

The Price for Bearing Default Risk

Darrell Duffie, Stanford University
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Based on collaboration with:

Antje Berndt

Rohan Douglas

Mark Ferguson

David Schranz

Main Objective

- How much are investors in corporate debt paid for taking default risk, above their expected default loss?
- Our analysis is based on Moodys KMV estimates of default probabilities and CIBC data on default swap (CDS) prices.
- The default risk premium is bigger, per dollar of expected default loss, for high-quality firms.
- The default risk premium, at fixed credit quality, was dramatically reduced from mid-2002 to the end of 2003, especially in the broadcasting and entertainment sector.

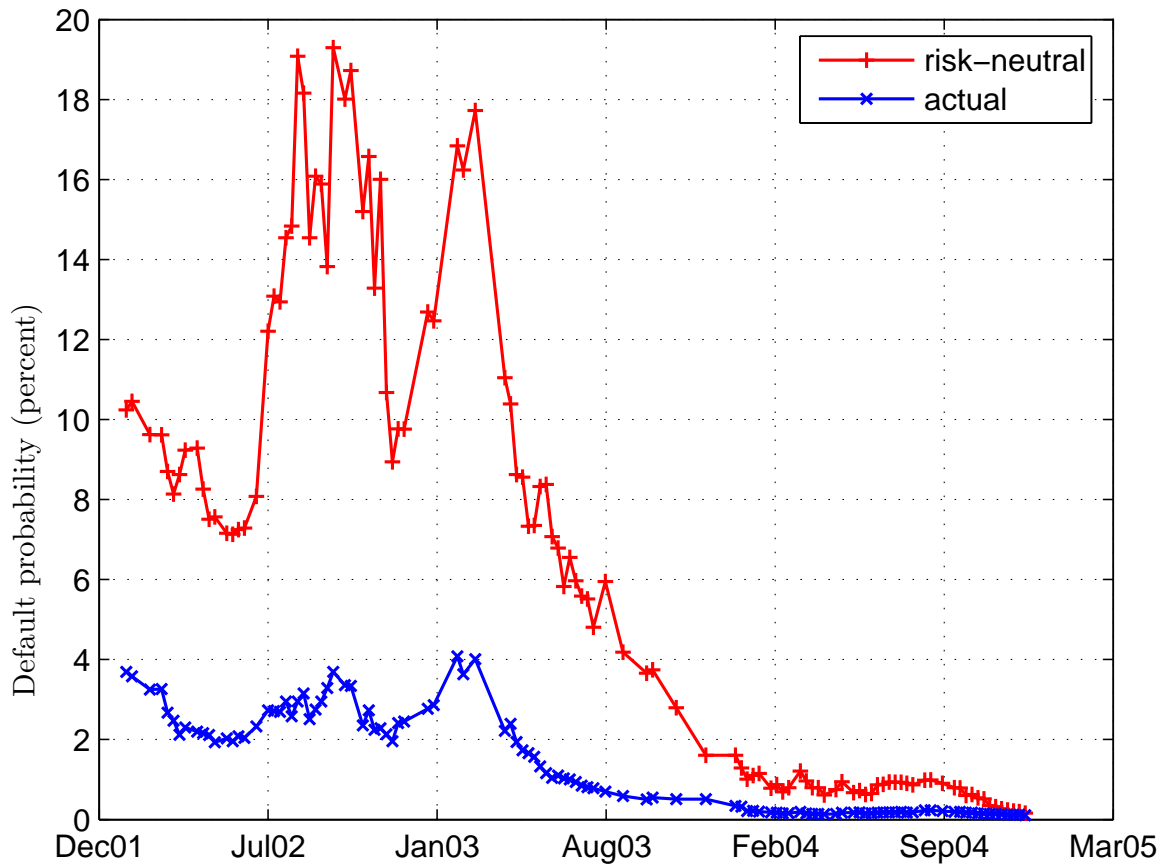


Figure 1: Estimated actual and risk-neutral 1-year default probabilities for Royal Caribbean Cruises.

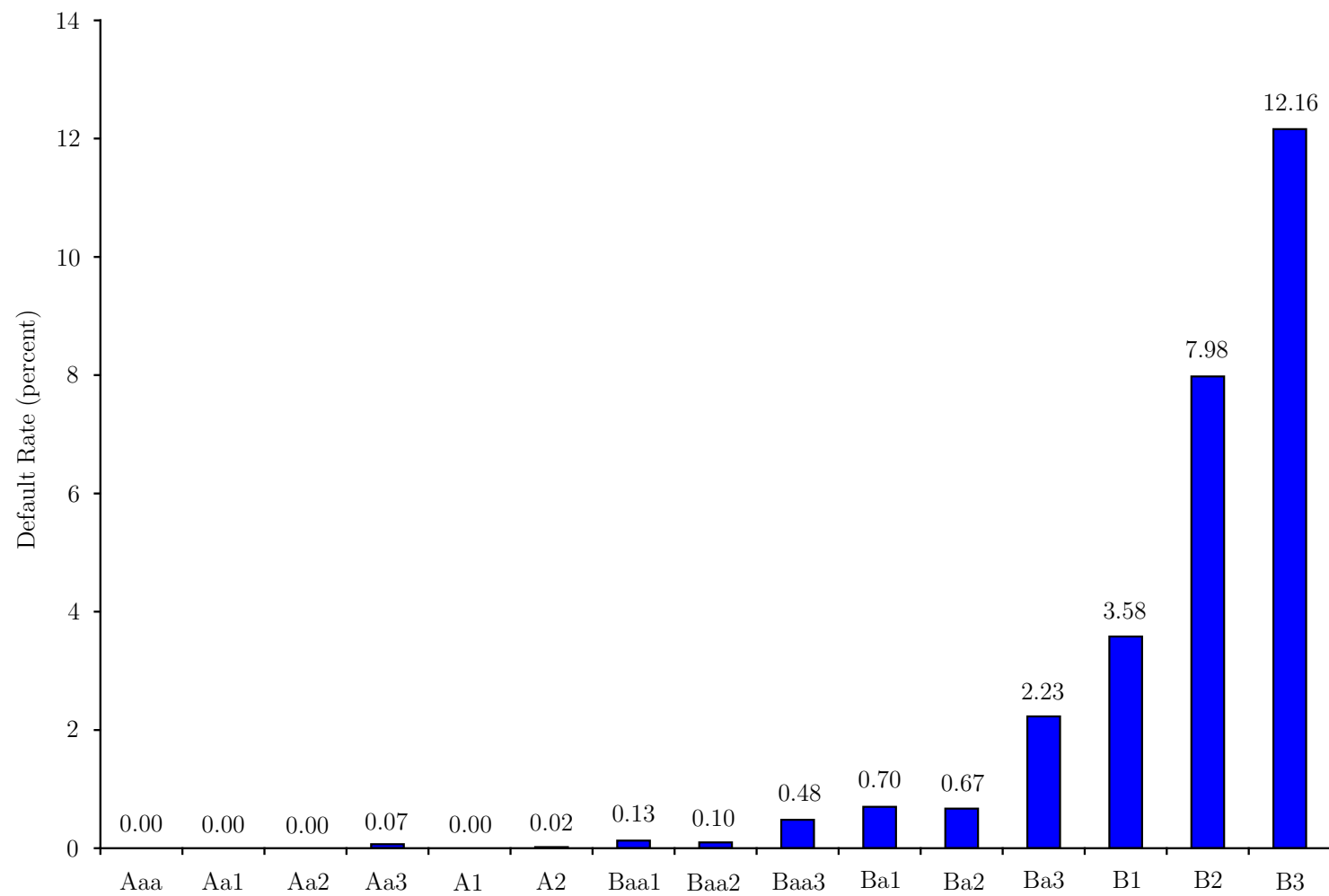


Figure 2: Default Rate by Moody's Modified Credit Rating.

