

United States: Options Research

Considering All Options

The VIX hits 42. Where will it land?

Financial risks moved to the forefront in a volatile week for equities. The VIX is 5 points above our macro-based estimate as uniformly high implied vol and correlation indicate stocks responding to a common risk factor. In our view, extremes will persist until financial system risks are resolved making it nearly impossible to call a near-term path.

Financial system risks, high realized vol push VIX to 6-year high

This week was painful for U.S. indices as Financial system risk sparked an aggressive and volatile market correction; the SPX had 3 moves greater than 4% and 10-day realized vol hit 51%. The VIX spiked to 42 intra-day, its highest level since 2002. For perspective, we look through the noise and hone in on the fundamental and statistical factors driving index implied volatility and find key metrics stretched to historical levels.

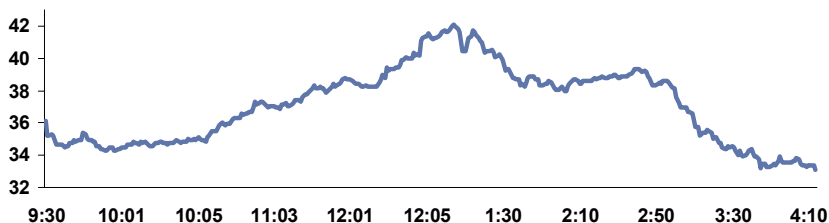
The VIX is 5 points above our macro-based estimate

Our fundamentally-based model for SPX implied vol suggests a short-term VIX level of approximately 28%, 5 points below current levels. In our view, the options market is pricing in a large and justifiable risk premium triggered by recent distress in capital markets and financial companies, which has made predicting a near-term path nearly impossible. We expect this will persist until financial risks are mitigated and the market can refocus on fundamental drivers.

Elevated implied vol and correlation suggest a common risk factor

Uniformly high implied volatility and correlation, which are at a 1-year high across stocks and sectors, indicate markets are trading in response to a common risk factor such as instability in the global financial system.

VIX: Intra-day price graph, 9/18/08 *(Source: Bloomberg)*



Krag Gregory

(212) 357-3770 | krag.gregory@gs.com
Goldman, Sachs & Co.

John Marshall

(212) 902-6848 | john.marshall@gs.com
Goldman, Sachs & Co.

Stuart Kaiser, CFA

(212) 357-6308 | stuart.kaiser@gs.com
Goldman, Sachs & Co.

Amy Wu

(212) 902-8960 | amy.wu@gs.com
Goldman, Sachs & Co.

The Goldman Sachs Group, Inc. does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that the firm may have a conflict of interest that could affect the objectivity of this report. Investors should consider this report as only a single factor in making their investment decision. For Reg AC certification, see the end of the text. Other important disclosures follow the Reg AC certification, or go to www.gs.com/research/hedge.html. Analysts employed by non-US affiliates are not registered/qualified as research analysts with FINRA in the U.S.

VIX still appears high relative to key macro drivers

No model will tell us how or when volatility will subside given the extreme stress in the system but with the intense focus on volatility, we think it is useful to examine how S&P 500 implied volatility levels are trading against key macro factors in an attempt to look through the noise.

