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**RE:** Liquidity Put Valuation

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Financial Control has performed an extensive review of the valuation of liquidity puts in Citigroup's HG ABS CDO transactions. This memo outlines our conclusions from this review.

One of the main conclusions is that liquidity puts are primarily liquidity products. We have reviewed several rating agency reports and the "outs to funding" that protect the liquidity put seller from credit deterioration, and conclude that the liquidity put is not intended as credit enhancement to protect ABCP investors against the risk of default.

The function and purpose of the liquidity puts is highly significant because it affects not only pricing, but RAP charges as well. Currently, a 10% credit conversion factor is applied to the liquidity puts, consistent with the rule for capital treatment for ABCP liquidity facilities. This rule only applies to facilities whose primary function is to provide liquidity. If the main function is to provide credit enhancement, the credit conversion factor increases to 50% - in other words, RAP charges increase by a factor of five.

We have concerns regarding the pricing model proposed by the business and its ability to capture and accurately value the liquidity risk. This risk includes the potential for a Citigroup downgrade as well as a disruption in the ABCP market. Modeling the liquidity risk is very difficult, not least because the liquidity risk needs to be isolated from the credit risk. We believe a better approach to valuing liquidity puts is to examine the pricing on other liquidity facilities that are comparable to the liquidity puts.

We reviewed the pricing on the liquidity facilities in the following transactions:

- Citigroup's multi-seller ABCP conduit business
- Citigroup's single-seller Extendible CP Programs
- Buckingham II, Mickinley Funding Ltd and Raffles Place Funding, Ltd
- Descartes Prime-1 rated short term notes

The pricing on the liquidity facilities in these transactions ranges from 15 to more than 30 bps. Based on these comparables, we believe it would be prudent to value the liquidity puts at 15 bps at the minimum. Therefore, based on the current mark of 10 bps, we propose to take an MVA of 5 bps on the CDO liquidity puts immediately and will consider additional MVA as warranted upon the completion of the valuation discussion.

The following additional factors should also be considered in this valuation discussion:

- Citigroup, as a holder of 55% of the ABCP liquidity facility market, is exposed to a significant concentration risk. Other major market players largely avoid significant liquidity facility exposures due to the perceived liquidity risks.
- Liquidity put fees that are received periodically while puts remain outstanding are subject to put exercise. A fair market valuation of the fees received should consider the probability that future fees may be lost due to put exercise.
- The liquidity puts have a maturity of one year, yet we are booking P/L under the assumption that the liquidity puts will be renewed for five years.
- Some of the liquidity risks may be mitigated through the NewCo SPV structure that the business has been discussing with CIB Treasury.

Attached please find an appendix with an in-depth description of our analysis.

## **APPENDIX – REVIEW DETAILS**

### **Observations**

*1. Liquidity puts are primarily liquidity products – they do not serve as credit enhancement to protect the CP investors against the risk of default.*

- According to the rating agencies, liquidity puts do not provide credit support for ABCP<sup>1</sup>. The CDO's collateral and structural mechanisms are the source of the P-1 rating for the short-term notes, while the purpose of the put is to provide funding on demand.
- If the credit deteriorates beyond a certain point, “outs” to funding (like a Maximum Principal Loss Test and an interest coverage test) protect the liquidity provider from losses due to defaults in the underlying assets. The outs ensure a certain quality of the underlying collateral at the time of a potential draw on the liquidity.
- One way to see that the credit risk is very limited is by using a bond option as an analogy. A seller of a put option on a corporate bond would normally be fully exposed to the risk of default on the underlying bond. However, let's assume the bond option has certain covenants – similar to those found in a liquidity put for a CDO. If the option is exercised, let's say that the bond cannot be defaulted and the value of the company's assets has to be at least, say, 105% of the company's liabilities for exercise to be allowed. The seller is not exposed to default – only to changes in the perceived risk of default, which in turn affects the market value of the bond – and he knows that there is a high likelihood that the company's assets will be sufficient to repay the debts if the bond were to be put to him. Any potential loss would be much smaller than if he owned the bond outright and the company were to default. If the credit spread of the company is Y bps, then the option seller will require much less than Y to bear the credit risk in the option described above.
- According to the business, the price of the super senior credit risk is somewhere in the 6-11 bps range.<sup>2</sup> We have not attempted to exactly determine the credit risk in the liquidity put but conclude that the outs to funding reduce this risk to much less than 6-11 bps.