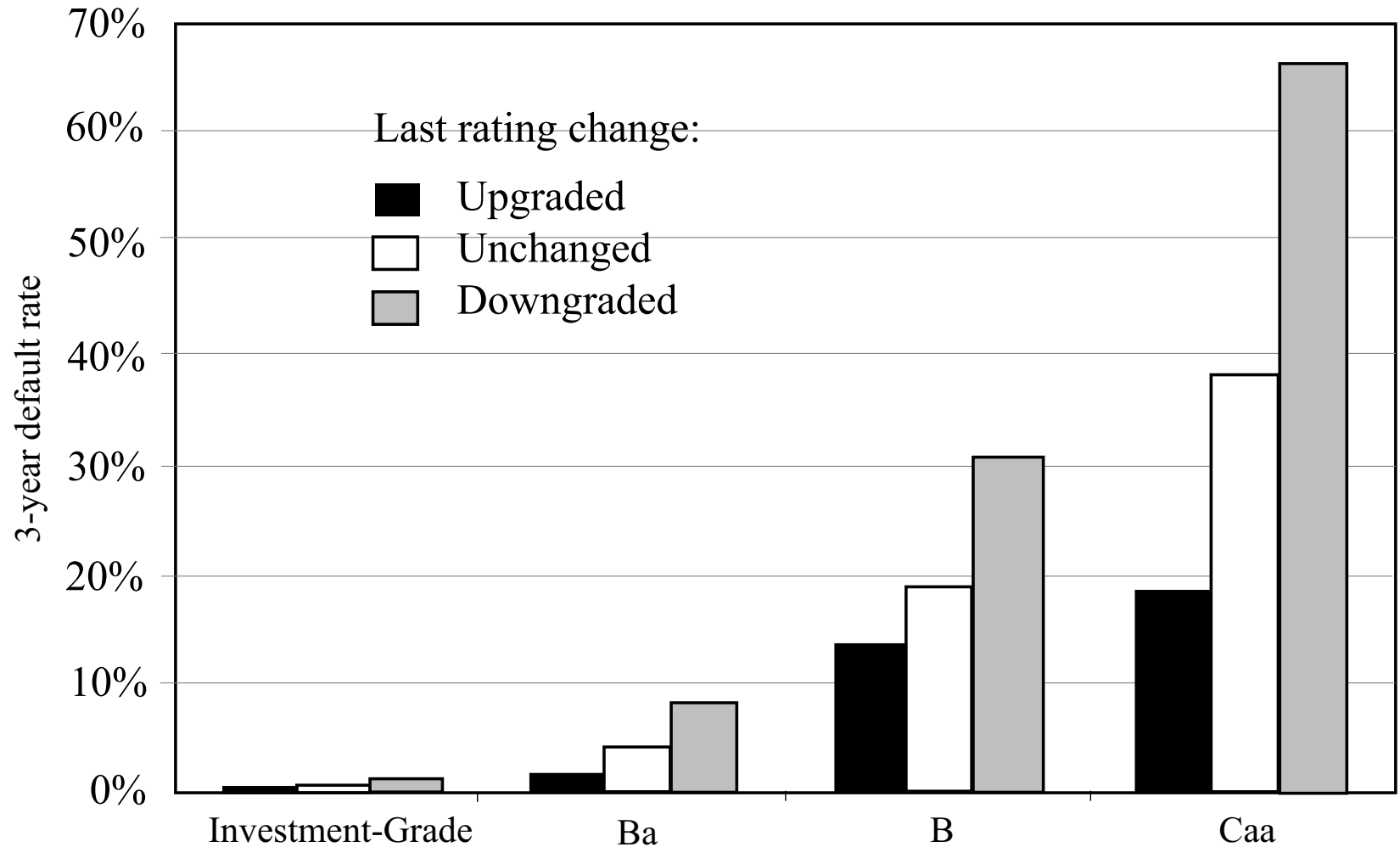


Figure 3: Upgrade-downgrade momentum (1996-2003 data). Source: Moody's, 2004.

Moody's KMV Estimated Default Frequency

- Asset value and volatility are computed jointly from a modified Black-Scholes options pricing model, treating equity as a call on assets struck at liabilities.
- The liability default boundary point is measured as short-term debt plus a fraction (half) of long-term debt.
- The “distance to default” is the number of standard deviations by which the expected asset value exceeds the default point.
- This firm's current *EDF* is the fraction of those firms in previous years with the same distance to default that actually did default within one year.

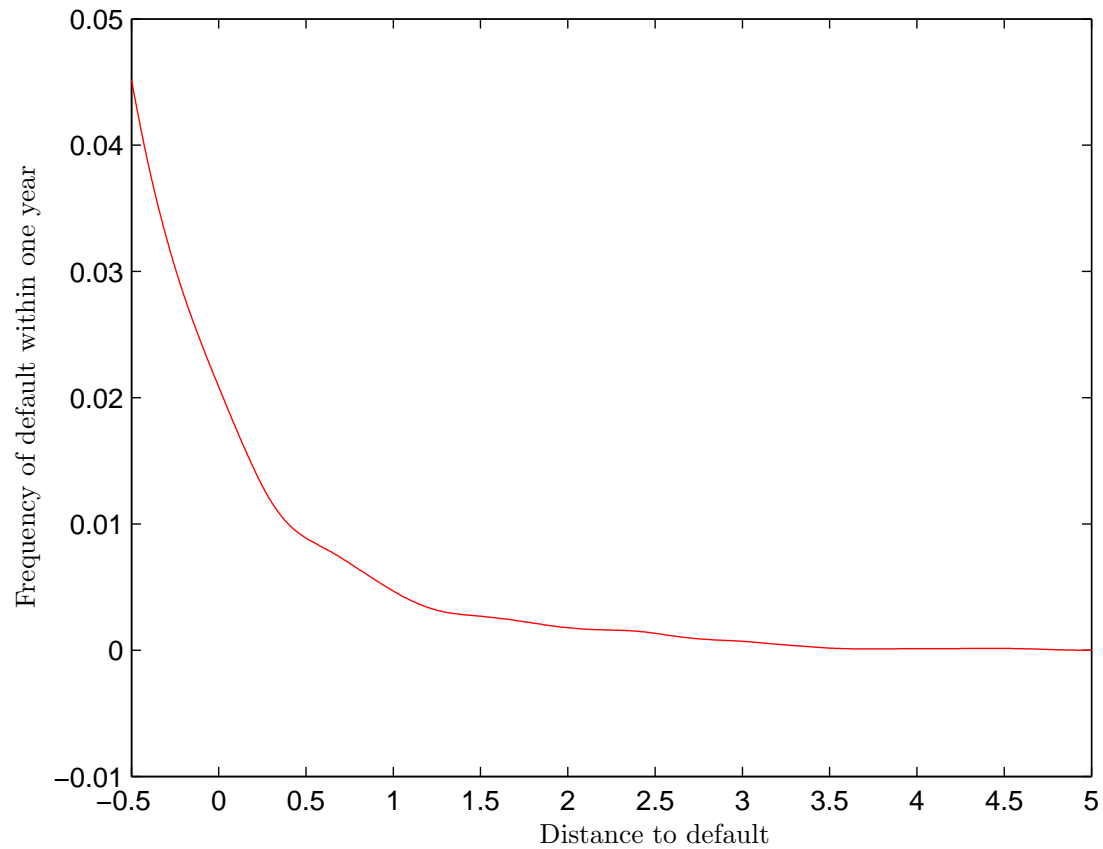


Figure 4: The dependence of empirical default frequency on distance to default. (Source: Duffie, Saita, Wang (2005)).

