

Par Equivalent CDS Spread analytics review, version 1.0

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Introduction

The purpose of this document is to describe the implementation of basic credit analytics for the valuations of Credit Default Swap contracts and risky cash Bond positions on corporate names. Two Excel Add-in functions, SimplePECSnew() and CDSParSpreadnew(), were created using Microsoft Visual C#. They are alpha versions and are in the testing stage.

Bond-CDS Negative Basis Trade

Please refer to reference [1] for negative basis trade ideas and its authors' views on the opportunities in the corporate credit market. Most of the implemented formulae are identical to those written in that document, except a few differences as in below

1. $PD(i) = PS(i-1) - PS(i)$. On page 82 of the reference, it is shown as $PD(i) = 1 - PS(i)$, which consider to be an innocent typo.
2. CDS spread with matching bond's maturity was not interpolated. Current version uses a quite simple method transferring the survival probability in to par spread, that consider to be more desired than interpolating the spread itself. Future version of the model would have the standard method that uses CDS trade in order to find the par spread to matching probability and maturity.

Bond trade is created as a Credit Linked Note (CLN) because the same valuation method is used.

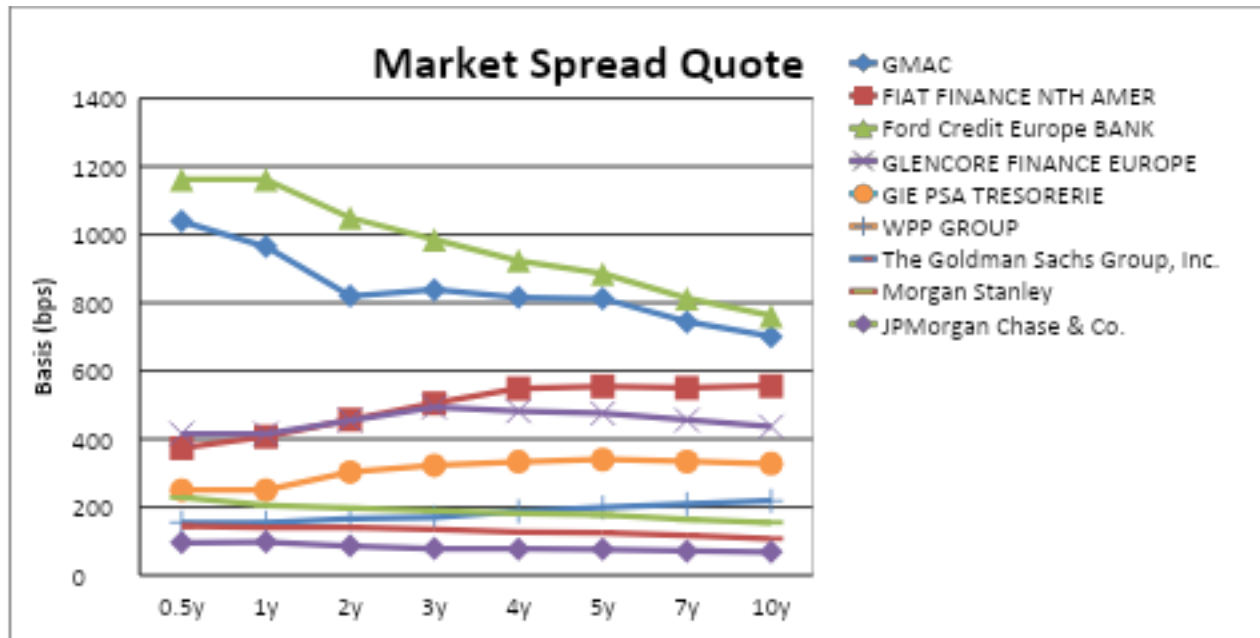


Figure 1. Sample market par spread quote of various corporate names as of July 23.

Instructions for Use

Type “=SimplePECnew()” in Excel cell and click *fx* to see the below screen.

Function Arguments

SimplePECnew

ParSpreadTenor: \$B\$5:\$B\$5 = {0.5,1,2,3,4,5,7,10}

parSpread: \$A\$7:\$B\$7 = {817.8,1259.7,1038.75,0,875.6,1...}

timetoMaturity: YEARFRAC(\$B\$2,\$C\$7) = 1.852777778

recovery: \$U\$7 = 0.4

fixedCouponRate: \$P\$7 = 0.05375

= TRUE

Simple PECS calculator .

ParSpreadTenor par Spread Tenors (in year) . .

