Recall

Last lecture we discussed investment management companies.

- Types of Investment Companies;
- Types of Investment Funds;
- Costs and Taxes; and,
- Issues and Controversies.

Today we will talk about crises.
Crises

Chapter 26, A Quantitative Primer on Investments with R
This part discusses crises. Specifically:

- Theory: Bubbles, Transmuters of Trouble;
- Pre-Modern Problems;
- LTCM Mini-case;
- Great Financial Crisis of 2008;
- European Sovereign Debt Crisis;
- Chinese Stock Market Meltdown of 2015;
- The Dogs Which Did Not Bark; and,
- Recovery and Reform.
Theory
A bubble is a growth in prices beyond fundamental value. However, we often associate additional phenomena w/bubbles:

- rapid price appreciation;
- speculation assuming continued price appreciation;
- widespread acknowledgement that prices are high;
- claims that “this time it’s different;” and,
- hype like “you can’t afford not to own this!”

Why do we care? Often attract *malinvestment*:

- Overinvest in over-valued industries.
- May attract a *lot* of capital.
- Bubbles eventually “pop” $\implies$ widespread losses, recession.
Detecting Bubbles

- There are a wide variety of methods attempting to detect bubbles.

  **Divergence from Fundamental Value:**
  - Market price − DCF price with growth, later fundamental value.

  **Strict Local Martingale Test:**
  - Look at $E(p/\hat{\sigma}^2(p))$ over $[t, \tau]$ as $\tau \uparrow$.
  - If variance grows faster than price: troubling.

  **Bubble Component of Call Prices:**
  - Call price includes $E$(bubble growth); put-call parity fails.

  **Super-Unit-Root Price Growth:** Do prices grow too quickly?

  \[
p_t = \mu + \phi p_{t-1} + \sum_{j=1}^{J} \Delta p_{t-j} + \epsilon_t. \quad (1)
  \]

  - **Campbell-Schiller Decomposition**;
  - **Uncertainty-Implied Volatilities from Gordon-Shapiro Model**.
While bubbles exist, they lead to malinvestment.

*Wealth effect*: People spend as if unrealized gains are realized.

- Bubble in financial assets: less destructive.
  - Excess money in bad stocks/bonds does not preclude starting new firm.

- Bubbles in hard assets: more destructive.
  - *e.g.* Excess money in real estate creates excess inventory of homes.
  - Makes it much harder to sell other homes (substitute goods).

- Popping a bubble can be difficult; hard to do gently.
Financial crises can also arise from other sources. Often, these sources transmute minor problems into major risks.

- **Hoarding**: people hold excess cash \(\Rightarrow\) deflation, liquidity trap;
- **Fire sales**: crises in one market migrate to other markets;
- **Runs**: Panic/fear about a bank can make it insolvent;
- **Crowded trades**: Many people in trade may want out at once.
- **Network effects**: network nodes may die, transmit risk.
- **Liquidity and intermediation**: may enter vicious spiral;
- **Capital structure**: may lead to fights b/w firm claimants.

Associated with these: many correlations “go to 1” in crisis.
Historical Crises
Crises are not new; can learn a lot from historical crises.

- Panic of 1857
- Long Depression: 1873–1896
- Panic of 1907
- Stock Market Crash of 1929
- Great Depression
- Stock Market Crash of 1987

Heavy speculation on western US land, RRss (new tech!).

But investors in NE US wanted to see local equity investment.

Rise of railroad farm mortgages (RRFMs): debt for equity swap.
- Farm mortgages issued, farmers get RR stocks instead of cash.
- Hope: RR increases farm value; RR dividends > loan interest.

Precipitating cause: failure of Ohio Life Insurance & Trust.
- Should have only held conservative investments.
- Instead, securitized RRFMs: sold loan portfolios to investors.
- Also tried to prop up RR run by their former Cashier (CFO).
- Thus became a (risky, unregulated, “shadow”) bank.

Worse: Many such speculative investments held by NYC banks.
The Long Depression: 1873–1896

- A lesson in how crises migrate across borders.
- 1869: Opening of Suez Canal reduces trade via British Empire.
- 1873: US, Germany stop backing currencies w/silver (only gold).
- Effect: reduces money supply (like raising interest rates).
- Silver prices plummet: devalues other countries’ currencies.
- Economies slow, triggering bank failures in Europe.
- Failures hit US banks holding risky RR ventures; they begin failing.
- 1890: Argentina wheat crop failure, coup.
- Panic of 1893: Philadelphia & Reading RR fails.
- Investors begin hoarding gold; sell US stocks to buy gold.
Stock Market Crash of 1929

- Second Industrial Revolution (1870–1914): wave of innovation.
  - Bulk steel; assembly line; automobiles; petroleum; chemicals;
  - electricity; appliances; telecommunications; modern management.
- Bubble arises in stocks, closed-end funds. (30+% premium!)
- Good weather meant large harvests; farmers see lowered income.
- UK: A few large investors found guilty of fraud; market spooked.
- 20 Sep 1929: UK market crashes on fraud, malinvestment fear.
- 24 Oct 1929: US, Canada markets begin to crash.
- 29 Oct 1929: US, Canada markets in freefall; local bottom.
Great Depression

