- To build a schedule, always consider settlement date as starting point

```
% Set the holidays
holidays=['21/03/2008';'24/03/2008’;…..;'01/01/2011’];
holidays=datetime(holidays,'InputFormat','dd/MM/yyyy’);
schedule=datetime(settle,'ConvertFrom','datenum’) +
       calmonths(3:3:36);
schedule=busdate(schedule-1,"follow",holidays);
```

- Asset swap spread is a credit risk measure in cash bond markets:

Fixed Income Risk ~ Interest Rate Risk + Credit Risk

Asset Swap Spread: Banks Balance Sheet in a Nutshell

ASSETS	LIABILITIES
Liquid Assets	Stakeholders
Cash / Reserves	Clients Deposits
Bonds (Governments, corporates)	Bonds by Payment Rank
Interbank Claims / Derivatives	Interbank funding
Loans & Mortgages	Shareholders Equity
~ EURIBOR + SPREAD	

How can you match fixed rate liabilities (client deposits and bond issuances) with lending assets as loans and mortgages euribor-indexed?

INTESA SANPAOLO Amount Outstanding [MM]

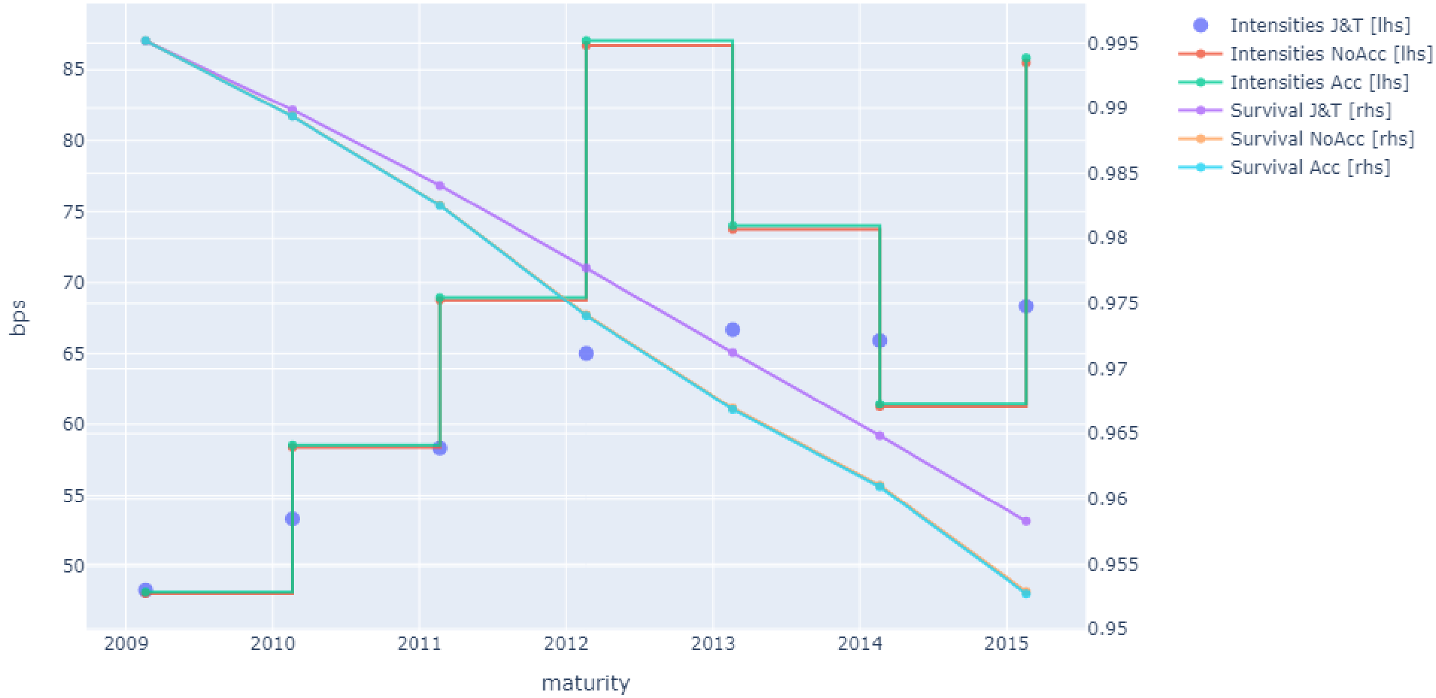
payment_rank	#	outstanding [MM]	outstanding %	ttm	ytm	asw
Jr Subordinated	13	691	18.7 %	4.6	6.66	334
Subordinated	33	435	11.8 %	2.9	5.66	200
Sr Unsecured	77	138	3.7 %	3.7	5.03	137
Sr Non Preferred	11	899	24.4 %	7.3	4.89	143
Sr Preferred	227	245	6.6 %	4.0	4.59	171
Secured	49	1,282	34.8 %	6.1	4.38	66
TOTAL	410	3,689	100.0 %	5.5	5.12	160

As of 18th March 2024, let us consider Intesa Sanpaolo SpA issuances, ranked by payment seniority in case of default: from most risky as subordinated, up to secured ones (i.e. by mortgages as covered bonds).

$$\hat{s}_i \cdot \sum_{j=1}^{i} S_j \cdot \delta_j \cdot D_j + \hat{s}_i \cdot \sum_{j=1}^{i} \frac{\delta_j}{2} \cdot (S_{j-1} - S_j) \cdot D_j = (1-\pi) \cdot \sum_{j=1}^{i} (S_{j-1} - S_j) \cdot D_j\,, \quad \forall i$$

Jarrow-Turnbull is constant throughout the period!

It is not piecewise constant!
This constant value is by chance similar to the mean value of the piecewise constant exact one?



First To Default

- Generate normal random variables 2xNsim sample
- Use Cholesky decomposition to correlate them and invert Gaussian CDF to get uniforms
- For each uniform drawn, invert the survival function (using boostrapped intensities) and get the random default times τ
- For each sample, pick up the smaller τ between the two issuers
- For each simulation: compute the two legs
  - Premium Leg = $\sum_i^j \delta \cdot D_i + \left(\tau - t_j\right) \cdot D_\tau$ if $\tau \leq T$ otherwise full BPV
  - Recovery Leg = $(1 - \pi) \cdot D_\tau$ if $\tau \leq T$ otherwise 0
- Mean the above and obtain the puntual average as $\frac{\text{Recovery Leg}}{\text{Premium Leg}}$
- Set the confidence level and compute the interval for the ratio of the two means via Fieller's theorem https://en.wikipedia.org/wiki/Fieller%27s_theorem

Num.Sim. = 100,000