Managerial Incentives and Financial Contagion

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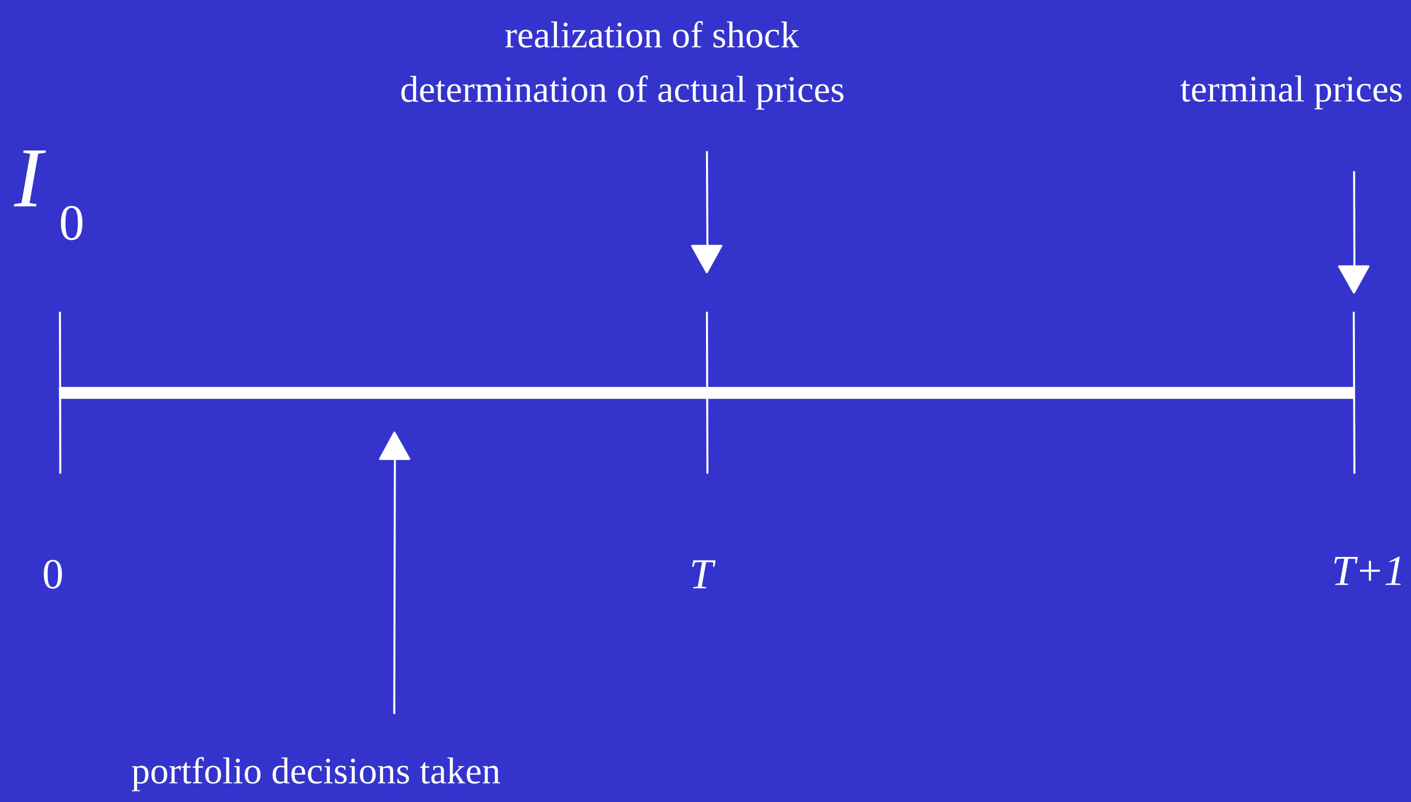
Objective

- To model cross-border contagion
  - Contagion will be defined as the co-movement of prices of seemingly unrelated markets
  - e.g. Russian debt default and LTCM collapse in 1998

Investment Timeline



Types of Managers and Investors

- Dedicated manager is compensated based on deviation from index, risk averse, cannot take short positions and invests in 3 assets: both emerging market assets and cash

- Opportunistic manager is compensated based on the absolute return on portfolio, risk averse, may take short positions to fund other positions and invests in 3 assets: both emerging market assets and a mature market asset

- Local investors exist for each emerging market asset and represent random demand drawn from a distribution with mean zero and variance σ^2

Dedicated Manager

Dedicated manager maximizes:

$$\max_{\lambda,\tau}\left\{\begin{array}{c}(\lambda-\alpha)\left(E(r^{A})\right)+(\tau-1+\alpha)\left(E(r^{B})\right)+(1-\lambda-\tau)r^{M}\\ -\dfrac{a}{2}[(\lambda-\alpha)^{2}\sigma_{A}^{2}+(\tau-1+\alpha)^{2}\sigma_{B}^{2}]\end{array}\right\}$$

$$\text{subject to: }\left\{\begin{array}{c}\lambda\geq 0\\ \tau\geq 0\\ \lambda+\tau\leq 1\end{array}\right.$$

Dedicated Manager's Optimal Portfolio Weights

If cash holding is zero:

$$\lambda^* = \frac{E(r^A) - E(r^B)}{a\left(\sigma_A^2 + \sigma_B^2\right)} + \alpha$$

$$\tau^* = \frac{E(r^B) - E(r^A)}{a(\sigma_A^2 + \sigma_B^2)} + (1 - \alpha)$$

Dedicated Manager's Behavior

If cash holding is zero:

- The dedicated manager is overweight the asset with the higher expected return and is underweight the asset with the lower expected return.

