Leverage Cycles and the Anxious Economy

Ana Fostel and John Geanakoplos

Discussion by Roberto Chang

Rutgers University and NBER

July 2008

Summary and Bottom Line

- The paper presents some stylized facts about *emerging assets*, and a theory based explanation.

Summary and Bottom Line

- The paper presents some stylized facts about *emerging assets*, and a theory based explanation.
- Significant contribution: clean modeling, a theory of asset pricing with collateral constraints.

Summary and Bottom Line

- The paper presents some stylized facts about *emerging assets*, and a theory based explanation.
- Significant contribution: clean modeling, a theory of asset pricing with collateral constraints.
- Less clear: empirical applicability of the model for the questions at hand.

Three Stylized Facts (1997-2002)

1. Spreads on emerging markets bonds and US high yield bonds are highly correlated (*contagion*).

Three Stylized Facts (1997-2002)

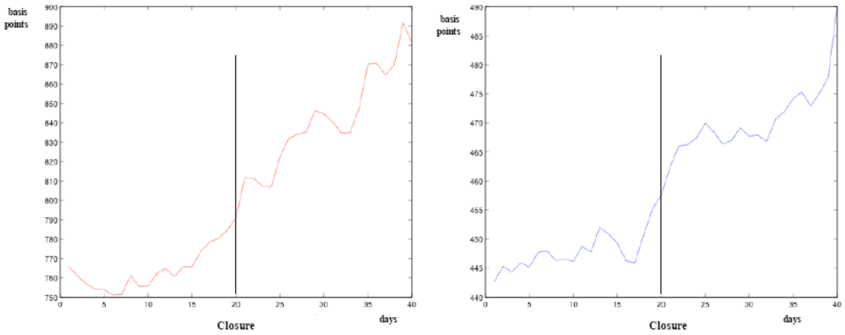
1. Spreads on emerging markets bonds and US high yield bonds are highly correlated (*contagion*).
2. Around market closures, sub grade emerging markets bonds fall more than investment grade ones (*differential contagion*).

Three Stylized Facts (1997-2002)

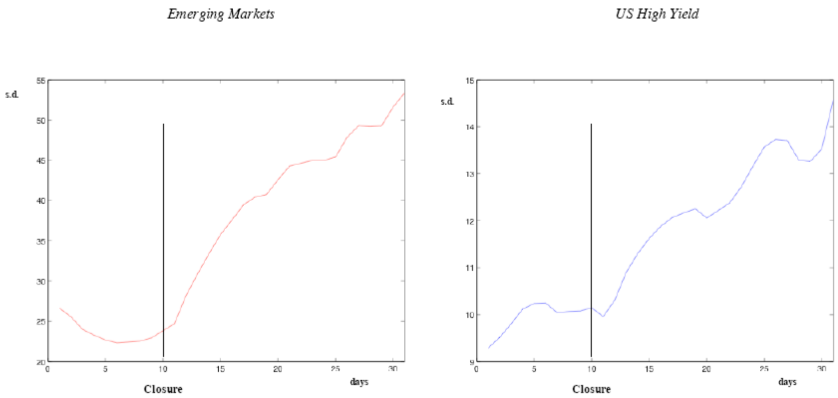
1. Spreads on emerging markets bonds and US high yield bonds are highly correlated (*contagion*).
2. Around market closures, sub grade emerging markets bonds fall more than investment grade ones (*differential contagion*).
3. During closures, the issuance of investment grade EM bonds falls by more than the issuance of sub grade bonds (*issuance rationing*).

Average Spreads around Closures

Emerging Markets | *US High Yield Spreads*



Average Spread Volatility around Closures



What the Data Suggests (to FG)

- FG's conjecture: "Periodic problems faced by emerging asset classes are sometimes symptoms of what we call a global *anxious economy* rather than of their own fundamental weakness".

What the Data Suggests (to FG)

- FG's conjecture: "Periodic problems faced by emerging asset classes are sometimes symptoms of what we call a global *anxious economy* rather than of their own fundamental weakness".
- That is, much of the volatility of emerging markets bonds is a result of the behavior *of international investors* reacting, in particular, to news *about US risky bonds*.

