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# **BVAL PRICING METHODOLOGY**

For Government, Supranational, Agency & Corporate Bonds

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## BVAL Price Methodology for Government, Supranational, Agency and Corporate Bonds (“GSAC”)

Bloomberg’s BVAL service provides transparent and highly defensible prices of fixed income securities across the liquidity spectrum. The key to BVAL’s methodology is its access to a wealth of market observations from thousands of contributed price sources. The accumulated mass of market data serves as the driver of an innovative and quantitative approach that first prices actively-traded bonds, and then observes their market values to derive a price on comparable bonds that trade less frequently. This methodology is aligned with Bloomberg’s tried-and-tested capabilities as the financial industry’s leading analytics platform and source of OTC securities market information. In addition to sophisticated algorithms that generate prices, the BVAL methodology assigns a BVAL Score based on the quantity and quality of market data used.

GSAC includes Government, Supranational, Agency and Corporate bonds – investment grade and high yield. Fixed and floating rate bonds are covered, as are a variety of bond structures.

## BVAL Evaluated Pricing Screen

BVAL’s unique pricing transparency starts on the terminal. Figure 1 below shows BVAL’s Evaluated Pricing screen, which summarizes all the analysis used in the pricing methodology of an individual bond (the “Target Security”). Simply pull up the Target Security on your Bloomberg terminal and type BVAL <GO>.



Figure 1: BVAL Evaluated Pricing – BVAL <GO>

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The Final BVAL Price is derived using a three-pronged approach based on a combined sequence of proprietary BVAL algorithms:

1. Step One – the **Direct Observations** methodology uses trades, indicative quotes and executable levels on the Target Security
2. Step Two – the **Historical Tracking** methodology uses the historical correlation of the Target Security to direct observations of comparable bonds when observable market data on the Target Security is insufficient
3. Step Three – the **Observed Comparables** methodology uses direct observations on comparable bonds to derive a relative value price for the Target Security when observable market data on the Target Security is insufficient

To corroborate the results of each algorithm, prices are run through all three steps regardless of the quality achieved in the first step. The results are then appropriately weighted and aggregated based on each algorithm's relative strength to derive a Final BVAL Price. In this way, BVAL produces a price on every Target Security, regardless of the quantity of observed market data available.

## Direct Observations

**Step One - Direct Observations** uses Bloomberg's proprietary screening algorithm to analyze market data received from BVAL's array of pricing contributors. This includes institutional size TRACE trades and indicative market quotes from global and regional banks, broker-dealers and exchanges as well as executable levels from Bloomberg's electronic trading platform. This contributed content is fed into BVAL's Direct Observation algorithm, filtered and time decayed to include only the highest quality, most recent observations on a per asset class basis, and corroborated to compute an independent Direct Observations Price. If the quantity of trade data received meets certain thresholds, the Direct Observations algorithm will be highly influenced by the trade algorithm. The Direct Observations algorithm uses either price or spread over benchmark inputs according to asset class to generate a bid, mid and ask price for every Target Security.

## Direct Observations Screen

Figure 2 below shows the BVAL Direct Observations screen, which summarizes all the analysis used to price a Target Security in the Direct Observations algorithm. Key highlights of the data displayed includes the Final BVAL Price, the Final BVAL Score (out of 10 - discussed in further detail below), the Direct Observations Price, the price and weights assigned to trades, executable bids/asks and indicative bids/asks, the number of filtered market observations used in the algorithm and their standard deviation. The market inputs used in the Direct Observations algorithm are then clearly displayed for every Target Security.