- Why did 1929 stock market crash lead to Great Depression?
  - Many economists think Great Depression was avoidable.
- Consumers lost wealth effect; cut spending.
- Hoover raised spending... and taxes; halted wage cuts.
- Big reason: Poor monetary policy; no lender of last resort.
  - Not flooding banks w/liquidity: 1/3 of banks failed.
  - Gold standard linked US, many countries’ monetary policies.
  - Fed did not lower rates enough; fear of capital flight.
  - Too-high rates, impaired/dead banks reduced money supply.
  - Deflation led to lower consumer spending, liquidity trap.

\(^2\) cf. Panic of 1907 when JP Morgan was lender of last resort.
19–20 Oct 1987: Stock markets worldwide fall 20%–45%.

Why did the markets fall? Still a mystery. Ideas:
- Property bubble in Oceania?
- Fears of US war w/Iran after missile attacks on US ships?
- Malinvestment, fraud in US savings & loans associations?
- Portfolio insurance? Index futures? (Not likely)

Response: Concerted loosening of monetary policy by central banks.

One exception: New Zealand. RBNZ did not increase money supply.

Result: rapid recovery... except in NZ.

NZ recovery? market: 10 years; unemployment: 17 years.
1994: Hedge fund Long-Term Capital Management (LTCM) opens.

Background: Salomon Bros. bond arbitrage group, academia, Fed.
   - Highly successful group; large share of Salomon’s profits.
   - Had been lauded in the popular book *Liar’s Poker*.
   - Cover story of BusinessWeek called them the “Dream Team.”.

Fund launches w/$1 bn; Greenwich (CT), Mayfair (London) offices.

Buys large part of mortgage portfolio from Askin Funds’ failure.

Questions to consider:
   - Do partners’ backgrounds influence how successful fund will be?
   - Would you trust these guys with your money?
   - Is 2-and-25 reasonable?
Capital in LTCP grew to $7.1 billion
Questions to consider:

- Does this sound like a good place to work? Would you work there?
- Is 2-and-25 reasonable in light of the returns?
- How do hedge funds manage with so few people?
- Some partners see fewer opportunities. What to do w/capital?
  - New strategies? New lines of business? Size up current strategies?
  - Invest in other funds? Hold cash to be safe? (ethical given fees?)
  - Close fund to new investors? Refund some money to get smaller?
5 Dec 1997: Fund memo reveals decision to refund $2.7 bn of capital.

Returning, reallocating capital leads to some volatility.
LTCM Mini-Case: Realignment

- LTCP refunds $2.7 bn; keeps early investors, partners, employees.
- Especially relevant since additional partner added in early 1998.
- Idea: focus on the “right” customers, not charge fees on idle cash.
- Portfolio response: down in Jan, then up more, down, then up more.
- Likely effect of reallocating capital in liquid investments.
- May–July: −6.7%, −10.1%, then +0.5%.
- Delayed effect of reallocating capital in less liquid investments?

Questions to consider:
- Did the fund refund too little or too much?
- Do funds want diversified investors or w/similar views?
- Would you be pleased or angry if your investment was refunded?
- Should LTCM have refunded some employee money?
- Early 1998 dip: likely from returning idle capital, shrinking?
- Who should pay costs of reallocation: old or new investors?
Aug–Sep 1998: Focus on running smaller, more-focused fund.
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August: LTCP began seeing very large single-day losses.
  - Movements of 2%-5%/day 3–6× larger than typical.
17 Aug: Russia defaults to avoid devaluing; leads to devaluation.
LTCP Russia exposure is less than 3%
Shorts: 10Y swap spreads, equity index volatility lose big.
LTCP loses 44% in August; down 52% from January.
Salomon unwinds bond arbitrage group. (Were they short vol?)
Firm solicits capital; notes opportunities as good as in 1994.

Questions:
- Minor Russia exposure; Salomon unwinding. Are losses temporary?
- What if other people have large exposure to Russia?
- Is this a good time to invest? Would you invest?
September was even more crazy and shocking.
- ER: “September was an LTCM crisis: Were we going to fail?”
- My area: making money; big losses after bank sees our holdings.

21 Sep: LTCP again loses $550 mn.
- LTCP has $900 mn revolving line of credit for emergencies.
- CFO pulls down $500 mn from revolver.

22 Sep: Goldman-AIG-Buffett make offer; demand answer w/in hour.
- $250 mn for LTCM, inject $4 bn, merge w/Goldman.
- But... offer not for LTCP; cannot change 15,000+ contracts in hour.
- Easy work-around possible... but could not reach Buffett.