What the Data Suggests (to FG)

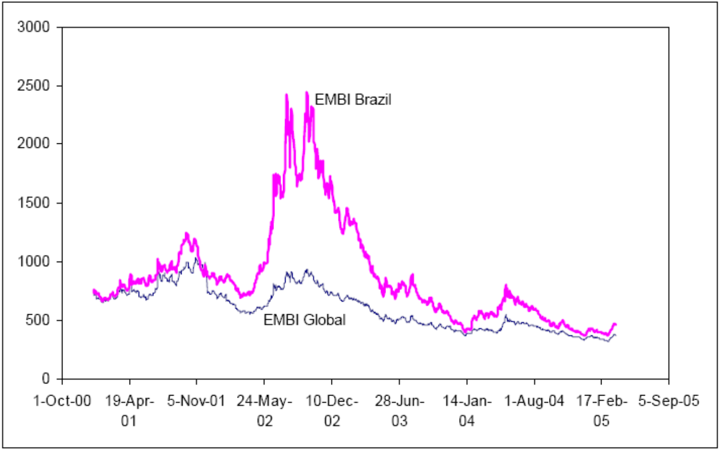
- FG's conjecture: "Periodic problems faced by emerging asset classes are sometimes symptoms of what we call a global *anxious economy* rather than of their own fundamental weakness".
- That is, much of the volatility of emerging markets bonds is a result of the behavior *of international investors* reacting, in particular, to news *about US risky bonds*.
- This contrasts with the view that such volatility reflects fundamentals in EMs themselves.

What the Data Suggests (to FG)

- FG's conjecture: "Periodic problems faced by emerging asset classes are sometimes symptoms of what we call a global *anxious economy* rather than of their own fundamental weakness".
- That is, much of the volatility of emerging markets bonds is a result of the behavior *of international investors* reacting, in particular, to news *about US risky bonds*.
- This contrasts with the view that such volatility reflects fundamentals in EMs themselves.
- Radical idea, potentially strong policy implications, certainly worth exploring.

True facts?

- FG emphasize that they do not focus on *crises driven* behavior. But for at least some cases, such behavior may be the dominant one.


3000
2500
2000
1500
1000
500
0
EMBI Brazil
EMBI Global
1-Oct-00
19-Apr-01
5-Nov-01
24-May-02
10-Dec-02
28-Jun-03
14-Jan-04
1-Aug-04
17-Feb-05
5-Sep-05

Theory: A Basic Situation

- Two trees, H and E.

Theory: A Basic Situation

- Two trees, H and E.
- E yields 1 unit of fruit with prob. q, or $e < 1$ with prob. $1 - q$, independently of what happens with H.

Theory: A Basic Situation

- Two trees, H and E.
- E yields 1 unit of fruit with prob. q, or $e < 1$ with prob. $1 - q$, independently of what happens with H.
- Normally, H yields 1 unit of fruit. But there is the possibility of bad news, in whose case H yields *either* 1 with prob. q *or* $h < 1$ with prob. $(1 - q)$.

Questions in Basic Situation

1. If bad news arrive about H, price of H naturally falls. But, would the price of E fall also?

Questions in Basic Situation

1. If bad news arrive about H, price of H naturally falls. But, would the price of E fall also?
2. If so, why?

Questions in Basic Situation

1. If bad news arrive about H, price of H naturally falls. But, would the price of E fall also?
2. If so, why?
3. If there are different kinds of E trees, whose price falls by more when bad news arrive?

FG: Answers in Conventional Setups

- With a representative agent, no contagion can occur.
- With heterogenous agents but complete markets, "only a tiny degree of contagion" (?).

$==>$ Need to allow for heterogenous agents and incomplete markets.

Model: Preferences and beliefs

- Agent i has utility

$$U^i = \sum_s \bar{q}^i_s \delta_i^{t(s)-1} u^i(x_s)$$

Model: Preferences and beliefs

- Agent i has utility

$$U^i = \sum_s \bar{q}_s^i \delta_i^{t(s)-1} u^i(x_s)$$

- Note the i subscripts, especially on $\bar{q}_s^i$.

Model: Preferences and beliefs

- Agent i has utility
$$U^i = \sum_s \bar{q}^i_s \delta_i^{t(s)-1} u^i(x_s)$$
- Note the i subscripts, especially on $\bar{q}^i_s$.
- For computed examples, $i =$ optimist or pessimist.

