

Traditional investing: risk vs reward

DATA-DRIVEN DECISION MAKING FOR BUSINESS



Ted Kwartler

Data Dude

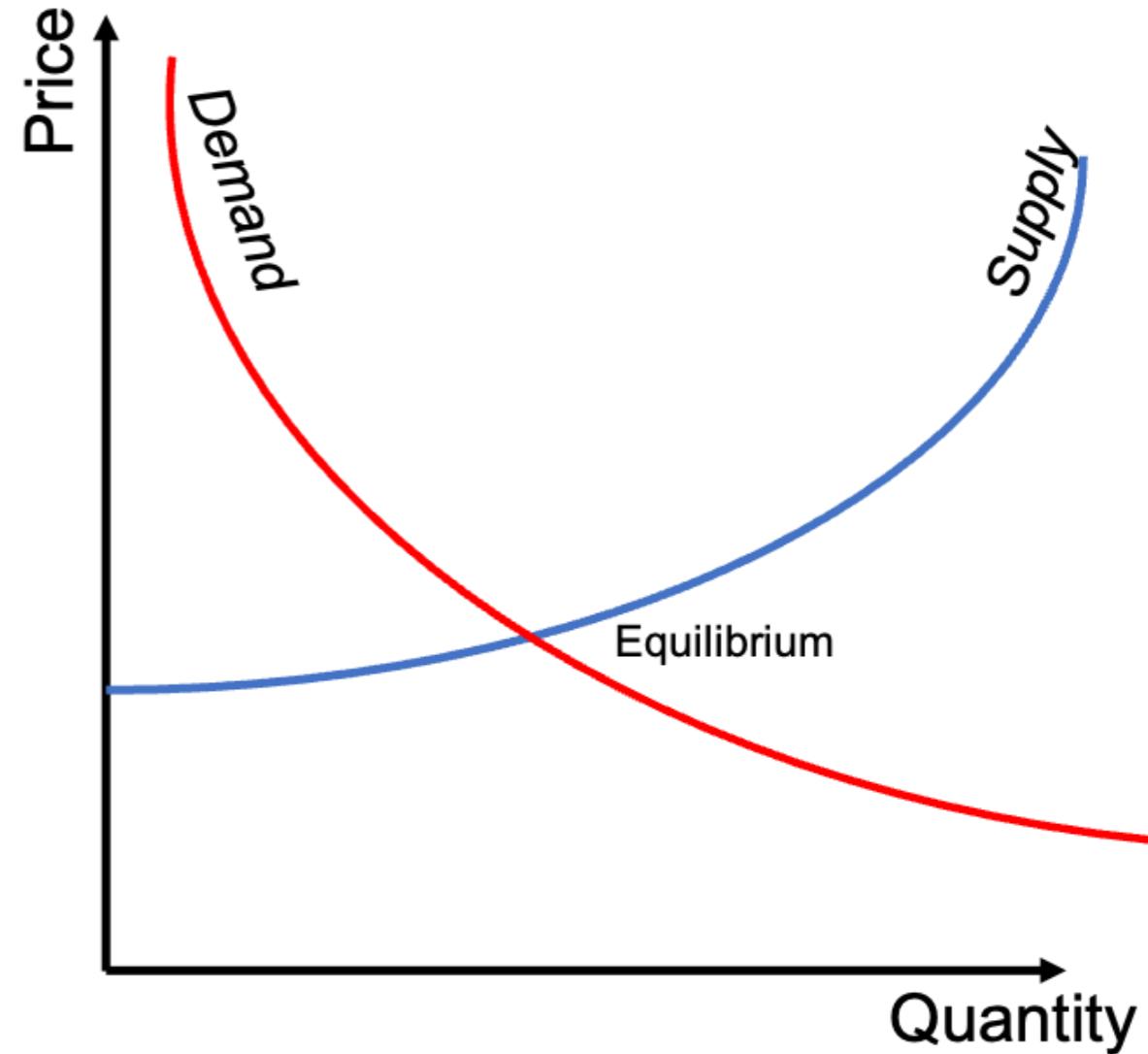
What is a market?

Traditional markets

Infrastructure where parties exchange goods

- Stock Markets
- Bond Markets
- Housing/Mortgages
- Commodities: gold/silver etc
- Crop Futures: corn/soybean
- Consumer Credit

Supply and demand



Investment strategies

- Belief-based investing
- High-frequency trading
- Financial fundamentals
- Technical trading rules

Belief-based investing



Buy the companies you *believe* will perform well or want to support

- "I bought stock in my favorite streaming service"
- "It was so busy last time I was there, I bought stock in my favorite fast food restaurant"
- "I won't buy stocks that produce tobacco"

High-frequency trading (HFT)

Providing liquidity or taking advantage?

- Highly automated
- No human in the loop
- Need speed, volume, and volatility to succeed
- Jump you in line and make money on your stock order
- Requires servers close to the market's data centers



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Financial fundamentals

Buy the companies demonstrating financial indicator strength

- "I bought stock X because they have excellent **revenue** growth"
- "I don't care if they are gun manufacturer, their **dividend** is high."



