

Report Prepared On: 05/22/13

**Structured Product Details**

<b>Name</b>	Trigger Phoenix Autocallable Optimization Securities linked to Citigroup
<b>Issue Size</b>	\$5.22 million
<b>Issue Price</b>	\$10
<b>Term</b>	18 Months
<b>Annualized Coupon</b>	8.85%
<b>Pricing Date</b>	May 3, 2013
<b>Issue Date</b>	May 8, 2013
<b>Valuation Date</b>	November 3, 2014
<b>Maturity Date</b>	November 7, 2014
<b>Issuer</b>	Royal Bank of Canada
<b>CDS Rate</b>	104.05 bps
<b>Swap Rate</b>	0.53%
<b>Reference Asset</b>	Citigroup's stock
<b>Initial Level</b>	\$46.97
<b>Dividend Rate</b>	0.09%
<b>Implied Volatility</b>	28.10%
<b>Fair Price at Issue</b>	\$9.73
<b>CUSIP</b>	78008Y301
<b>SEC Link</b>	<a href="http://www.sec.gov/Archives/edgar/data/1000275/000121465913002547/57130424b2.htm">www.sec.gov/Archives/edgar/ data/1000275/000121465913002547/ 57130424b2.htm</a>

**Trigger Phoenix Autocallable  
 Optimization Securities linked to  
 Citigroup**

**Description**

Royal Bank of Canada issued \$5.22 million of Trigger Phoenix Autocallable Optimization Securities linked to Citigroup on May 8, 2013 at \$10 per note.

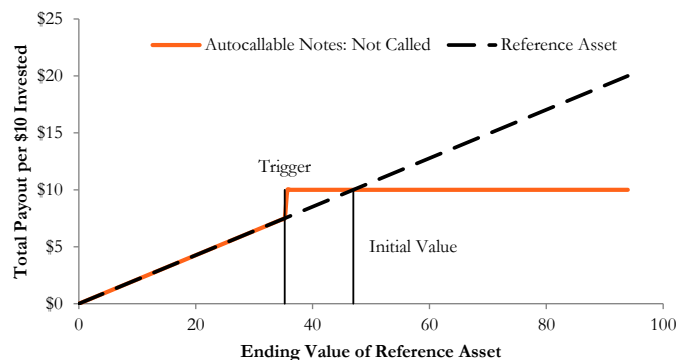
These 18-month notes are UBS-branded reverse convertible notes. On the quarterly coupon observation date, if the notes are not called back, they pay either quarterly coupon at an annualized rate of 8.85% if Citigroup's stock price closes above the coupon barrier \$35.23, or no coupon if the stock price closes below the barrier. The first coupon observation date is August 5, 2013. This autocallable notes will be called back if the reference stock price on any quarterly call observation date after August 5, 2013 exceeds the initial stock price \$46.97. In this case, investors receive the principal plus any unpaid coupons. At maturity, the notes convert into shares of the reference security—0.21 share of Citigroup's stock in this case—if the market value of the reference stock at the note's maturity is below the trigger price \$35.23 (75% of the reference asset on May 3, 2013). Otherwise, investors will receive the \$10 face value.

**Valuation**

This note can be viewed as a combination of a zero-coupon note from Royal Bank of Canada, a series of contingent coupon payments, and a short put option on the reference asset. For reasonable valuation inputs this note was worth \$9.73 per \$10 face value when it was issued on May 8, 2013, including \$9.89 for the present value of the zero-coupon note, (\$0.64) for the short put options, and \$0.48 for the present value of all future contingent coupon payments.

There is no active secondary market for most structured products. Structured products, including this note, therefore are much less liquid than simple stocks, bonds, notes and mutual funds. Investors are likely to receive less than the structured product's estimated market value if they try to sell the structured product prior to maturity. Our valuations do not incorporate this relative lack of liquidity and therefore should be considered an upper bound on the value of the structured product.

**Payoff Curve at Maturity**



The payoff diagram shows the final payoff of this note given Citigroup's stock price (horizontal axis). For comparison, the dashed line shows the payoff if you invested in Citigroup's stock directly.