Model: Budget Constraint

At each t , agent i's budget constraint is:

$$x_t, y_{tj} \geq 0$$

$$x_t - e_t^i + \sum_j p_{tj}(y_{tj} - y_{t-1,j}) \leq \frac{1}{1+r_t}\phi_t - \phi_{t-1} + \sum_j y_{t-1,j} D_{tj}$$

$$\phi_t \leq \sum_{j \in J^C} y_{tj} \gamma_{tj}$$

where γ_{tj} is asset $j's$ *collateral capacity:*

$$\gamma_{tj} = \min_{\sigma} \ [p_{t\sigma,j} + D_{t\sigma,j}]$$

and the min is over the possible states of nature (σ) at next stage.

Individual Optimality

Most of my intuition came from looking at these!
Let $\lambda_{it} = u'(x_{it})$ and μ_{it} denote *nonnegative* Lagrange multipliers:

1. For each tree j (defining $\gamma_{tj} = 0$ if $j \notin J^C$):

$$\lambda_{it} p_{tj} = \delta^i \left[\sum_{\sigma} q^i_{t\sigma} \lambda_{i,t\sigma} (p_{j,t\sigma} + D_{j,t\sigma}) \right] + \mu_{it} \gamma_{tj}$$

i.e.

$$p_{tj} = \delta^i \left[\sum_{\sigma} q^i_{t\sigma} \frac{\lambda_{i,t\sigma}}{\lambda_{it}} (p_{j,t\sigma} + D_{j,t\sigma}) \right] + \frac{\mu_{it}}{\lambda_{it}} \gamma_{tj}$$

Individual Optimality

Most of my intuition came from looking at these!

Let $\lambda_{it} = u'(x_{it})$ and μ_{it} denote *nonnegative* Lagrange multipliers:

1. For each tree j (defining $\gamma_{tj} = 0$ if $j \notin J^C$):

$$\lambda_{it} p_{tj} = \delta^i \left[\sum_{\sigma} q^i_{t\sigma} \lambda_{i,t\sigma} (p_{j,t\sigma} + D_{j,t\sigma}) \right] + \mu_{it} \gamma_{tj}$$

   i.e.

$$p_{tj} = \delta^i \left[\sum_{\sigma} q^i_{t\sigma} \frac{\lambda_{i,t\sigma}}{\lambda_{it}} (p_{j,t\sigma} + D_{j,t\sigma}) \right] + \frac{\mu_{it}}{\lambda_{it}} \gamma_{tj}$$

2. FOC for borrowing:

$$\frac{1}{1 + r_t} \lambda_{it} = \delta^i \sum_{\sigma} q^i_{t\sigma} \lambda_{i,t\sigma} + \mu_{it}$$

Implications

$$p_{tj} = \delta^i \left[\sum_{\sigma} q^i_{t\sigma} \frac{\lambda_{i,t\sigma}}{\lambda_{it}} (p_{j,t\sigma} + D_{j,t\sigma}) \right] + \frac{\mu_{it}}{\lambda_{it}} \gamma_{tj}$$

- If the term $\frac{\mu_{it}}{\lambda_{it}}\gamma_{tj}$ is zero, we have a conventional asset pricing formula: the price of asset j is equal to its *payoff value*.
- The term $\frac{\mu_{it}}{\lambda_{it}}\gamma_{tj}$ is a new source of value (j's *collateral value*)
- Since $\gamma_{tj} = \min_{\sigma} \left[p_{t\sigma,j} + D_{t\sigma,j} \right]$, $j's$ collateral capacity and its collateral value are endogenous and forward looking.
- But collateral value is zero unless $\mu_{it} > 0$.

$$\frac{\mu_{it}}{\lambda_{it}} = \frac{1}{1+r_t} - \delta^i \sum_{\sigma} q^i_{t\sigma} \frac{\lambda_{i,t\sigma}}{\lambda_{it}}$$

- $\mu_{it} > 0$ only if agent $i's$ wants to borrow more than he can at the market interest rate (i.e. there is a *liquidity wedge*)
- For given r_t, changes in μ_{it} (the *liquidity wedge cycle*) must be necessarily accommodated by changes in the $\lambda'_{it}s$. (This would affect the $p'_{tj}s$ *even in the absence of leverage.*)
- When leverage is possible, the impact of the liquidity wedge cycle on prices can be amplified through the term $\frac{\mu_{it}}{\lambda_{it}}\gamma_{tj}$ (*leverage cycle*).
- Very complex interactions, resulting in new and unexpected behavior, appear possible.