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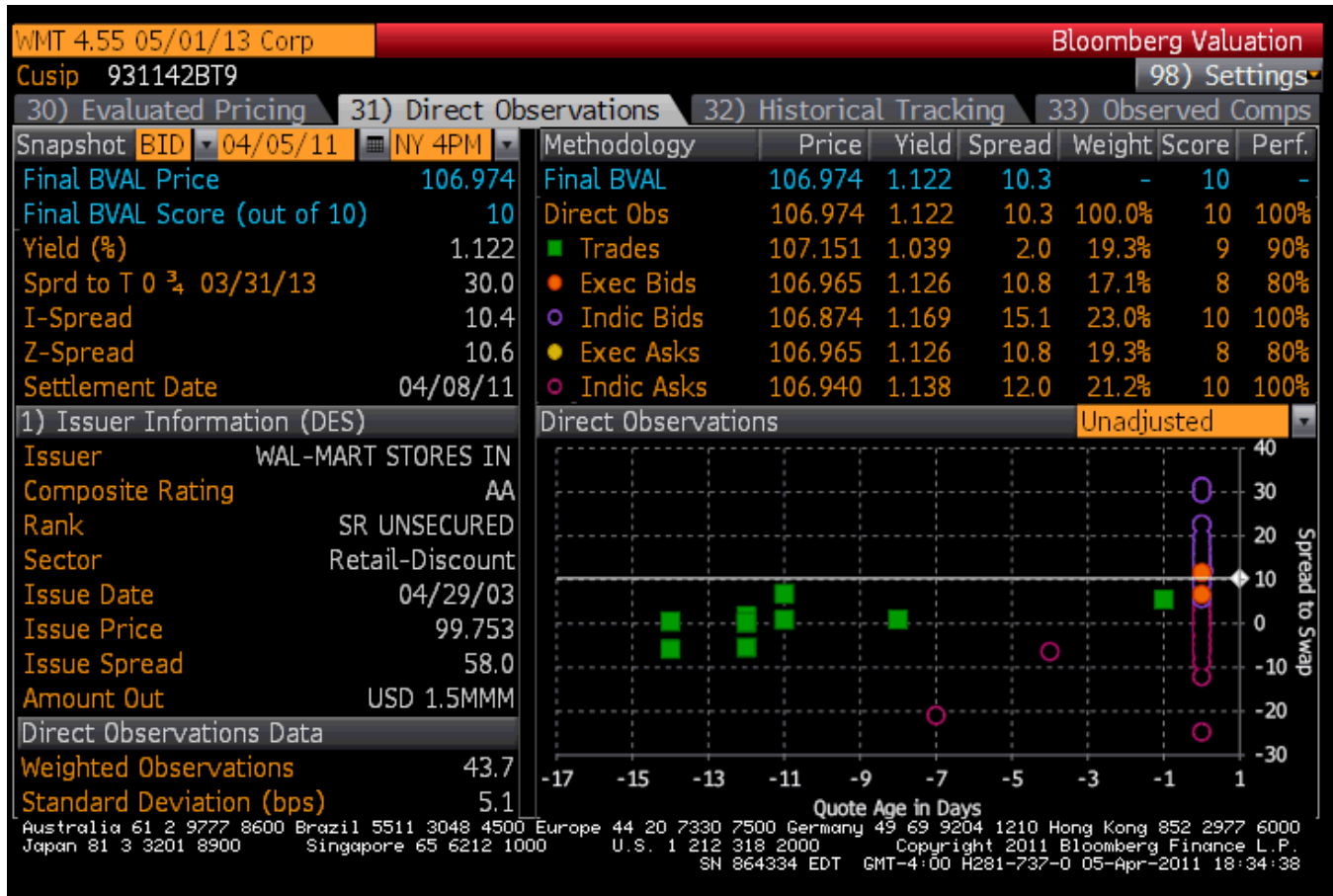


Figure 2: Direct Observations

## Historical Tracking

**Step Two – Historical Tracking** uses Bloomberg’s proprietary historical correlation algorithm, in conjunction with Direct Observations, to price a Target Security based on its moving relationship to comparable bonds. Comparable bonds are defined by key attributes such as industry, credit quality and capital structure rank as well as its proximity to duration and CDS levels of the Target Security. The Historical Tracking algorithm compares the relative historical spread movements of the Target Security to those of its most highly correlated peer group over time. In the event there are no acceptable direct market observations on a Target Security, the Historical Tracking algorithm will use this historical correlation to price the Target Security.

## Historical Tracking Screen

Figure 3 below shows the Historical Tracking screen which summarizes all the analysis used to price a Target Security in the Historical Tracking algorithm. Key highlights of the data displayed include the Historical Tracking Price, the Historical Tracking Score (out of 7 – discussed in further detail below), the weight of the Historical Tracking algorithm used in the Final BVAL Price, the number of comparable bonds used, the regression results and details on the five most highly correlated comparable bonds.