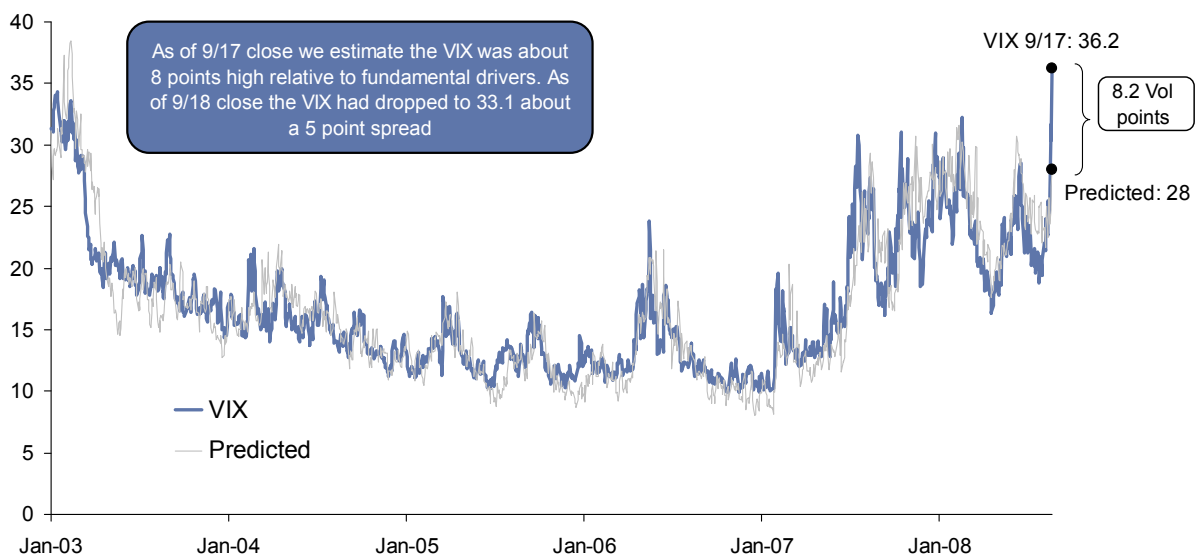
Our results suggest a short-term VIX level of 28%, a decline of 5 vol points from current levels. In our view, this is evidence that option prices currently reflect a large risk premium triggered by recent distress in capital markets and financial services companies that makes predicting a near-term path nearly impossible. However, by incorporating a fundamentally driven short-term VIX estimate investors can better quantify and understand the risk/reward of positions in the context of their own views of financial system risk.

Our Equity Trading Strategies team recently launched a Global Index Compass Monitor which is designed to quantify how major international indices respond to the equity markets outlook for economic growth, interest rates, oil prices, and common global market risk. The Global Index Compass shows that equity indices share a common set of macro drivers that explain a substantial part of index returns over time as well as index returns relative to one another. We utilize this toolkit to analyze how S&P 500 implied volatilities are trading relative to key macro drivers. For more information on this methodology see their October 25, 2007 report, "Introducing our Global Index Compass".

Our model includes explanatory building blocks which monitor shifts in the equity market's view of key macroeconomic forces, namely economic growth, interest rates, oil prices and shifts in common market risk not picked up by these three major macroeconomic drivers. These factors are extracted daily from US equity prices using our Equity Trading Strategy teams Wavefront models. Regressions of changes in implied volatility versus these four macro factors suggest a short-term value of 28% for the VIX, a decline of 5 vol points from current levels.

Exhibit 1: The VIX still appears high relative to key macro drivers

The VIX versus prediction from macro factors; Data as of 09/17/08 market close.



Source: Goldman Sachs Research estimates.

Bottom-up analysis shows extremely high volatility and correlation

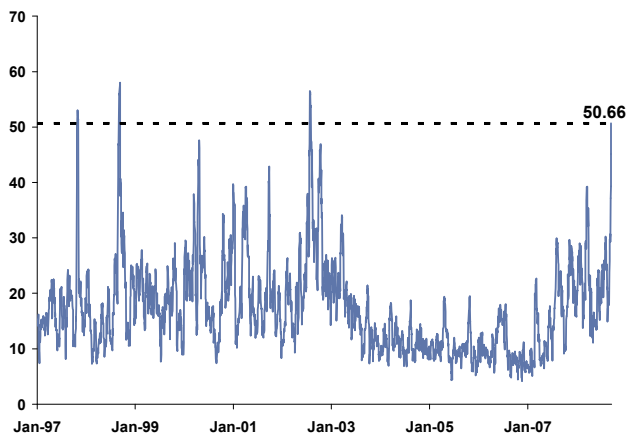
While our top-down analysis indicated implied volatility is at premium to fundamental drivers, bottom-up metrics show uniformly high volatility and correlation across stocks and sectors that are supportive of high short-term implied vol. Elevated realized correlation between Financials and the SPX, as well as versus other sectors, is another indicator that the market is trading a Financials theme.

