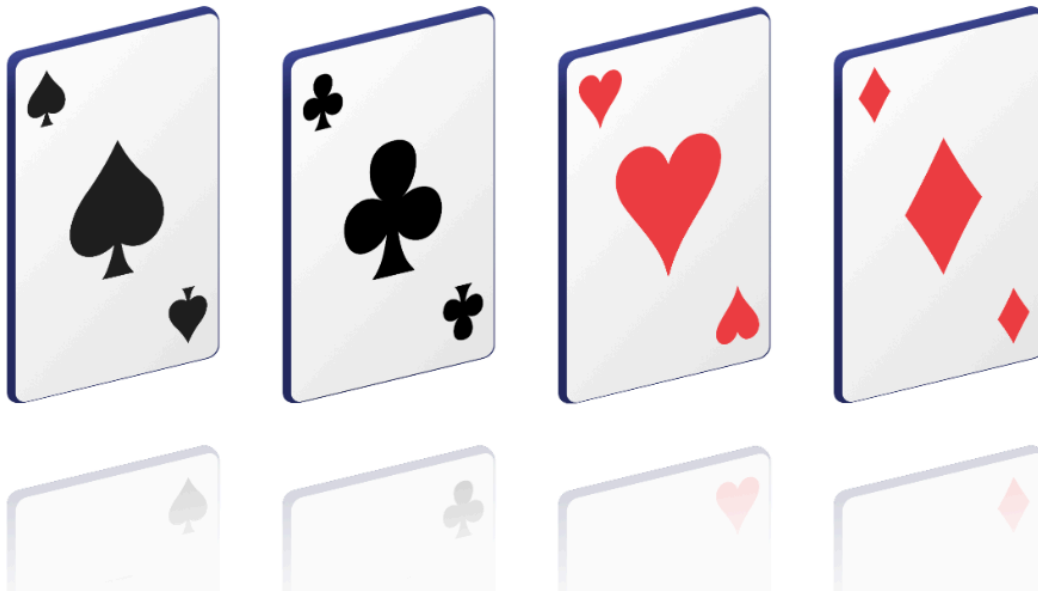


By QuantCrest



Market Making Games



Basics:

- **Bid Price:** The price you are willing to buy at
- **Ask Price:** The price you are willing to sell at
- **Size:** The quantity of shares/contracts/etc you are willing to buy/sell
- **Spread:** The difference between the sell and buy price you are quoting
- When verbally stating your quotes, it is most commonly phrased as 'bid ask'.

Ex: "I'm at 40@45" implies you are willing to buy at 40 and sell at 45.

Introduction:

Market making involves trading financial instruments like equities, bonds, commodities, futures, and options to uphold market liquidity. Market makers stand ready to buy or sell these assets at quoted prices, creating a trading platform for other market participants. The term **Market Making** reflects their role in actively facilitating trade, quoting both buy (bid) and sell (ask) prices.

Market makers play a dual role:

- They enhance liquidity by consistently offering to buy or sell securities, ensuring a counterparty for other participants. This improves market efficiency, cuts transaction costs, and aids in price discovery.
- Secondly, market makers contribute to maintaining market stability by absorbing risk, facilitating smoother price transitions, and reducing volatility. Profits for market makers come from the bid-ask spread the difference between buying and selling prices.

Responsibilities of a Market Maker:

1. Increasing market efficiency:

Market makers contribute to efficiency by continually providing bid and ask quotes, enabling other traders to find counterparts for their transactions. This ensures swift transaction execution, contributing to a market where prices promptly reflect available information.

2. Reducing transaction costs:

Market makers narrow the bid-ask spread, representing transaction costs in financial markets. This benefits traders by reducing costs incurred during trading, as they don't need to pay as much over the bid price to buy or take as much of a discount under the ask price to sell.

3. Promoting price discovery:

Market makers contribute to price discovery by continuously buying and selling, producing a flow of information about acceptable prices for market participants. Bid and ask quotes reflect their perceptions of the asset's value, aiding the ongoing process of price discovery.

Market makers derive profit from the spread between their buying and selling prices the bid-ask spread. They buy at a slightly lower price (the bid) and sell at a slightly higher price (the ask), gaining profit from the difference. This spread compensates them for the risk associated with providing liquidity and maintaining the orderly functioning of markets.

Bid-Ask Market

For instance, stating a market as **200 at 250** indicates the intention to buy at 200 and sell at 250.

To control the gap between bid and ask prices, players can set a maximum spread, either as a fixed amount or a percentage of the mid-market price.

Categories of Market-Making Games

Based on the characteristics of predictions and the structure of payouts, there are three main categories of market-making games:

1. Standard Market

- In this segment, the earnings hinge on the difference between the real value of the underlying asset or event and the price at which the player carried out the trade.
- **Ex:** If you predict that a particular stock will conclude above 400, and it indeed finishes at 420, you make a profit from the 20-point difference when you placed a buy order at 400.