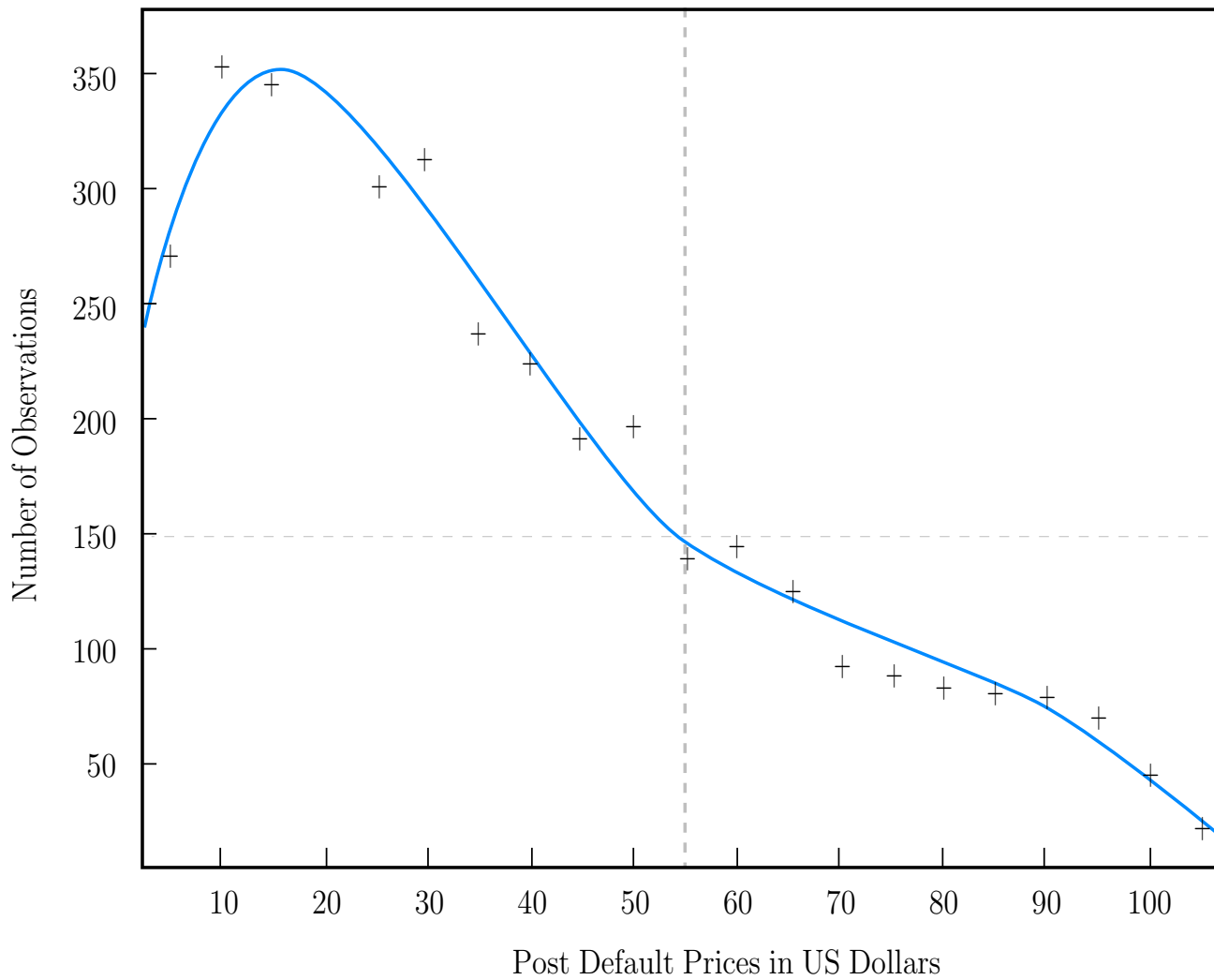


Figure 5: Distribution of senior unsecured recovery rates, 1982 - 2002. Source: Moody's Default and Recovery Report (2003).

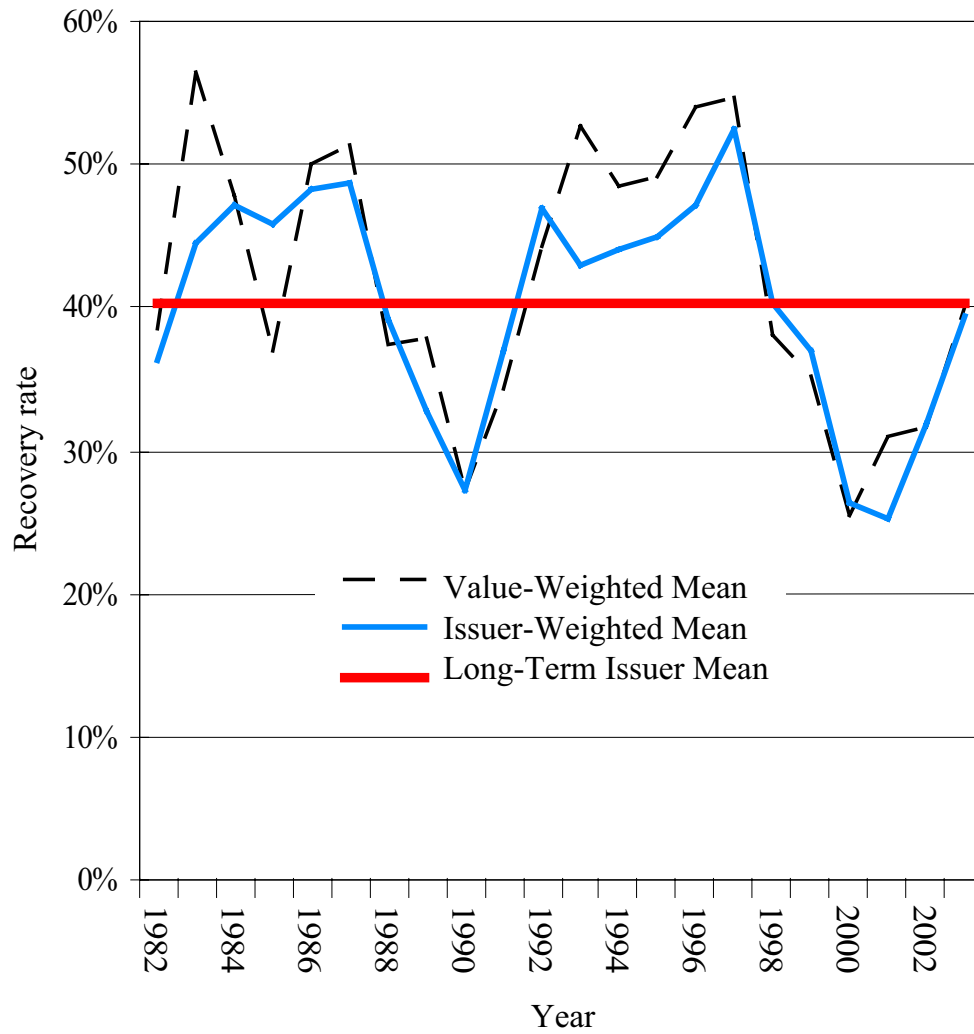


Figure 6: Time variation in average recovery rates, 1982 - 2003. Source: Moody's.

