Government Safety Net, Stock Market Participation and Asset Prices

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Introduction

- Goal: study of the effects on prices of government intervention during crises
- Question: does government intervention sow the seeds of crises that the intention is to prevent in the first place?
- Object of study: equilibrium prices resulting from the investment decision on assets characterized by different degrees of information about future returns
- Contribution: comparison of prices across different frameworks (with and without government intervention) for different classes of assets; example of a situation where a government safety net increases the likelihood of crises
Example: Mortgage-Backed Securities

**Figure:** Impact of government intervention and feedback.
Comparison of Equilibrium Prices

Figure: Effects from government intervention.
Model

- Economy with a government sector, populated by a continuum of agents (investors), \( I = [0, 1] \), four dates, \( t = 0, 1, 2, 3 \);
- 1 consumption good (money) and 2 financial assets:
  - Riskless asset in infinite supply, yielding interest rate normalized to \( r = 0 \);
  - Risky asset in supply of \( K \) units, with payoff (in money units) given by a uniform random variable, \( \tilde{\theta} \sim U [0, 1] \);
- Agents are initially endowed with \( A \) units of money;
- Preferences: agents are risk-neutral and utility derives from the payoff of the investment strategy at the final date;
- Investment strategy: agents decide whether or not to pay \( p \) to buy a single unit of the risky security, \( X_i = 1 \) or \( X_i = 0 \), with the remainings being allocated to the riskless asset;
- Consumption occurs in the final period, at which point the risky asset is liquidated at the cost \( t \).
Timeline of Events

- State of fundamentals, $\theta$, is drawn at $t=0$
- Investors choose their investment strategy at $t=1$
- Government observes social welfare and whether to intervene at $t=2$
- Investors liquidate their portfolios and consume the proceeds at $t=3$

**Figure:** Timeline of events.
Government Intervention

▷ For any agent \( i \in I \), the payoff of the investment strategy is

\[
R_i (X_i, \theta, A, t) \equiv X_i (\theta - t) + A - X_ip = X_i (\theta - p - t) + A;
\]

▷ Social welfare is defined as the sum across investors of their portfolios’s payoff,

\[
S (\theta, A, t) \equiv \int_0^1 [X_i (\theta - p - t) + A] \, di;
\]

▷ Government intervention policy: there’s intervention if and only if social welfare goes below a certain threshold \( C \),

\[
S (\theta, A, t) < C.
\]
Government Intervention

- Using the market clearing condition, \( \int_0^1 X_i di = K \), the condition for government intervention can be written as

\[
S(\theta, A, t) < C
\]
\[
\Leftrightarrow \int_0^1 [X_i (\theta - p - t) + A] di < C
\]
\[
\Leftrightarrow (\theta - p - t) \int_0^1 X_i di + A \int_0^1 di < C
\]
\[
\Leftrightarrow (\theta - p - t) K + A < C
\]
\[
\Leftrightarrow \theta < \frac{C-A}{K} + p + t \equiv \theta^*;
\]

- In the event of government intervention, social welfare is restored to its minimum acceptable level, \( C \), which implies the asset’s return being as if \( \theta = \theta^* \);

- Investors’s beliefs about government intervention are, therefore, translated as beliefs of \( \theta \) being smaller than \( \theta^* \).
Informational Scenarios

- Imperfect information: investors receive a signal, $\xi_i$, uniformly distributed around $\theta$, $\tilde{\xi} \sim \mathbb{U} [\theta - \tau, \theta + \tau]$, with $\tau > 0$. Conditional on $\xi_i$, agents know that $\theta$ is at most $\tau$ units away from the signal received, i.e., $\theta \in [\xi_i - \tau, \xi_i + \tau]$, $\forall i \in I$;

- Perfect information: investors know the true $\theta$;

- Common prior: the only information investors have is that $\tilde{\theta} \sim \mathbb{U} [0, 1]$;

- Informational scenarios are meant to be proxies for different classes of assets, to the extent that their returns can be forecasted.
Investors’ Problem with Govt & Imperfect Information

▸ With the payoff from the investment strategy being
\[ R_i (X_i, \theta, A, t) = X_i (\theta - p - t) + A, \]
investors solve

\[
\max_{X_i} X_i \left[ \mathbb{E} (\tilde{\theta} | \xi_i) - p - t \right] + A \\
\text{s.t. } A \geq p \text{ if } X_i = 1, \quad \forall i \in I.
\]

▸ With \( \theta^* = (C - A) / K + p + t \) and government intervention happening only for \( \theta < \theta^* \), the fact that agents face the same price \( p \) but receive different signals \( \xi_i \) mean that their outlooks on the possibility of intervention will be different, according to (recall that \( \theta \in [\xi_i - \tau, \xi_i + \tau] \))

(I) \( \theta^* \leq \xi_i - \tau \) (intervention is ruled out);
(II) \( \xi_i - \tau < \theta^* \leq \xi_i + \tau \) (intervention is possible);
(III) \( \xi_i + \tau < \theta^* \) (intervention is certain).
Investment in the Risky Asset and Equilibrium Price

