

# Moody's International Policy Perspectives

INTERNATIONAL ECONOMIC AND FINANCIAL POLICY RESEARCH

## Stress-testing the modern financial system

*This is the second paper in a series of reports that addresses the macro issues related to the subprime problem and associated market dislocation. Next in the series will be a paper on rating agencies in the context of the subprime problem.*

\*\*\*

### Summary

This summer's financial panic has imposed a major stress test on the modern disintermediated financial system. Among the causes of the panic are: an extended period of credit risk under-pricing, reflecting a temporary shift in the balance of power between lenders and borrowers; a pervasive illusion of liquidity; the bursting of the US house price bubble; and very poor performance of some subprime mortgage securities that imposed market losses on many institutions and cast a shadow over the valuation of certain classes of structured securities.

What turned an overdue risk reappraisal into a financial panic is the combination of untested financial innovation, price-sensitive accounting rules, leverage and opacity. This cocktail has proved explosive.

This paper draws some tentative lessons from the first full-scale stress-test of the modern post-disintermediation financial system, in which the arm's-length financial model has taken precedence over the traditional relationship model centered on banks. In fact, even though crises take different routes in these two models, the outcome is very similar: a liquidity stress – a bank run in earlier times is today's run on the credit market. The problem is that central banks were designed to handle bank runs, not market confidence crises.

The lessons to be learned are for a good part lessons to be learned again. Most of the deficiencies exposed by the current episode were identified in the aftermath of the Long-Term Capital Management (LTCM) crisis in 1998: the modern financial system over-relies on the presumption of liquidity; risk is increasingly difficult to localize; asset correlations increase in times of stress; and leverage changes the scale of market dynamics, on the upside as well as on the downside.

We expect market and official pressure to require greater transparency from financial actors, to introduce larger liquidity buffers into the system, and to consider ways to introduce automatic stabilizers to counter some of the pro-cyclicality inherent in an increasingly market price-sensitive accounting system. We also expect central banks to consider broadening the scope of their action in times of stress. Beyond providing "liquidity" to deposit-taking institutions, the challenge is to ensure "fluidity" throughout the system, in order to ensure that systemically important non-bank financial institutions obtain vital irrigation.

### Table of Contents

Introduction: a disorderly risk reappraisal	2
A paradigm shift	2
...But not a crisis-proof environment...	2
...As yet no crisis management rule book	3
Leverage and the presumption of liquidity	3
Leverage and the illusion of liquidity	4
Large, leveraged, (and opaque) actors amplify market trends	5
Stress testing a securitized financial system	6
The way forward: policy considerations	6

### Contact Us

#### Email

internationalpolicyanalysis@moody's.com

**Christopher Mahoney** +1.212.553.1653  
Vice Chairman - MIS  
christopher.mahoney@moody's.com

**Pierre Cailleteau** +44.20.7772.8735  
Chief international Economic and  
Financial Policy analyst  
pierre.cailleteau@moody's.com

**Client Services** +44.20.7772.5454  
clientservices@moody's.com

**Media Relations:** +44 20 7772 5456





## Introduction: a disorderly risk reappraisal

In this paper we develop the following arguments:

- The paradigm shift from a bank-dominated to a market-based financial world...
- Has not translated into a crisis-proof environment...
- But has, by and large, left public authorities without a crisis management rule book.
- Leverage is predicated on the "presumption" of ultimate liquidity...
- But also sometimes on the "illusion" of liquidity.
- Large, leveraged and opaque actors amplify market volatility...
- And securitization is being severely tested.
- Looking forward, what is the way ahead?

## A paradigm shift...

Over the past 40 years, the global financial system has evolved from a sleepy world of fixed exchange rates, capital controls, bank-dominated financial flows and modest domestic and international capital markets into one in which capital flows freely across borders, investors and borrowers invest and borrow globally, capital is allocated by the securities market rather than by banks, and all of this occurs around the clock in a computerized world with instantaneous communication.

