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Modelling Corporate Bonds

Current Issues In Life Assurance
Edinburgh 20 May 2004

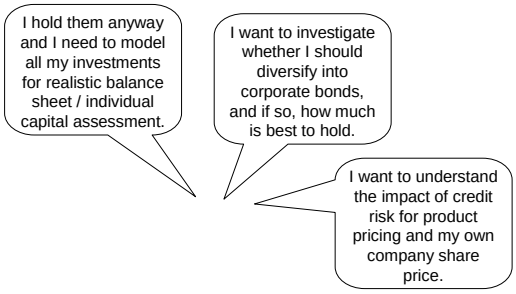
Andrew Smith *email* AndrewDSmith8@deloitte.co.uk

Presentation Outline

- Why model corporate bonds?
- Corporate bond investment characteristics
- Monte Carlo models
- Explaining bond spreads
- Conclusions

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Why Model Corporate Bonds?

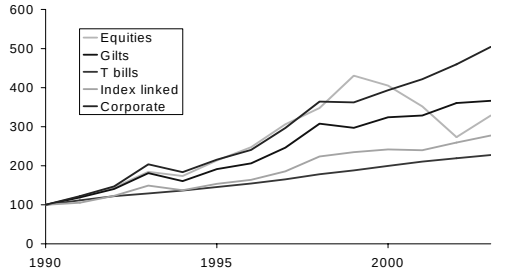


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Corporate Bond Investment Characteristics

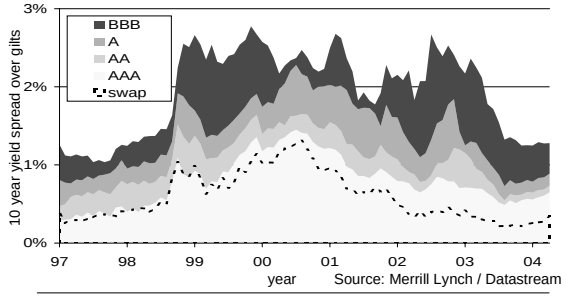
Recent Good Corporate Performance



Source: Barclays capital

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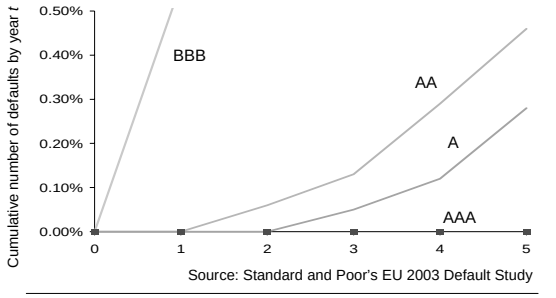
UK Corporate Bond Spreads: History



Source: Merrill Lynch / Datastream

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Historic Cumulative Default Rates



Source: Standard and Poor's EU 2003 Default Study

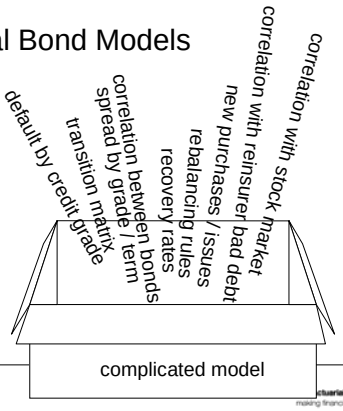
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Monte Carlo Models

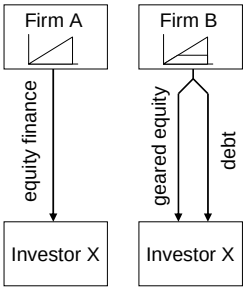
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Individual Bond Models

Some complex individual bond models are now being used for capital modelling work.



Structural Model (Merton)
Equity = Geared Equity + Debt



- Credit spreads reflect an option premium
  - Interest is expensed in accounting terms
  - but the option has cost and value
- Prestige ratings reflect lower option value
  - not "better" companies

Credit Graded vs Structural Models

- Model by grade is close to how portfolios are managed in practice
- Grades are subjective, out of date and sometimes arbitrary
- Historic data excludes the main catastrophe where modelling is needed

- Easily market consistent, because spread is a market price
- Correlations: bond/bond and bond/equity easily calibrated
- Structural model output can be arranged into bands and expressed as transition matrix

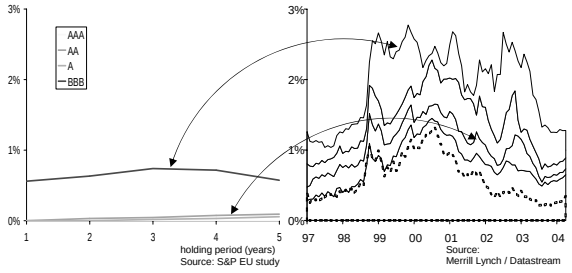
Modelling Dilemma: Why we need to be careful about small effects