Realized Volatility- SPX 10-day realized volatility of 51% is at its highest level since August 2002 and consistent with levels reached during previous market crisis periods. At the sector level, Energy, Staples and Tech are at 3-year highs while all other sectors are in their upper decile over the same period. The degree of volatility is further shown in intra-day moves of the VIX, which traded in nearly a 10 point range today, touching 42% and closing above 33% for the second consecutive day.

Implied Volatility- Consistent with the elevated level of the VIX, virtually every S&P 500 sector had one-month implied volatility levels at multi-year highs as of 9/17 market close. Financials is the notable standout with implied volatility of 82%.

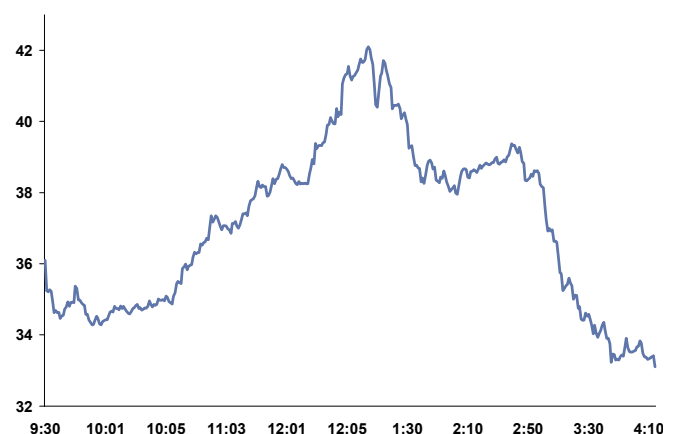
Correlation- A key driver of high realized volatility has been an increasing correlation amongst stocks and sectors that was absent during the summer when Energy and Financials stocks had a negative correlation. The average pair-wise correlation of S&P 500 stocks is 0.51, which is its 95th percentile over the past 3 years and up from 0.25 in the past month. Similar levels of correlation are found at the sector level where 5 of the 10 S&P sectors are in their upper decile and Financials and Energy stocks have realized correlation above 0.70. Perhaps most telling is the high correlation of the XLF to both the market and other S&P sectors, which confirms the market is trading a financials theme, in our view.

Exhibit 2: SPX realized vol is at a 6-year high and consistent with previous crisis periods
S&P 500 10-day realized volatility



Source: Goldman Sachs Research estimates.