*2. We have concerns regarding the pricing model proposed by the business and its ability to capture liquidity risk.*

- The liquidity risk in the liquidity puts is the risk that Citigroup must purchase ABCP or long term notes that cannot be sold quickly enough to prevent or minimize a loss. Part of the liquidity risk in liquidity puts is the risk of a Citigroup downgrade, which can lead to \$26 billion of liquidity put exercises hitting our balance sheet simultaneously. In this scenario, Citigroup is faced with a severe concentration risk. Also part of the liquidity risk is a market disruption in the ABCP market, during which Citigroup would end up the owner of one or more securities for which there is no liquid market.

- As long as the credit of the CDO collateral continues to perform, the ABCP buyer is not exposed to liquidity risk. One of the reasons why the spread paid on ABCP is lower than the spread paid on a long term super senior note is that when ABCP is issued, the liquidity put provider assumes most of the liquidity risk. In other words, part of the term note spread is compensation for taking liquidity risk.
- A model that attempts to price the liquidity risk in liquidity facilities covering ABCP must isolate the liquidity risk from the credit risk. While the liquidity put seller is fully exposed to liquidity deterioration, he is only marginally exposed to credit deterioration.
- In addition to omitting size as an input, we have two concerns with the modeling approach suggested by the business.

First, the model uses the CP spread as a proxy for both credit and liquidity risk without separating the two factors. This is a problem because the liquidity provider mainly suffers if an increase in the CP spread is due to liquidity problems. If the CP spread increases due to defaults in the collateral, credit related triggers will eventually prevent the liquidity put from being exercised.

Second, the ABCP comes with a liquidity guarantee embedded in the pricing. A consequence of this is that the level at which the A1/P-1 CP trades will contain little or no information about the liquidity risk that the liquidity provider is assuming. As a result, it is inappropriate to use the A1/P-1 CP level to calculate the liquidity risk.

*3. The view that liquidity puts are primarily credit instruments is incompatible with how we currently calculate regulatory capital for the puts.*

- Currently, a 10% credit conversion factor is used for the liquidity puts, consistent with the regulatory agencies' rule for capital treatment for liquidity facilities supporting ABCP programs. The agencies stress that this rule applies to "any facility...whose primary function, in form or in substance, is to provide liquidity to ABCP."<sup>3</sup> According to a RAP expert in Finance, RAP charges would increase five times (50% credit conversion factor) if the liquidity puts in fact provide credit enhancement.

*4. The fair market premium for a liquidity put cannot be easily modeled. However, pricing levels on comparable liquidity facilities give us an opportunity to estimate the market price of liquidity puts. We believe that price to be in the 15-30 bps range, inclusive of the expected cost of the contingent credit risk. Below follows a discussion of several comparable liquidity facilities that support this conclusion.*

**A. Multi-seller ABCP conduit business**

After discussions with Citigroup ABCP conduit business, reviewing rating agency documentations, and discussing with industry contacts, we believe that liquidity put supporting the conduit ABCP is exposed to less credit risk than the liquidity put supporting the CDO ABCP. The 15 bps charged by the Conduit business for backstop liquidity providing is almost pure compensation for liquidity risk. We believe that the multi-seller ABCP conduit business indicates that CDO liquidity puts should be

valued at least at 15 bps for being exposed to more credit risk and possessing less liquidity risk mitigation in the structure.