Deregulation, disintermediation and financial innovation (with technology as their handmaiden) have created a financial system that is vastly more efficient than before, and which allows excess savings anywhere in the world to finance investment anywhere else. Risks have been unbundled and rebundled into tradable instruments which allow origination and portfolio investment to be decoupled.

Financial innovation and financial market efficiency have made a major contribution to global growth, and there is realistically no reverse gear to this financial innovation and liberalization absent a catastrophic deleveraging process.

## ... But not a crisis-proof environment...

However, the new financial paradigm has brought with it some problems, which the world's financial policy technicians have not yet solved. Each credit crisis teaches new lessons, often resulting in corrective reforms. The current "Panic of '07" will as well.

Less reassuring is the fact that each crisis also points to the same deficiencies or weaknesses, which would therefore seem to be difficult to cure.

In the days before disintermediation, credit crunches occurred when, in order to slow the economy, the Federal Reserve Bank brought the funds rate above the time deposit interest rate ceiling, causing funds to flow out of the banking system, forcing banks to restrict credit. Today, the mechanics of a credit crunch are different. Credit crunches can occur when the Fed is tightening or easing, although they usually occur during the tightening phase. Modern credit crunches are caused by an unexpected exogenous shock which destroys market confidence: a geopolitical event (1990-1); a sovereign default and the near-collapse of a big hedge fund (1998); major accounting frauds and associated defaults (2001-2); or the unexpected collapse in value of a large asset class (2007). The transmission vector in the modern credit crunch is not bank credit or interest rates, but rather sudden changes in market risk premia as expressed in credit spreads and credit availability.

Credit crunches often occur immediately following the peak of the credit cycle. The exogenous shock changes market psychology overnight. Thus, after the cycle peaks, it does not descend in an orderly fashion toward the trough; instead it tends to fall precipitously. Thus the inflection comes as a shock, and causes substantial psychological damage (panic, contagion, flight to quality).

The latest up-cycle lasted five years from trough to peak (2002-07), during which no shocks were big enough to derail bullish sentiment. Excesses appeared in many asset classes, including mortgage lending in the U.S., leveraged investment strategies at hedge funds and other players, and in speculative grade credit, whose spreads were bid down to historical lows and original-issue Caa-rated junk bonds could be readily marketed.



It would appear that we have now entered the long-awaited "Big Unwind" following a frightening "global margin call." This process, like prior crises, will illuminate the strengths and weaknesses of the modern financial system.

Each of the recent credit crunches has revealed problems, taught lessons and resulted in remedial legislation: 1990-1 witnessed the demise of wildcat banking and the passage of banking reforms; 2001-2 saw corporate malfeasance resulting in accounting and governance reforms. This time around there may be a number of areas in which improvements may be needed. Many of these concerns were raised in the aftermath of LTCM, and will now be raised again.

### ... As yet no crisis management rule book

In the (pre-modern) intermediated financial system, credit relationships were bilateral, and the creditor had the implicit backing of the central bank. Thus, the creditor had presumptive access to unlimited liquidity, and the creditor had a stake in the continued ability of the borrower to stay in business. Additionally, the financial authorities were in a position to influence the behavior of most credit market participants, which gave them the ability to calm the waters and to ensure the continued flow of liquidity to systemically important actors. In the intermediated financial system, the "weakest link" was a bank, or the whole banking system, which the authorities had the tools at hand to resolve.

By contrast, in the modern disintermediated system, credit relationships are arm's-length, impersonal, multilateral and often purely electronic. Many important — even systemically important — credit market participants lack access to (and the implicit backing of) the central bank. Many market participants have little stake in the continued viability of the issuers of the securities they trade or in the counterparties they trade with, particularly if they are short or have bought default protection. The financial authorities are unable directly to influence the behavior of many important actors, such as hedge funds, and thus have less ability to reintroduce stability. In a disintermediated financial system, the "weakest link" is confidence, which, as a state of mind, is challenging for financial authorities to fix.