Explaining the Stylized Facts

- The paper computes the equilibria of a series of example economies, and argues that the model can easily generate contagion and differential contagion.

Explaining the Stylized Facts

- The paper computes the equilibria of a series of example economies, and argues that the model can easily generate contagion and differential contagion.
- The example economies are elaborations on the basic situation described above.

Explaining the Stylized Facts

- The paper computes the equilibria of a series of example economies, and argues that the model can easily generate contagion and differential contagion.
- The example economies are elaborations on the basic situation described above.
- The general equilibrium interactions are not discussed as clearly as I would have liked.

Explaining the Stylized Facts

- The paper computes the equilibria of a series of example economies, and argues that the model can easily generate contagion and differential contagion.
- The example economies are elaborations on the basic situation described above.
- The general equilibrium interactions are not discussed as clearly as I would have liked.
- It is unclear (at least to me) how informative this exercise can be. Example economies are too stylized (only three periods, only two types of agents, a very particular information structure...) to argue that the outcomes are robust. Parameters are postulated with only a minimal attempt at linking them to observable data.

Explaining the Stylized Facts

- The paper computes the equilibria of a series of example economies, and argues that the model can easily generate contagion and differential contagion.
- The example economies are elaborations on the basic situation described above.
- The general equilibrium interactions are not discussed as clearly as I would have liked.
- It is unclear (at least to me) how informative this exercise can be. Example economies are too stylized (only three periods, only two types of agents, a very particular information structure...) to argue that the outcomes are robust. Parameters are postulated with only a minimal attempt at linking them to observable data.
- Some of the assumptions in the examples appear counterfactual (e.g. emerging markets bonds can be used as collateral but U.S. junk bonds cannot)

Some Quibbles, Other Issues

- Optimism and pessimism are just assumed, subjective probabilities do not have to be linked in any way to objective probabilities.

Some Quibbles, Other Issues

- Optimism and pessimism are just assumed, subjective probabilities do not have to be linked in any way to objective probabilities.
- In fact, for the analysis in the paper objective probabilities do not even have to be defined. (The focus on what happens under anxiety, i.e., conditional on bad news arriving.)

Some Quibbles, Other Issues

- Optimism and pessimism are just assumed, subjective probabilities do not have to be linked in any way to objective probabilities.
- In fact, for the analysis in the paper objective probabilities do not even have to be defined. (The focus on what happens under anxiety, i.e., conditional on bad news arriving.)
- I would have liked to see a discussion of how you solved for the general equilibrium (guess: a real pain) and how one can solve for more realistic versions of the model.

Some Quibbles, Other Issues

- Optimism and pessimism are just assumed, subjective probabilities do not have to be linked in any way to objective probabilities.
- In fact, for the analysis in the paper objective probabilities do not even have to be defined. (The focus on what happens under anxiety, i.e., conditional on bad news arriving.)
- I would have liked to see a discussion of how you solved for the general equilibrium (guess: a real pain) and how one can solve for more realistic versions of the model.
- What do we learn for policy and welfare?

Some Quibbles, Other Issues

- Optimism and pessimism are just assumed, subjective probabilities do not have to be linked in any way to objective probabilities.
- In fact, for the analysis in the paper objective probabilities do not even have to be defined. (The focus on what happens under anxiety, i.e., conditional on bad news arriving.)
- I would have liked to see a discussion of how you solved for the general equilibrium (guess: a real pain) and how one can solve for more realistic versions of the model.
- What do we learn for policy and welfare?
- Next versions of this model should be much more user friendly.

Final Thoughts

- Does this theory successfully explain emerging assets? Not clear.

Final Thoughts

- Does this theory successfully explain emerging assets? Not clear.
- The model, however, is a useful step towards the understanding of the role of financial frictions and incomplete markets in asset pricing.

Final Thoughts

- Does this theory successfully explain emerging assets? Not clear.
- The model, however, is a useful step towards the understanding of the role of financial frictions and incomplete markets in asset pricing.
- Developing more potentially realistic versions of this model is, hence, a promising endeavor.