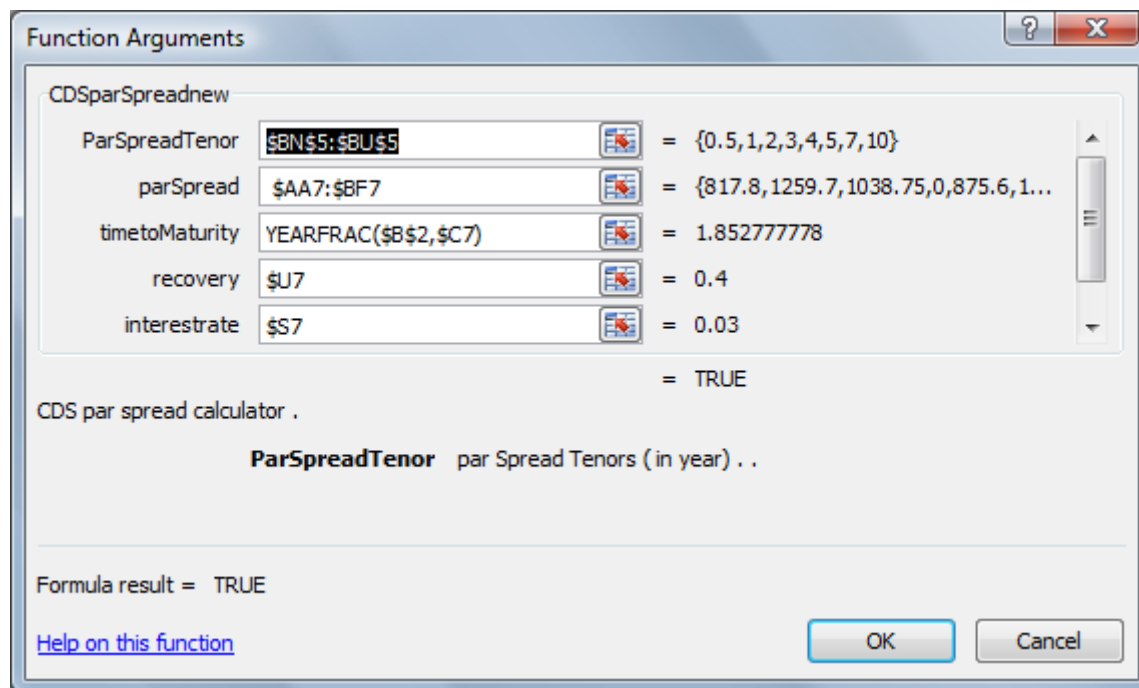
Formula result = TRUE

[Help on this function](#)

OK Cancel

BondPrice is in units of 100. PayFreq is 1 for annually paid coupon and 4 for quarterly paid coupon. Par Spread is in units of bps. The output is calculated Par Equivalent CDS Spread.

Type “=CDSparSpreadnew()” in Excel cell and click *fx* to see the below screen.



The output is CDS par spread for given (bond's) maturity.

Library Structure

All classes are categorized in to three kinds; market object, trade object, and utility object. Every class inherits one of the three abstract base classes of MarketObj, TradeObj, and UtilityObj. MarketObj is the abstract base class from which YieldCurve, parSpreadCurve, and various market data objects should be derived. TradeObj is the abstract base class, under which the instrument needs to be valued resides, e.g. CDS, SimpleCLN (credit linked note), Risky Bond, etc. UtilityObj is the abstract base class, under which generic utility functions are placed, e.g. OneDimNewtonianSolver (the simplest form of Newton-Raphson method). Additional categories of the class objects will be needed when the simple library is extended further.

Designing an in-house analytics library requires planning many years' work and use. It would be painful to make major changes later. Inputs from Computer Scientists and Technology specialists are extremely important and quantitative development should comply with the designers' plan, especially at this stage.

Initial Testing

Initial testing effort was made to compare the outputs of the excel add-in function to the results of the first 10 names in Table 12 on page 60 of reference [1].

OUTPUT								
Basis	Basis from Ref	Basis diff	PECS	PECS from Ref	PECS diff	CDS spread	CDS from Ref	CDS diff
-16.39 %	-16.55%	0.16%	27.94%	28.00%	-0.06%	11.55%	11.45%	0.10%
-11.47 %	-12.86%	1.39%	24.89%	25.65%	-0.76%	13.43%	12.78%	0.65%
-12.31 %	-12.44%	0.13%	26.28%	26.78%	-0.50%	13.97%	14.34%	-0.37%
-8.33%	-9.31%	0.98%	19.54%	20.52%	-0.98%	11.21%	11.21%	0.00%
-7.19%	-7.59%	0.40%	19.07%	19.46%	-0.39%	11.88%	11.88%	0.00%
-7.00%	-7.16%	0.16%	18.04%	18.20%	-0.16%	11.04%	11.04%	0.00%
-5.96%	-7.08%	1.12%	19.39%	21.23%	-1.84%	13.43%	14.16%	-0.73%
-7.02%	-6.98%	-0.04%	9.54%	9.49%	0.05%	2.52%	2.52%	0.00%
-7.36%	-6.96%	-0.40%	14.68%	14.28%	0.40%	7.32%	7.32%	0.00%
-6.83%	-6.70%	-0.13%	11.39%	11.26%	0.13%	4.56%	4.56%	0.00%