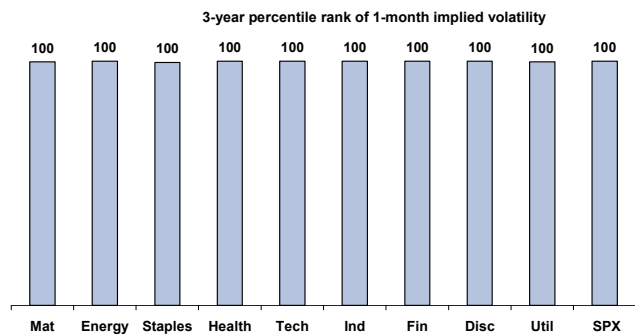
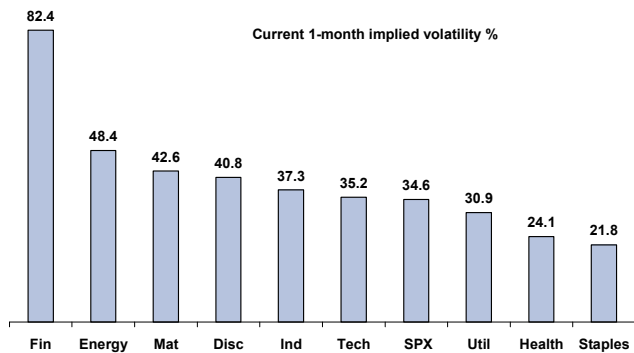
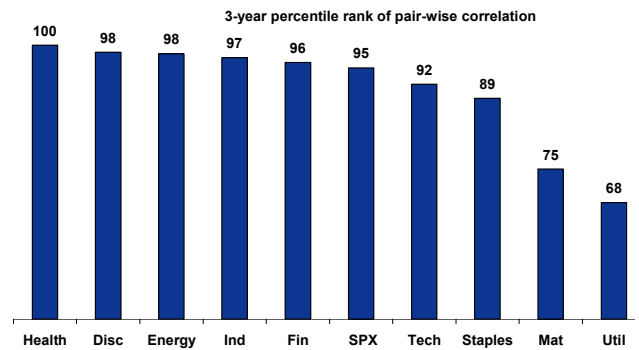
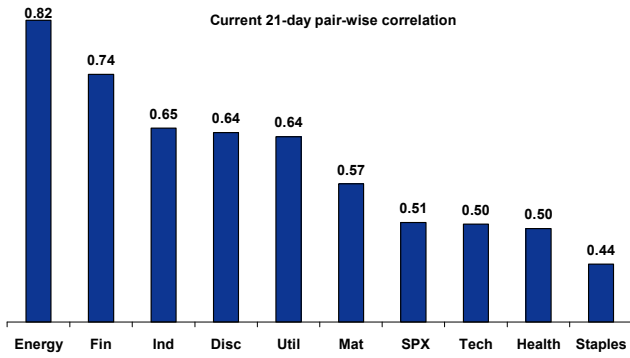
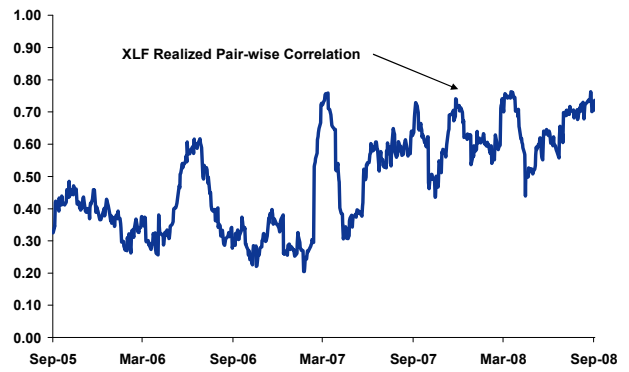
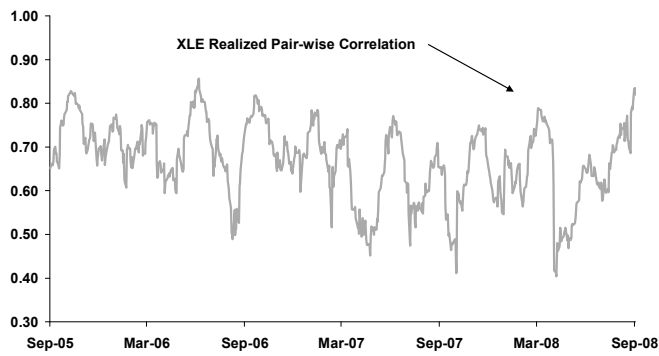
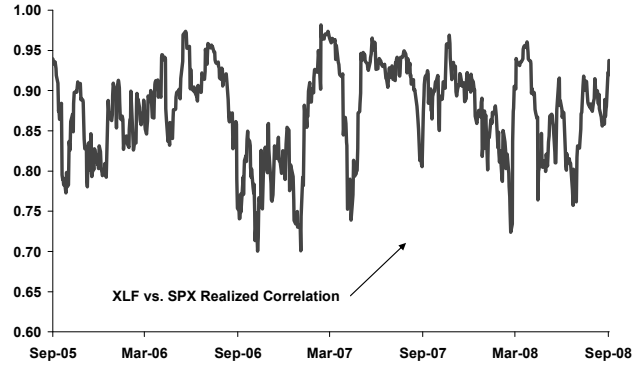
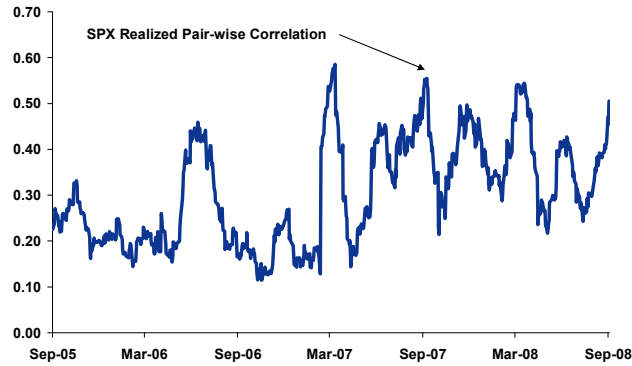
Exhibit 3: VIX traded in a 10 point range on 18-Sep
Intra-day VIX pricing for 09/18/08



