

Corporate Modeling

Nathan Seegert

nathan.seegert@gmail.com

www.nathanseegert.com

Session 1

A. Basics of Modeling—example Berger and Seegert (2023)

1. BEFORE READING. Consider a simple model described by supply and demand for a product in the retail market (retail firm and customers) and wholesale market (retail firm and wholesale firms). Consider two types of retail firms. Those with and without access to bank accounts (cash management). How would you draw the demand and supply curves for these two types of retail firms in the retail market. How about the wholesale market?
2. NOW READ SECTION II. What assumptions were made in this section? Why? Were they reasonable assumptions?
3. Using the graphs in section II, how would you calculate the economic value of cash management in these markets? After answering this question, READ APPENDIX E.

B. Incidence and Welfare—example Mace, Patel, and Seegert (2020)

Consider a simple model of supply and demand in the retail market. The following equations give supply and demand in this market,

$$P_{\text{demand}} = a + bq + cq^2 \quad (1)$$

$$P_{\text{supply}} = z + yq \quad (2)$$

For concreteness, we will consider two calibrations;

$$P_{\text{demand convex}} = 14,000 - 240q + 2.25q^2 \quad (3)$$

$$P_{\text{demand concave}} = 14,000 - 110q - q^2 \quad (4)$$

$$P_{\text{supply}} = 1000 + 150q \quad (5)$$

1. Find the equilibrium quantity and price if the market is competitive.
2. Find the equilibrium quantity and price if the market has a monopolist.
3. Add a tax of \$2000. Now find the equilibrium quantity and price if the market is competitive and if the market is run by a monopolist.
4. How much of the tax did consumers and producers pay in each case?
5. Now read Mace, Patel, and Seegert (2020) Section 6 and Appendix D. Can firms with more market power always push more of the tax?

6. Does incidence, given as the percent of the tax paid by consumers, have to be between 0 and 100? See Pless and Benthem (2019)

Session 2

A. Connecting the model with empirical work—examples Agostini et al. (2023) and Coles, Patel, Seegert, and Smith (2022)

1. Consider a simple model where firm profit is a concave function of capital K given by

$$\pi(K) = \frac{1+e}{e} K^{\frac{e}{1+e}}.$$

Now, suppose that taxable income $Y(K, \rho)$ is a function of capital that produces profit and tax adjustment behavior given by ρ ; $Y(K, \rho) = \pi(K) - \rho$. **Write** out the value function to be maximized, taking into account the cost of capital, corporate taxes τ , and a cost of tax adjustments $c(\rho)$. HINT: see equation (2) in Coles et al. (2022).

2. Take the first-order conditions and find an expression for the equilibrium level of capital. HINT: see equation (3) in Coles et al. (2022).
3. Does the corporate tax distort capital? What assumptions are necessary for this result?
4. Consider the model in Agostini et al. (2023) given in equation (1) in section 4. How does this model differ from Coles et al. (2022)?
5. Consider a kink in the corporate tax schedule, either due to tax brackets or the asymmetric treatment of losses (so a kink at zero). How would you incorporate the change in corporate tax rate after some threshold κ ? HINT: see equation (2) in Agostini et al. (2023).
6. Take the first-order condition of your model with the kink. What does the solution look like? HINT: see equation (3) in Agostini et al.(2023).
7. Consider the graphs in Figures 2 and 3 of Agostini et al. (2023). What does these graphs tell us about what the distribution of taxable income Y will look like? Compare it to equation (5).
8. BEFORE LOOKING. Given the distribution of Y that you solved for (and in equation 5), how could you take this model to the data? Now, skim section 5 to see how they took it to the data.

B. Adding Bells and Whistles to the Basic Model—example, Coles, Sandvik, and Seegert (2023)

1. Start with a basic two-period model of corporate decision-making. Firms, maximize shareholder value V and choose their level of dividend D , such that capital in period 2 is given by their retained earnings minus dividends $I = X - D$.

$$\max_D \quad V = D + \frac{f(X - D) + X - D_0}{1 + r}. \quad (6)$$

2. Add dividend taxes to the model.
3. Allow firms to make an acquisition of another firm as an alternative to making an internal investment. Let the value of the assets gained from the acquisition be given by $\theta(g(C) + C)$, where θ is a synergy parameter, C is the target's capital and $g(\cdot)$ is its production function. Assume the firm has to pay the target firm's shareholder's their reservation payment

$$M = (1 - \tau_d) \frac{g(C) + C}{1 + r}. \quad (7)$$

4. Consider manager's utility over wealth as $U = -e^{-\rho W}$, with expected utility given by $\mu_W - \frac{1}{2}\rho\sigma_W^2$, where ρ captures risk aversion, μ_W is the expected wealth and σ_W^2 is its variance. Allow firms to align manager incentives through several contractual features. First, allow them to give effective ownership δV to the CEO via the accumulation of stock and options. Second, allow shareholders to add convexity to the compensation policy through CEO vega ν , through option grants, which lower the CEO's effective risk aversion. Find the manager's expected utility to maximize.
5. Read Coles, Sandvik, and Seert (2023) section 2 to compare how they added these features into the basic corporate model.