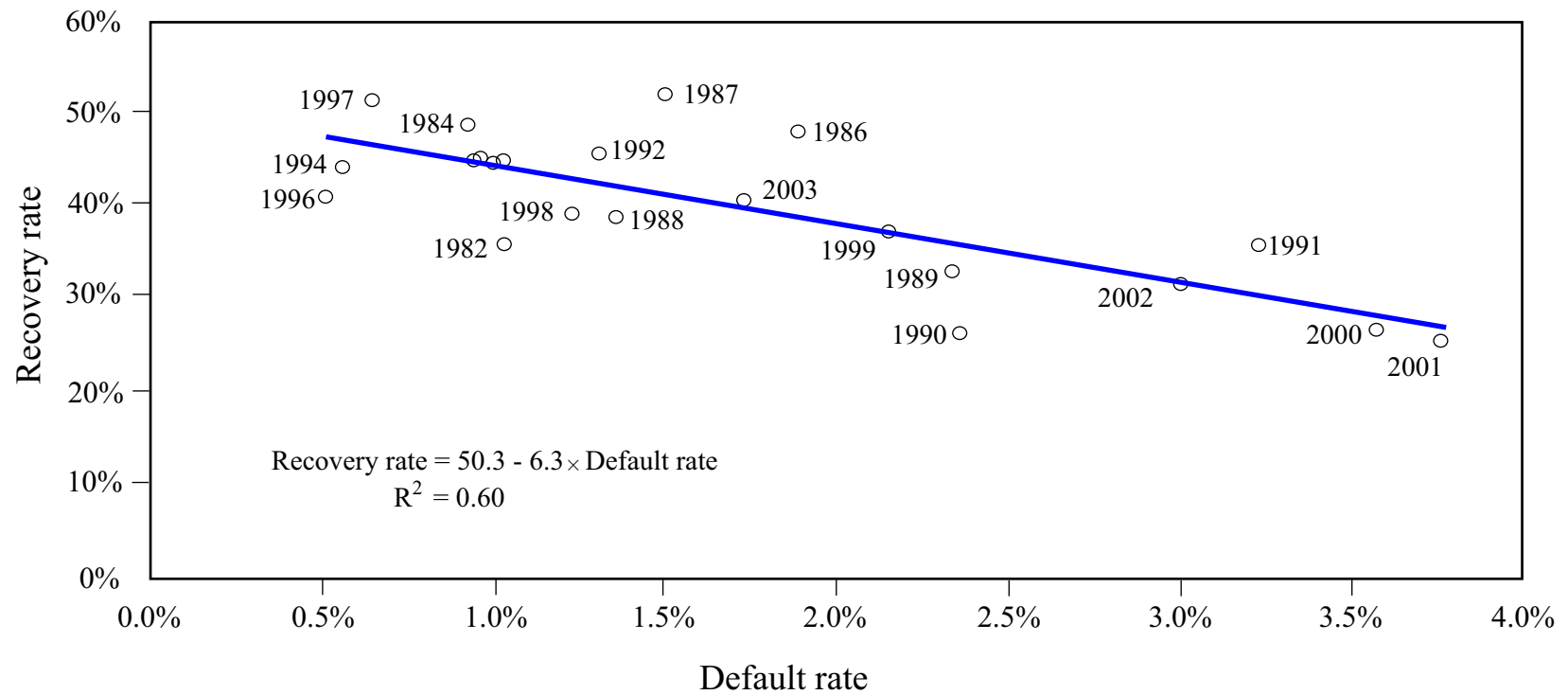


Figure 7: Correlation of Speculative Grade Default and Recovery Rates.
 Source: Moodys Default and Recovery Report (2004).

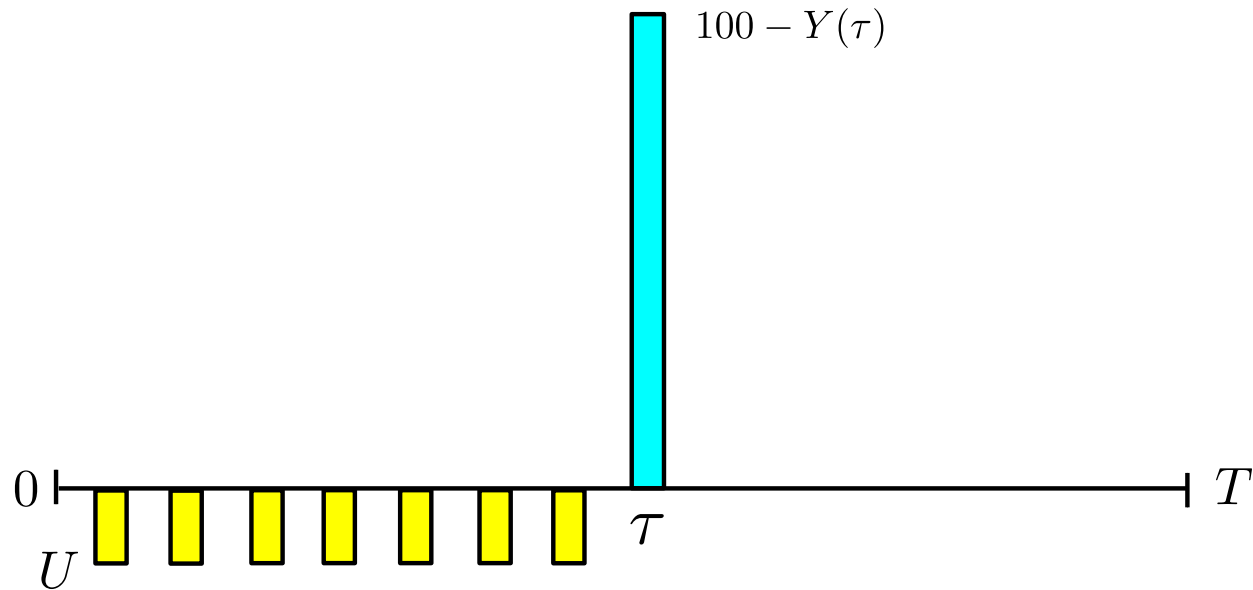


Figure 8: Default swap: buyer of protection pays the CDS rate U quarterly, and at the default time τ delivers bond worth $Y(\tau)$ in exchange for notional (100).

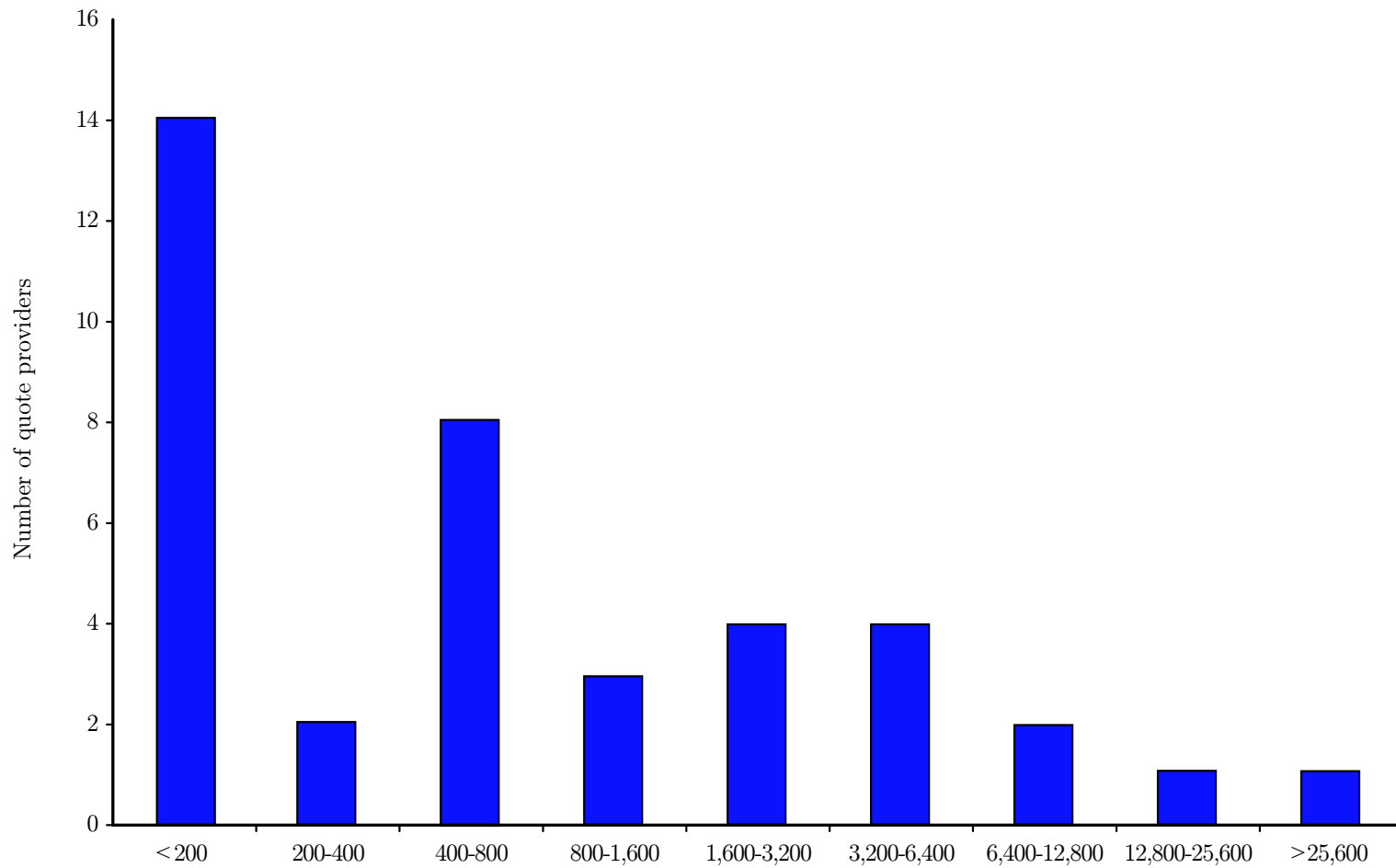


Figure 9: Distribution of CDS quote providers by number of quotes provided.
Data source: CIBC.