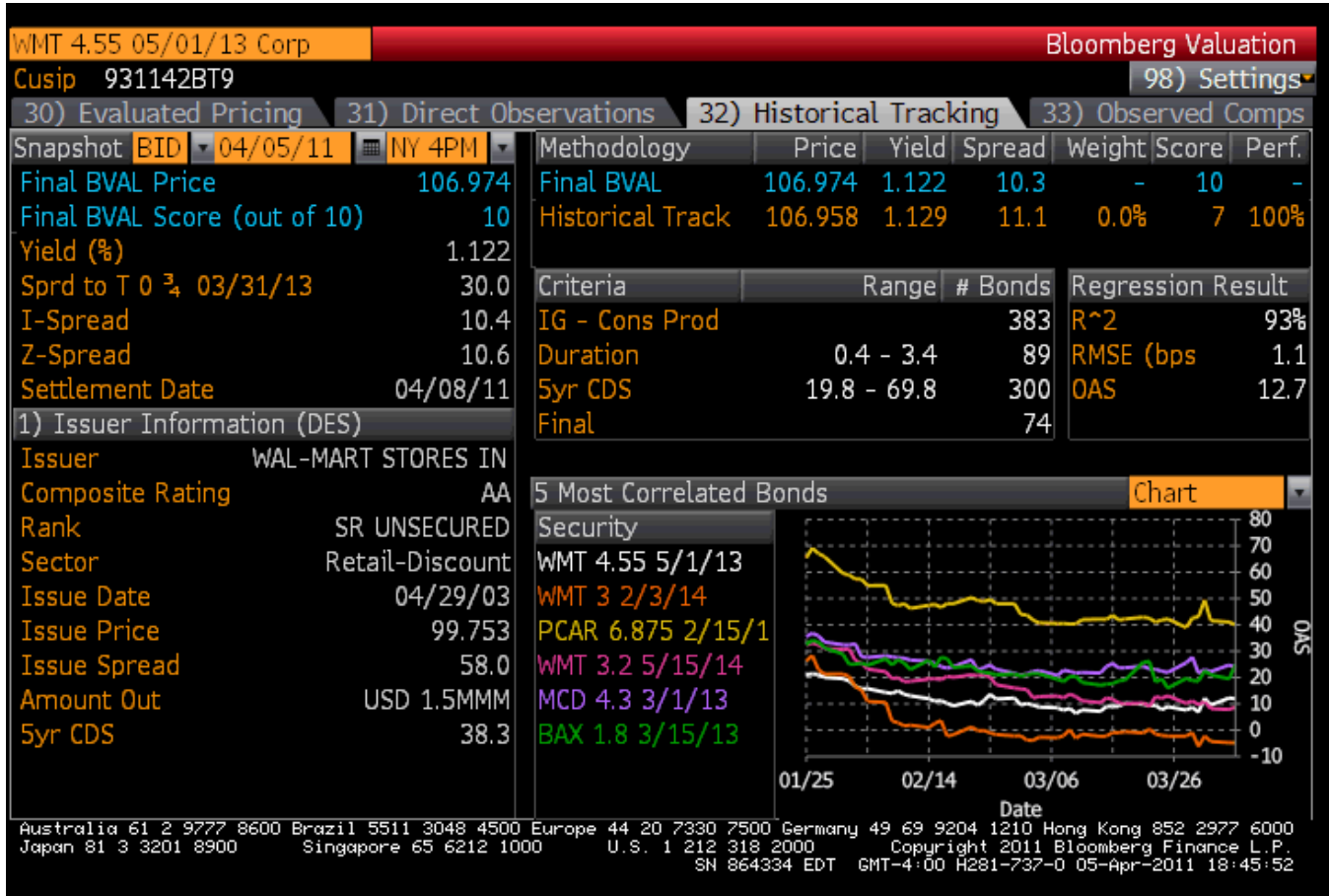


Figure 3: Historical Tracking

## Observed Comparables

**Step Three – Observed Comparables** uses Bloomberg’s proprietary relative value algorithm to price bonds with little to no market data. A Target Security with insufficient market data is priced relative to comparable bonds which have observations. In this final step, BVAL uses three different algorithmic approaches based on a bond’s asset class and structural characteristics:

1. **Yield to Maturity Model - Investment Grade bullet bonds (fixed and floating).** This methodology derives a par issuer curve based on direct market observations across an issuer’s term structure. A Target Security with no market observation is algorithmically priced off the appropriate maturity point on the par issuer curve. If a par issuer curve cannot be derived from market observations, an appropriate par reference curve is created from a combination of liquid comparable peer curves within the same industry, credit quality and seniority rank in the capital structure.
2. **OAS Duration Model – Investment Grade callable bonds (“Target Callable Security”).** This methodology uses the liquid bullet par issuer curve as the benchmark and quantitatively determines the OAS/Duration of the Target Callable Security. If a liquid bullet par issuer curve cannot be derived, an appropriate bullet reference curve is created from a combination of liquid comparable peer curves within the same industry, credit quality and seniority rank in the capital structure. An OAS/Duration of the Target Callable Security is then calculated to derive an Observed Comparables price.
3. **Yield to Worst to Duration Model – High Yield bonds** (across Corporate and Emerging Market Sovereign sectors). This methodology uses liquid bonds through an issuer’s capital structure to create a yield to worst

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vs. duration curve to price an illiquid bond at the same seniority level. If a liquid curve cannot be derived at the issuer level, this methodology uses market observations of affiliated bonds and ultimately bonds in the same industry based on a similar risk profile.

In addition, for investment grade corporate bonds, the BVAL Price is adjusted for technical issues specific to a bond's unique characteristics. These residual adjustments include those for coupon, size of issue and age in the market.

## Observed Comparables Screen - Yield to Maturity (IG Bullets)

Figure 4 below shows the Observed Comparables screen which summarizes all the analysis used to price a Target Security. Key highlights of the data displayed includes the Observed Comparables Price, the Observed Comparables Score (out of 5 - discussed in further detail below), the weight of the Observed Comparables algorithm used in the Final BVAL Price, the point on/off the reference curve used to price the Target Security, the Observed Residual (if there is observable market data), a Predicted Residual (which is statistically derived if there is no observable market data) and, if necessary, a Credit Residual to align the composite rating of the reference curve with the Target Security's composite rating.



Figure 4: Observed Comparable Screen (IG Bullets) - Yield to Maturity

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## Observed Comparables Screen – OAS Duration (IG Callables)

Figure 5 below shows the Observed Comparables screen which summarizes all the analysis used to price a Target Callable Security. This is a robust dual-pronged methodology which recognizes the OAS associated with a callable bond relative to an issuer’s yield to maturity bullet curve. To clearly illustrate, the Observable Comparables screen is split to show the bullet reference curve and OAS to the reference curve for a Target Callable Security. Additional key highlights of the data displayed includes the Observed Comparables Price, the Observed Comparables Score (out of 5 – discussed in further detail below), the Observed Comparables Price weight used in the Final BVAL Price, OAS, the Observed Residual (if there is observable market data), a Predicted Residual (if there is no observable market data) and, if necessary, a Credit Residual to align the composite rating of the reference curve with the Target Security’s composite rating.

