_X\rho$$

Find F_E from the following equation:

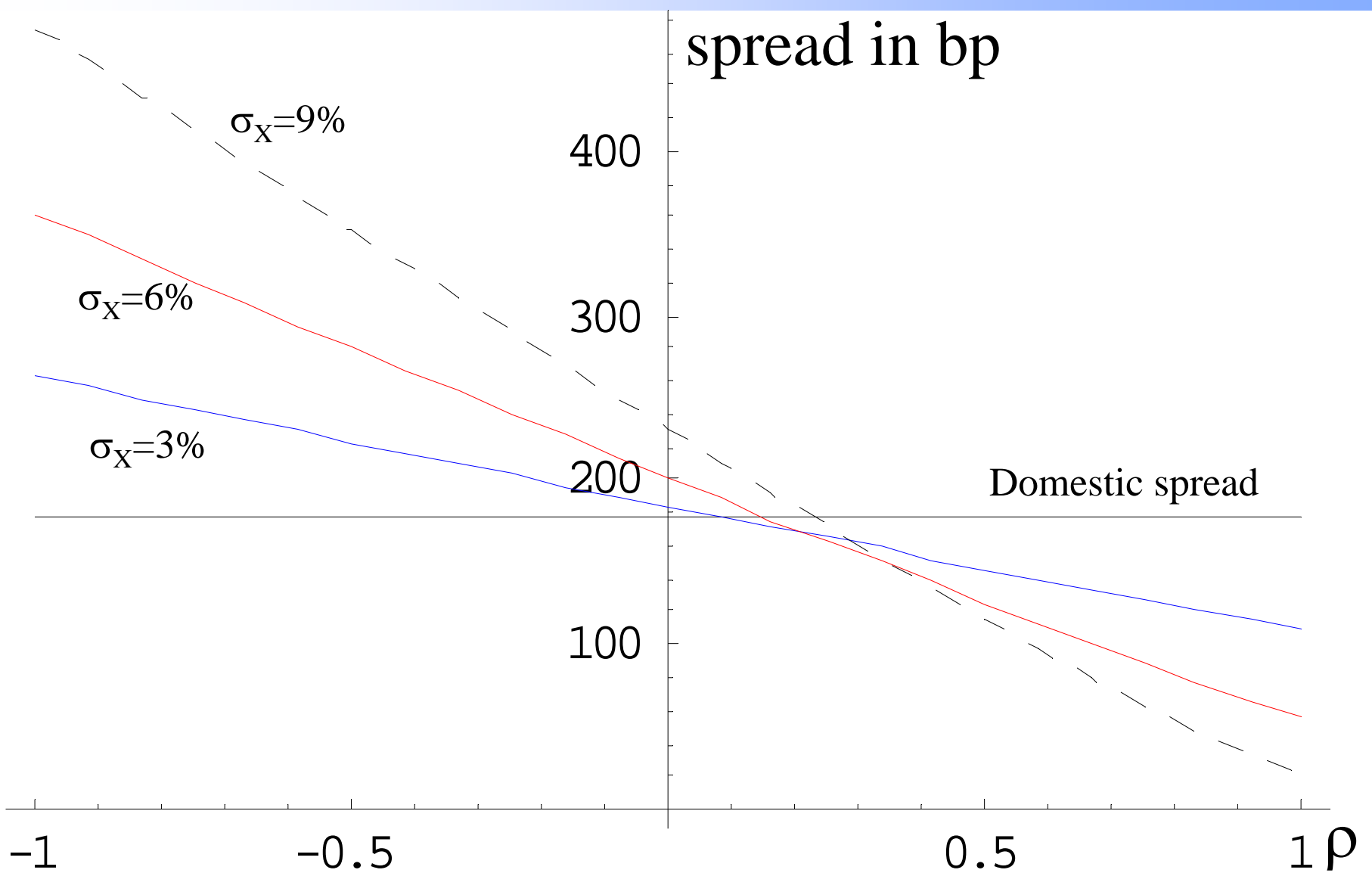
$$B = V \cdot N(-d_1) + Fe^{-rT} \cdot N(d_2) = x_0 \left(V \cdot N(-d_{1E}) + F_E e^{-r_E T} \cdot N(d_{2E}) \right) = x_0 B_E$$

The foreign spread is given by:

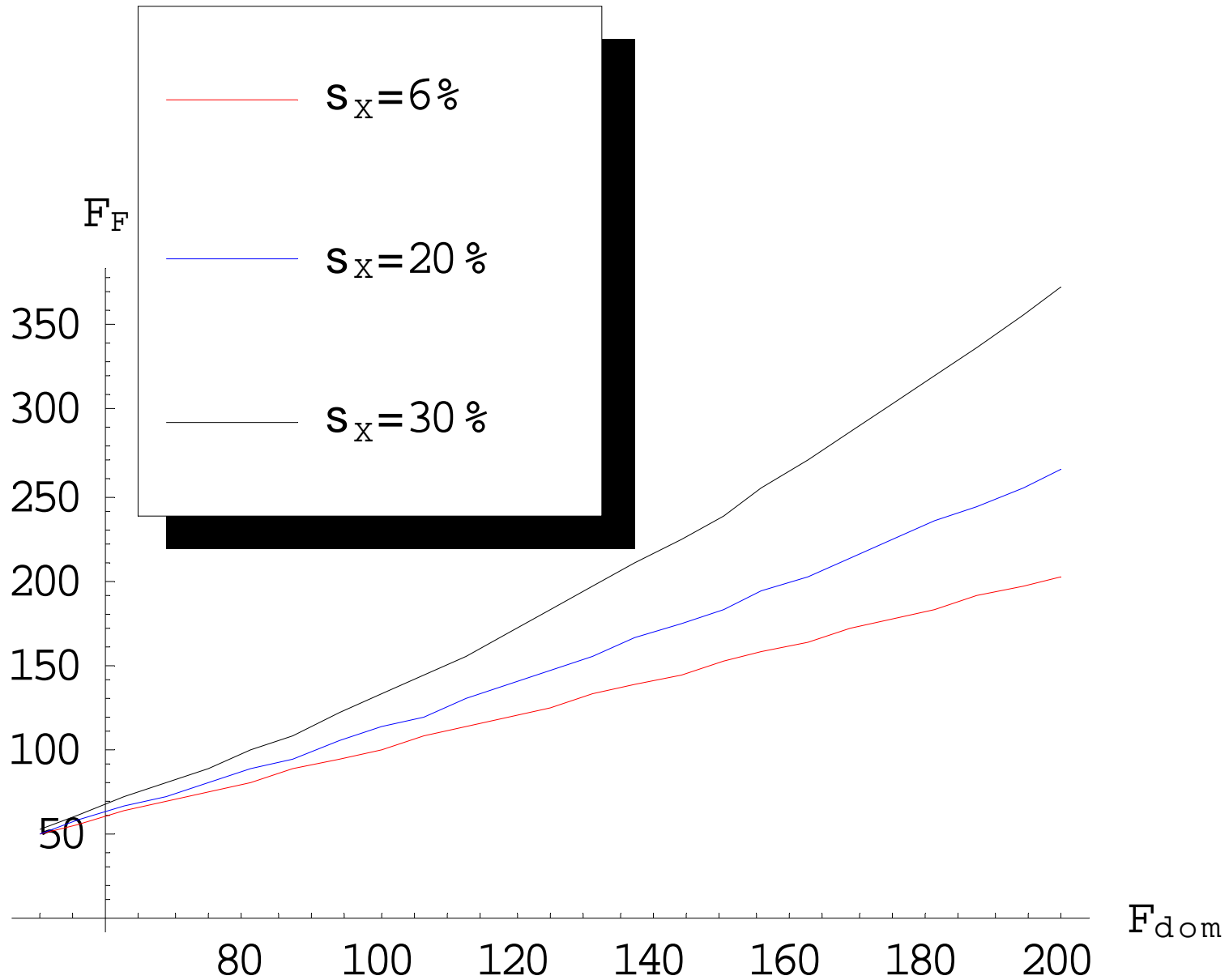
$$s_E = -\frac{1}{T} \ln \left(\frac{V}{F_E e^{-r_E T}} N(-d_{1E}) + N(d_{2E}) \right)$$

correlation	Face value (in €)	Spread	PD (risk neutral)	Put value
-0.4	102.6	265 bp	43.0%	9.92
-0.3	101.8	249 bp	41.7%	9.29
-0.2	101.0	233 bp	40.4%	8.66
-0.1	100.2	217 bp	39.1%	8.04
0	99.4	202 bp	37.7%	7.43
0.1	98.6	186 bp	36.2%	6.83
0.2	97.9	171 bp	34.6%	6.24
0.3	97.1	155 bp	33.0%	5.66
0.4	96.4	140 bp	31.2%	5.09