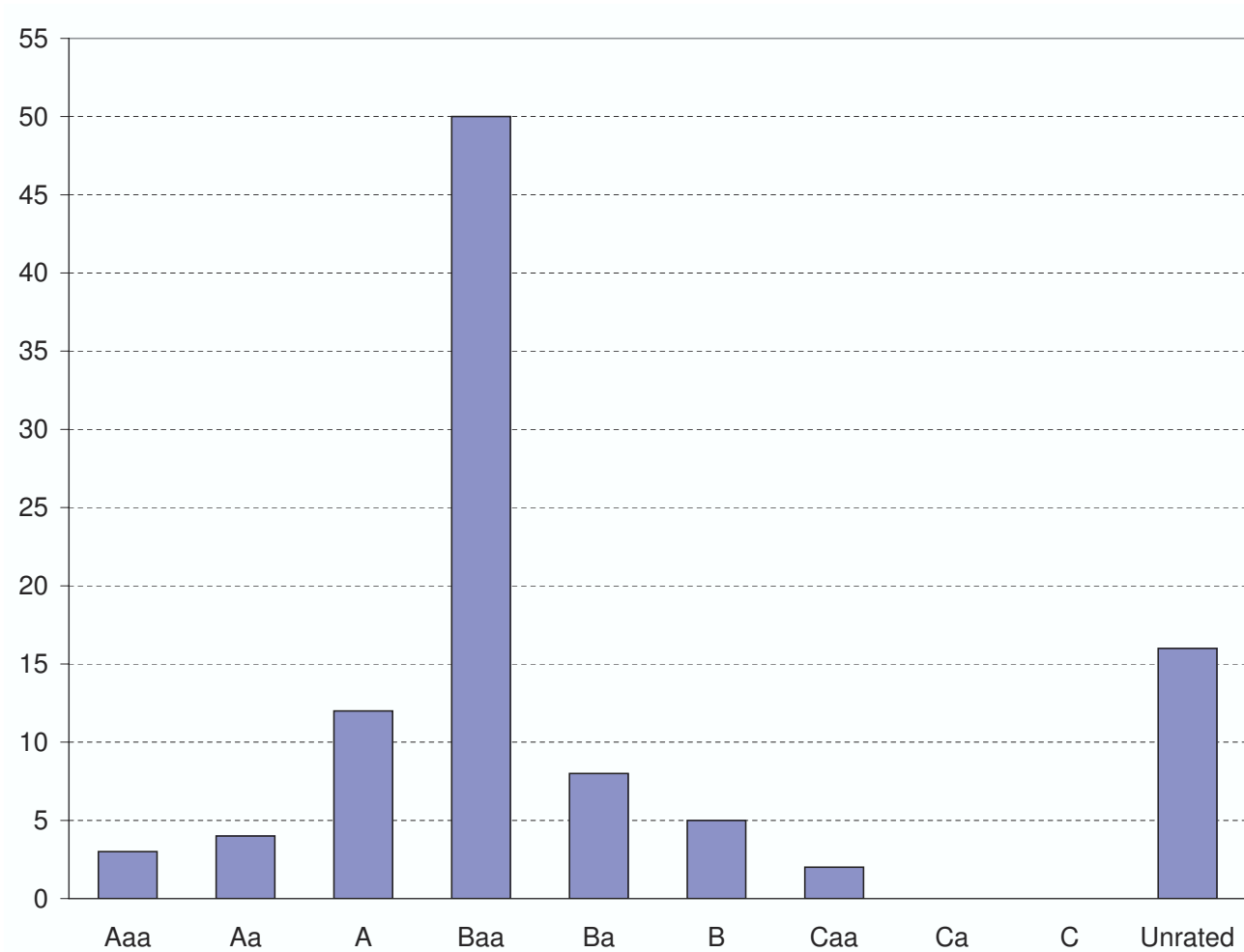


Figure 10: Distribution of firms by median credit rating during the sample period. Sources: CIBC and Moody's.

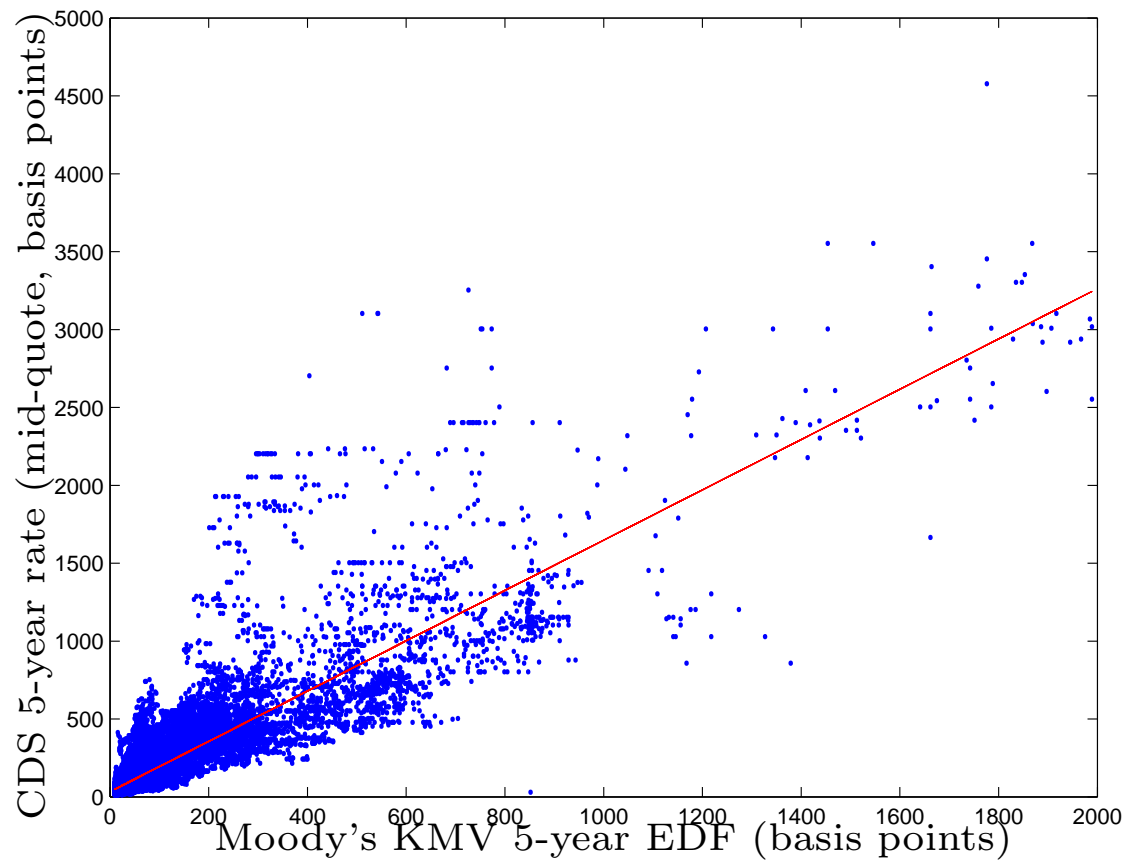


Figure 11: Scatter plot of EDF and CDS observations and OLS fitted relationship. Source: CIBC (CDS) and Moody's KMV (EDF).