- An increase in (a) would result in "hugging of the index." If the manager is underweight an asset, an increase in (a) would result in the manager increasing her exposure of that asset and decreasing her exposure of the other asset.

- An increase in the variance of either asset reduces the size of the overweight/underweight positions as well, resulting in the dedicated manager to move closer to the benchmark index.

Dedicated Manager's Optimal Portfolio Weights

If cash holding is non-zero:

$$\lambda^{**} = \begin{cases} \dfrac{E(r^A) - r^M}{a\sigma_A^2} + \alpha, \text{ whenever } \dfrac{E(r^A) - r^M}{a\sigma_A^2} + \alpha > 0 \\ 0, \text{ whenever } \dfrac{E(r^A) - r^M}{a\sigma_A^2} + \alpha \leq 0 \end{cases}$$

$$\tau^{**} = \begin{cases} \dfrac{E(r^B) - r^M}{a\sigma_B^2} + (1-\alpha), \text{ whenever } \dfrac{E(r^B) - r^M}{a\sigma_B^2} + (1-\alpha) \geq 0 \\ 0, \text{ whenever } \dfrac{E(r^B) - r^M}{a\sigma_B^2} + (1-\alpha) < 0 \end{cases}$$

Dedicated Manager's Behavior

If cash holdings are positive:

- The manager will go overweight the asset that outperforms cash. Conversely, if one or both emerging market assets underperform cash, the manager will be underweight one or both assets, but will not necessarily hold zero of either asset.
- As (a) rises, the demand for asset A or B falls, if the manager is overweight the asset. If the manager is underweight the asset, an increase in (a) results in her reducing her underweight position.
- As the variance of either asset rises, the manager hugs the index.

Opportunistic Manager

The opportunistic manager solves the following problem:

$$\max_{\phi,\delta} \phi E(r^A) + \delta E(r^B) + (1-\phi-\delta)E(r^Z) - \frac{a}{2}\left[\phi^2\sigma_A^2 + \delta^2\sigma_B^2 + (1-\phi-\delta)^2\sigma_Z^2\right]$$

Opportunistic Manager

Solving the maximization problem yields the following optimal portfolio weights:

$$\phi^* = \frac{\sigma_Z^2}{U}\left[\frac{E(r^A) - E(r^B)}{a}\right] + \frac{\sigma_B^2}{U}\left[\sigma_Z^2 + \frac{E(r^A) - E(r^Z)}{a}\right]$$

$$\delta^* = \frac{\sigma_Z^2}{U}\left[\frac{E(r^B) - E(r^A)}{a}\right] + \frac{\sigma_A^2}{U}\left[\sigma_Z^2 + \frac{E(r^B) - E(r^Z)}{a}\right]$$

$$(1 - \phi - \delta)^* = 1 - \frac{\sigma_B^2}{U}\left[\sigma_Z^2 + \frac{E(r^A) - E(r^Z)}{a}\right] + \frac{\sigma_A^2}{U}\left[\sigma_Z^2 + \frac{E(r^B) - E(r^Z)}{a}\right]$$

Opportunistic Manager's Behavior

- If asset A outperforms asset B and cash, the opportunistic manager would go long asset A.

- As (a) increases, the opportunistic manager would reduce her exposure to the highest yielding asset, and increase her exposure to the lowest yielding asset.

- As the return on an emerging market asset increases, the manager will increase her exposure in that asset and lower her exposure to at least one of the other two assets.

Opportunistic Manager's Behavior

- If asset B and cash outperform asset A, the opportunistic manager would short asset A and go long at least one other asset that has higher positive expected returns if:

$$\sigma_Z^2\left[\frac{E(r^B)-E(r^A)}{a}\right]+\sigma_B^2\left[\frac{E(r^Z)-E(r^A)}{a}\right]>\sigma_B^2\sigma_Z^2$$

Note that returns do not have to be negative to short the asset, just less than that of the other two.

Equilibrium

- Consider a group of dedicated (cash > 0) and opportunistic managers with a demand shock from local investors:
  - Opportunistic managers' portfolio rebalancing causes contagion
  - Dedicated managers' portfolio rebalancing does not result in contagion

Equilibrium

- Consider a group of dedicated (cash=0) and opportunistic managers with a demand shock:
  - Both dedicated and opportunistic managers’ portfolio rebalancing result in contagion
  - A dedicated manager has a greater impact on contagion than the opportunistic manager

Conclusion

- Differences in fund manager incentives may lead to systematic deviation of prices from their long-term fundamentals.

- Fund manager’s incentive structures may lead to lead to contagion.