- There are multiple credit enhancements both at the pool/deal level as well as at the program/conduit level:
  - Pool/Deal level credit enhancements include haircut/gross-up reserve/overcollateralization (OC)/Guarantees or letters of credit (LC)/AMBAC surety bond/Asset diversification
  - Program/Conduit level credit enhancement is typically in the form of OC, Subordination, surety bond, total return swap (TRS), etc.
- Conduit is set up such that deteriorating assets will be liquidated long before the liquidity put gets exercised; also being the conduit manager, Citigroup is able to actively monitor and manage the assets in the conduit. We can take the asset out of the conduit to restructure before taking any losses. This reflects the great alignment of interest between the conduit manager and liquidity provider (unlike in the CDO case).
- The resulting credit quality is so high that the CP issued by the ABCP Conduit sometimes trades at LIBOR-15 bps; it is typically traded at LIBOR-8 to LIBOR-10 bps while CDO ABCP usually trades at LIBOR-5 bps.
- Citigroup negotiated a “pass-through” arrangement that when Citigroup is downgraded to A2/P2, CP will continue to roll as A2/P2 paper; the actual funding cost is passed on to the sellers (not limited to LIBOR+35 bps like CDO ABCP)
- Citigroup can pledge the assets in the ABCP conduit to the Fed if necessary whereas the same is not true for CDO collateral.
- Our own Structured Finance colleagues as well as our industry contacts believe that the multi-seller ABCP conduit tends to present less risk than the single seller conduit (such as CDO); the conduit liquidity put is in general based on deal level (much smaller size) not on program level like CDO liquidity put.
- In a Partially-supported ABCP, the supporting liquidity facility is only available to the extent that there are non-defaulted receivables as collateral; liquidity funding becomes unavailable if surety bond provider becomes insolvent or credit enhancement has been reduced below certain amount.

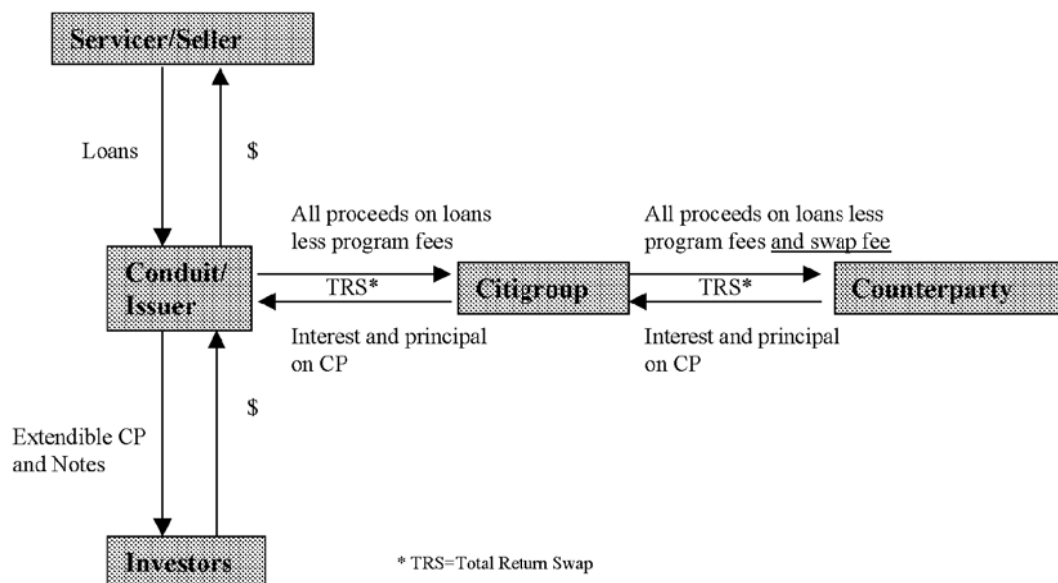
#### **B. Single-seller Extendible CP Programs**

We have had several conversations with the Global Structured Credit Products desk regarding single-seller extendible CP programs where Citigroup is involved as both swap provider and CP dealer. As of May 2006, Citigroup provided swaps to five different programs sponsored by various mortgage originators totaling \$6 billion.