Source: Goldman Sachs Research, Bloomberg.

Exhibit 4: Sector correlation and implied volatility levels are uniformly high

Data as of 09/17/08 market close.



Source: Goldman Sachs Research estimates.

Risks

Investors who sell a variance swap risk unlimited losses if the realized volatility of the index exceeds the reference strike of the variance swap at expiration.

Investors who buy a variance swap risk a maximum loss equal to the square of the variance strike times the variance notional (variance units*variance strike²).

Investors who sell a variance swap on one index and buy a variance swap on another risk unlimited losses if the realized volatility of long goes to zero and the realized volatility of the short goes to infinity.

Buying puts or put spreads: Investors who buy put options risk loss of the entire premium paid if the underlying security finishes above the strike price at expiration. Investors who buy put spreads (buy a put and sell a further OTM put) also have a maximum loss of the upfront premium paid. The maximum gain from buying put spreads is the difference between the strike prices, less the upfront premium paid.

Most spreads and all uncovered strategies must be effected in a margin account. Multiple leg strategies, including spreads, straddles, and strangles will incur multiple commission charges. Supporting documentation for any claims, comparison, recommendations, statistics, or other technical data, will be supplied upon request. Returns cited might be achieved only if the parameters described can be duplicated and there is no certainty of doing so.

Reg AC

I, Krag Gregory, hereby certify that all of the views expressed in this report accurately reflect my personal views about the subject company or companies and its or their securities. I also certify that no part of my compensation was, is or will be, directly or indirectly, related to the specific recommendations or views expressed in this report.

Disclosures

Distribution of ratings/investment banking relationships

Goldman Sachs Investment Research global coverage universe

	Rating Distribution			Investment Banking Relationships		
	Buy	Hold	Sell	Buy	Hold	Sell
Global	28%	57%	15%	50%	46%	40%

As of July 1, 2008, Goldman Sachs Global Investment Research had investment ratings on 3,006 equity securities. Goldman Sachs assigns stocks as Buys and Sells on various regional Investment Lists; stocks not so assigned are deemed Neutral. Such assignments equate to Buy, Hold and Sell for the purposes of the above disclosure required by NASD/NYSE rules. See 'Ratings, Coverage groups and views and related definitions' below.

Disclosures required by United States laws and regulations

See company-specific regulatory disclosures above for any of the following disclosures required as to companies referred to in this report: manager or co-manager in a pending transaction; 1% or other ownership; compensation for certain services; types of client relationships; managed/co-managed public offerings in prior periods; directorships; market making and/or specialist role.