Historical CDS data as of 2/2/2009 were not available and curve was manually created and adjusted. This test could be revisited with more accurate market data.

Limitations

The modeling and implementation contain various inaccuracies. Major ones are due to simplifications, such as,

Flat interest rate curve, simplified bootstrap of CDS par spread, simple day-counting, etc.

The screen clip below shows the impact from the different interest rate and recovery assumptions for a single bond.

Flat Interest Rate	Price (Dirty)	Recovery	Basis	PECS	CDS spread
2.00%	88.1453	15.00%	1.72%	7.99%	9.71%
3.00%	88.1453	15.00%	2.74%	6.97%	9.71%
3.00%	88.1453	40.00%	2.55%	7.16%	9.71%

Future implementation could include the work removing the above simplifications. Proper reflection method should be in place to pass objects from Excel spreadsheet to a C# library. Multiple calculated outputs need to be accessed from the spreadsheet by applying various requests to the created object on the spreadsheet. Various curve interpolation methods need to be implemented. Intensive testing and debugging are essential.

Model Properties

Figure 2 shows the calculated basis for various interest rate assumptions. Higher discounting rate justifies the relatively low bond price, therefore would decrease PECS and increase the basis.

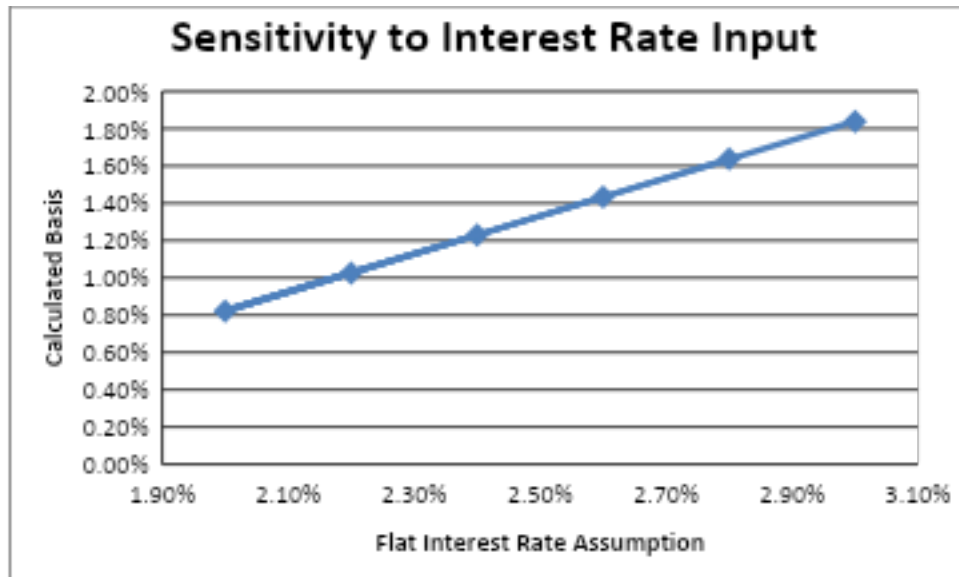


Figure 2. Calculated Bond-CDS basis (= CDS – PECS) vs. flat interest rate inputs.

Figure 3 shows the calculated basis for various recovery assumptions. Changing recovery doesn't impact CDS spread at Bond's Maturity in this simplified version. The impact would be minor in production version as well. Higher recovery would increase the PV of the cash bond position and would require higher PECS to match the current price. Therefore higher recovery assumption reduces the basis.