Technical trading rules (TTR)



Trade based on mathematical indications

- "The **MACD crossover** is positive for this stock so I bought it"
- "The **relative strength indicator** shows a stock is overbought, so I decided to sell"

Capital Asset Pricing Model (CAPM)

Expected **return of** investment (ER) =

Risk **free** rate + (Beta * (Expected market **return** - Risk **free** rate))

- **Beta** (risk of the investment): how a stock moves with respect to the market
 - Beta between 0-1: stock is less volatile than the market
 - Beta > 1: stock is more volatile than the market
- **Risk free rate**: rate of return for an investment that never defaults
 - In practice: 3-month US Treasury bill's interest rate minus inflation

Capital Asset Pricing Model (CAPM)

Expected **return of** investment (ER) =

Risk **free** rate + (Beta * (Expected market **return** - Risk **free** rate))

Example

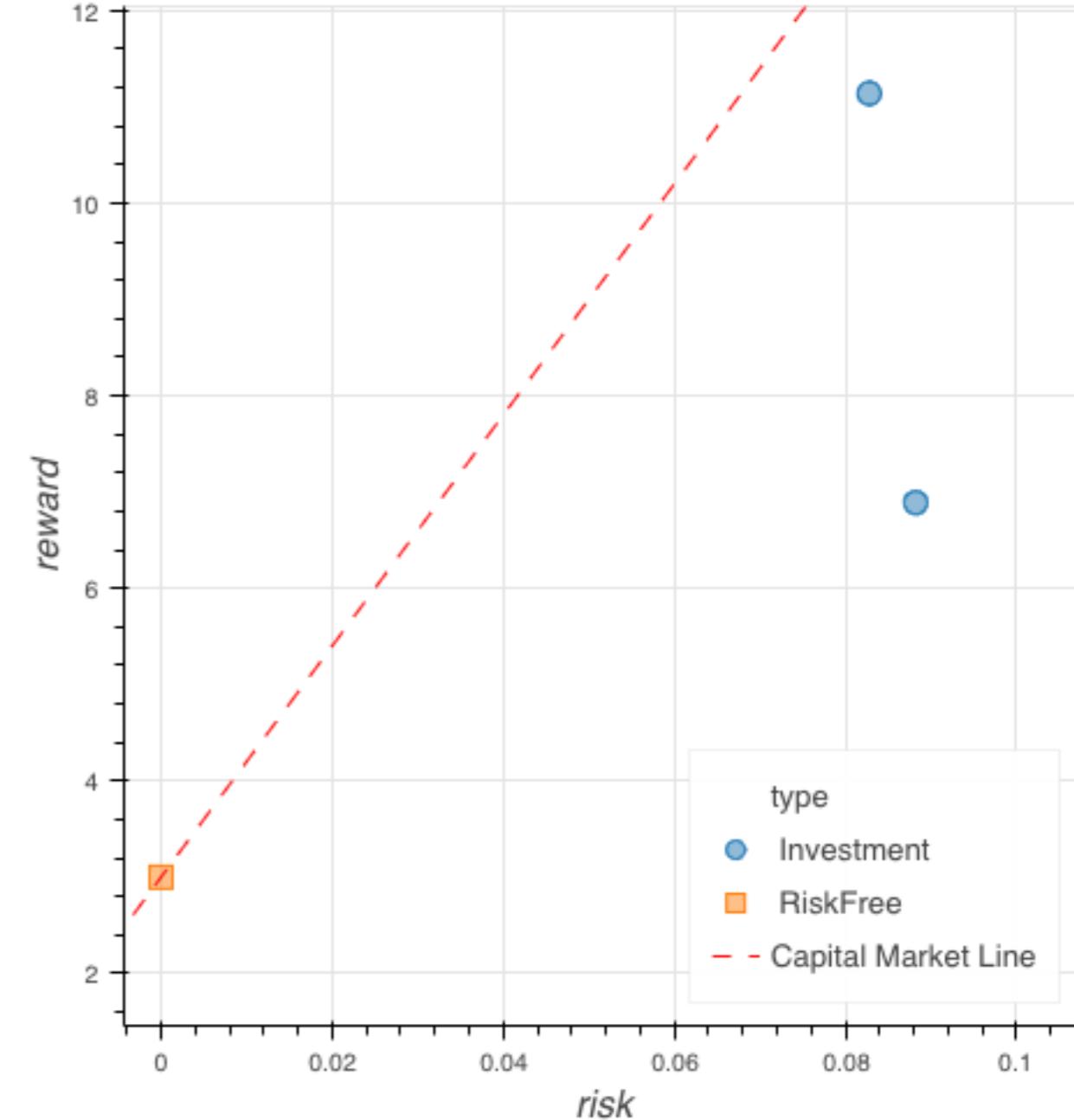
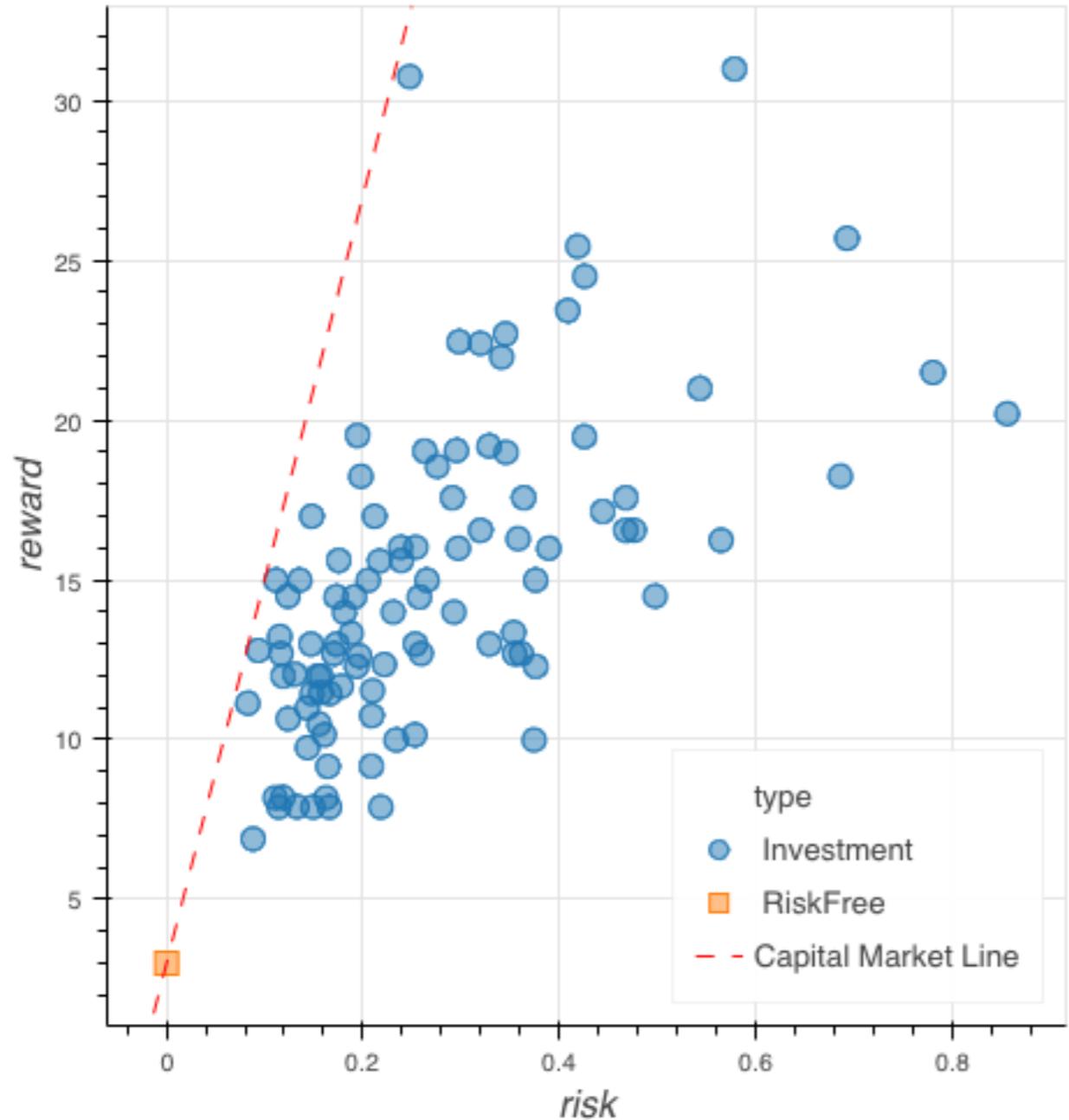
- Risk free rate = 0.03
- Expected market return = 0.09
- Beta of stock X = 0.5

$$ER = .03 + .5(.09 - .03)$$

$$ER = .03 + .5(.06)$$

$$ER = .03 + .03 = 0.06$$

Interpreting a CAPM chart



¹ <https://www.investopedia.com/terms/c/capm.asp>

Data-driven investing!