The following are additional required disclosures: **Ownership and material conflicts of interest:** Goldman Sachs policy prohibits its analysts, professionals reporting to analysts and members of their households from owning securities of any company in the analyst's area of coverage. **Analyst compensation:** Analysts are paid in part based on the profitability of Goldman Sachs, which includes investment banking revenues. **Analyst as officer or director:** Goldman Sachs policy prohibits its analysts, persons reporting to analysts or members of their households from serving as an officer, director, advisory board member or employee of any company in the analyst's area of coverage. **Non-U.S. Analysts:** Non-U.S. analysts may not be associated persons of Goldman, Sachs & Co. and therefore may not be subject to NASD Rule 2711/NYSE Rules 472 restrictions on communications with subject company, public appearances and trading securities held by the analysts. **Distribution of ratings:** See the distribution of ratings disclosure above. **Price chart:** See the price chart, with changes of ratings and price targets in prior periods, above, or, if electronic format or if with respect to multiple companies which are the subject of this report, on the Goldman Sachs website at <http://www.gs.com/research/hedge.html>. Goldman, Sachs & Co. is a member of SIPC(<http://www.sipc.org>).

Additional disclosures required under the laws and regulations of jurisdictions other than the United States

The following disclosures are those required by the jurisdiction indicated, except to the extent already made above pursuant to United States laws and regulations. **Australia:** This research, and any access to it, is intended only for "wholesale clients" within the meaning of the Australian Corporations Act. **Canada:** Goldman Sachs Canada Inc. has approved of, and agreed to take responsibility for, this research in Canada if and to the extent it relates to equity securities of Canadian issuers. Analysts may conduct site visits but are prohibited from accepting payment or reimbursement by the company of travel expenses for such visits. **Hong Kong:** Further information on the securities of covered companies referred to in this research may be obtained on request from Goldman Sachs (Asia) L.L.C. **India:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (India) Securities Private Limited; **Japan:** See below. **Korea:** Further information on the subject company or companies referred to in this research may be obtained from Goldman Sachs (Asia) L.L.C., Seoul Branch. **Russia:** Research reports distributed in the Russian Federation are not advertising as defined in Russian law, but are information and analysis not having product promotion as their main purpose and do not provide appraisal within the meaning of the Russian Law on Appraisal. **Singapore:** Further information on the covered companies referred to in this research may be obtained from Goldman Sachs (Singapore) Pte. (Company Number: 198602165W). **Taiwan:** This material is for reference only and must not be reprinted without permission. Investors should carefully consider their own investment risk. Investment results are the responsibility of the individual investor. **United Kingdom:** Persons who would be categorized as retail clients in the United Kingdom, as such term is defined in the rules of the Financial Services Authority, should read this research in conjunction with prior Goldman Sachs research on the covered companies referred to herein and should refer to the risk warnings that have been sent to them by Goldman Sachs International. A copy of these risks warnings, and a glossary of certain financial terms used in this report, are available from Goldman Sachs International on request.

European Union: Disclosure information in relation to Article 4 (1) (d) and Article 6 (2) of the European Commission Directive 2003/126/EC is available at http://www.gs.com/client_services/global_investment_research/europeanpolicy.html

Japan: Goldman Sachs Japan Co., Ltd. is a Financial Instrument Dealer under the Financial Instrument and Exchange Law, registered with the Kanto Financial Bureau (Registration No. 69), and is a member of Japan Securities Dealers Association (JSDA) and Financial Futures Association of Japan (FFJAJ). Sales and purchase of equities are subject to commission pre-determined with clients plus consumption tax. See company-specific disclosures as to any applicable disclosures required by Japanese stock exchanges, the Japanese Securities Dealers Association or the Japanese Securities Finance Company.

Ratings, coverage groups and views and related definitions

Buy (B), Neutral (N), Sell (S) -Analysts recommend stocks as Buys or Sells for inclusion on various regional Investment Lists. Being assigned a Buy or Sell on an Investment List is determined by a stock's return potential relative to its coverage group as described below. Any stock not assigned as a Buy or a Sell on an Investment List is deemed Neutral. Each regional Investment Review Committee manages various regional Investment Lists to a global guideline of 25%-35% of stocks as Buy and 10%-15% of stocks as Sell; however, the distribution of Buys and Sells in any particular coverage group may vary as determined by the regional Investment Review Committee. Regional Conviction Buy and Sell lists represent investment recommendations focused on either the size of the potential return or the likelihood of the realization of the return.