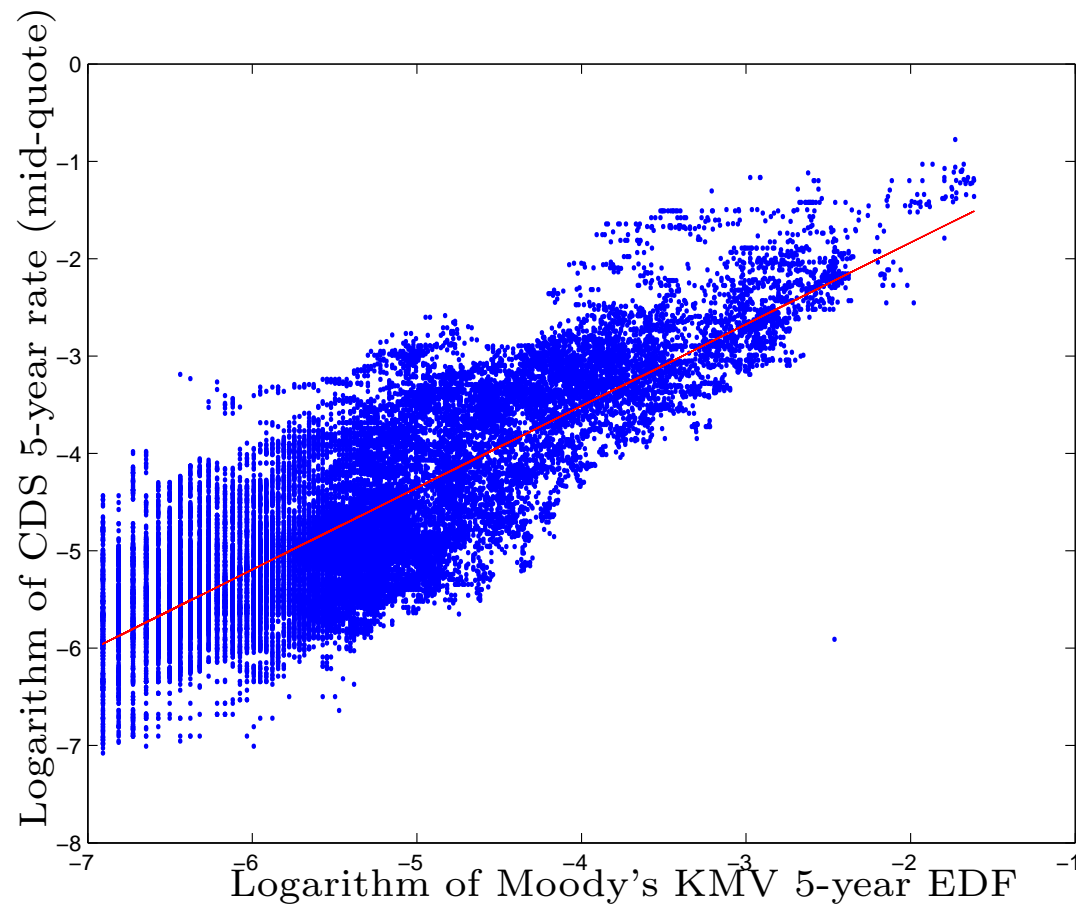


Figure 12: Scatter plot of EDF and CDS observations, logarithmic, and OLS fitted relationship. Source: CIBC (CDS) and Moody's KMV (EDF).

CDS versus EDF (5-year)

For 33,912 paired daily median observations over 2000-2004:

$$\log \text{CDS}_i = 1.45 + 0.76 \log \text{EDF}_i + \sum \hat{\beta}_j D_{\text{month, sector}}(i) + z_i,$$

(0.05) (0.02)

- Standard errors estimated for panel correlation.
- $R^2 = 74.4\%$.
- One-sigma confidence band for a given CDS rate places it between 59% and 169% of the fitted rate.

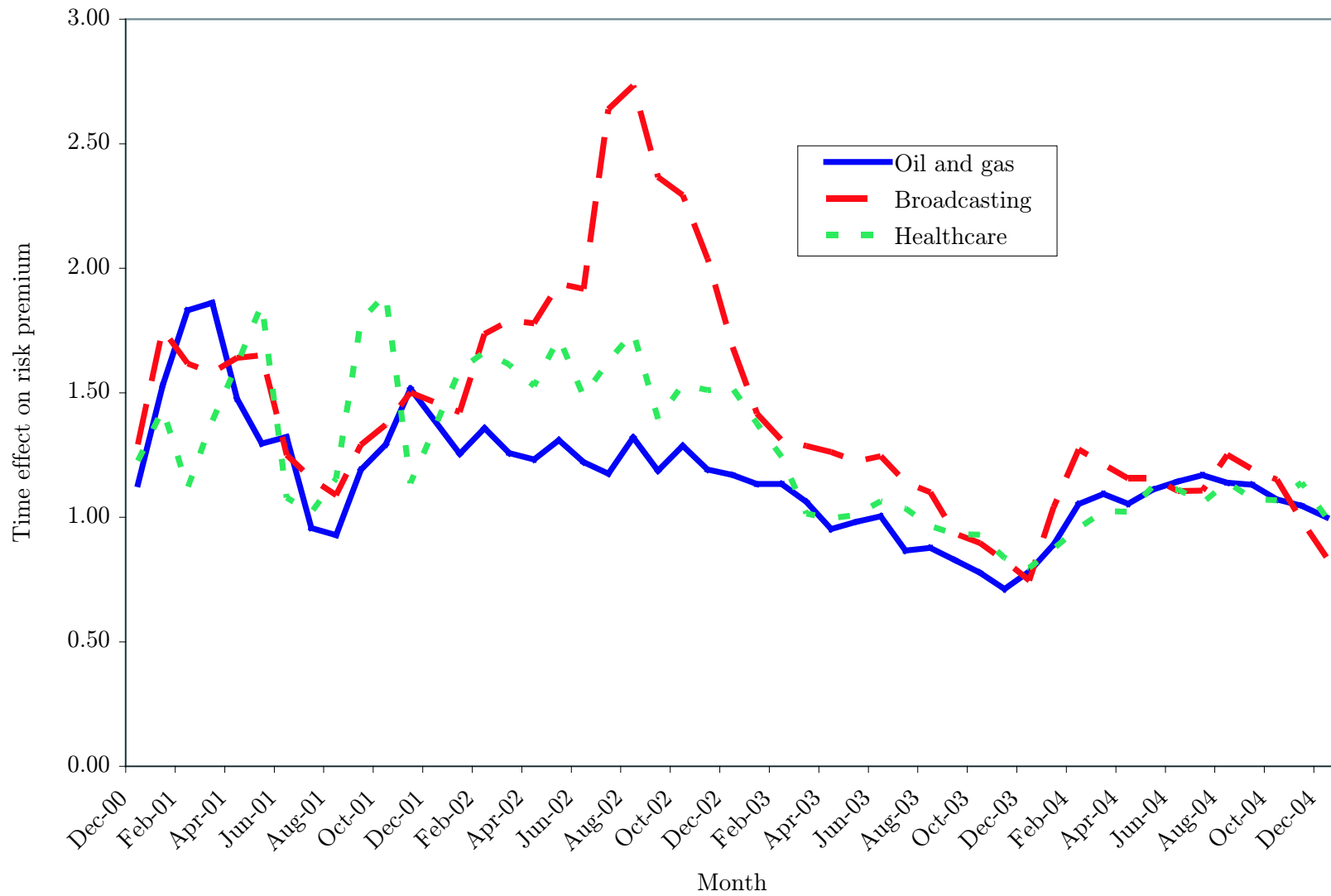


Figure 13: Monthly dummy multipliers in CDS-to-EDF fit.