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Other traditional asset investing

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Data Dude

Investing in a vacation condo



Month	Occupied Nights	Avg Per Night
Jan-21	6	\$53
Feb-21	12	\$95
Mar-21	18	\$134

Money coming in

Month	Occupied Nights	Avg Per Night
Jan-21	6	\$53
Feb-21	12	\$95
Mar-21	18	\$134

Total money coming in

Month	Occupied Nights	Avg Per Night	Gross Income
Jan-21	6	\$53	\$318
Feb-21	12	\$95	\$1140
Mar-21	18	\$134	\$2412

Gross Income

- 6 nights * \$53 = 318
- 12 nights * \$95 = 1140
- 18 nights * \$134 = 2412

Money going out

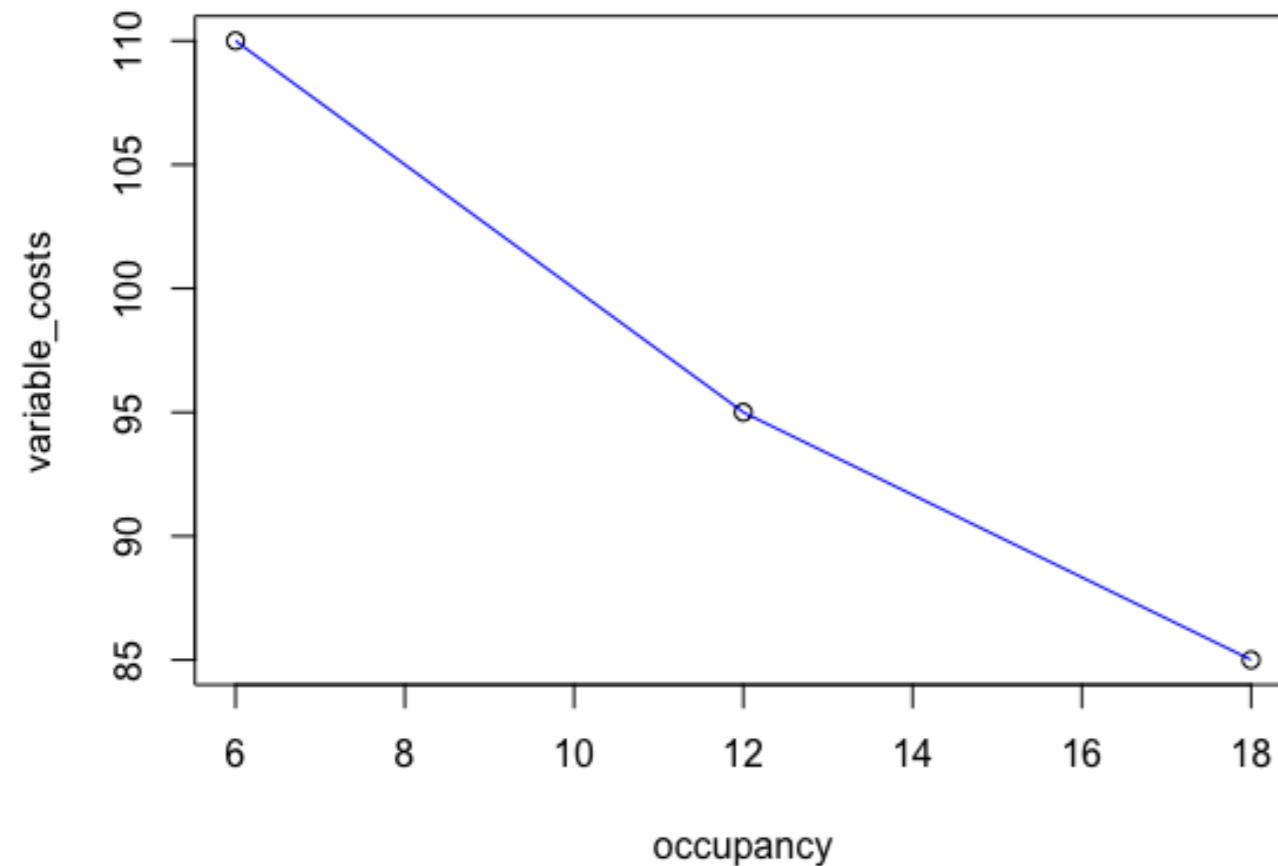
Fixed Cost	Variable Costs	Occupied Nights	Total Costs
\$100	\$110	6	\$760
\$100	\$95	12	\$1240
\$100	\$85	18	\$1630