- Investors’ heterogenous beliefs about the possibility of intervention imply that they have different expectations about the asset’s payoff, $E\left(\tilde{\theta} \mid \xi_i\right)$, so that

$$X_i \left[ E\left(\tilde{\theta} \mid \xi_i\right) - p - t\right] + A$$

$$= X_i \left\{ \mathbb{I}(I)\xi_i \right. + \mathbb{I}(II) \frac{1}{2\tau} \left\{ \left( C - A \right) + p + t \right\} \left[ \frac{1}{2} \left( C - A \right) + p + t \right] - (\xi_i - \tau) \right\} + \frac{1}{2} (\xi_i + \tau)^2 \} + A$$

$$+ \mathbb{I}(III) \left( C - A \right) + p + t\} - p - t \} + A$$

$$\equiv U_i (X_i, \xi_i, A, p), \quad \forall i \in I.$$

- If the asset is affordable, i.e., $A \geq p$, investor $i$ is willing to buy the risky asset if $U_i (1, \xi_i, A, p) \geq A$. The equilibrium price $P$ will be such that the fraction of investors satisfying this condition equals the supply, $K$. 
Feasible Levels of Government Support

Figure: Support of $\tilde{\theta}$, distribution of signals, range uncertainty and location of $\theta^*$. 
Equilibrium Prices

Main factors determining equilibrium prices:

(i) The magnitude of $\tau$ (degree of uncertainty) relative to the downside risk, $(A - C)/K$;

(ii) The supply level of the asset, $K$.

<table>
<thead>
<tr>
<th>Low Supply, $0 &lt; K \leq 1/2$</th>
<th>High Supply, $1/2 &lt; K \leq 1$</th>
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</thead>
<tbody>
<tr>
<td>Low Uncertainty, $\tau &lt; (A - C)/K$</td>
<td>$P = \theta + \tau(1-K) - t$</td>
</tr>
<tr>
<td>High Uncertainty, $\tau &gt; (A - C)/K$</td>
<td>$P = \theta + 2\tau(1-K) + (A-C)/K - {2[\tau(A-C)/K]^{1/2} + t}$</td>
</tr>
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</table>

Figure: Asset price characterization in terms of uncertainty and supply level.
Comparative Statics

Figure: Downside-risk intervals and equilibrium price according to uncertainty and supply levels.
Effects of Government on Equilibrium Prices

- Imperfect Information: equilibrium price when the government is absent corresponds to the one with the lowest level of support in the government intervention framework: \( P^G \geq P^{NG} \);
- Perfect Information: equilibrium prices in both frameworks are the same since the payoff of the asset is known: \( P^G = P^{NG} \);
- Common Prior: government intervention truncates the distribution of \( \tilde{\theta} \), leading to a higher expected value in the government framework as opposed to the case where there’s no safety net: \( P^G \geq P^{NG} \);

Corollary

Regardless of the informational scenario faced by investors being one of imperfect, perfect, or common prior information, the resulting equilibrium price is at least as high in the framework with the presence of the government relative to the one where the government’s safety net is absent.
Recall that the government intervenes in the economy only if social welfare goes below a specific threshold, i.e., if $S(\theta, A, t) < C$, which is equivalent to the realized payoff of the asset being such that

$$\theta < \left( \frac{C - A}{K} + p + t \right) \equiv \theta^*$$

A higher price $p$, therefore, implies a higher likelihood of intervention.

**Corollary**

*If crises are to be defined as events demanding intervention, the existence of a government safety net increases the likelihood of them happening, as a result of the government intervention policy leading to undoubtedly higher prices - regardless of the informational scenario at hand.*
Testable Implications

- Assets with some sort of guarantee from the government (implicit or explicit) should be traded at a premium over otherwise similar securities;

- With the possibility of government intervention, an increase in uncertainty is beneficial for assets in low supply (less liquid) but detrimental for the ones in high supply (more liquid);

- Prices associated with a high possibility of intervention are supported to the extent that there’s still some ambiguity related to the decision of the government: intervention is sure to occur only at extremely high prices, at which a rational investor wouldn’t be willing to trade;

- Crises are more likely to happen in economies with stronger government support, or safety net.
Extensions

Market participation is affected only by heterogeneity in the signals investors receive, not initial wealth. Introducing heterogeneity in the endowment of investors would allow one to study the effects on prices of the distribution of wealth too;

The measure of social welfare considered abstracts from the government itself and does not provide any clue regarding what the optimal level of intervention should be. Such a question could potentially be addressed by adding a real sector to the model.
Related Literature

Effects of different types of intervention:

- Farhi and Tirole (2011): strategic complementarity between government intervention (interest rate) and maturity transformation;
- Diamond and Rajan (2011): indirect intervention (interest rate) more preferable than direct intervention (bailout);
- Acharya and Yorulmazer (2007): government intervention only in systemic crises leads to a too-many-to-fail type of guarantee;
- Acharya, Shin and Yorulmazer (2010): effects of different policies on banks’ choice of liquidity;
- Ennis and Keister (2009): efficient government intervention policies might lead to self-fulfilling bank runs;

Market participation effect:

- Allen and Gale (1994): model with incomplete market participation and heterogeneous liquidity preferences leading to a multiplicity of equilibrium prices.