**Related Research**

**Research Papers:**

[www.slcg.com/research.php](http://www.slcg.com/research.php)

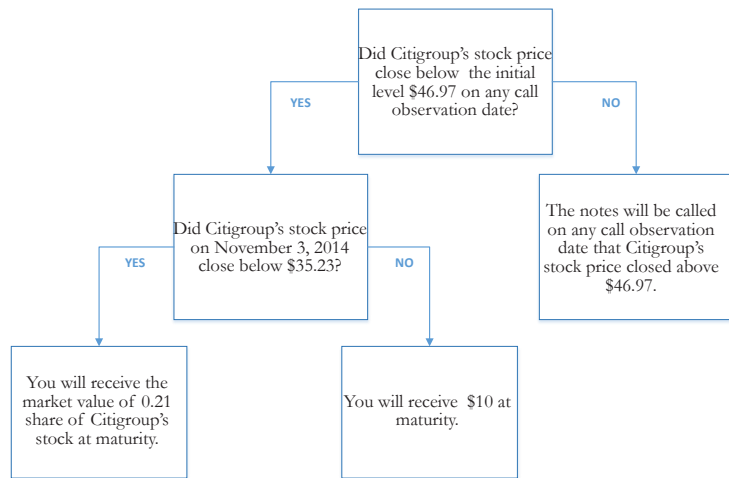
- "Are Structured Products Suitable for Retail Investors?" December 2006.
- "Structured Products in the Aftermath of Lehman Brothers," November 2009.
- "What TiVo and JP Morgan Teach Us about Reverse Convertibles," June 2010.

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**Principal Payback Table**

Citigroup's Stock	Note Payoff
\$0.00	\$0.00
\$4.70	\$1.00
\$9.39	\$2.00
\$14.09	\$3.00
\$18.79	\$4.00
\$23.49	\$5.00
\$28.18	\$6.00
\$32.88	\$7.00
\$37.58	\$10.00
\$42.27	\$10.00
<b>\$46.97</b>	<b>\$10.00</b>
\$51.67	\$10.00
\$56.36	\$10.00
\$61.06	\$10.00
\$65.76	\$10.00
\$70.46	\$10.00

**Maturity Payoff Diagram**



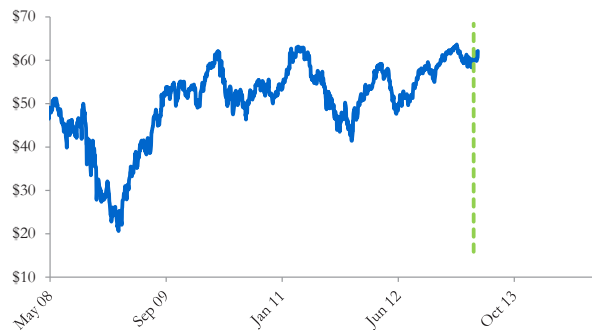
*The contingent payoffs of this Trigger Phoenix Autocallable Optimization Security.*

**Analysis**

The 8.85% coupon rate on this Trigger Phoenix Autocallable Optimization Security is higher than those paid by Royal Bank of Canada on its straight debts but, in addition to Royal Bank of Canada's credit risk, investors bear the risk that, 1) the note may be called; 2) the note may pay zero coupon because of the coupon contingency; 3) and the note will be converted into shares of Citigroup's stock when Citigroup's stock is worth substantially less than the face value of the note.

Investors purchasing these autocallable phoenix notes effectively sell contingent put options to Royal Bank of Canada and post the note's issue price as collateral to secure satisfaction of the investors' obligations under the option contracts. Royal Bank of Canada pays investors a contingent coupon that is part payment for the put options and part interest on the investors' posted collateral. This Trigger Phoenix Autocallable Optimization Security is fairly priced if and only if the difference between the contingent coupon and interest paid on Royal Bank of Canada's straight debt equals the value of the contingent put options investors are giving to Royal Bank of Canada. Whether this Trigger Phoenix Autocallable Optimization Security is suitable or not is identically equivalent to whether selling put options on the reference stock at the option premium being paid by Royal Bank of Canada was suitable for the investor.