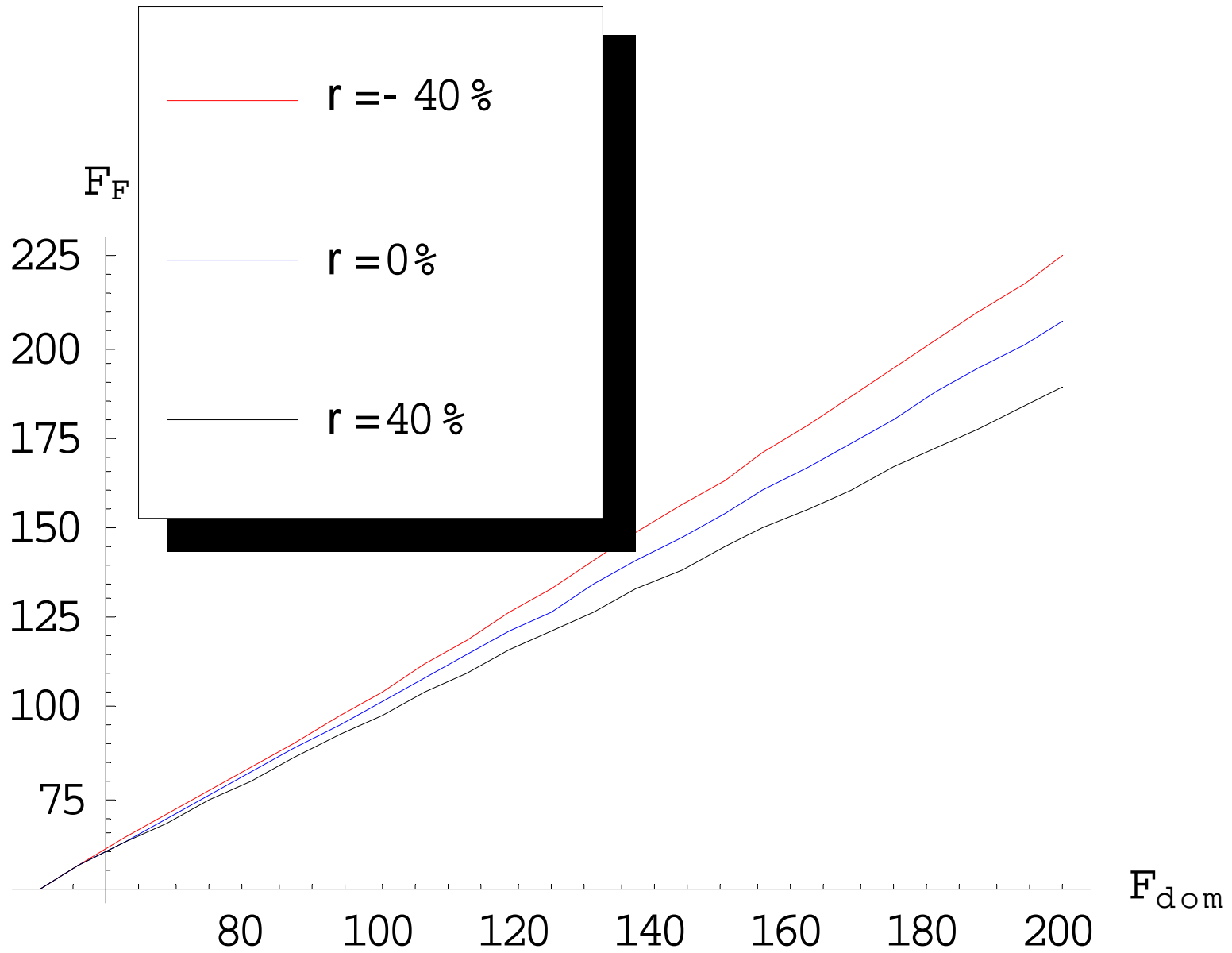
$$V=100, B=70, r=r_E=5\%, T=5y, \sigma=20\%, \sigma_X=6\%$$



$V=100, r=5\%, \sigma=20\%, T=5y, r_E=5\%, s=178bp$



$V=100, r=5\%, \sigma=20\%, T=5y, r_E=5\%, \rho=10\%$



$V=100, r=5\%, \sigma=20\%, T=5y, r_E=5\%, \sigma_X=6\%$