In these transactions, the Seller sets up an SPV that issues extendible CP and subordinated notes. The proceeds from the issuance are used by the Issuer to buy residential mortgage loans from the Seller. The loans are warehoused by the Issuer, typically no longer than 90 days, and then sold either directly

to the market or through securitization. The issued CP is extendible CP - basically ABCP paper with an extension feature at the option of the Issuer. Extendible CP typically has expected maturities of 90-180 days and a final maturity of an additional 180 days in the event of an extension.

Citigroup enters two offsetting total return swaps. In the first swap, Citigroup pays the interest and principal on the CP to the Issuer, while receiving all loan proceeds less program fees paid by the Issuer. In the offsetting total return swap, Citigroup receives the interest and principal on the CP from the loan Seller (or an entity closely affiliated with the Seller), while paying the loan proceeds, less program fees and the swap fee, to the Seller. The net result of the two offsetting swaps is that Citigroup retains the swap fee, as long as the Seller does not default. Below follows a figure depicting the transaction structure.



The extension feature helps relieve the issuer of some of the need for a liquidity facility since it provides time to unwind the CP program. The primary cost savings comes from not having a backstop liquidity line, but the total return swaps are still necessary. The extension feature also affects the CP rating and pricing. Non-extendible CP typically pays LIBOR-5 bps while extendible CP pays LIBOR flat, in other words a 5 bps premium for the extendibility. In addition to the extension premium, the issuer also pays Citibank a 10-15 bps premium for providing the swaps. The total liquidity related cost in this extendible structure is thus 5 bps + 10 to 15 bps = 15-20 bps.

Finally, per our contact on the GSCP desk, the overall liquidity cost in the extendible CP structure will be 5-10 bps lower due to the higher inherent collateral liquidity, indicating a total cost for backstop liquidity for the CDO ABCP in the range of 20-30 bps.

### C. Buckingham II

The desk provided the Buckingham II deal sponsored by Barclays Capital as a comparable and referenced that this deal pays Barclays 10bps for providing the back stop liquidity for the super senior ABCP program. We compared the deal with our own two deals Mickinley Funding Ltd and Raffles Place Funding, Ltd and agree that Buckingham II is one of the better comparables but noted the following differences between Buckingham and our deals.

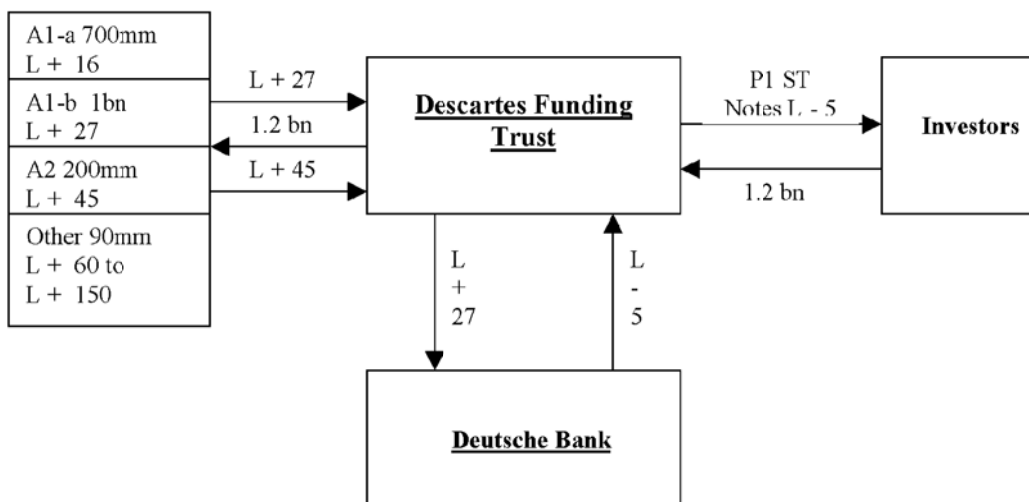
- Conditions to exercise the puts and the strike level of the puts:* The strike rate is 22 bps lower (LIBOR+18 versus LIBOR+40 bps) than the comparable strike level of the put option provided by the Citigroup deals, but it is also important to review the other conditions to exercise along with the strike level. First, the backstop liquidity facility under the Buckingham II structure is structured as an ABCP program unlike the Citigroup deals that are structured as put contracts. The Citigroup deals have conditions where the put will be exercised as soon as the strike rate reaches LIBOR+40 bps. The Buckingham II liquidity facility on the other hand will be drawn upon only after the CP cost has been above LIBOR+18 bps for 12 consecutive months. Barclays does need to fund the CP holders if at any time the CP rate gets higher than LIBOR+18 bps per the terms of the liquidity advances. However, after a Liquidity Advance is made, if new CP Notes are issued, the proceeds from such issuance will upon receipt be promptly paid to the Liquidity Provider in repayment of the advance. Also, while Buckingham II has a maximum principal loss (knockout amount) of 8% before the liquidity backstop terminates, Mickinley Funding has to reach 10% principal loss before the liquidity backstop terminates.
- Put Premium:* Per the definition of the commitment fees in the Buckingham II PPM, Barclays receives 10 bps for the first 5 years and 17 bps thereafter as put premium. Buckingham II also received \$12.5mm via a prepaid swap agreement which was then used to pay expenses and fees of the structure. Included in this is an additional amount payable to the liquidity provider. Given that Barclays received compensation via the prepaid swap agreement in addition to the 10bps (17bps after 5 years) received as liquidity premium, the total compensation received by Barclays for providing the backstop facility is more than 10 bps.