Central banks are in a position to help stabilize the system through conventional or more ingenious liquidity provision operations because of their unique ability to create liquidity. The difficulty is that while they are able to fend off liquidity stress for banks, buttressing confidence in non-bank counterparty risk is more difficult, and restoring "fluidity" throughout the non-bank financial system will be even more complicated. The point here is that large banks remain central to a systemic risk resolution — on their strength hinges the solidity of the system and the permanence of credit intermediation — but that solidifying their position will not alleviate the credit pain flowing throughout the financial system.

### Leverage and the presumption of liquidity

#### The presumption of liquidity and the pivotal role of banks

The modern financial system is built on leverage. (The 2007 ratio of private sector debt<sup>1</sup> to GDP in the US is three times that of 1965.) Such leverage is only tolerable in the context of a presumption of liquidity: if creditworthy borrowers (including financial institutions as well as households) cannot at all times obtain credit on reasonable terms and if quality collateral cannot be readily borrowed against, the level of leverage in the system is unsustainable.

A lender of last resort—who is willing and able to lend—is therefore an essential ingredient of a leveraged financial system. It is possible to operate a financial system without a lender of last resort, which the US demonstrated in the 19th century. But such a system is marked by panics, bank failures, deflations and depressions, and the ability to operate with leverage is severely limited. Levels of financial system leverage were negligible relative to the modern era.

Today's financial system is therefore implicitly predicated upon the existence of a responsible monetary authority (authorities), with the ability and willingness to maintain systemic liquidity in the face of panic and contagion. Banks play a pivotal role, as they stand between the central bank and the rest of the financial system—the franchised distributors of the central bank's vital product.

<sup>1</sup> It includes GSEs & GSE and agency mortgage pools.



## Policy challenges raised by the presumption of liquidity

While financial stability is clearly within the remit of the central bank, two other objectives are at risk of trumping financial stability at times of stress in the modern era: price stability and market discipline.

There should be little conflict between the goals of financial stability and price stability, as an uncontrolled flight to quality (cash and governments) will lead to deflation. Market discipline, however, is a thornier problem. "Chicago School" doctrine (modern orthodoxy) prescribes deregulated markets, with market discipline replacing the heavy hand of government regulation. By exposing participants to the consequences of their actions, the market will automatically discipline miscreants before they grow to systemically-threatening proportions. Therefore, attempts by the authorities to ameliorate problems caused by market failure will only weaken discipline and embolden the reckless.

The problem with market discipline is that while application of this theory may act as a deterrent and thus reduce the number of serious incidents, when incidents do occur, it is not very useful as a corrective process. The fire department may post signs saying "Don't start fires," but the department still has to take action should one be set. Likewise, the monetary authorities must play their role when panics occur. It is neither prophylactic nor wise to let a fire burn out of control in order to teach a salutary lesson. This is because market confidence is fragile and, once broken cannot be readily repaired, and, like a fire, may burn out of control.

Skillful central bankers should be able to avoid compromising their twin objectives while restoring confidence without perverting incentives. But, on the brink of a financial disaster, long-term objectives will inevitably be subordinated to financial stabilization.

The modern financial system is built on leverage, which is only possible with the presumption of liquidity. Panics remove that presumption, and it can only be restored by the authorities, who must ensure that systemically important bank and non-bank actors do not fail and trigger a systemic crisis, such as occurred in 1930-33, when the US financial system almost collapsed (and pushed the real economy into an abyss).

The greater the loss of confidence, the harder it is to restore, and—crucially—the greater the erosion of confidence, the greater the contagion, and the broader the financial safety net may have to be spread. This is the ultimate conundrum of the philosophy of market discipline. The authorities may seek to outsource prudential regulation to the market, but may ultimately end up having to decide between bailing out the reckless and witnessing financial meltdown. It is an unpalatable choice.

## Leverage and the illusion of liquidity

### Macroeconomic liquidity vs. market liquidity

During the credit boom of 2003-7, there was much debate about the abundance of "liquidity." Why were risk spreads so low? The general consensus was that excessive Asian savings and underdeveloped Asian financial markets were flooding the West with investment.