2. Probability Market

- Here, participants create markets based on the likelihood of an event happening. Prices range from 0 (*indicating 0% probability*) to 100 (*indicating 100% probability*). After a trade is executed, payouts are computed by considering the agreed-upon notional and the difference from 100%.
- **Ex:** For instance, if you participate in a market concerning the NIFTY 50 closing lower than its opening and buy at 20 (*reflecting a 20% probability*), potential payouts are outlined as follows:
 1. Winning the bet results in receiving $(1 - 0.2) * \text{notional}$ from your opponent.
 2. If you lose: You are obligated to pay $0.2 * \text{notional}$ to your opponent.

3. Binary Market

A PATHWAY TO QUANTITATIVE EXCELLENCE....

- In a binary market, the payout is a fixed notional amount if the specified condition is met. Participants predict an outcome, and if the actual result meets or exceeds the predicted outcome, the player who took the correct position receives the agreed-upon notional.
- **Ex:** if you predict the number of goals in a football game and buy at 2 goals, winning the notional amount (e.g., 1 euro) occurs if the game ends with 5 goals. The payout remains constant regardless of whether the actual outcome is 2, 5, or even 10 goals.

Interview Setup:

- A 'market maker' is an individual ready to provide both a bid and an offer for a product. The counterpart completing the quoted orders is known as the 'market taker.'
- A bid-order represents the price and volume for which the market maker is willing to buy an asset, while an ask-order outlines the price and volume for which they are willing to sell. The price difference between the bid and ask order is termed the 'spread.'
- The market taker, acting swiftly to fill the quoted order, gains the right to transfer the asset from the market maker.

Interview Framework

Stage 1:

- The interviewer asks you to make a market on a specific topic, such as the total number of residential units in the Netherlands. In response, you should first detail your strategy to estimate this number, followed by stating your bid and ask prices.
- Example of how to determine a wide market, as an equivalent for a 95% confidence interval: There are approximately 16 million people in the Netherlands. If we assume a maximum of one house per person and a minimum of one house for every eight people, we can quote a bid price for 2 million houses and an ask price for 16 million houses.

Stage 2:

- The interviewer knows that the last known number is 7.9 million houses. The given confidence-interval is wide and the value of 7.9 million falls in between. Therefore, the interviewer will not buy from you (*since he won't buy something for 16 million if he knows that it is worth 7.9 million*) and he won't sell it to you (*since he won't sell something for 2 million while knowing that it's worth 7.9 million*). The interviewer will ask the applicant to make a tighter market, with a specific spread.
- Example: You are asked to make a market with a 5% spread from your bid price. Starting from a market of 2 to 16 million, a reasonable mid-point is 9 million. Thus, you could make a market with a 9 million bid price and a 9.45 million ask price.

Stage 3:

- Following your adjustment, the interviewer evaluates your market. As the true value is lower than 9 million, and you have agreed to buy at that price, the interviewer sells you a share. This transaction results in the interviewer having one short position, and you one long position.
- With this new information, the interviewer asks you to adjust your market. Since the interviewer just sold a share for 9 million, you know that the market has to be adjusted downwards.
- Example: You adjust your market to a 5 million bid-price and a 5.25 million ask-price.

Stage 4:

- Given the true value is higher than your ask price, the interviewer buys the share from you for 5.25. Now, both of you hold a neutral position.

Stages 5:

This process repeats until your quoted prices are close to the true value. Normally, you won't be allowed to quote more than five or six markets. The reason being, you should remember all your trades without noting them down. Sometimes this is made clear at the outset; other times it's a test of your alertness.

Post-Game Questions:

Post-game, the interviewer might ask questions like:

1. What is your position? (*This is the number of shares that you're long or short. For example, if you bought twice and sold three times, your position is -1. If you bought twice and sold once, your position is 1. In the simulator, your answer should be '1', not '+1'.*)
2. What is your maximum guaranteed loss? (*This helps understand that the game always results in a loss. For example, if you bought for 500 and sold for 200, your maximum guaranteed loss is 300.*)
3. If you want to make your position neutral, what would be your break-even point? (*This tests your ability to calculate your break-even point. It's worth noting that in some situations, it may not be possible to break even.*)

Like many endeavors, proficiency in the market-making game requires practice. Recalling positions and solving end-game questions may pose unexpected challenges, particularly in the intensity of an interview.

Other Market Making Games Like:

1. Guesstimates
2. Card Game
3. Combination of Card and Dice Game

These games require calculation of expected value on each round depending on the scenario and we have to adjust our bid and ask price accordingly.

Announcement:

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QuantCrest will be including the "Market Making Guesstimates, Card Game and Dice and Card Game" in their market-making guide, which is part of their **Quant Interview Guide**.

- These games are known for being a bit more calculative, as candidates are required to calculate the expected value after each round.
- QuantCrest is also launching a **Quant Guide** that will cover these games, providing candidates with a structured approach to tackling these questions and solving them as more conditions are put on by the interviewer.
- Candidates are encouraged to follow **QuantCrest** for further updates on the launch of the **Quant Guide**.

These games are often an essential part of trading interviews, providing the interviewer with a clear insight into how candidates react under pressure and make strategic decisions based on limited information.

Therefore, being well-prepared for these types of questions is crucial, especially when applying for positions at high-frequency trading firms or other quantitative trading roles. Do **follow** on

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