

FINM2002 Derivatives

FINM6041 Applied Derivatives

Workshop 4

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Overview

- The GME short squeeze
- An example of violation of option price bounds

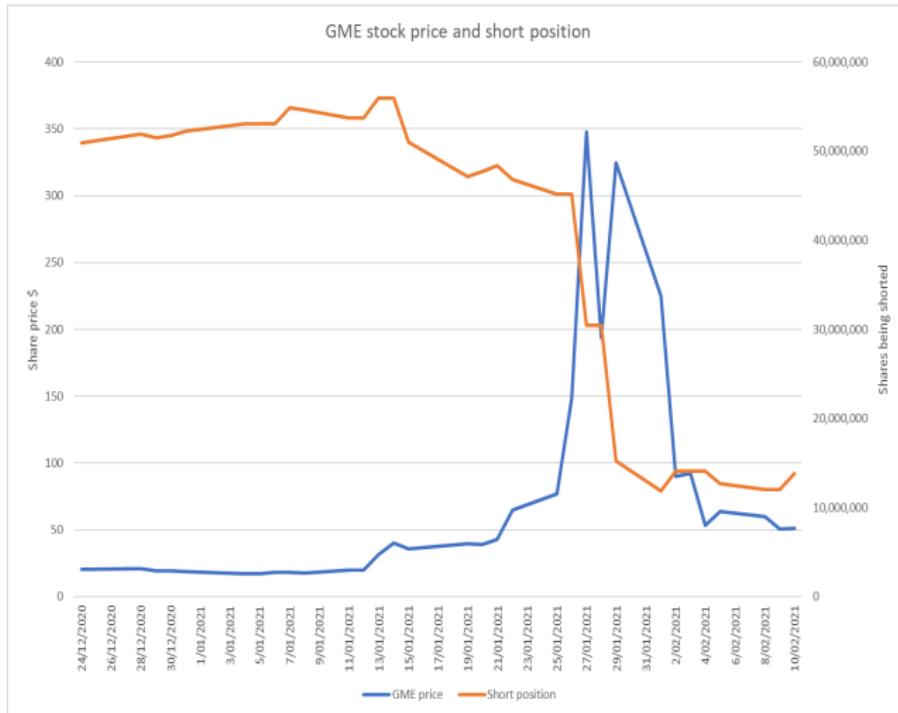


1. The GME short squeeze

- Recall from Lecture 1
- Short selling: profit from a decline in a security's price.
 - Borrow security from lenders through a broker or dealer
 - Sell the borrowed security
 - At a later date, cover the short position: purchase the equivalent security and pay back the one borrowed
 - Must pay dividends and other benefits that would have accrued to the lender
 - Margin account with the broker is required, so that possible adverse movements (increases) in the price of shorted security are covered
 - Incur lending fee



1. The GME short squeeze



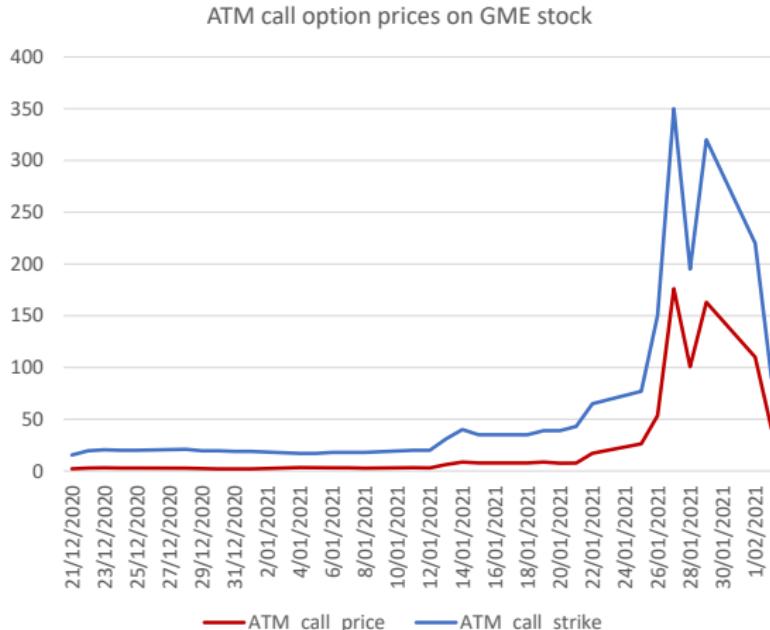
1. The GME short squeeze

- In January 2021, short squeeze of GameStop (GME)
- Short-sellers were “squeezed out” by extreme increase in share price, and suffered huge losses
 - More stocks were sold short than available for borrow in early January 2021, observed and targeted
 - Lending fee rate above 40% p.a.
 - Initially triggered by users of the Reddit r/wallstreetbets
 - Push up price and “diamond hand” to force short sellers to close short position at high price
 - Stock price increased by 10 times in a week
 - Short sellers cannot maintain minimum margin
 - Big market and regulations consequences



1. The GME short squeeze

- Another battleground: options market



Source: DataStream

1. The GME short squeeze

- Options of GME during short squeeze
 - A sharp increase in option price during the short squeeze event
 - American option
 - At-the-Money call options $X = S_\tau$
 - Payoff = $\max(S_T - X, 0)$
 - ATM call options on GME was priced at around \$1-3 before mid-Jan 2021
 - However, an ATM call option on Jan 26, with underlying GME stock price = \$150, and strike price = \$150, was sold at $C = \$53.5$
 - You get profit only when GME goes above \$203.5!



1. The GME short squeeze

- What happened on the next day
 - Trading volume increased by 4 times!
 - The stock price on Jan 27 raised to \$347.5!
 - ITM and ATM calls on GME were too expensive, many investors also bought a lot of deeply OTM calls with higher strike, but much lower price
 - E.g. OTM call with strike of \$200, was sold at \$4, the profit next day = $347.5 - 200 - 4 = \$143.5$



2. An example of violation of option price bounds

- Lower bound for European call option

$$c \geq \max(S_0 - Xe^{-rT}, 0)$$

- A European call option on a non-dividend-paying stock
 - Strike price $X = \$18$
 - Expiration date in one year, $T = 1$
 - Current price $c = \$3$
 - Stock price today $S_0 = \$20$
 - Risk-free rate 10% p.a., continuously compounded
- Calculate the theoretical minimum price for option
- Set up a strategy if there is arbitrage opportunity



2. An example of violation of option price bounds

- Given information: $S_0 = 20$, $X = 18$, $r = 10\%$, $T = 1$, $c = 3$ The lower bound of this European call option is

$$c_{min} = \max(S_0 - Xe^{-rT}, 0) = 20 - 18e^{-10\% \times 1} = \$3.71$$

- The current option price ($c = \$3$) is smaller than the lower bound
- Therefore arbitrage opportunity exists
- “Buy cheap and short expensive”

2. An example of violation of option price bounds

	Time 0	Time T If $S_T < \$18$	Time T If $S_T > \$18$
Long call option	-3	0	$S_T - 18$
Short share	20	$-S_T$	$-S_T$
Long bond	-17	$17e^{0.1 \times 1} = 18.79$	18.79
Net payoff	0	$18.79 - S_T > \$0.79$	$\$0.79$

- Zero initial investment
- Lock in risk-less profit $\geq \$0.79$ at time T
- Will do as many as possible