Fixed Cost + Variable Costs = Total Costs

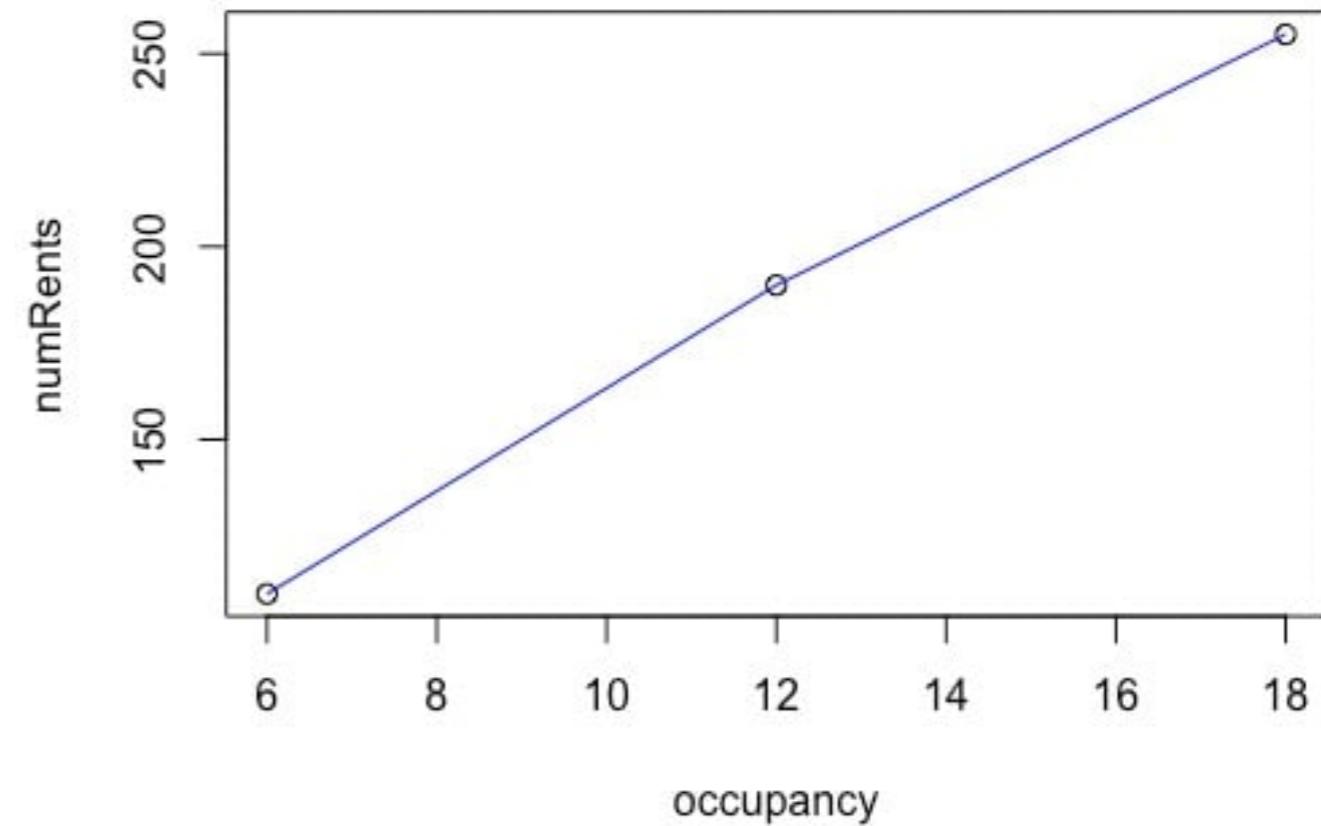
- $100 + (\$110 * 6 \text{ nights occupied}) = 760$
- $100 + (\$95 * 12 \text{ nights occupied}) = 1240$
- $100 + (\$85 * 18 \text{ nights occupied}) = 1630$

How should variable costs behave?

Var Cost *per night* decreases the more rented nights



With more rented nights the overall expense increases



Calculating the operating expense ratio (OER)

Month	Occupied Nights	Avg Per Night	Gross Income	Total Costs	Income - Costs	OER
Jan-21	6	\$53	795	760	35	0.955
Feb-21	12	\$95	1,140	1,240	-100	1.087
Mar-21	18	\$134	2,412	1,630	782	0.675

Operating Expense Ratio: Total Costs / Gross Income

- $760 / 795 = 0.955$
- $1240 / 1140 = 1.087$
- $1630 / 2412 = 0.675$

Summarizing OER

Month	Occupied Nights	Avg Per Night	Gross Income	Total Costs	Income - Costs	OER
Jan-21	6	\$53	795	760	35	0.955
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1. OER = (0.955, 1.087, 0.675)

2. Weights:

- (6 Jan nights / 36 total nights) = 0.167
- (12 Feb nights / 36 total nights) = 0.33
- (18 Mar nights / 36 total nights) = 0.5

3. Weighted avg = (0.955 * 0.167) + (1.087 * 0.33) + (0.675 * 0.5) = 0.859

Another investing ratio: cap rate

Month	gross_income	total_costs	net
Jan-21	\$795	760	35
Feb-21	\$1140	1240	-100
Mar-21	\$1340	1300	40
Apr-21	\$1850	1350	500
May-21	\$5000	2000	3000
Jun-21	\$7000	2200	4800
...
Dec-21	\$850	950	-100

Cap Rate: Net Income / Total Cost

- Assume the annual net income = \$20,000

net_income = (\$35 - 100 + 782 + ... - 100) = 20000

- Assume the purchase price = \$100,000

purchase_price = 100000

- Sum annual net income / total cost of the property

cap_rate = 20000 / 100000 = .20

Comparing properties

ID	Beds	Baths	Square Feet	OER	Cap Rate
Property_1	2	1	750	0.86	0.2
Property_2	3	1.5	1250	1.05	0.27
Property_3	3	2	1500	0.75	0.33
Property_4	2	1.5	1100	1.23	0.11
Property_5	4	2	2000	0.68	0.13

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- Keep only OER < 1

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- Keep only OER < 1
- Maximize cap rate

Let's practice!

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Non-traditional investing: Magic the Gathering

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Ted Kwartler
Instructor

What is a non-traditional market?

Traditional

- Stock market
- Housing market



Non-traditional

- Crypto currencies (although it's changing)



¹ https://www.huffpost.com/entry/beanie-baby-fever-in-1999_n_58af7d12e4b060480e0661fe

Introducing Magic The Gathering



¹ https://magic.wizards.com/en/products/core2021?source=MX_Nav2020

The need for more power

- The market for these cards changes often
- Speculation



Many places to purchase cards



Vintage Magic | Factory Sealed Arabian Nights Booster Box |
Juzam/Bazaar/Library
Pre-Owned
\$199,999.88
or Best Offer
Free Shipping
98 Watching

 FAST 'N FREE
Estimated delivery Tue, Jun 26



ENGLISH P3K Portal Three Kingdoms Booster Box 60 Packs Portal 3
Kingdoms
Brand New
\$30,000.00
Buy It Now
Free Shipping
29 Watching



Magic MTG 3rd Revised Edition Booster Pack Box FACTORY SEALED
NEW
Brand New
\$20,000.00
Buy It Now
Free Shipping
102 Watching

Booster packs

Booster Card Pack Contents

Rarity	Likelihood
Mythic	1 in 8 packs
Rare	1 per pack unless there is a mythic
Common	3 per pack
Uncommon	11 per pack

* 1 in 6 packs will replace a random card with a foil, limited edition version

If you want a specific card

- Pay premium to buy a single card from another player
- Purchase a booster pack

Buy an individual card or take your chances opening a pack?



RISK Each booster pack will have worthless cards from the set.

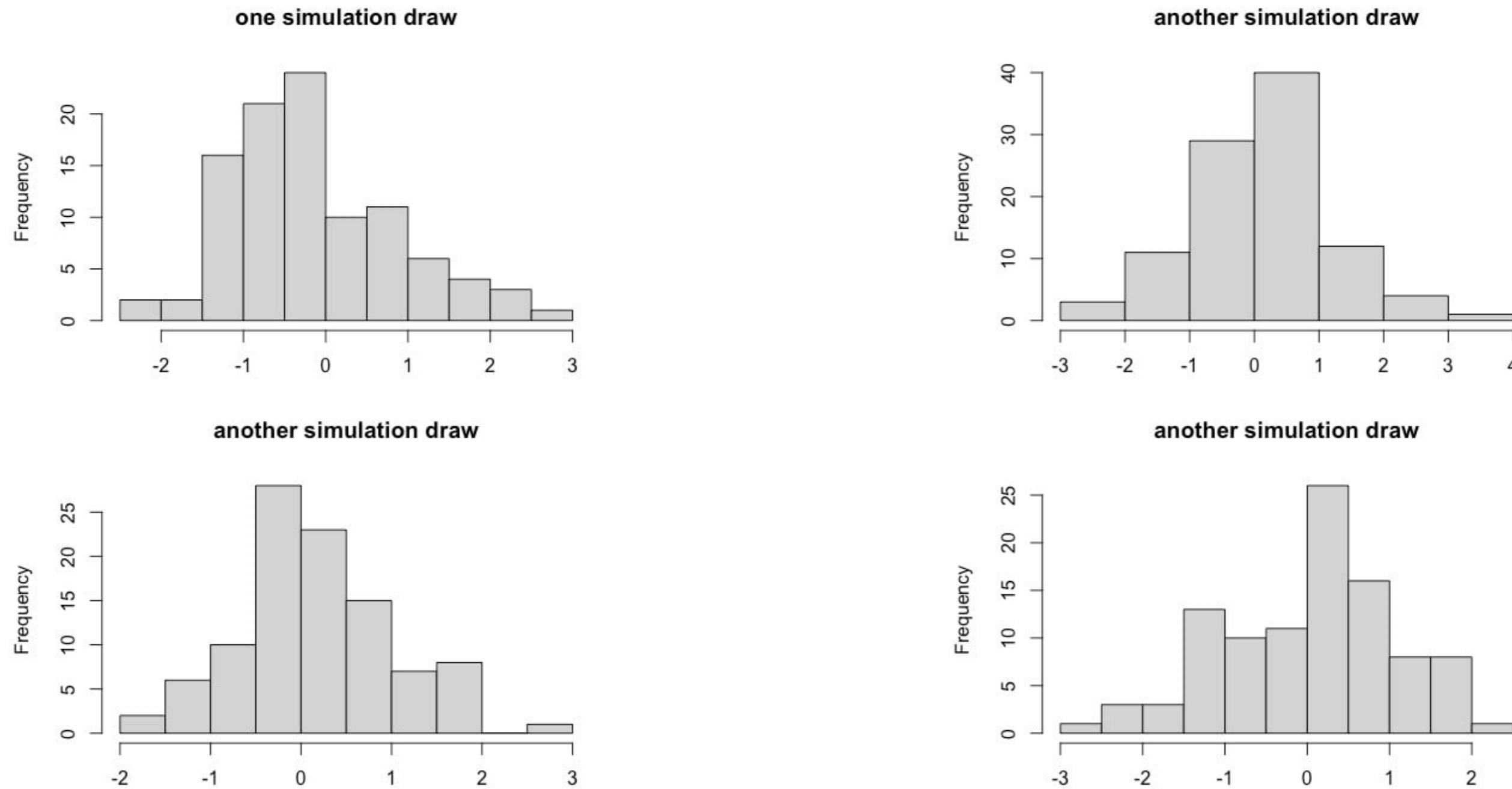
REWARD Some packs will contain the rare, expensive cards which can immediately be sold for more than the cost of the pack.

Using data to assess risk vs. reward

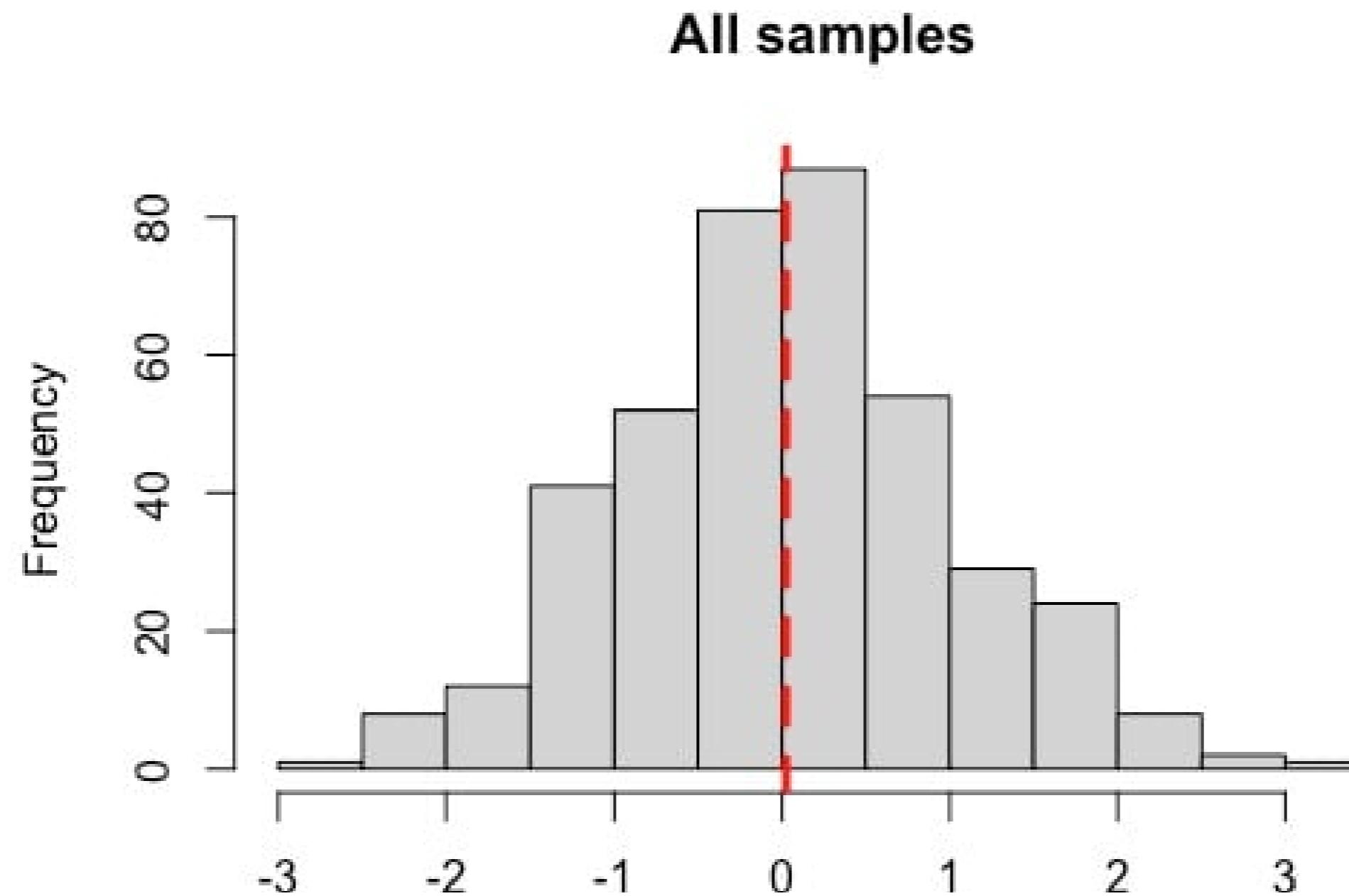


- Known information:
 - Cards in a set
 - Current prices
 - Probabilities of getting specific cards
- Simulate pack openings

What is a simulation?



Aggregating all the simulated samples



Simulating Magic The Gathering

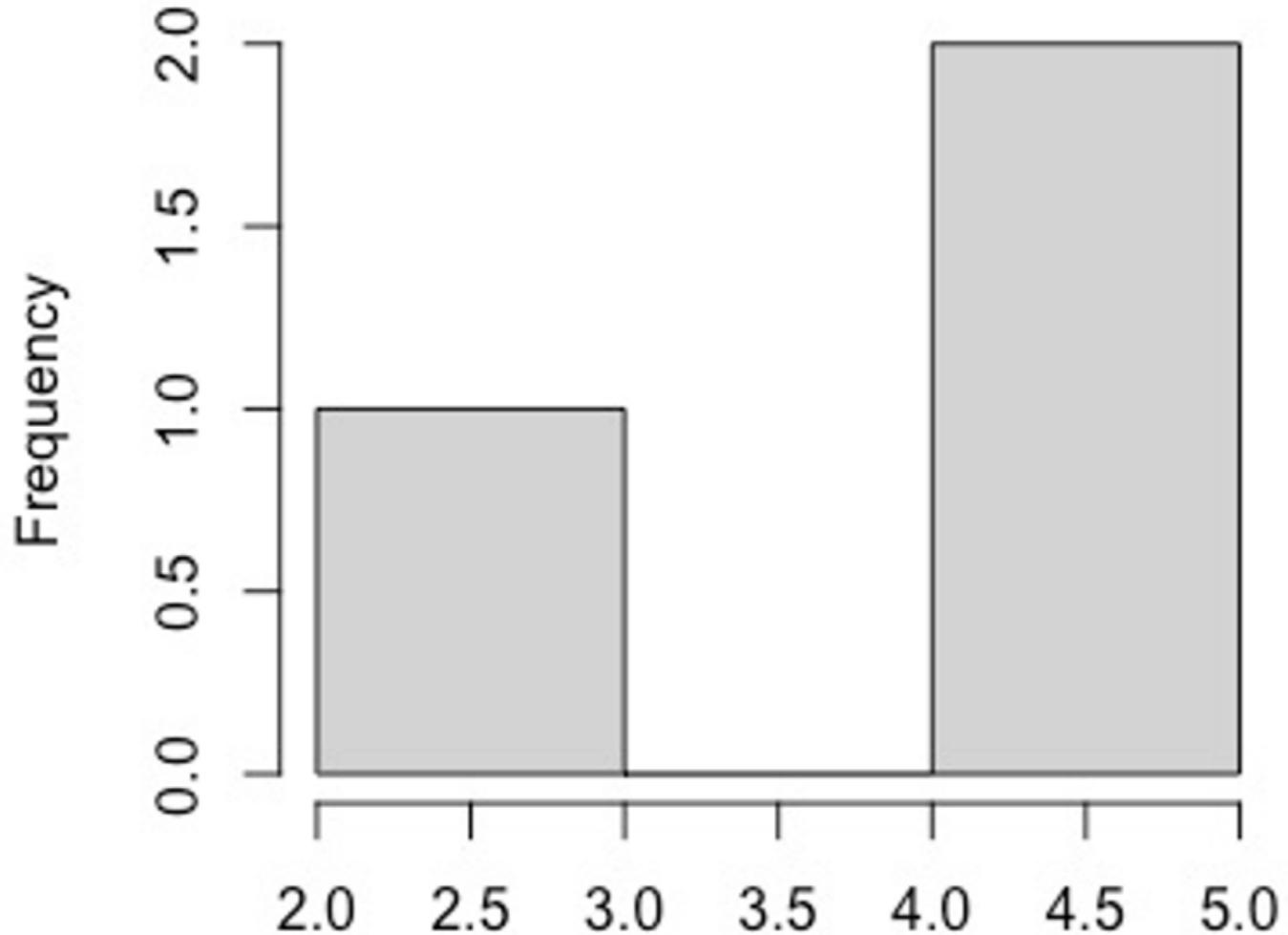


Booster box: 36 booster packs

Booster card pack contents

Rarity	Published Likelihood
Mythic	1 in 8 packs
Rare	1 per pack unless there is a mythic
Common	3 per pack
Uncommon	11 per pack

A simple example



Average return

$$\begin{aligned} &= (\$2 + \$5 + \$5) / 3 \\ &= \$4 \end{aligned}$$

Account for all additional expenses.

Profit

net profit = revenue - cost

Example

net profit = selling price
- (purchase price
+ listing fees
of 10% of sales price)
= \$100 - (\$50 + \$10)
= \$100 - (\$60) = \$40

Profit margin

profit margin = profit / revenue

profit margin = profit / revenue
= \$40 / \$100
= .4

Let's practice!

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