

Professor Karl Shell

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## Economics 732: Monetary Economics II

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Cornell University

### Problem Set # 5

**1. Uncertainty:** Let there be two states of nature,  $s = \alpha, \beta$ . Formally establish the relationship between the equilibria from the contingent claims economy with equilibria from the spot-market-plus-Arrow-securities economy. *Notation:* Let  $x_h^i(s)$  be the holding by consumer  $h$  of commodity- $i$ -deliverable-in-state- $s$ . Let the price of this contingent claim be  $p^i(s)$ . Let  $b_h(s)$  be the holding by consumer  $h$  of money good only in state  $s$ . Let the price of this security be  $p_b(s)$ . Let  $\hat{x}_h^i(s)$  be consumption by  $h$  of  $i$  given the occurrence of  $s$ . Let  $\hat{p}^i(s)$  be the spot market price of  $i$  given the occurrence of  $s$ .

**2. Intertemporal:** Let there be two periods,  $t = 1, 2$ . Formally establish the relationship between the equilibria from the forward-market economy and the equilibria from the economy with spot markets. *Notation:* Let  $x_h^{i,t}$  be a forward purchase at price  $p^{i,t}$ . Let  $\hat{x}_h^{i,t}$  be a spot purchase at price  $\hat{p}^{i,t}$ . Let the money price be  $p^{m,t}$  and additions to money holdings be  $x_h^{m,t}$ . *Hint 1:* Consumer  $h$  cannot plan to die a debtor. *Hint 2:* Find restrictions on  $p^{m,t}$  that follow from no-arbitrage in the money markets.

### 3. Money-denominated taxes:

- (3a) *One commodity:* Let  $\omega_1 = 7, \omega_2 = 15, \omega_3 = 4$ . Completely describe: (i) the set of bonafide taxes,  $(\tau_1, \tau_2, \tau_3)$ , (ii) the set of normalized bonafide taxes,  $(\tau_1, \tau_2, \tau_3)$ , and (iii) the set of equilibrium money prices. Which of these sets are convex?
- (3b) *l commodities:* Show that the above three sets are convex if the utility functions are linear in logarithms.
- (3c) *Convexity:* Are these sets convex in general? Write a one paragraph essay.
- (3d) *Connexity:* Is the set  $P^m$  in general connected? Write a one paragraph essay.