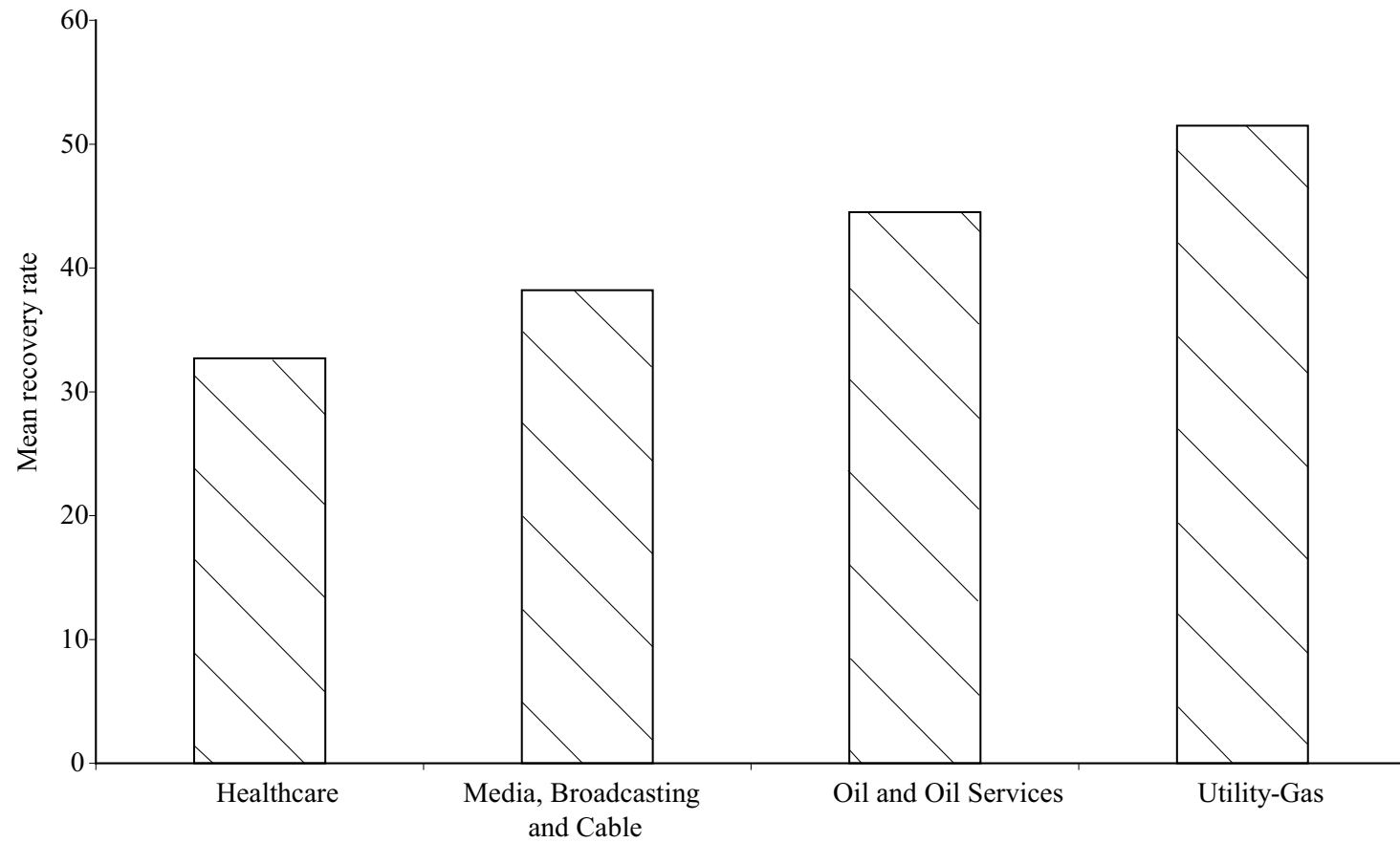


Figure 14: Sectoral recovery differences.

Default Intensity

- λ_t is the conditional mean arrival rate of default.
- The probability of survival for t years is $p(t) = E \left(e^{-\int_0^t \lambda(s) ds} \right)$.
- The risk-neutral probability of survival for t years is $p^*(t) = E^* \left(e^{-\int_0^t \lambda^*(s) ds} \right)$.
- $p^*(t) < p(t)$ because
 - $\lambda_t^* > \lambda_t$.
 - $E^*(\lambda_t^*) > E(\lambda_t^*)$.

Dynamic Default Intensity Models

- Actual intensity, λ_t log-normal with mean reversion, fitted from 12 years of monthly observations of 1-year EDFs by maximum likelihood.
- Sector homogeneity of volatility and mean reversion.
- Risk-neutral intensity:

$$\log \lambda_t = a + b \log \lambda_t + u_t,$$

where u_t is an independent gaussian auto-regressive process.

- Fit a , b , and dynamic parameters from 1-year and 5-year CDS.

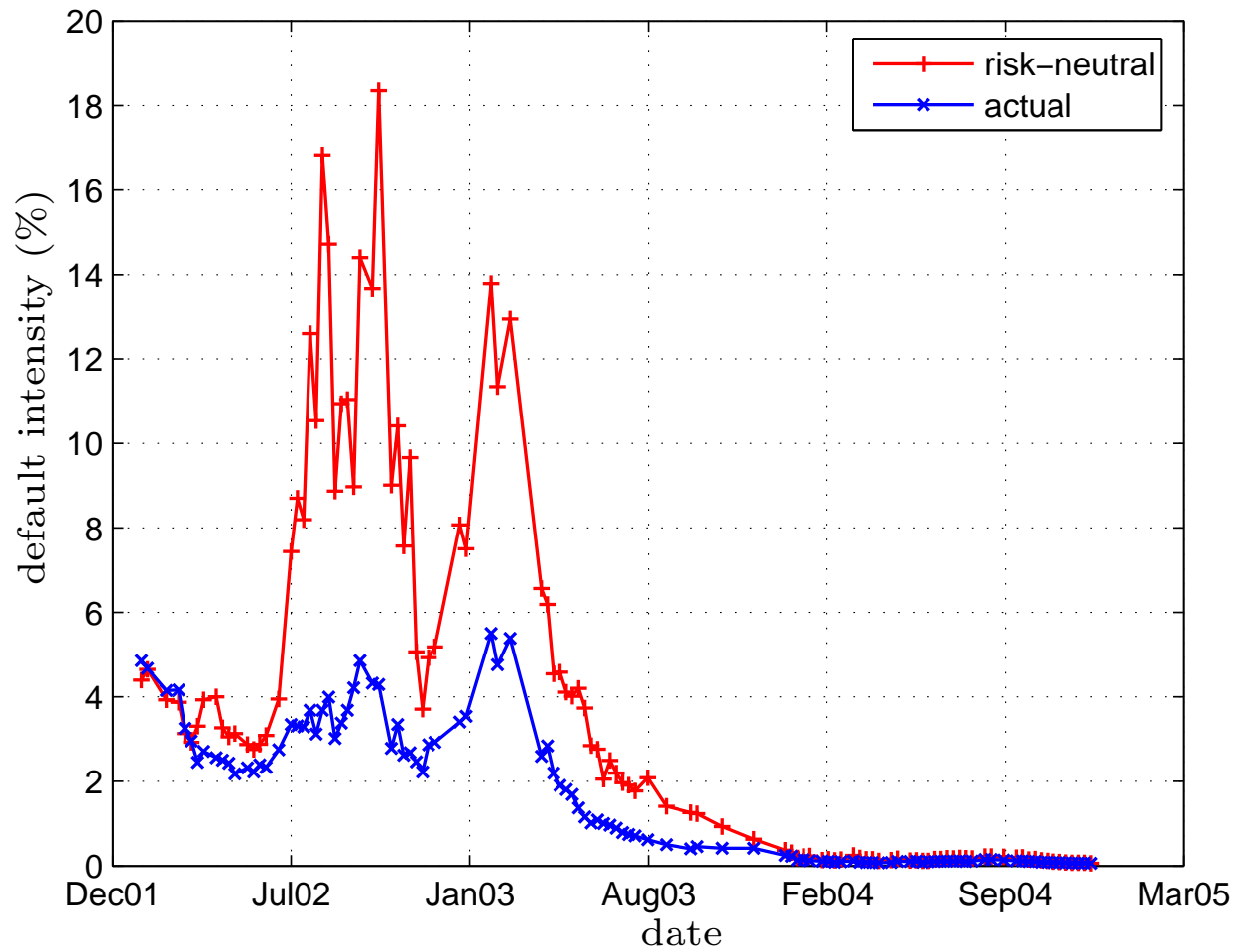


Figure 15: Implied default intensities for Royal Caribbean Cruises.