This is part of the liquidity story—the macroeconomic one. The other part of the story is group psychology. When prices rise (as buyers bid them up), risk-takers "win," take bigger risks, and "win" again. Rising prices (falling risk premia) create an incentive cycle that rewards the taking of risk. Markets are therefore "liquid" when prices are rising (sentiment is bullish) and "illiquid" when prices are falling (sentiment is bearish). A good example is house prices: when they are rising, there is substantial market activity; when they are falling, nothing moves as both buyers and sellers sit on their hands. While influenced by changing fundamentals, the bullish/bearish market psychology pendulum is endogenous and operates largely independent of real phenomena.

This psychological element is the one that makes market liquidity – that is, the ability to sell large amounts without moving prices – so volatile and unreliable. Note that market liquidity has recently disappeared with no change in the macroeconomic environment: Asian savings continue to flow westward, and real interest rates are moderate.

### The illusion of liquidity

The presumption of liquidity has an even more dangerous variant, the "illusion of liquidity." The former is the presumption that markets will always function, that good borrowers can borrow and good collateral can be sold or pledged at reasonable values.



The latter is the more extreme belief that, under almost any circumstance, one will be able to trade large amounts of any kind of security without affecting prices.

Of course, in extremis, the concepts converge: the provision of last resort liquidity to banks will indirectly improve market liquidity. However, most of the time, investors will realize at their expense that the illusion of liquidity is just that: a costly illusion. Central banks support functioning markets; they are not designed to act as market-makers for distressed asset classes, and even less for ensuring depth in capital markets.

### **Disintermediation has made the credit cycle more volatile**

During the recent period, credit spreads were low, at least in part, due to the lack of an exogenous shock strong enough to dislodge the psychology of optimism. There were no unexpected geopolitical shocks, no banking crises, no big sovereign or corporate defaults. There was no major shock for five years from the default of WorldCom in 2002 until the summer of 2007. Additionally, low credit spreads allowed weak credits to refinance, which further dampened credit shocks. Now we are witnessing the other side of the coin: fear replaces greed, and risk premia shoot skyward.

While credit cycles predate disintermediation, disintermediation makes credit cycles worse because the proportion of tradable assets to national wealth is so much greater. Disintermediation has made the financial system more confidence sensitive. It has had the effect of making the core of the system – the large banks – less vulnerable while also making the intensity of an eventual crisis more severe. As a result, it has increased the potential of a systemic shock, which underlines the critical importance of the systemic shock absorbers: the central bank and the banking system.

### **Large, leveraged, (and opaque) actors amplify market trends**

Deregulated financial markets have allowed the creation of large financial institutions that are often leveraged, usually opaque, and sometimes systemically important, most notably hedge funds (e.g., LTCM).

The regulator of hedge funds is the market, in the form of prime brokers and repo counterparties. The need to pledge marked-to-market collateral with appropriate margins has imposed a market discipline on hedge funds, which has generally worked well (pace LTCM). However, now that marks are falling and margins are rising, some hedge funds are being squeezed and are being forced to delever. Rapid deleveraging and forced sales can lead to contagion from troubled asset classes to untroubled ones because the most liquid securities are sold first (leaving the core illiquid positions in the fund).

The proliferation of hedge funds is having many effects on financial markets, only some of which have been revealed to date. Among the effects: (1) creation of significant supply/demand imbalances for “high return” assets during the formative period of the hedge fund sector’s growth. More buyers of risk encouraged creation of more supply, which encouraged extensions of credit to borrowers who, in normal times, would be unworthy of such credit; and (2) hedge funds structurally need greater-than index returns (or high absolute returns), which encourages a reach for yield into more complex, illiquid or otherwise riskier instruments, sometimes additionally turbocharged with leverage. This strategy has been pejoratively described as “beta with leverage”.