Return potential represents the price differential between the current share price and the price target expected during the time horizon associated with the price target. Price targets are required for all covered stocks. The return potential, price target and associated time horizon are stated in each report adding or reiterating an Investment List membership.

Coverage groups and views: A list of all stocks in each coverage group is available by primary analyst, stock and coverage group at <http://www.gs.com/research/hedge.html>. The analyst assigns one of the following coverage views which represents the analyst's investment outlook on the coverage group relative to the group's historical fundamentals and/or valuation. **Attractive (A).** The investment outlook over the following 12 months is favorable relative to the coverage group's historical fundamentals and/or valuation. **Neutral (N).** The investment outlook over the following 12 months is neutral relative to the coverage group's historical fundamentals and/or valuation. **Cautious (C).** The investment outlook over the following 12 months is unfavorable relative to the coverage group's historical fundamentals and/or valuation.

Not Rated (NR). The investment rating and target price, if any, have been removed pursuant to Goldman Sachs policy when Goldman Sachs is acting in an advisory capacity in a merger or strategic transaction involving this company and in certain other circumstances. **Rating Suspended (RS).** Goldman Sachs Research has suspended the investment rating and price target, if any, for this stock, because there is not a sufficient fundamental basis for determining an investment rating or target. The previous investment rating and price target, if any, are no longer in effect for this stock and should not be relied upon. **Coverage Suspended (CS).** Goldman Sachs has suspended coverage of this company. **Not Covered (NC).** Goldman Sachs does not cover this company. **Not Available or Not Applicable (NA).** The information is not available for display or is not applicable. **Not Meaningful (NM).** The information is not meaningful and is therefore excluded.

Ratings, coverage views and related definitions prior to June 26, 2006

Our rating system requires that analysts rank order the stocks in their coverage groups and assign one of three investment ratings (see definitions below) within a ratings distribution guideline of no more than 25% of the stocks should be rated Outperform and no fewer than 10% rated Underperform. The analyst assigns one of three coverage views (see definitions below), which represents the analyst's investment outlook on the coverage group relative to the group's historical fundamentals and valuation. Each coverage group, listing all stocks covered in that group, is available by primary analyst, stock and coverage group at <http://www.gs.com/research/hedge.html>.

Definitions

Outperform (OP). We expect this stock to outperform the median total return for the analyst's coverage universe over the next 12 months. **In-Line (IL).** We expect this stock to perform in line with the median total return for the analyst's coverage universe over the next 12 months. **Underperform (U).** We expect this stock to underperform the median total return for the analyst's coverage universe over the next 12 months.

Coverage views: Attractive (A). The investment outlook over the following 12 months is favorable relative to the coverage group's historical fundamentals and/or valuation. **Neutral (N).** The investment outlook over the following 12 months is neutral relative to the coverage group's historical fundamentals and/or valuation. **Cautious (C).** The investment outlook over the following 12 months is unfavorable relative to the coverage group's historical fundamentals and/or valuation.

Current Investment List (CIL). We expect stocks on this list to provide an absolute total return of approximately 15%-20% over the next 12 months. We only assign this designation to stocks rated Outperform. We require a 12-month price target for stocks with this designation. Each stock on the CIL will **automatically** come off the list after 90 days unless renewed by the covering analyst and the relevant Regional Investment Review Committee.

Global product; distributing entities

The Global Investment Research Division of Goldman Sachs produces and distributes research products for clients of Goldman Sachs, and pursuant to certain contractual arrangements, on a global basis. Analysts based in Goldman Sachs offices around the world produce equity research on industries and companies, and research on macroeconomics, currencies, commodities and portfolio strategy.

