Asset Pricing In A Financial Crisis.

In August 2007 global financial markets underwent a period of turmoil triggered by a reassessment of the market for U.S. subprime mortgage debt securities. Inspired by these events, this question requires you to consider several possible interpretations of asset price movements, using the Lucas (1978)/C-CAPM model (Hint: The Gordon model of asset pricing is useful but can also be misleading because it neglects general equilibrium effects).

The Lucas economy has two risky assets, which we will call 'subprime debt' (S) and 'other risky assets' (O). The distinction between S and O is that S is subject to larger shocks than O and therefore, for any given quantity of holdings of the two securities, the covariance between consumption and movements in S will be greater. (Both covariances are positive because in a Lucas economy all production is consumed).

Leading up to period t the two assets were priced according to a belief that the variance of the payoff from a unit holding (a share) of S was $x > 1$ times the size of the variance of the payoff from a share of O. Using the Lucas model, describe the patterns you would expect to observe at time t in response to each of the following three possible scenarios. (Assume that, aside from the change described, nothing else about the economy changes). For each case, describe what happens to the level of the two prices P_S and P_O and to the two price/dividend ratios P_S/D_S and P_O/D_O (you can assume that the subprime market is small relative to the size of the other market).

1. There is a one-time, permanent drop in the level of dividends per share of S to half the original level. The expected future relative variance of dividends per share for S is unchanged (around this new lower level) in the future.

   Answer:

   > The benchmark Gordon asset pricing model with risk-neutral investors says that the price of a security is equal to the present discounted value of the dividends you receive from owning it. We have cut dividends in half, so if risk did not matter we would expect to cut the price in half leaving the dividend/price ratio unchanged.

   > The Lucas asset pricing model says that asset prices will depend, in addition, on the covariance of asset prices with consumption. However, the question does not indicate that this covariance has changed, and explicitly says to assume that all factors other than those explicitly mentioned have remained unchanged. Thus, to a first approximation, the answer in the Lucas model would be the same as in the benchmark Gordon model: Prices fall by half but the price/dividend ratio is unchanged.

   > Nothing in this scenario changes either the level or the variability of future dividends received as a consequence of holding O, so neither the price/dividend ratio nor the level of prices of O should change. (A subtle technicality is that this relies on the assumption that the subprime market is 'small' so that the decline in consumption variability from this

source has no effect on the covariance of consumption with dividends on O).

2. The variance of dividends associated with holding a share of S will be permanently higher, but the mean expected level of dividends remains unchanged.

   Answer:

   If the variance of returns on S goes up, then the covariance of those returns with consumption should go up, since the marginal propensity to consume out of wealth is positive.

   The key insight of the Lucas model is that the prices of securities that covary more with consumption will be relatively lower (and their expected returns consequently higher), because those securities offer less insurance against consumption risk. Therefore, the price of the subprime securities should fall, both in absolute terms and relative to dividends. However, the increase in the variance of returns for S has no implications for the variance of returns on O so there is not much reason to expect a big change in the price of O.

3. There is an increase in the level of 'risk aversion' (the coefficient of relative risk aversion of the representative agent) in the market. (You can assume that there is a riskless asset in the market as well).

   Answer:

   An increase in ρ would affect both securities' prices, assuming investors have access to a riskless asset as well, since greater risk aversion will make investors want to withdraw money from all riskless assets in order to concentrate assets in the riskless form. This can be seen from the formula for the expected excess return on a security,

   $$\mathbb{E}[\mathbf{R}_{t+1,i}] - \mathsf{R} \quad \approx \quad \rho\operatorname{cov}(\Delta\log C_{t+1}, \mathbf{R}_{t+1,i}) \qquad (1)$$

   Even if the covariance remains unchanged, a higher ρ means that a risky security will need to earn a higher return to make investors willing to hold it.

   Furthermore, the price of the subprime security will probably fall more, since the covariance of its returns with consumption was assumed to be larger.

References

Lucas, Robert E. (1978): "Asset Prices in an Exchange Economy," *Econometrica*, 46, 1429–1445, Available at http://www.jstor.org/stable/1913837.