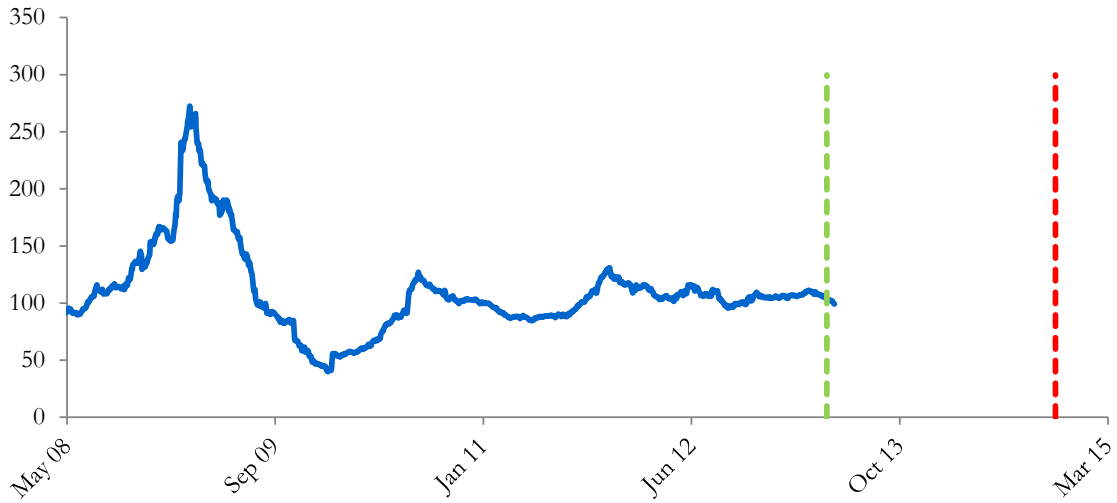
**Royal Bank of Canada's Stock Price**



*The graph above shows the adjusted closing price of the issuer Royal Bank of Canada for the past several years. The stock price of the issuer is an indication of the financial strength of Royal Bank of Canada. The adjusted price shown above incorporates any stock split, reverse stock split, etc.*

### Royal Bank of Canada's CDS Rate

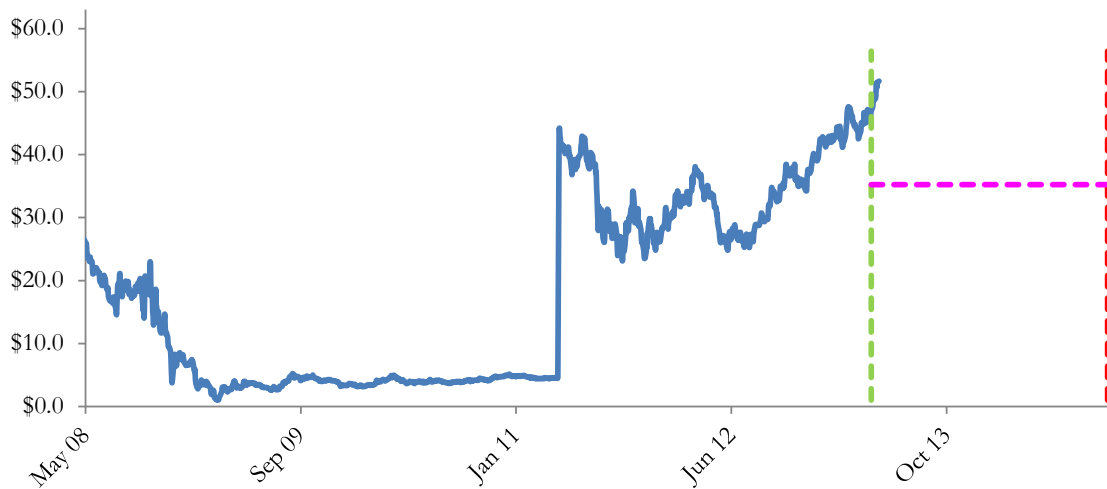
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Credit default swap (CDS) rates are the market price that investors require to bear credit risk of an issuer such as Royal Bank of Canada. CDS rates are usually given in basis points (bps). One basis point equals 0.01%. Higher CDS rates reflect higher perceived credit risk, higher required yields, and therefore lower market value of Royal Bank of Canada's debt, including outstanding Trigger Phoenix Autocallable Optimization Security. Fluctuations in Royal Bank of Canada's CDS rate impact the market value of the notes in the secondary market.

### Citigroup's Stock Price

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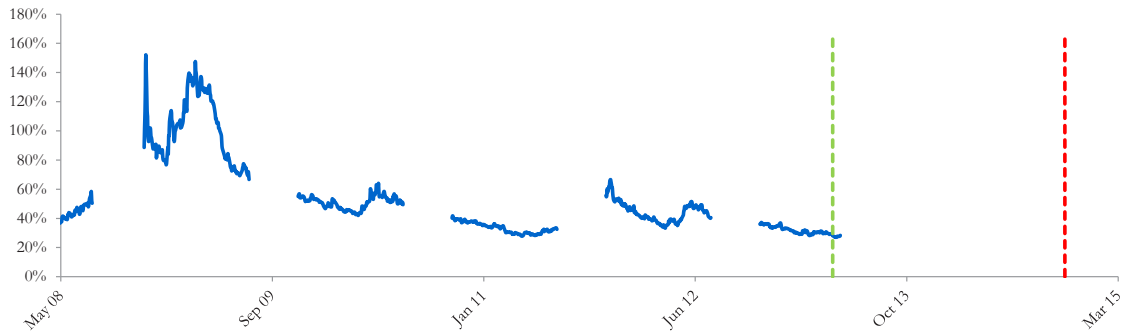
The graph above shows the historical levels of Citigroup's stock for the past several years. The final payoff of this note is determined by Citigroup's stock price at maturity. Higher fluctuations in Citigroup's stock price correspond to a greater uncertainty in the final payout of this Trigger Phoenix Autocallable Optimization Security.