Buyer surplus plus the reach for yield converged to accelerate the creation and sale of bespoke instruments which lack deep, battle-tested secondary markets, and without sufficient transparency to allow secondary markets to mature rapidly. This, in turn, led to greater reliance on models for valuation and diversification, many of which (1) lack precision around the way in which markets change when under stress (asset correlations that work in functioning markets fall apart in troubled times as contagion touches sectors that normally would be uncorrelated); and (2) signal identical actions (i.e. sell) at the same time for the same securities, flooding the market, with the secondary consequence of having to sell normally uncorrelated securities, which then show sudden correlation because of common risk management and hedging strategies.

The world would be a much safer place if all securities were held by “real money” buy-and-hold investors who did not have to mark to market, and who therefore did not have to make forced sales into



panicked markets. Unfortunately, literally trillions of dollars of securities are now held by leveraged mark-to-market institutions relying on other people's money to finance sometimes opaque, complex and risky investments.

## Stress testing a securitized financial system

Securitization is a highly efficient way of packaging risk and of separating origination from portfolio investment. A mortgage bank can make mortgage loans that can end up in a portfolio on the other side of the world. This increases "finance-ability" for economic agents who can more easily borrow against all sorts of future cash-flows, and creates securities whose properties can better accommodate the specific needs of investors.

However, securitization is a relatively new phenomenon that only became a major component of the flow of funds in the last 20 years. As such, the new financial world created by securitization had not been subjected to a stress test of this magnitude until now. A number of different structures designed in the structured finance laboratory are now being tested in the real world: subprime residential mortgage-backed securities, collateralized debt obligations, asset-backed commercial paper, structured investment vehicles, and others. These tests are revealing the strengths and weaknesses of these structures and of structured finance itself.

The current market stress is identifying some problems with the securitization model:

- Securitization relies upon historical relationships (e.g., subprime default and loss levels) that can change unexpectedly and by orders of magnitude.
- The proliferation of non-standard products has impeded the development of a liquid secondary market for many types of securitizations. As we are observing, there is no observable market price for a unique security.
- Securitization creates an agency problem by separating the originator from the ultimate holder. While this is one of securitization's cardinal virtues, it is also a problem in that originators may be incentivized to maximize origination volume, instead of quality. And, as we see

in subprime, some originators may be tempted to misrepresent the quality of loans being sold or, less sinisterly, originators are not motivated to care about the quality of loans because they aren't owners of the assets for very long.

- The opacity and/or complexity of some securitization products have led some investors to over-rely upon third-party credit analysis (i.e., ratings) without fully understanding what they are buying (and now what they own). And many market participants have over-relied on ratings in determining appropriate price levels for such securities.
- Some companies' business models were built on the presumption of securitization as a viable funding source. When certain asset classes fall out of favor, these actors may find themselves out of business.
- Idiosyncratic risk is different for structured securities than for corporate instruments. Idiosyncratic risk in RMBS appears most visibly at the originator and vintage levels. Originator risk may be analogous to individual company risk, but vintage risk is an overlay that has no corporate analog. And even with twin forms of idiosyncratic risk, structured securities may exhibit fewer significant idiosyncratic attributes – causing more herd-like changes in creditworthiness – due to more limited operating characteristics and more homogenous assets.

## The way forward: policy considerations

The current crisis has been accentuated by the combination of opacity about where risk resides, untested financial innovations, market-sensitive accounting methods and leverage. Any crisis brings new lessons, and, no doubt, some corrective reforms will be introduced. Coupled with a heightened degree of risk aversion, this should make the system more robust.

However, it must also be noted that most of the deficiencies brought to light in the current panic and described above had already been identified in the aftermath of LTCM. As financial stability authorities have not been inert since 1998, this points to the fact that there are some enduring features of the



modern financial system that breed sporadic financial convulsions.

What are our predictions with regard to the future of the global financial system and the way to make it safer?

