Goldman Sachs (GS) Options Strategy

Daniel Gutierrez Velez

Target Price 418.49
Last Price 386.98

Call strategy summary

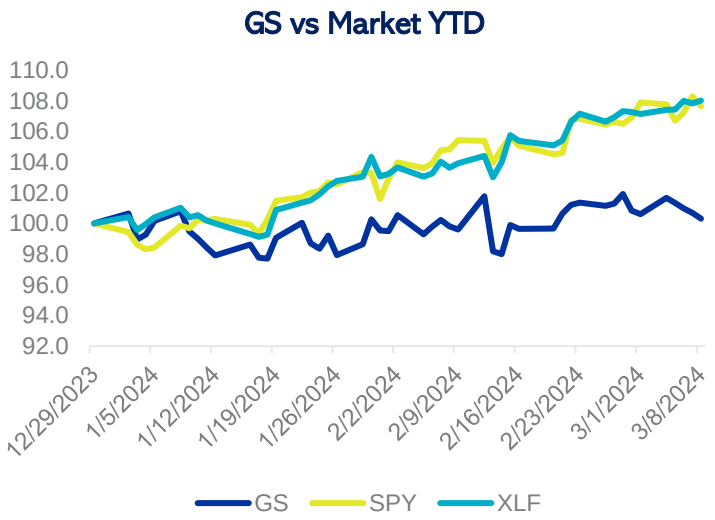
The **GS** stock closed on March 8th at 386.98. In the options market, there was notable activity for both out-of-the-money and at-the-money call options. To assess if these options were valued appropriately or if there was a chance for arbitrage, we examined the price of at-the-money options by comparing them to the closest strike price from the last closing price.

Using a binomial pricing model, we calculated the theoretical fair value of these call options. Our analysis showed that the price deviation between the market prices and our model's prices was minimal—only 0.06% for the 3-month call option and 0.63% for the 6-month call option. Such slight discrepancies suggest that the options are reasonably priced in the market and could be utilized effectively in hedging strategies, for example, when short selling the underlying stock.

However, it's important to remain cautious about these findings as our model relies on several underlying assumptions. The accuracy of our pricing model could be enhanced by adopting a more complex model such as the Black-Scholes Model, which may provide a more sophisticated analysis of the options' fair value.

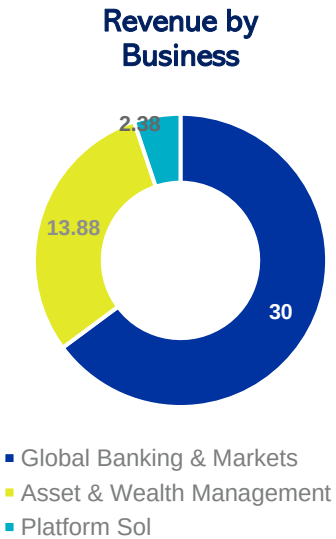
Binomial Tree	3M Call	6M Call
Annualized Volatility σ	20.23%	21.90%
Spot	386.99	386.99
Strike (K)	386.99	386.99
Call price	**21.66**	**32.90**
Price / strike	**5.60%**	**8.50%**

Market	3M Call	6M Call
Implied volatility	25.49%	26.50%
Spot	386.99	386.99
Strike (K)	385.00	385.00
Call Price (Mid)	**21.78**	**30.30**
Price / strike	**5.66%**	**7.87%**
Difference (Price)	**0.11**	**-2.60**
Difference (Price / strike)	**0.06%**	**-0.63%**



Company Overview

The Goldman Sachs Group, Inc. (GS) is a leading global investment banking, securities, and investment management firm that provides a wide range of financial services to a substantial and diversified client base. The firm is well-known for its roles in investment banking, asset management, wealth management, securities trading, and providing advice on mergers and acquisitions, as well as its role in the trading and management of various financial assets. The company is headquartered in New York City, but it has major offices and operations in financial centers around the world, including London, Tokyo, Frankfurt, and Hong Kong.



Key Executives

Among its main executives are David Solomon as CEO, Denis Coleman as CFO and John Waldron as COO.
David Solomon has served as CEO since October of 2018. Before this role he was COO since 2017 and has been in directive roles in the investment banking division since 2006.

Goldman Sachs (GS) Options Strategy

Daniel Gutierrez Velez

Target Price 418.49
Last Price 386.98

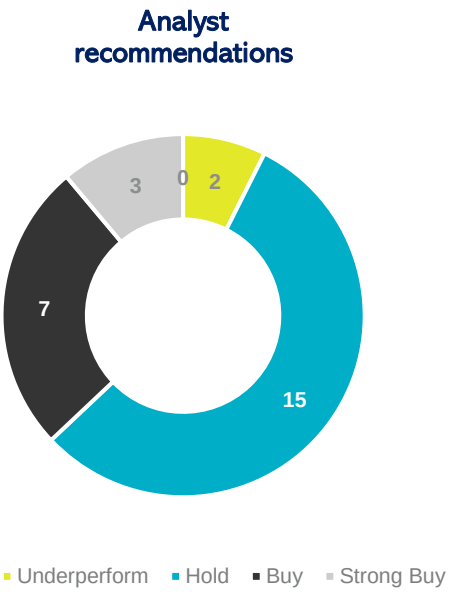
Key Figures

For the fourth quarter of 2023, Goldman Sachs (GS) reported a net revenue of $46.25 billion and net earnings of $8.52 billion. This translates to a net margin of 18.42%, along with a Return on Equity (ROE) of 7.5% and a Return on Tangible Equity (ROTE) of 8.1% for the year.