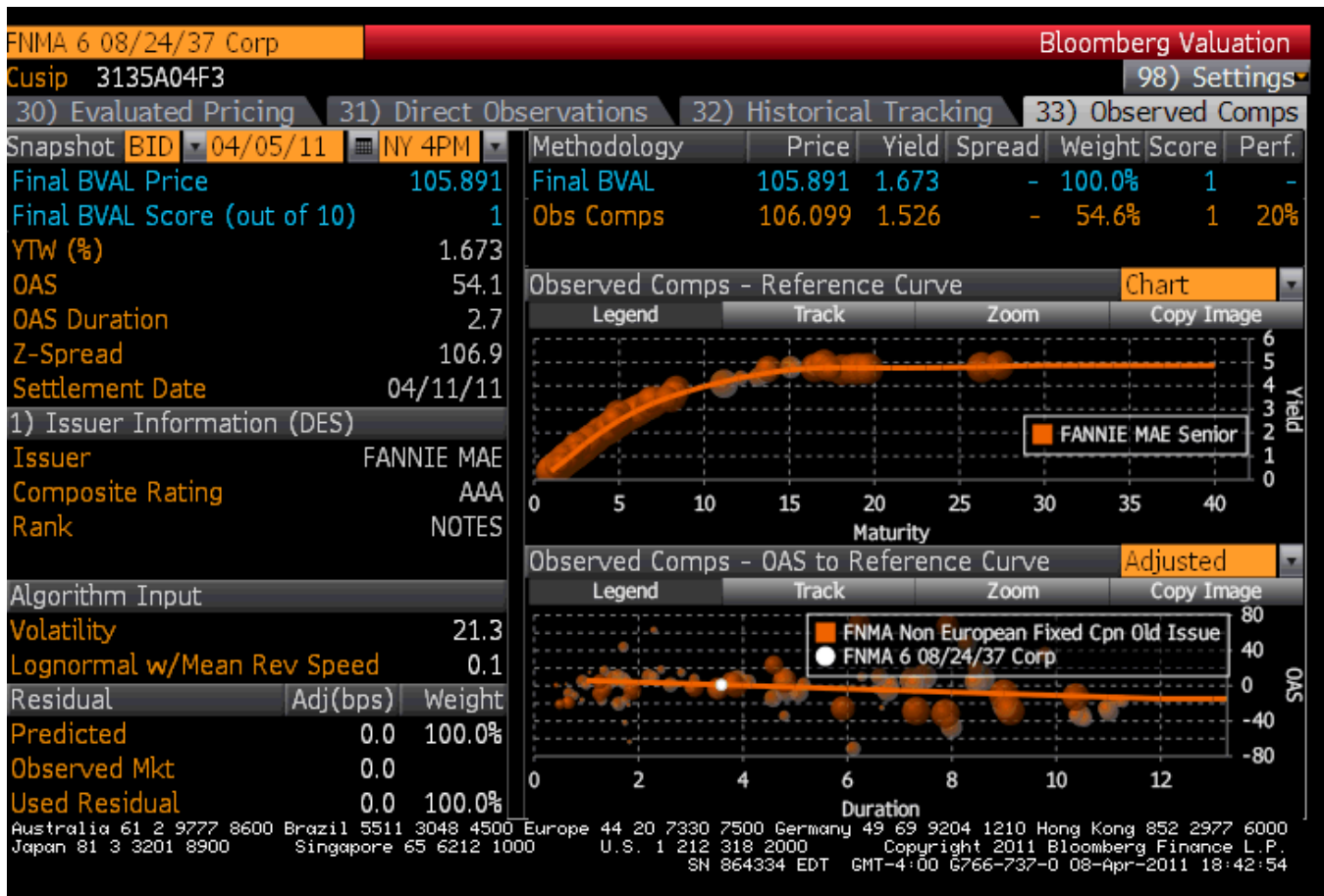


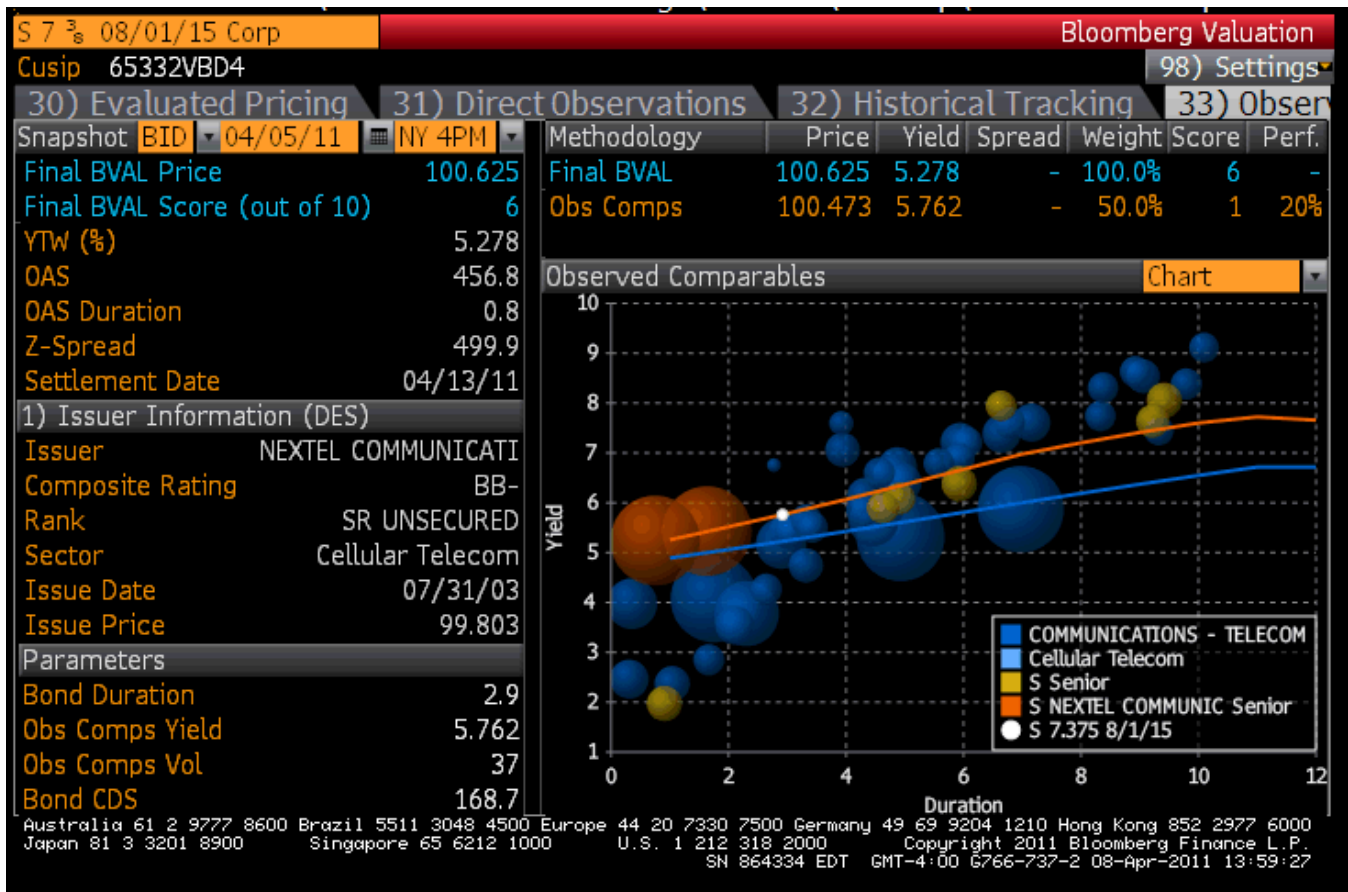
Figure 5: Observed Comparables Screen (IG Callables) – OAS to Duration