- Under arbitrage-free models, corporate bonds behave like a (dynamically rebalanced) mixture of gilts and equities. There is one equity risk, but two places in a model where that risk is priced – the equity model and the corporate bond model.
- A strategy "sell equities and buy corporate bonds" is a close substitution whose attractiveness is very dependent on asset model parameters – in particular the relative cost of equity risk implicit in the equity ad corporate bond models. Worse still, the decision can be dependent on flukes of a particular set of random simulations.
- Danger that asset selection outcome determined by asset model calibration and not (much) by business dynamics

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Explaining Bond Spreads

Historic Default << Yield Spreads



annualised historic defaults

yields vs gilts

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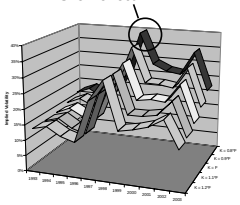
Yield Spread vs Default

- Yield spread >> historic default rates
- How do we explain the differences?
  - free lunch?
  - sampling error?
  - risk premium?
  - gilt collectors' premium?
  - liquidity premium?

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Default Risk Premiums are Explainable

Skew effect:

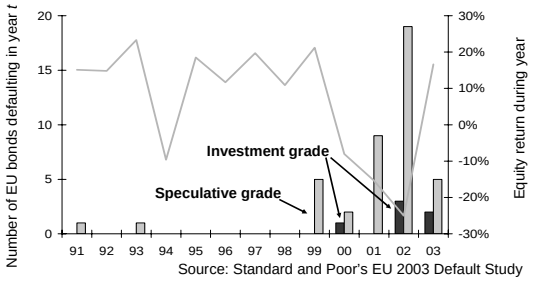


FTSE 100 implied vol
Source: LIFFE

- Default involves extreme downside events
- The existence of skews in volatilities is well known in out-of-money options
  - default equates with extreme out-of-money puts
- Yield spread vs default difference not an obvious anomaly
- If your asset model does not capture equity skew effect then its probably not worth trying to replicate historic bond defaults

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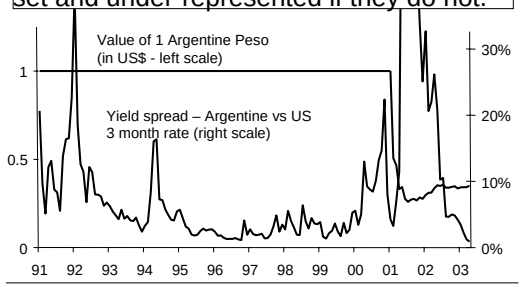
Historic Default Rates = Small Samples
So true default rates very uncertain anyway



Source: Standard and Poor's EU 2003 Default Study

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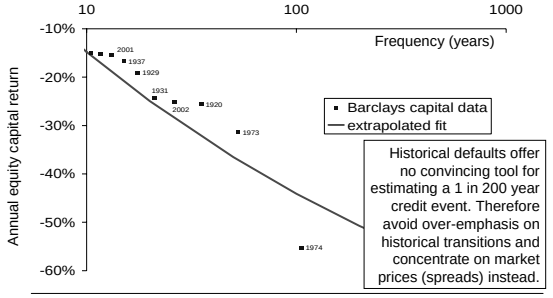
The Peso Effect: Rare default events are over-represented if they occur in the data set and under-represented if they do not.



Source: DataStream

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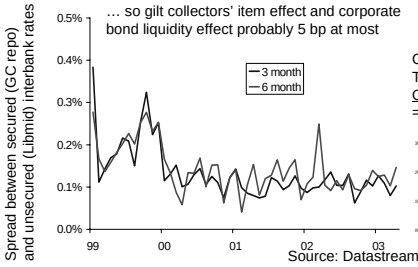
We can extrapolate equity returns but it is difficult to do the same for bond defaults



Historical defaults offer no convincing tool for estimating a 1 in 200 year credit event. Therefore avoid over-emphasis on historical transitions and concentrate on market prices (spreads) instead.

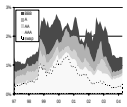
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Swap / Gilt spread explained by: credit risk (repo vs libmid) and transaction costs (libor vs libmid)



… so gilt collectors' item effect and corporate bond liquidity effect probably 5 bp at most

Credit	15
TC's	10
Others	0
= Swap-Gilt	25 bp



Source: Datastream

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Corporates – Subtle Considerations

- Corporate bonds might behave like equity plus gilts, but tax, statutory valuation and ECR treatment is different
- Liquidity – needed to maintain credit exposure within limits, so estimate transaction costs carefully
- Investment management costs, including risk management and audit
- Possibility for income from repo market (especially on most liquid gilts if there is a squeeze and they go special on repo)
- What matters is effect on a life office *relative to what is priced into bonds in the first place*

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Conclusions

Conclusions

- Many similarities: puzzles for corporate bonds and puzzles for equities
  - why is the risk premium so high?
  - free lunch vs efficient markets vs arbitrage-free
- Building a complicated simulation model can (maybe, just maybe) give additional insights
  - Risk that a decision to hold corporate bonds (or not) is effectively hard-coded in the guts of an asset model calibration rather than deliberate consequence of the business model
- If an investment looks too good to be true - it probably is
  - actuaries' equity free lunch claims discredited
  - let us not repeat the mistake with corporate bonds

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Current Issues In Life Assurance
London 28 April 2004 / Edinburgh 20 May 2004

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