1. The old days of the bank-based intermediation system are gone. It is improbable that a dramatic reversal, a scaling back of securitization and credit risk transfer will take place. Banks are unlikely to alter again their business model and take credits back onto their balance sheet. Even though the aftermath of the Drexel junk bonds crisis saw a drying-up of securitization activity, the secular trend was not interrupted. However, the premium put on liquidity – and as a result on the access to central banks' refinancing – as well as the importance of diversified revenue sources may lead to an indirect re-intermediation process whereby large diversified banks will become even larger and will play a pivotal role in markets. This will not radically alter the business model (moving rather than storing most of the credit risk) but will provide some guarantee about the ability to safely warehouse the risk, if needed. A disintermediated financial system does not signal the demise of big banks, on the contrary.
2. Reintermediation almost inevitably implies deleveraging, which is bearish for asset prices. The greater the degree to which markets reject various structured technologies and force assets onto banks or the auction block, the lower the prices will be for the assets held in such structures. This could impose very large mark-to-market losses on the system, with implications for financial regulation.
3. Looking forward, there will be more regulatory and market pressure for transparency. A way to look at the current crisis is to say that financial deepening and sophistication has outstripped the available information resources in the system, and when things turned sour, it aggravated the (perception of) information asymmetries. However, it would be illusory to believe that we will ever come back to a situation where one can have a precise and instantaneous view about the risk distribution in the system.
4. This will probably be compensated for by a higher demand for capital and liquidity buffers throughout the financial system, which will marginally increase the cost of capital. This, for instance, will come through more realistic market valuations, taking into account recent developments in models and stress-tests.
5. Likewise, we expect official authorities and market participants to reconsider ways to introduce automatic stabilizers in a system prone to booms and busts. After LTCM and during the Basel II negotiation, some thought was given to the question of the pro-cyclicality of finance: de facto lowering capital cushions when times are good, and increasing them when things turn sour. The underlying idea was that risks mount up in the good times and only materialize in bad times, justifying counter-cyclical regulation. This prudential approach aiming at smoothing financial cycles clashed with the fair-value accounting paradigm. Revising pro-cyclical tendencies in regulation may be needed rather rapidly as the rise in the cost of capital and the need to replenish such capital by banks may coincide with a slowing down of the economy that they could just magnify.
6. The combination of a difficulty to locate risk with a difficulty to price risk has proven to be a recipe for panic. Mark-to-model practices, while unavoidable for highly customized products, appear to have often produced unrealistic valuations. As for mark-to-market valuations, they have accurately reflected market exuberance and then (not so accurately) reflected market panic. They have added to the pro-cyclicality of finance.
7. Leverage will be, for a time, constrained. However, leverage will not disappear – that would be economically catastrophic – and will rise again as fear fades away, as it always does.
8. As for financial innovation, there is no reverse gear, even if products aiming at ostensibly arbitraging regulatory constraints will be targeted and even if there will be a transitory "flight to simplicity". The premium market will place on liquidity for some time will lead to standardization, perhaps to risk mutualization through organized markets, and to the un-bundling of the most complex and customized securities.



9. Lastly, banks and central banks, in an interesting twist, have staged a comeback in the disintermediated financial market. Central banks, in market "peace-keeping operations," will be able to restore some order in money markets. However, the intensity of the impact of a financial shock on the economy will depend on the central banks' ability to restore "fluidity" throughout the system – that is, to non-bank institutions – and this is an arduous task.





### International Policy Analysis Team

#### Email

internationalpolicyanalysis@moodys.com

**Pierre Cailleteau** +44.20.7772.8735

Chief international Economic and

Financial Policy analyst

pierre.cailleteau@moodys.com

**Aurélien Mali** +44.20.7772.5567

Associate Analyst

International Policy Analysis

aurelien.mali@moodys.com

Click on the titles below to see previous reports

### International Policy Analysis Reports - 2007

- From illiquidity to liquidity: The path toward credit market normalization, September 2007
- The Asian crisis ten years later what we know, what we think we know and what we do not know, May 2007.
- Global Imbalances: A Positive-Sum Game from a Global Credit Perspective, April 2007.
- French Presidential Elections: A Slow Entry into the 21st Century, April 2007.
- The European Union at 50: Are its Best Years Behind it?, March 2007.
- Current Account Deficits In Emerging Europe – More “Inflammability” But No Repeat Of Asian Crisis, March 2007.
- Why Is Credit Risk Priced so Low? A Perspective on Global Liquidity, February 2007.