## Observed Comparables Screen – YTW to Duration (High Yield)

Figure 6 below shows the Observed Comparables screen which summarizes all the analysis used to price a Target Security in the high yield market. This methodology recognizes the convention of yield to worst and duration associated with high yield bond structures. Key highlights of the data displayed includes the Observed Comparables Price, the Observed Comparables Score (out of 5 – discussed in further detail below), the Observed Comparables Price weight used in the Final BVAL Price, the YTW to Duration and bond CDS (if available).



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**Figure 6: Observed Comparables Screen (High Yield) – Yield to Duration**

## BVAL Score

The BVAL Score is an innovative metric designed to gauge the level of market data used in constructing the Final BVAL Price. The BVAL Score measures the quantity and quality of the market data used in each step of the BVAL Evaluated Pricing methodology. A BVAL Score is calculated for each algorithmic step - Direct Observations, Historical Tracking and Observed Comparables, which are then appropriately weighted to derive a Final BVAL Score. The Final BVAL Score is measured on a scale of 1 (the weakest) to 10 (the strongest).

Given the BVAL score measures the quantity and quality of market data observed, the Direct Observations methodology can receive a maximum BVAL Score of 10. Historical Tracking, however, uses market observations of correlated comparable bonds when there are no market observations on the Target Security, and therefore only receives a maximum BVAL Score of 7. Observed Comparables derives a price using comparable bond observations, and can therefore only receive a maximum BVAL Score of 5.

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## Previous BVAL Price – Stabilization Factor

In addition to the three-pronged approach detailed above, BVAL has implemented a stabilization mechanism to reduce price volatility from one snapshot to the next. This factor is used in connection with the Observed Comparables algorithm when the current snapshot has weaker market data relative to the previous Final BVAL Price. In these cases, the Previous BVAL Price is algorithmically weighted and combined with the newly derived Observed Comparable Price to appropriately manage price volatility on less liquid bonds.

## BVAL at a Glance – BVAL<GO>

The BVAL <GO> function, available on the BLOOMBERG PROFESSIONAL service, enables clients to view BVAL Evaluated Prices, the BVAL Score, related metrics and useful information that are available to Bloomberg Data License clients via its data feeds. Throughout the BVAL <GO> function, you can examine how the BVAL methods are applied and the depth of data supporting the algorithms. The interface provides a level of transparency unavailable anywhere else today. This visibility greatly assists our clients in making highly informed fixed income valuation decisions.

## Summary

The Final BVAL Price is a product of Bloomberg's proprietary quantitative approaches and methodologies. The algorithms used, along with Bloomberg's wealth of information, analytics and transparency, are all key features that set BVAL apart from its competitors. Distinct from a single-technique approach, BVAL is able to corroborate its pricing by employing multiple methodologies to produce separate prices for a Target Security subject to market data. These prices are ultimately combined to derive a Final BVAL Price.