This research is disseminated in Australia by Goldman Sachs JBWere Pty Ltd (ABN 21 006 797 897) on behalf of Goldman Sachs; in Canada by Goldman Sachs Canada Inc. regarding Canadian equities and by Goldman Sachs & Co. (all other research); in Germany by Goldman Sachs & Co. oHG; in Hong Kong by Goldman Sachs (Asia) L.L.C.; in India by Goldman Sachs (India) Securities Private Ltd.; in Japan by Goldman Sachs Japan Co., Ltd.; in the Republic of Korea by Goldman Sachs (Asia) L.L.C., Seoul Branch; in New Zealand by Goldman Sachs JBWere (NZ) Limited on behalf of Goldman Sachs; in Singapore by Goldman Sachs (Singapore) Pte. (Company Number: 198602165W); and in the United States of America by Goldman, Sachs & Co. Goldman Sachs International has approved this research in connection with its distribution in the United Kingdom and European Union.

European Union: Goldman Sachs International, authorised and regulated by the Financial Services Authority, has approved this research in connection with its distribution in the European Union and United Kingdom; Goldman, Sachs & Co. oHG, regulated by the Bundesanstalt für Finanzdienstleistungsaufsicht, may also be distributing research in Germany.

General disclosures in addition to specific disclosures required by certain jurisdictions

This research is for our clients only. Other than disclosures relating to Goldman Sachs, this research is based on current public information that we consider reliable, but we do not represent it is accurate or complete, and it should not be relied on as such. We seek to update our research as appropriate, but various regulations may prevent us from doing so. Other than certain industry reports published on a periodic basis, the large majority of reports are published at irregular intervals as appropriate in the analyst's judgment.

Goldman Sachs conducts a global full-service, integrated investment banking, investment management, and brokerage business. We have investment banking and other business relationships with a substantial percentage of the companies covered by our Global Investment Research Division.

Our salespeople, traders, and other professionals may provide oral or written market commentary or trading strategies to our clients and our proprietary trading desks that reflect opinions that are contrary to the opinions expressed in this research. Our asset management area, our proprietary trading desks and investing businesses may make investment decisions that are inconsistent with the recommendations or views expressed in this research.

We and our affiliates, officers, directors, and employees, excluding equity analysts, will from time to time have long or short positions in, act as principal in, and buy or sell, the securities or derivatives (including options and warrants) thereof of covered companies referred to in this research.

This research is not an offer to sell or the solicitation of an offer to buy any security in any jurisdiction where such an offer or solicitation would be illegal. It does not constitute a personal recommendation or take into account the particular investment objectives, financial situations, or needs of individual clients. Clients should consider whether any advice or recommendation in this research is suitable for their particular circumstances and, if appropriate, seek professional advice, including tax advice. The price and value of the investments referred to in this research and the income from them may fluctuate. Past performance is not a guide to future performance, future returns are not guaranteed, and a loss of original capital may occur. Fluctuations in exchange rates could have adverse effects on the value or price of, or income derived from, certain investments.

Certain transactions, including those involving futures, options, and other derivatives, give rise to substantial risk and are not suitable for all investors. Investors should review current options disclosure documents which are available from Goldman Sachs sales representatives or at <http://www.theocc.com/publications/risks/riskchap1.jsp>. Transactions cost may be significant in option strategies calling for multiple purchase and sales of options such as spreads. Supporting documentation will be supplied upon request.

Our research is disseminated primarily electronically, and, in some cases, in printed form. Electronic research is simultaneously available to all clients.

Disclosure information is also available at <http://www.gs.com/research/hedge.html> or from Research Compliance, One New York Plaza, New York, NY 10004.

Copyright 2008 The Goldman Sachs Group, Inc.

No part of this material may be (i) copied, photocopied or duplicated in any form by any means or (ii) redistributed without the prior written consent of The Goldman Sachs Group, Inc.