

# FINM2002 Derivatives

## FINM6041 Applied Derivatives

### Workshop 4

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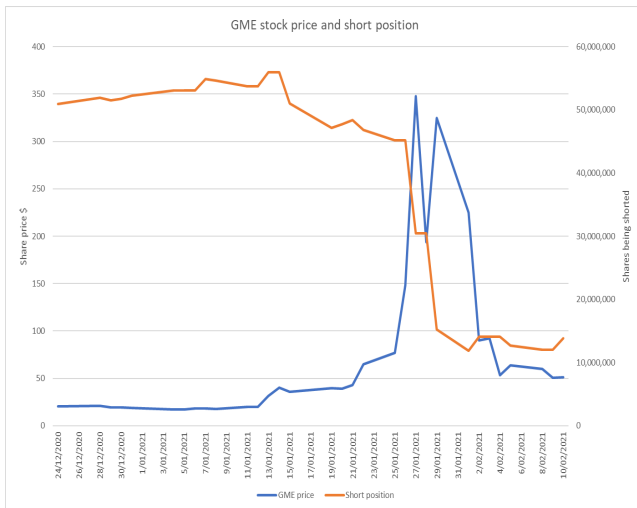
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- The GME short squeeze
- An example of violation of option price bounds

# 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

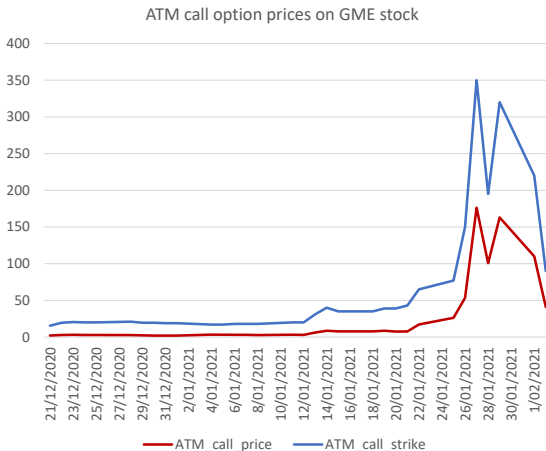


# 1. The GME short squeeze

- 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  $X = S_T$
  - 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