### Realized Payoff

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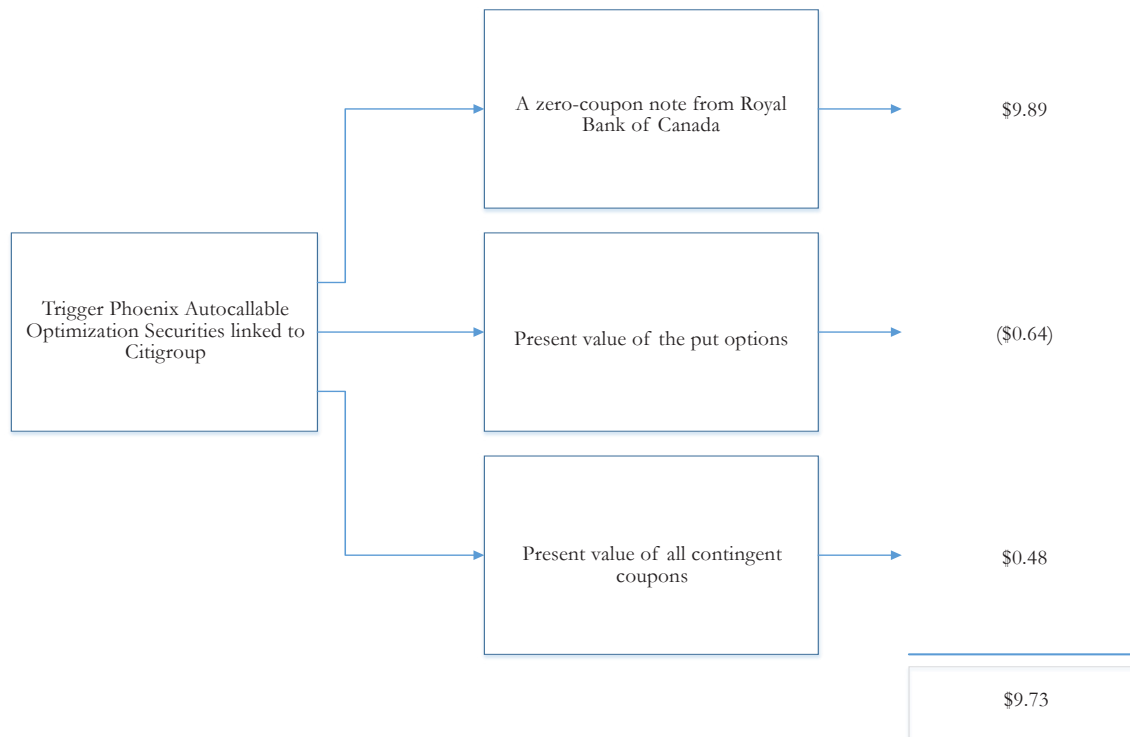
This product will mature on November 7, 2014.

## Reference Asset Citigroup's Stock's Implied Volatility



The annualized implied volatility of Citigroup's stock on May 3, 2013 was 28.10%, meaning that options contracts on Citigroup's stock were trading at prices that reflect an expected annual volatility of 28.10%. The higher the implied volatility, the larger the expected fluctuations of Citigroup's stock price and of the Note's market value during the life of the Notes.

## Decomposition of this Trigger Phoenix Autocallable Optimization Security



This note can be decomposed into different components, and each component can be valued separately. The chart above shows the value of each component of this Trigger Phoenix Autocallable Optimization Security.

1. Delta measures the sensitivity of the price of the note to the Citigroup's stock price on May 3, 2013.
2. CDS rates can be considered a measure of the probability that an issuer will default over a certain period of time and the likely loss given a default. The lower the CDS rate, the lower the default probability. CDS rate is given in basis points (1 basis point equals 0.01%), and is considered as a market premium, on top of the risk-free rate, that investors require to insure against a potential default.
3. Fair price evaluation is based on the Black-Scholes model of the Citigroup's stock on May 3, 2013.
4. Calculated payout at maturity is only an approximation, and may differ from actual payouts at maturity.
5. Our evaluation does not include any transaction fees, broker commissions, or liquidity discounts on the notes.