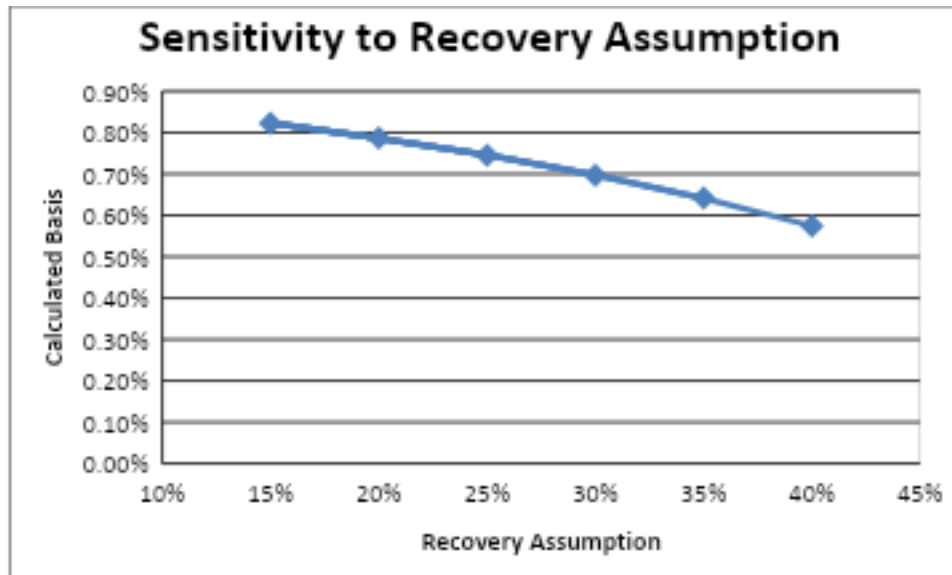


Figure 3. Calculated Bond-CDS basis (= CDS – PECS) vs. Recovery Inputs.

Figure 4 shows the calculated basis for varying coupon frequency input. Higher pay frequency should increase bond price, which requires higher PECS to match the market quote. Therefore, it decreases the basis.

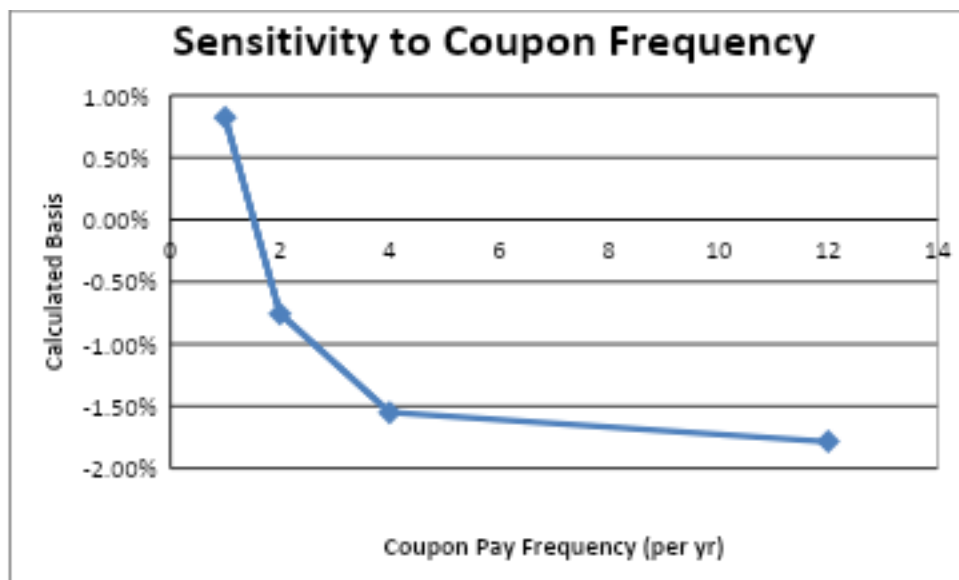


Figure 4. Calculated Bond-CDS basis (= CDS – PECS) vs. Pay Frequency Inputs.

Market Risk Management

Basis trade assumes that CDS market is more efficient than credit bond market. Profitable negative basis trade could be (a) bullish trade if PECS decreases while credit bond catches up CDS or (c) bearish trade if CDS spread widens to catch down the bond price. Lowering market interest rate will lift up the cash bond price while not impacting 'that' much on CDS, which would benefit the negative basis trade. Market view change to the higher recovery would benefit the position as well by lifting up the bond price, 'if' CDS spread remains constant. In real world, it would tighten the spread significantly.

Using interest rate derivative, interest rate risk of the negative basis trade can be hedged. This model can provide the hedge ratio. Interest rate derivative models can be added in to the library.

Closing Remarks

This is an initial attempt to create a basic credit library structure. A simple add-in function calculating Par Equivalent CDS Spread was implemented. The major inaccuracies included in the current version are due to simplifications. Well-designed structure would save on the cost of future projects.

References

[1] Bond-CDS Basis Handbook, Europe Credit Derivative Research, J.P. Morgan Chase, February 5 (2009)