BVAL's multi-method approach ensures that if there is insufficient market data (i.e. thinly traded securities), the Target Security will be priced nonetheless. The BVAL Score, which measures the quantity and quality of data used in the BVAL algorithms, is a valuable and unique concept created specifically for Bloomberg's evaluated pricing service. The transparency available on the Bloomberg terminal via BVAL<GO>, the ability to integrate Bloomberg's Enterprise feed into our clients' infrastructure via Data License, and the access to a global team of evaluators in New York, London and Asia with significant capital markets experience, are second to none. Quality pricing via seven same-day snap-shots, broad-based asset class coverage, timely distribution, and full transparency establish BVAL as the highest standard in the evaluated pricing industry.

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## APPENDIX - A

### BVAL Price Methodology for Convertible Bonds

BVAL's pricing methodologies for convertible bonds ("Convertibles") is similar to those used in the other GSAC asset classes, with important modifications to account for the differences and complexity of this hybrid asset class.

BVAL for Convertibles maintains a two-pronged algorithmic approach – Direct Observations, which continues to use Bloomberg's wealth of market data, and a Convertible Model, which leverages Bloomberg's OVCV convertible bond model. See Figure 7 below.



Figure 7: BVAL Evaluated Pricing for Convertible Bonds – BVAL <GO>

### Direct Observations - Convertibles

**Step One** - BVAL Direct Observations for Convertibles filters Bloomberg's collection of observed market data, namely institutional size trades and indicative bid/ask levels, to derive a price. Direct Observations for Convertibles applies an appropriate time decay factor and outlier removal tool to all market data. The Direct Observations Price is further refined by using real-time equity market prices of the underlying stock at each of BVAL's seven global snapshots, and then delta adjusts the market data to accurately reflect market volatility from the time the data was received.

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Figure 8 below shows the BVAL Direct Observations screen, which summarizes all the analysis used to price a Convertible in the Direct Observations algorithm. Key highlights of the data displayed includes the Final BVAL Price, the Final BVAL Score (out of 10 ), Parity, Premium, the Reference Stock Price, the Direct Observations Price, the price and weights assigned to Trades and Indicative Bids/Asks, the number of filtered market observations used in the algorithm and their standard deviation. The market data used in the Direct Observations algorithm are then clearly displayed for every Convertible.