### D. Descartes Prime-1 Rated Short Term Notes Structure Descartes CDO Ltd

This transaction represents a variation on the financing of a super senior CDO tranche. Descartes CDO Ltd is a \$2bn High grade ABS CDO deal sponsored by Deutsche Bank that closed in December 2003. The Class A-1b note (\$1bn Size, LIBOR+27 bps coupon) and the class A-2 note (\$200mm Size, LIBOR+45 bps coupon) are funded via a separate Prime-1 rated short-term note program (Descartes Funding Trust) sponsored by Deutsche Bank. While Descartes Funding Trust does not issue commercial paper, it issues either a discount or interest bearing short term paper with a maximum tenor of 397 days.

Deutsche Bank has entered into a cost of funding swap with Descartes Funding Trust. This swap, similar to a backstop liquidity facility is not intended to provide credit enhancement in support of the notes issued by Descartes CDO Ltd. Like the liquidity backstop facilities, this structure has a similar knockout feature (4.5% max principal loss) where the swap terminates upon the collateral of the CDO

reaching a certain default level. Also, similar to the commercial paper program, if the trustee is unable to issue new short term paper on a roll date, Deutsche Bank will buy the notes of the CDO per the swap agreement. Below follows a figure showing the structure of the transaction.



For the Class A-1b note, Deutsche bank receives the difference between LIBOR+27 bps and the funding cost (about LIBOR-5 bps) of the short term paper in return for providing the swap. Since the A-1b and A-2 classes were priced as part of the fair market valuation for a CDO transaction, this transaction gives a direct view of the implied liquidity cost embedded in the pricing of the swap. DB's obligation is to fund upon a failed remarketing of the notes issued by the Trust, and for that undertaking DB receives a net of approximately 32 bps.

While this structure is a little different than the typical commercial paper programs, it still provides another example illustrating the levels at which some of the liquidity premia in these structures trade at.

*5. Market participants perceive significant risks in providing liquidity to ABCP paper. Citigroup is currently assuming liquidity risks that other participants are unwilling to take.*

- Liquidity facilities have become scarcer and more expensive over the past few years due to the risk in these products. Bank mergers have reduced the number of liquidity providers, and events associated with LTCM, Russia in 1998 and the weakened economy in 2000-2001 has led banks to increase liquidity pricing in line with the perception of increased risk.