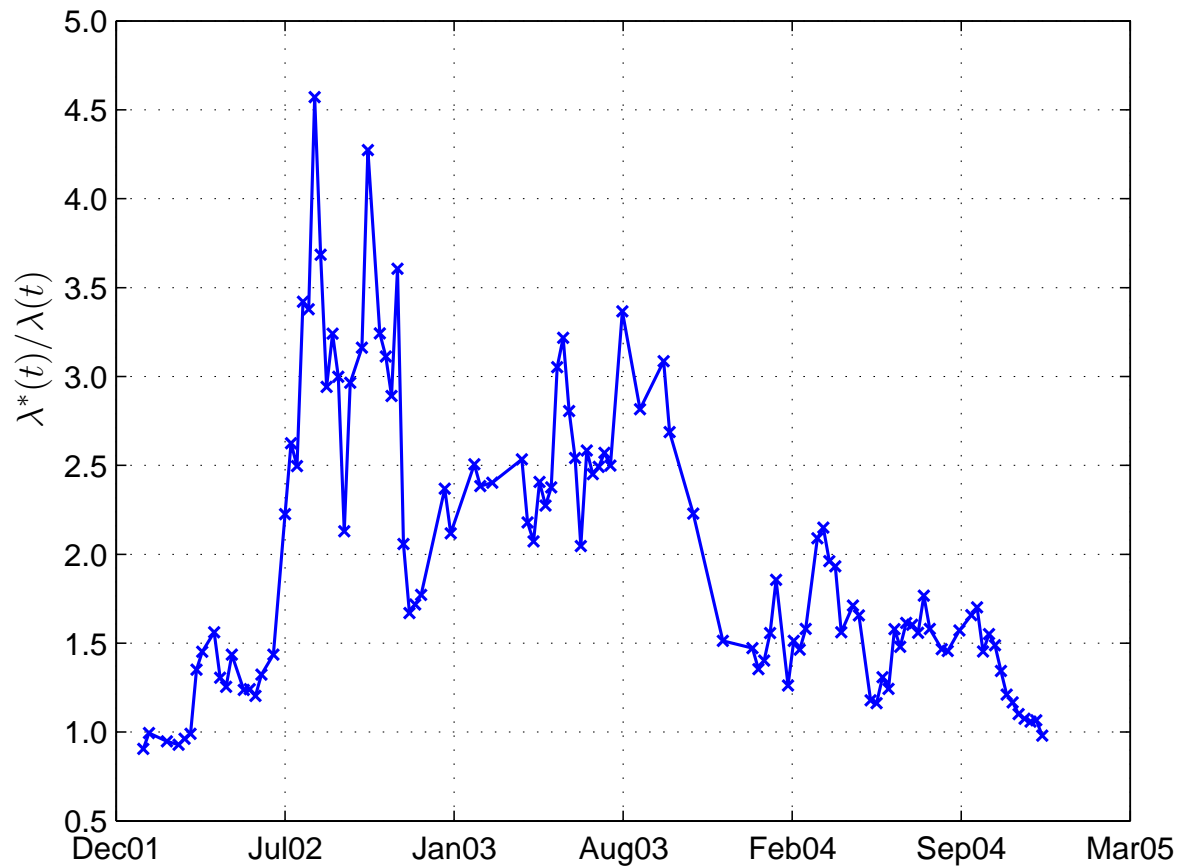


Figure 16: Estimated default risk premia, λ^*/λ , for Royal Caribbean Cruises.

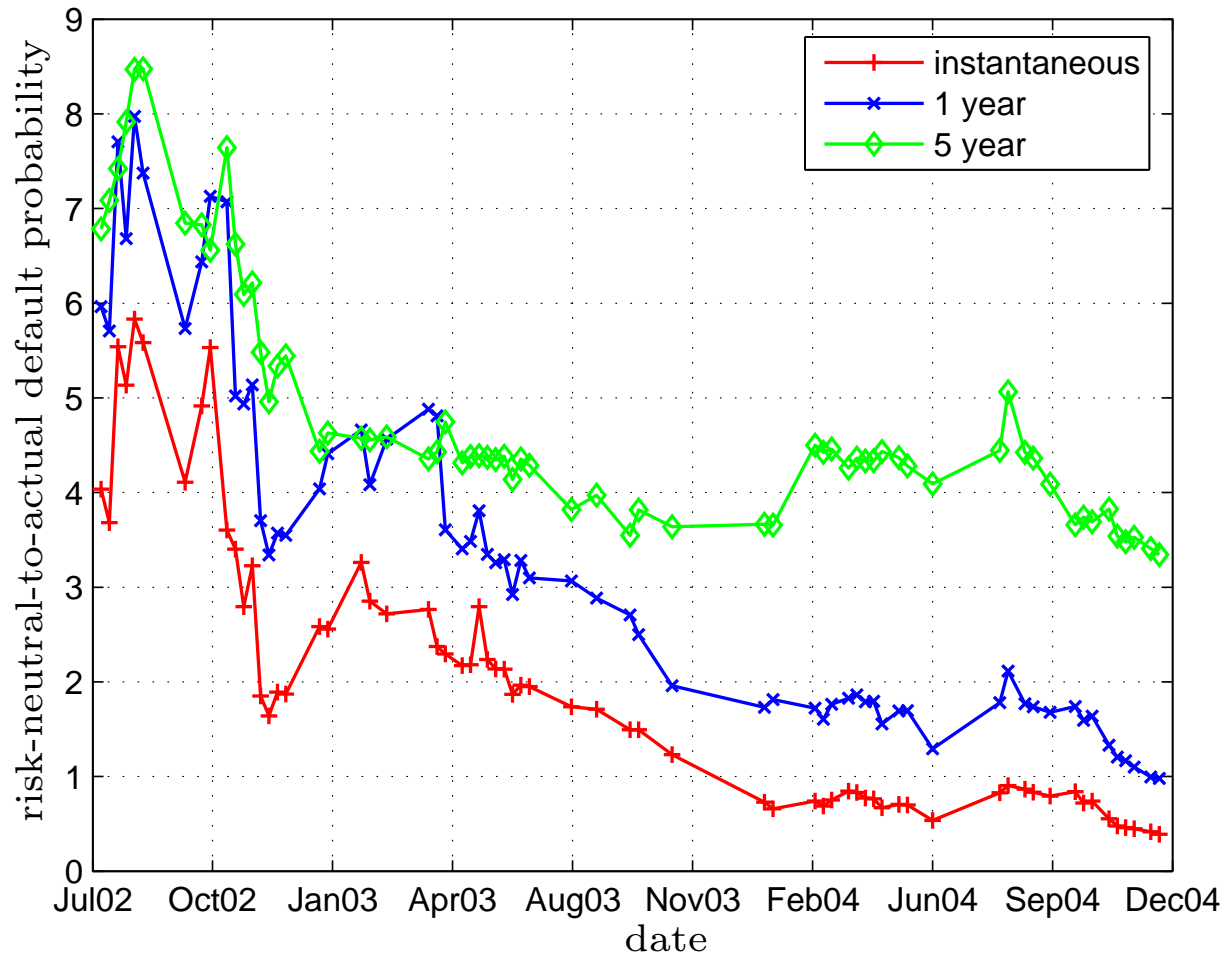


Figure 17: Median default risk premia, broadcasting-entertainment.