

# Stochastic Correlation in Credit Risk Modelling

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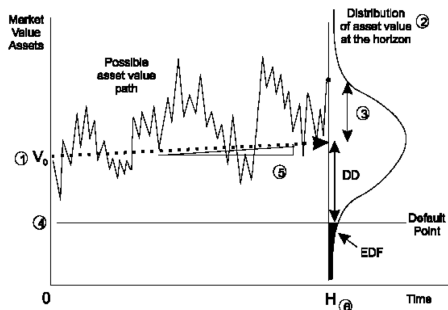
June 8, 2011

# Outline

- 1 The model
  - The Merton model
  - The Merton-Heston Model with Stochastic Covariance
- 2 The case of Fannie Mae and Freddy Mac

# The traditional Merton-Black-Cox model

A firm's default occurs when liabilities exceed asset value



The value of equity is a call option on the firm's assets, with a strike price equal to its liabilities.

# The model

We consider Merton's credit model, where the assets follow a Heston stochastic volatility model:

## The Merton-Heston credit model

$$dA_j(t) = \mu_j A_j(t) dt + \sqrt{v_j(t)} A_j(t) dZ_j(t) \quad (1)$$

$$dv_j(t) = \kappa_{v,j} (v_{\infty,j} - v_j(t)) dt + \varepsilon_{v,j} \sqrt{v_j(t)} dZ_j^v(t) \quad (2)$$

$$dZ_1(t) dZ_2(t) = \rho dt \quad (3)$$

$$dZ_1^v(t) dZ_2^v(t) = 0 \quad (4)$$

$$dZ_i(t) dZ_j^v(t) = 0 \quad i, j \in \{1, 2\} \quad (5)$$

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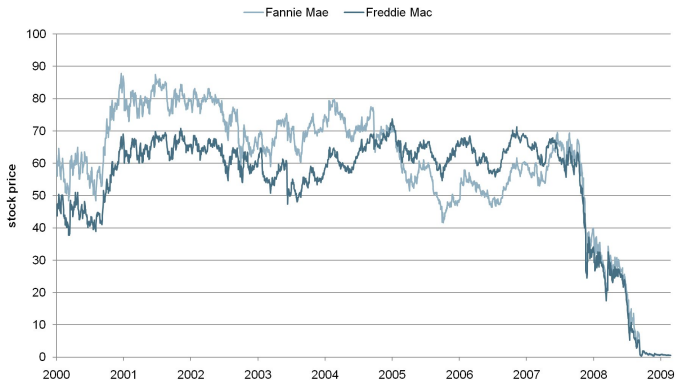
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- 2 We assume the company's liabilities are deterministic and grow exponentially with the risk-free rate.
- 3 We assume the value of the firm's assets is a barrier option on the firm's assets and strike equal to the company's liabilities.

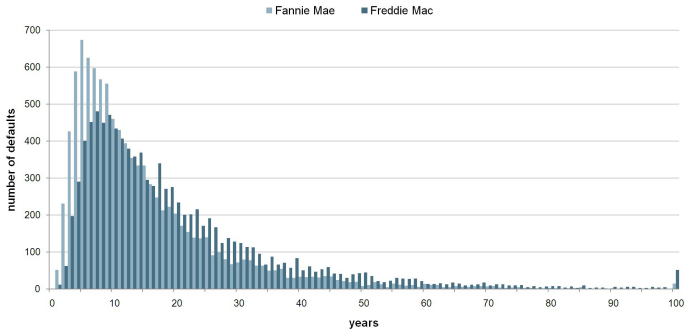
# Empirical case: Fannie Mae and Freddie Mac

We calibrate the model with data until 2007:



# Default frequency

We generate MonteCarlo default events



# Credit degradation in 2008

We re-run the model with data until July 2008, and we compare results for the survival probabilities of both models:

