

The class is going to simulate a small economy- a simplified economy, but with many realistic features. Each student group runs their own corporation and will have the opportunity to purchase and manage businesses (group size = 3 members, self-enrolling groups on Brightspace, you will automatically be assigned a group if not enrolled by Thursday). You may well be able to make decent profits just by "winging it," but if you wish to truly thrive, you will need to apply the principles you learn in this class to make sound decisions consistently.

Your goal is to make as much money as possible during the semester. Whoever has the most money at the end of the semester is the winner. Your corporation may have other assets at the end of the semester- buildings, surplus goods or raw materials, etc.- but these will not "count," even if it is arguable that they have a cash value. The winner will be the group with the most money at that point.

Your corporation: Assets

You will have the opportunity to acquire various assets during the simulation. Most will be available through auctions, which will occur in class. Others you can purchase if you wish at a fixed price. Details on each possible investment are given individually later.

Some assets, like bonds, require no further work on your part- you acquire them, and then when they "mature" the money is automatically added to your bank balance. Others need some direct management on your part. For example, if you own a factory or a mine, you must specify a production rate for that factory or mine every turn.

Interacting with other Players' Businesses

Assets are transferable- you can borrow money from other players, buy raw materials or products from other players, rent space in other players' warehouses, or even buy and sell the mines, factories and other businesses themselves.

The exact terms of any transaction involving two or more players must be confirmed in writing by all parties. Each party should note the agreement in their Turn Instructions submitted on Brightspace for the given week. If you make an agreement with another player but do not communicate it to the instructor in the form of a contract, then the instructor will not get involved in enforcing the agreement.

If, on the other hand, you do establish a written contract with another player, and you renege on that contract, you will be declared Bankrupt. (See below)

Mergers and acquisitions of other corporations are prohibited in this simulation. Monopolies are illegal under federal antitrust laws, which will also be enforced in this simulation.

Interacting with the Rest of the Economy

There are several other services in the economy, run by the instructor, that you will need to do business with during the simulation.

The Bank of Walton

The Bank of Walton loans money at 15% per turn, and interest is compounded every turn. The Bank of Walton also pays 5% interest on savings accounts, and this interest too is compounded every turn. You

may deposit, withdraw, borrow or pay back money at the Bank of Walton whenever you wish. (Exception: see Bankruptcy below.)

Walton's Pick and Shovel

All raw materials (clay, wood, iron, stone and crude oil) are available for \$10/unit from Walton's Pick and Shovel. If you find these prices outrageous, you'll just have to find a classmate who owns a mine or oil well that will give you a better deal.

The Walton Shipyards

The Shipyards will not be open for business until turn 8. At that time (or any time after) you can place an order for either a fishing boat, which costs \$200,000, or a pirate ship, which costs \$350,000. It takes one turn to outfit a ship. Thus, if you place the order in turn 8, the money will be deducted from your account in turn 8, but you will not be able to start using the ship until turn 9.

Turns

The simulation will be 25 turns long. For most of the semester, each "turn" will occupy a week of real time, but will represent some longer time frame- it might help you in doing the calculations if you think of turns as years. Each week, you will receive a statement from the instructor that will list:

- The assets (e.g. mines, factories, and warehouses) you currently own.
- Your balance (either positive or negative) at the Bank of Walton
- Any orders (i.e., 5000 widgets at \$60 each) you have received for the coming turn. Factory orders are announced one turn ahead so that you can source the correct quantity of raw materials from the mine owners.

Then, by the specified time on Brightspace, you must submit instructions for your corporation for the upcoming turn. Your instructions must include:

- A list of all transactions you are carrying out (Bank of Walton, other players, etc.)
- Instructions concerning what your assets are doing this turn. For example, if you own a pirate ship, you must indicate what quest it is going on. If you own a mine or factory, you must indicate its production rate and the associated costs
- A list of all the products you wish to sell *next* turn, and the price you will be charging for each. These prices must be in integral numbers of dollars.

You are encouraged to simplify things by giving "default" instructions. For example, you can tell me "Keep doing this every turn until I say otherwise."

If you have a net gain in a given turn and you don't specify otherwise, it is assumed that your profits are simply being deposited at the Bank of Walton (or used to pay off debt.) Similarly, net losses are assumed to be withdrawn or borrowed from the Bank unless stated otherwise. Computation of interest is the LAST thing that is done every turn. Example: If you start the turn with a \$1000 debt, and you have a net profit of \$500, this profit is subtracted from your debt FIRST. This makes your balance -\$500. You are then assessed 10% interest on \$500, so your balance is now -\$550.

If your instructions for the turn are in any way unclear or incomplete, you are completely at the mercy of the instructor.

Bankruptcy

If you want, instead of submitting directions in a particular turn, you may file for bankruptcy. If you do this, all of your assets will be confiscated and put up for auction at the next class period. The proceeds from the auction will be given to whomever you owe money to. Any debts beyond this are simply forgiven- if you owe another student money, tough luck for that student.

Thus, if you file for bankruptcy or are declared bankrupt by the instructor, you will effectively be starting over with no money and no assets. To get your new company off the ground, you will have to persuade another player to loan you money, because the Bank of Walton will never loan money to you again.

Grading

The winner- the group who finishes the semester with the most money- will receive 50 bonus homework points. Submitted work will be graded based upon the merits of, and reasoning behind, the decisions made each week.

Thus, each turn, with your instructions for running the company, you should submit to the instructor any calculations and/or text you need to explain your decisions. Similarly, after each auction, you will submit calculations to explain your bid. Remember that we are looking for evidence of education here. Thus, even if you do not actually win anything in the auction, by coming up with an intelligent bidding strategy and communicating it to the instructor, you will be able to demonstrate your understanding of the material and will be graded accordingly. You may abstain from bidding on any assets, but still need to show calculations of the asset worth if you wish to receive full credit.

Each week, the instructor will review what you submitted and give it a score. You may have already analyzed future turn options but will only be graded on the calculations relating to the current turn – so please submit each week.

The rest of this handout deals with specific investment opportunities.

Bonds

Bonds can be acquired through auction in Turn 0, or they will also be offered at a flat rate during Turn 1. A bond has a value and a maturity date. Once you have purchased a bond, that money is COMPLETELY inaccessible until the maturity date. When the bond matures, the money is automatically added to your bank account.

During Turn 1, some bonds will be available for sale. During that turn, AND THAT TURN ONLY, you may buy up to \$300,000 worth of bonds (\$300,000 refers to the total of purchase prices, not the maturity values) from the table below.

Purchase Price	Maturity Value	Maturity Date
\$50,000	\$200,000	Turn 15
\$50,000	\$120,000	Turn 12
\$120,000	\$500,000	Turn 20
\$25,000	\$28,500	Turn 3
\$300,000	\$1,000,000	Turn 25

Theaters: Five theaters are being auctioned off, but when you buy one in the auction, you are receiving an old building that needs work. You must outfit the building before it is open for business. The cost of outfitting the building is in addition to the price you pay in the auction. You can outfit the theater three different ways.

Movie Theater. It costs \$100,000 to outfit your Theater as a movie theater. Once operational, a movie theater makes a constant \$50,000 profit per turn.

Concert Hall: It costs \$140,000 to outfit your Theater as a concert hall. Once operational, it will make a constant \$60,000 profit per turn.

Playhouse: It costs \$200,000 to outfit your Theater as a playhouse. A playhouse takes a little while to gain popularity. As a result, the first turn the playhouse is in business, it will make only \$6,000 in profit. This will double to \$12,000 the second turn, \$24,000 the third turn and so on until it makes an \$192,000 profit the sixth turn. In the seventh turn it will make a \$200,000 profit, and the \$200,000 revenue per turn will remain constant for the rest of the time the playhouse is open.

Mines, Factories, Warehouses

These will be discussed simultaneously because they are closely related. Mines harvest natural resources. Factories convert natural resources into consumer products. If you are running a mine, you can either use the natural resources in your own factories or sell them to other players who have factories. If you are running a factory, you are dependent upon orders from customers to make money. The instructor will determine how many orders you receive, based upon the demand, the price you are charging and possibly competition from other factories. Warehouses simply allow you to store things. For example, if your mine has a capacity of 300,000 units per turn, and you can only use 100,000 units this turn but you expect the demand to increase in the future, you can operate at full capacity and put the excess material in a warehouse for future use.

You cannot co-own a mine, factory or warehouse- each business must have a sole owner who is in charge of setting the agenda for that business each turn, and for paying the bills and receiving the revenues.

Maintenance: ALL these buildings- mines, factories and warehouses- require \$10,000 per turn for routine maintenance and security. You must pay this money for mines and factories even if they are producing nothing this turn. You must pay this money for warehouses whether they are full or empty. If you do not pay the maintenance cost, the building will be considered abandoned. It will be removed from the simulation.

Mines: Producing raw materials in a mine costs \$40,000 + \$7/unit. In other words, producing one unit of iron costs \$40,007 and producing 10,000 units costs \$110,000. The \$10,000 for maintenance brings these totals to \$50,007 and \$120,000 respectively. The four raw materials early in the simulation are wood, iron, cloth and stone. (Crude oil is another natural resource that is introduced later in the simulation.) A particular mine can produce up to 300,000 units per turn of one of these raw materials. Supplies can be considered unlimited: e.g., an iron mine can produce 300,000 units of iron per turn for the entire semester without ever running out.

Factories: Producing finished consumer goods in a factory costs \$120,000 + \$20/unit, plus raw materials. In other words, producing one unit costs \$120,000 + \$20 + \$10,000 for maintenance, for a total of \$130,020, and producing 10,000 units costs a total of \$330,000. The production cost is the same for all products, but the raw materials needed vary from one product to another. A factory can produce up to 100,000 units per turn of a particular product. A factory that has been producing one product cannot switch over and start making another.

Consumer Products: There are four consumer products in the economy that can be produced from iron, stone, cloth and wood. The products, and raw materials required to produce them, are as follows:

Product Raw Materials per Unit of Product

Widgets: 1 wood + 2 iron

Gadgets: 1 iron + 3 cloth

Gizzmos: 2 stone + 3 iron

Snarfblatts: 1 wood + 1 cloth

The demand for each of these products is a function of the price you charge. However, the "demand curve" itself will be constant for the entire semester.

Warehouses: There are no costs associated with running a warehouse apart from maintenance costs. You pay \$10,000 per turn whether the warehouse is full or empty. The warehouse can hold up to 800,000 units of anything- raw materials or finished goods in any combination.

Going Fishing: You can "go fishing" with either a fishing boat or a pirate ship. Fishing boats can ONLY go fishing, while pirate ships can also quest for buried treasure. Each turn, it costs \$12,000 per boat to outfit a fishing expedition. Each turn, five six-sided dice will be rolled, and the total multiplied by \$20,000. This money is divided evenly between all the boats that fish in a given turn. Example: In a particular turn, Dr. Howell launches two fishing boats, and Drs. Bowie, van Heiningen and Neivandt each launch one. The dice come out 3,4,1,3 and 6, so there are \$340,000 in fishing revenue that turn. This is divided evenly, \$68,000 per boat. Thus, Bowie, van Heiningen and Neivandt each make a \$56,000 profit that turn, while Howell makes \$112,000 because she had two boats.

Searching for Buried Treasure: To go on a quest for buried treasure, you must have both a pirate ship and a treasure map. Naturally, the owner of a pirate ship and the owner of a treasure map can get together and organize a quest but must agree ahead of time how they are going to divide the expense and profits! It costs \$60,000 to outfit a quest (this is in addition to the cost of the map). A quest takes four turns. Example: Dr. van Walsum orders a pirate ship from the Walton Shipyards in Turn 8. The money is deducted from his account in Turn 8 and the ship is ready to sail in Turn 9. At the Turn 8 auction, Dr. van Walsum purchases the Holy Grail treasure map and a Fist-Sized Pearl treasure map. The Holy Grail quest takes four turns, so the \$60,000 outfitting fee is paid in turn 9, and the ship is questing in turns 9, 10, 11, and 12. The value of the Holy Grail turns out to be \$1,567,400 and this money is added to Dr. van Walsum's account in Turn 12. (This is just an example, the real value of the Holy Grail is a random number to be determined, see the auction schedule.) In Turn 13, Dr. van Walsum pays another \$60,000, and the ship goes on a quest for a fist-sized pearl in turns 13-16. He has time for a third quest in turns 17-20, but has no maps left and can't find anyone to sell him one, so he goes fishing with his pirate ship for the rest of the turns.

Gold Mines: This is a very risky investment. A gold mine produces \$75,000 per turn for as long as it operates, but when you purchase it, you don't know how long it's going to operate. Every turn, the owner of the mine rolls two six-sided dice, and if it comes out to a 7, the mine "craps out." This means that you receive \$75,000 that turn but it stops producing afterward. Example: Dr. Bousfield buys a gold mine for \$160,000 at the Turn 9 auction. So, \$85,000 is deducted from his account that turn- the sum of the \$160,000 expense plus the \$75,000 in revenue the mine generated. Dr. Bousfield also rolls the dice and gets a 9, so this means the mine is ok. In Turn 10, Dr. Bousfield rolls the dice again but gets a 7- that means he receives \$75,000 revenue in Turn 10 but the mine is worthless thereafter. Poor Dr. Bousfield- he lost money on this one!

Drugs: There are three prescription drugs that will be introduced into the economy late in the semester- Hwaleksium, Desistothium and Schwartzinium. Drugs are manufactured in chemical plants. Chemical plants are similar to factories in that it costs \$10,000/turn for routine maintenance and security, and \$120,000 + \$20/unit to manufacture the drugs. However, unlike factories, a chemical plant has a maximum capacity of 150,000 units per turn.

Drugs require only one raw material- crude oil. It takes two units of crude oil to produce one unit of any of the three drugs. A crude oil well has the same specifications as other mines- it costs \$10,000 for routine maintenance and security, and \$40,000 + \$7/unit to run the well. The maximum capacity of each well is 30,000 units per turn.

Excess drugs and crude oil can be stored in warehouses just like any other raw material or product.

The most important difference between drugs and other products is that income from sale of drugs is TAXED. There is an income tax on revenues generated from selling drugs, and there is also an income tax on revenues generated from selling the crude oil to make drugs. Consequently, all profits generated by EITHER a drug plant OR a crude oil well are taxed at a rate of 25%.

The government allows you to depreciate the purchase price of your oil well or chemical plant by either the straight line or MACRS 5-year method. It's your choice. Choose wisely.

If your chemical plant or oil well has a net loss in a given turn (say, because you made a bunch of extra material and put it in a warehouse) then you won't pay any tax that turn and your loss will be carried forward. For example, if your taxable "income" is a \$1000 loss in turn 11 and a \$2000 gain in turn 12, then you will pay no taxes in turn 11 and pay \$250 (25% of \$1000, because the loss in turn 11 offsets half of the profit in turn 12) in turn 12.

Ice Cream Trucks: *This investment is only available in Turn 11, and you can only own one truck at a time.* A truck costs \$100,000 and makes \$120,000/turn of revenue. There is no time lag between when you buy the truck and when it starts making profits for you- you just drive it off the lot and start earning profits right away! For the first turn you're using a truck, there is no maintenance/repair cost beyond the purchase price. In the next turn, the cost is \$10,000, and it increases in a gradient series by \$10,000 per turn from there. So, the cash flow diagram for a truck purchased in Turn 11 would look like this:

Turn	Revenue	Expense
11	\$120,000	\$100,000
12	\$120,000	\$10,000
13	\$120,000	\$20,000
14	\$120,000	\$30,000
15	\$120,000	\$40,000
16	\$120,000	\$50,000

You can purchase a new ice cream truck for \$100,000 any time you want.

It is assumed that everyone is buying an ice cream truck in turn 11, because there is no reason not to. **What you need to do is provide** (in your Turn 11 instructions) your schedule for replacing the truck. ("Buy a new one in turn 16", "Buy new ones in turns 14 and 17", etc.)

And save some chocolate chip cookie dough for me, please.

Demand for Factory-Produced Consumer Goods. These are the total demand for the entire economy. If there are two people offering the same product at the same price, they will each receive half of the number of orders given in this table. If two people offer the same product at two different prices, they will each receive orders, but the person offering the lower price will receive considerably more.

Selling Price	Widgets Demand	Gadgets Demand	Gizmos Demand	Snarfblatts Demand
40	250000	180000	250000	120000
41	249500	171000	249000	114000
42	249000	162500	248000	108000
43	248500	154400	247000	103000
44	248000	146700	246000	98000
45	247500	139400	245000	93000
46	247000	132400	244000	88000
47	246500	125800	243000	84000
48	246000	119500	242000	80000
49	245500	113500	241000	76000
50	245000	107800	240000	72000
51	244500	102400	239000	68000
52	244000	97300	238000	65000
53	243500	92400	237000	62000
54	243000	87800	236000	59000
55	242500	83400	235000	56000
56	242000	79200	234000	53000
57	241500	75200	233000	50000
58	241000	71400	232000	48000
59	240500	67800	231000	46000
60	240000	64400	230000	44000
61	239500	61200	229000	42000
62	239000	58100	228000	40000
63	238500	55200	227000	38000
64	238000	52400	226000	36000
65	237500	49800	225000	34000
66	237000	47300	224000	32000
67	236500	44900	223000	30000
68	236000	42700	222000	29000
69	235500	40600	221000	28000
70	235000	38600	220000	27000
71	234500	36700	219000	26000

Demand for Prescription Drugs Manufactured in Chemical Plants. Since there is only one chemical plant of each type available, there is no competition and no uncertainty regarding number of orders.

Sale Price	Hwaleksium	Desistothium	Schwartzinium
\$50	50000	72000	35000
\$51	48500	67000	33250
\$52	47000	62000	31500
\$53	46000	58000	29750
\$54	45000	54000	28250
\$55	44000	50000	26750
\$56	43000	47000	25250
\$57	42000	44000	23750
\$58	41000	41000	22500
\$59	40000	38000	21250
\$60	39000	35000	20000
\$61	38000	33000	18750
\$62	37000	31000	17500
\$63	36000	29000	16250
\$64	35000	27000	15000
\$65	34000	25000	13750
\$66	33000	23000	12500
\$67	32000	21000	11250
\$68	31000	20000	10000
\$69	30000	19000	8750
\$70	29000	18000	7500
\$71	28000	17000	6250
\$72	27000	16000	5000
\$73	26000	15000	3750
\$74	25000	14000	2500
\$75	24000	13000	1250

Auctions: Every week, some assets will be auctioned off, by the schedule shown below.

Most auctions will be sealed bid auctions. Each group will write down their bids. Then all bids will be revealed simultaneously. The highest bidder wins the item at the bid price. When more than one identical item is auctioned off, they are sold simultaneously to the highest bidders. For example, if Dr. Co bid \$5,000 for a Widget factory, Dr. Wheeler bid \$3,500 and Dr. Pendse bid \$3,000, then Dr. Co and Dr. Wheeler would each receive a factory- identical, but Dr. Co would have to pay \$1,500 more! Dr. Pendse would receive nothing at all.

Note that because you only have the opportunity to make one bid, you need to prepare carefully for the auction and make it a good one!

Time 0: Bonds

One \$500,000 bond maturing in Turn 25
 One \$300,000 bonds maturing in Turn 10
 One \$50,000 bonds maturing in Turn 5

Turn 1: Annuities

One annuity - \$30,000 per turn, starting in turn 2 and continuing all simulation

One better annuity - \$30,000 in turn 2, \$32,000 in turn 3, \$34,000 in turn 4, etc. increasing by \$2,000 each turn until the end of the simulation

Note: Additional Bonds can be purchased in Turn 1.

Turn 2: Five Theaters

Once purchased, theaters can be outfitted as movie theaters, playhouses or concert halls. Your instructions must include your decision on which you will build. In turn 2, you will pay BOTH the auction price AND the cost of outfitting. Your theater will begin generating revenue in Turn 3.

Turn 3: Two Widget Factories, Two Gadget Factories, Two Gizmo Factories, and Two Snarfblatt Factories

Factories can begin operation in Turn 5. If you own a factory, your Turn 4 instructions must include a Turn 5 sale price.

Turn 4: Two Wood Yards, Two Iron Mines, Two Sheep Farms, Two Stone Quarries and Six Warehouses

All can begin operation immediately.

Turn 5: One Hwaleksium Plant, One Desistothium Plant, One Schwartzinium Plant, and two Crude Oil Wells

All will be ready to begin operation in Turn 7. Your turn 6 instructions must include a selling price.

Turn 6: Mystery Auction! Several examples of investment opportunities will be presented to you at the beginning of class.

Turn 7: Mystery Auction!

Keep in mind the Walton Shipyards is open for business on turn 8, and if you order a Pirate Ship or Fishing Boat right away, it will be ready to sail in Turn 9!

Turn 8: Treasure Maps- the following treasure maps are available:

Treasure values are determined using a random distribution over the given range when the ship returns from the quest.

The Holy Grail – worth \$1,000,000-1,600,000

King Dorland's Tomb – worth \$700,000-\$1,300,000

Dread Pirate Roberts' Stash – worth \$600,000-\$1,000,000

Pearls the Size of your fist – three maps, each worth \$400,000-\$700,000, each is considered a separate quest.

Pearls the Size of Dr. Dahm's brain- three maps, each worth \$200,000-\$500,000, each is considered a separate quest

Turn 9: Four Gold Mines – ready to begin operation right away!

Turns 10: Periodic Mystery Auctions!

Turn 11: Mystery Auction!

Keep in mind that ice cream trucks are available for purchase in Turn 11. Your Turn 11 instructions must include a replacement schedule.

Turns 12 – 25: Assets continue to grow