The book value per share at the end of 2023 was $313.56, which sets the stock's price-to-book **(P/B)** ratio at **1.23x.**

Market Analysis
Currently, shares of GS are trading at a trailing twelve months Price-to-Earnings (TTM PE) ratio of 16.92x. This compares to an industry average of 18.43x, as indicated by the Financial Select Sector SPDR Fund (XLF ETF), and a broader market average of 25.78x, represented by the S&P 500 ETF (SPY ETF). GS's PE ratio suggests that the stock is trading in line with its industry peers and does not significantly deviate from the overall market.

Analyst Recommendations
Analysts featured on Yahoo Finance have set an average target price for GS stock at $418.49, which represents an **+8.14%** increase from its last trading price. The consensus among these analysts is to maintain a 'hold' position on the stock.



Market Prices

We have reviewed the market prices for **GS** ATM call options, focusing on the strike price of 385, which is nearest to the current stock price. Our analysis covers two durations: a 3-month term and a 6-month term.

For the 3-month term, we selected the **GS June 2024** call option with a strike price of 385.00, set to expire on June 21, 2024. Similarly, for the 6-month term, we chose the **GS September 2024** call option with the same strike price of 385.00, which will expire on September 20, 2024.

The primary market data for these two call option expiries can be found in the table that follows:

Market	3M Call	6M Call
Last Price	386.99	386.99
Strike (K)	385.00	385.00
Ask	21.95	30.80
Bid	21.60	29.80
Mid	**21.78**	**30.30**
Implied volatility	25.49%	26.50%
Mid / Strike (K)	5.66%	7.87%
Open Interest	949	143

The strike price of the options is closely aligned with the last price, which facilitates a comparison using risk-neutral valuation methods. Additionally, the implied volatilities for the two different maturities are comparable. Note that the option with the shorter maturity is showing higher open interest and a lower Mid / strike price.
The next step in our analysis is to determine the fair value of the call option using a binomial tree model. This will help us assess whether the options are priced correctly in the market or if there is a potential arbitrage opportunity.

Goldman Sachs (GS) Options Strategy

Daniel Gutierrez Velez

Target Price 418.49
Last Price 386.98

Binomial Tree Model

Using the binomial tree model we now estimate the price of a call option on **GS** under a series of assumptions. The pricing is presented in the table bellow

Procedure and assumptions

- The annualized volatility **σ** was calculated using the daily returns for the adj. close of the underlying for 3 and 6 months, respectively.
- The factors up (***u***) and down (***d***) were calculated using the formulas:
- $u = e^{\sigma\sqrt{\Delta t}}, \quad d = e^{-\sigma\sqrt{\Delta t}}$
- The risk-free rates r used were: The 3-month SOFR for the 3-month call and the 6-month zero-cupon Treasury rate for the 6-months call.
- Δt is the fraction of years, so ¼ or ½ in the 3-month and 6-month calls respectively.
- The probability was estimated through
- $q = \frac{e^{(r-\gamma)\Delta t} - d}{u - d}$, where γ is the dividend yield of the stock.
- The spot price is the adjusted close for the 8th of march.
- The *su* and *sd* are just the spot(or strike since their coincide in this model) times the ***u*** and ***d*** factors.
- ***Payoff u*** is $\max(su - k, 0)$, while the ***Payoff d*** is $\max(sd - k, 0)$. Where k is the strike price 386.99.
- Finally, the Call price is calculated using the following formula:
- $P_o^{call} = e^{-(r-\gamma)\Delta t} * [(q * payoff\ u) + ((1-q) * (payoff\ d))]$
- Additionally, the ratio Price / strike is presented to normalize the price and asses if it is consistent with the market values.

Call Model	3M Call	6M Call
Annualized Volatility σ	20.23%	21.90%
u	1.11	1.17
d	0.90	0.86
Risk free rate	5.32%	5.34%
months	3	6
Δt in years	0.25	0.5
q	0.532	0.525
1-q	0.468	0.475
dividend during option	2.75	5.50
dividend yield γ	0.71%	1.42%
strike	386.99	386.99
su	428.19	451.81
sd	349.76	331.47
payoff u	41.20	64.82
payoff d	0.00	0.00
Call price	**21.66**	**32.90**
Price / strike	5.60%	8.50%

Conclusions

We see that the options for the 3 and 6 months behave accordingly to theory, in which the longer maturity implies a higher price, and the higher volatility also increases the price for the 6 month-call.

Daniel Gutierrez
Msc. Data Science Student
University of Padova
daniel.gutierrezvelez@studenti.unipd.it