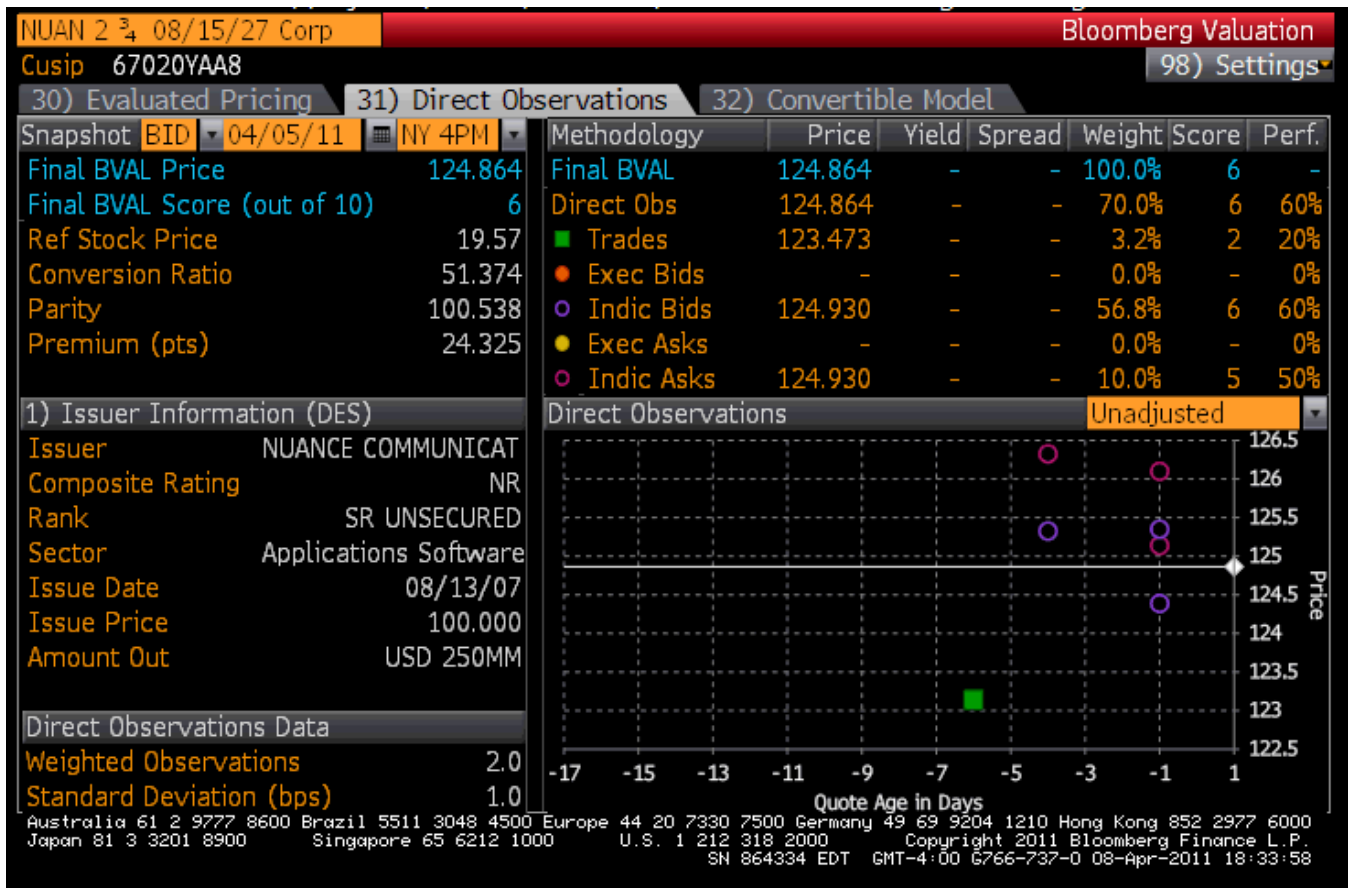


Figure 8: BVAL Direct Observations for Convertible Bonds

## Convertible Model – OVCV

**Step Two** - BVAL for Convertibles produces a model result when market observations are insufficient to derive a strong Direct Observations price. BVAL's Convertible Model uses historical OAS derived from previous snapshots to populate Bloomberg's OVCV convertible bond model. The Convertible Model then incorporates the current equity volatility, yield curve, credit curve, recovery assumptions and specific Convertible characteristics to generate a price.

For a more detailed view into Bloomberg's OVCV model please refer to IDOC 2051538 and IDOC 2051748.

Figure 9 below shows the BVAL Convertible Model screen, which summarizes all the analysis used to price a Convertible. Key highlights of the data displayed includes Yield to Maturity, Yield to Call/Put, Bond Floor, Equity Option Value and Conversion Ratio.

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NUAN 2 3/4 08/15/27 Corp		Bloomberg Valuation								
Cusip 67020YAA8		98) Settings								
30) Evaluated Pricing		31) Direct Observations		32) Convertible Model						
Snapshot	BID	04/05/11	NY 4PM	Methodology	Price	Yield	Spread	Weight	Score	Perf.
Final BVAL Price		124.864		Final BVAL	124.864	-	-	100.0%	6	-
Final BVAL Score (out of 10)		6		Convert Model	124.864	-	-	30.0%	3	30%
Ref Stock Price		19.57		Algorithm Information						
Conversion Ratio		51.374		Yield to Maturity	1.086					
Parity		100.538		Yield to Call	-4.065					
Premium (pts)		24.325		Yield to Put	-					
1) Issuer Information (DES)				Bond Floor	91.262					
Issuer	NUANCE COMMUNICAT			Equity Option Value	33.602					
Composite Rating	NR									
Rank	SR UNSECURED									
Sector	Applications Software									
Issue Date	08/13/07									
Issue Price	100.000									
Amount Out	USD 250MM									
5yr CDS	-									

Australia 61 2 9777 8600 Brazil 5511 3048 4500 Europe 44 20 7330 7500 Germany 49 69 9204 1210 Hong Kong 852 2977 6000  
 Japan 81 3 3201 8900 Singapore 65 6212 1000 U.S. 1 212 318 2000 Copyright 2011 Bloomberg Finance L.P.  
 SN 864334 EDT GMT-4:00 6766-737-0 08-Apr-2011 18:35:38

Figure 9: BVAL Convertible Model