- The Basel II accords will likely result in increased regulatory capital assessed against liquidity backup lines provided by banks.
- Conversations with other market participants indicate that some of them avoid liquidity facilities altogether due to the risk of several large funding obligations hitting the balance sheet simultaneously<sup>4</sup>.
- Citigroup holds 55% of the liquidity facility market while none of the other major banks has more than one or two deals on their books. This highlights the liquidity risk that Citigroup is assuming.

### **Additional Considerations**

- Liquidity put fees that are received periodically while puts remain outstanding are subject to put exercise. A fair market valuation of the fees received should consider the probability that future fees may be lost due to put exercise. We have observed a similar case in the Hybrids business. Some of the periodic fees received in that business can be lost when customers redeem the notes that they purchased, while other periodic fees are recovered through redemption penalties. Our conclusion for the Hybrids business was that P/L should only be recognized to the extent that we are comfortable that the P/L will not be lost when redemptions occur. This conclusion may be applicable to the liquidity puts as well.
- The liquidity puts have a maturity of one year, yet we are booking P/L under the assumption that the liquidity puts will be renewed for five years.
- The desk is working with Treasury to alleviate some of the funding and liquidity concerns expressed by Treasury regarding liquidity puts. More specifically, the desk has proposed a program under which a new SPV ("NewCo") is created. If successful, this structure would create a contingent financing strategy that could potentially reduce the liquidity exposure in the event of a Citigroup downgrade.

### **Conclusions**

- We believe that liquidity puts are primarily liquidity products. This has important implications on both valuation and how RAP charges are calculated.
- The comparables described above illustrate that the fees paid for liquidity facilities by market participants cannot be explained by contingent credit risk alone, which is minimal in most cases. They provide evidence that market participants do perceive a risk in bearing the liquidity risks in liquidity facilities, and that this perceived risk is reflected in the observed market pricing.

- The comparables also illustrate that market participants pay anywhere from 15 to 30 bps to lay off the ABCP liquidity risk. Accordingly, the fair market value of the liquidity puts should be somewhere in the 15-30 bps range.
- In addition to the comparable liquidity facilities, the observations listed under “Additional Considerations” above should also be considered when determining the appropriate valuation methodology for the liquidity puts.

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<sup>1</sup> According to Moody’s, “The purpose of the put option is to provide liquidity, not credit enhancement, to the short-term notes. The CDO’s underlying structure and collateral provide the credit support necessary to attain the Prime-1 rating on the short-term notes.” (See p.4, “CDOs with Short-Term Tranches: Moody’s Approach to Rating Prime-1 CDO Notes.”) S&P (see <http://www.riskcenter.com.tr/referans/abc3.pdf>) describes a Liquidity Facility as “A facility, such as an LOC, used to enhance the liquidity (but not the creditworthiness) of securitized assets.”

<sup>2</sup> Per Dajiang Guo, the market quote for super senior CDS is around 7 bps. A recent AAA insurance wrap on a super senior (AMBAC providing insurance on Diversey Harbor) was quoted at 6.5 bps. Citigroup sold protection on the Mandakat transaction for 10.5 bps.

<sup>3</sup> In this joint agency rule regarding liquidity facilities supporting ABCP, the agencies also state that “although the agencies believe that liquidity facilities expose banking organizations to credit risk, the agencies also believe that the short term of commitments with an original maturity of one year or less exposes banking organizations to a lower degree of credit risk than longer term commitments, provided the liquidity facility meets certain asset quality requirements... This difference in degree of credit risk should be reflected in the risk-based capital requirement for the exposure.” See Federal Register, Vol. 69, No.144, p. 44910 – it can be found at <http://www.occ.treas.gov/fr/fedregister/69fr44908.pdf>.

<sup>4</sup> We spoke with a senior cash CDO underwriter from CSFB. He indicated that CSFB Treasury deliberately made the decision to issue term notes instead of ABCP, due to the risk of being exercised on several deals simultaneously. Joe Martinelli in CIB Treasury also mentioned that UBS has stayed out the ABCP business for the same specific reason.