### International Policy Commentaries – 2007

- A Credit Perspective on the New French Political Environment, May 2007.
- EADS highlights governments' role as odd rescuers, March 2007.
- G7 efforts to promote developing countries' bond markets a longer-term solution, February 2007.
- Prodi's survival probable, but reform remains compromised, February 2007.

### International Policy exchanges of perspectives

- The Asian crisis ten years on: A Moody's discussion with Michel Camdessus.

### Related Global Banking Series - 2007

- Banking consolidation in Europe: a rating agency perspective, June 2007.
- Summer 2007: another false alarm in terms of banking systemic risk but a reality check, July 2007.
- Banking Systemic Fears are Exaggerated – Vanishing Liquidity in an Abundantly Liquid World, August 2007.

*To order reprints of this report (100 copies minimum), please call 1.212.553.1658.*

© Copyright 2007, Moody's Investors Service, Inc. and/or its licensors including Moody's Assurance Company, Inc. (together, "MOODY'S"). All rights reserved. ALL INFORMATION CONTAINED HEREIN IS PROTECTED BY COPYRIGHT LAW AND NONE OF SUCH INFORMATION MAY BE COPIED OR OTHERWISE REPRODUCED, REPACKAGED, FURTHER TRANSMITTED, TRANSFERRED, DISSEMINATED, REDISTRIBUTED OR RESOLD, OR STORED FOR SUBSEQUENT USE FOR ANY SUCH PURPOSE, IN WHOLE OR IN PART, IN ANY FORM OR MANNER OR BY ANY MEANS WHATSOEVER, BY ANY PERSON WITHOUT MOODY'S PRIOR WRITTEN CONSENT. All information contained herein is obtained by MOODY'S from sources believed by it to be accurate and reliable. Because of the possibility of human or mechanical error as well as other factors, however, such information is provided "as is" without warranty of any kind and MOODY'S, in particular, makes no representation or warranty, express or implied, as to the accuracy, timeliness, completeness, merchantability or fitness for any particular purpose of any such information. Under no circumstances shall MOODY'S have any liability to any person or entity for (a) any loss or damage in whole or in part caused by, resulting from, or relating to, any error (negligent or otherwise) or other circumstance or contingency within or outside the control of MOODY'S or any of its directors, officers, employees or agents in connection with the procurement, collection, compilation, analysis, interpretation, communication, publication or delivery of any such information, or (b) any direct, indirect, special, consequential, compensatory or incidental damages whatsoever (including without limitation, lost profits), even if MOODY'S is advised in advance of the possibility of such damages resulting from the use of or inability to use, any such information. The credit ratings, if any, constituting part of the information contained herein are, and must be construed solely as, statements of opinion and not statements of fact or recommendations to purchase, sell or hold any securities. NO WARRANTY, EXPRESS OR IMPLIED, AS TO THE ACCURACY, TIMELINESS, COMPLETENESS, MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE OF ANY SUCH RATING OR OTHER OPINION OR INFORMATION IS GIVEN OR MADE BY MOODY'S IN ANY FORM OR MANNER WHATSOEVER. Each rating or other opinion must be weighed solely as one factor in any investment decision made by or on behalf of any user of the information contained herein, and each such user must accordingly make its own study and evaluation of each security and of each issuer and guarantor of, and each provider of credit support for, each security that it may consider purchasing, holding or selling. MOODY'S hereby discloses that most issuers of debt securities (including corporate and municipal bonds, debentures, notes and commercial paper) and preferred stock rated by MOODY'S have, prior to assignment of any rating, agreed to pay to MOODY'S for appraisal and rating services rendered by it fees ranging from \$1,500 to \$1,800,000.



**Moody's Investors Service**