LTQM Mini-Case: Final Performance

Growth of $1 AUM (USD bn)

% Returns

LTCM Mini-Case: Fallout

- Short swap spreads, index vol: 35% and 30% of losses.
- UBS sold call struck at $800 mn; then “hedged” by investing.
  - Net effect: like being short a put struck at $800 mn.
  - Q3 1998: $700 mn charge; CEO and 3 top execs resign.
- Jon Corzine (Goldman CEO) forced out; Merrill risk head resigns.
- Many banks take charges in hundreds of millions USD.
- Consortium lays off some employees; agrees not to hire remainder.
- Consortium repaid in Jun, Sep, Dec 1999; made 10% on investment.
- Some remaining employees form JWM Partners to run at lower risk.

Questions:

- Could LTCM have accepted Goldman offer? Should they have?
- Did the various banks act ethically?
- Did the NY Fed do the right thing?
- Should employees invest in their employer? Hedge?
Was the LTCM crisis singular? No.

Many same forces also drove the Great Financial Crisis (GFC).
  - Fire sales, runs, crowded trades, network effects, cpty risk.
  - Also: market+funding liq. interactions; capital structure gaming.

Unusual yet efficient and revealing way to look at the crisis:
  - As a three-act tragedy.
  - Act I: sets up situation, tensions, catalyst, seeds of destruction.
  - Act II: situation worsens; people choose poorly, seal their doom.
  - Act III: people suffer; widespread despair; resolution of tension.
Low interest rates increase real estate investments, refis. Investors hungry for higher yields buy MBSs. Structured products arise: CDOs lower, CDSs eliminate default risk. Securitization, refis make banks lots of money; they profit. Bank executives do well, encourage growth of lending. New loans, refis dry up, banks encourage lower-credit borrowing. Banks also use low teaser-rate ARMs, even fraud to issue more loans. Poor risk measures used would not see problems, even w/true data. Issuers pay rating agencies, want high ratings. Agencies want fees. High ratings let investors buy products full of shaky loans.
Demand for yield outstrips supply of even shaky mortgages.

Synthetic CDOs, full of CDSs, sold to investors to meet demand.

CDSs have counterparty risk; many written by AIG.

Some CDSs demand more collateral if counterparty credit declines.

Housing speculation in full force now; Fed raises rates to intervene.

Higher rates end refis, make ARMs more expensive, slow economy.

Mortgage defaults rise impairing CDOs and triggering CDSs.

New accounting rules force write-downs, triggering collateral calls.

Banks sell lower-quality assets, prices fall → need more collateral.

Banks reduce lending: slows economy more, leads to credit crunch.

Defaults increase: credit crunch and collateral calls rage.
GFC: Act III

- Bear Stearns nearly fails until NY Fed arranges buyer.
- Ratings business dries up; agencies repent and begin downgrading.
- Many mortgage originators fail or forced to sell.
- Lehman: huge losses, fails to find buyer, enters bankruptcy.
- Lehman default on OTC derivatives; cpty risk spreads panic, failures.
- US bails out AIG despite Lehman having been larger.
- US bans shorting financials, plans $700 bn bailout of banks.
- Goldman, Morgan Stanley become normal banks to qualify for bailout.
- US bailout: buys troubled assets, forces cash, takes risky collateral.
- US drops ST, raises LT rates; takes over FNM, FHLMC, Citi.
- Economy crashes: firms cut costs+workers, outsource, automate.
- Many eliminated jobs cease to exist making recovery uncertain.
European sovereign debt crisis was follow-on from GFC.
US credit crunch, bank failures, cpty risk spread crisis to Europe.
This exposed and fed on divisions, contradictions in Eurozone.
One major problem: EMU means monetary, but not fiscal, union.
- Countries may collect revenue and spend carefully or sloppily.
- How bad? Greece missed 2009 revenues equal to 30% of deficit.
- Leads to a free rider problem: let others pay for your party.
Initial problems were in UK building societies, European banks.
Some failed; BofE, ECB pumped money in; some banks nationalized.
Iceland banks fail, trapping UK/European depositor funds.
Unemployment reaches high levels; deflation creeps in.
European Sovereign Debt Crisis: A Gloom of One’s Own I

- Crisis took on European focus; nebulous due to policy failures.
- Makes dynamics slower; causes and risks that are unclear.
- 2009: Greek stats cleaned up; reveal EUR 300 bn debt (113% GDP).
- 2010: Greek deficit revealed to be $3.7 \times$ bigger than stated.
  - Greece out of Eurozone compliance; adopts austerity.
  - Greeks riot and strike; EUR falls against GBP, USD.
  - May: Eurozone, IMF agree on EUR 110 bn bailout of Greece.
  - Nov: agree on EUR 85 bn bailout of Ireland; “Portugal is OK.”
- 2011: Eurozone, IMF agree on EUR 78 bn bailout of Portugal.
  - Greece: austerity unpopular but continued; debt downgraded to CCC.
  - Greece may have to leave Eurozone — and hence EU.
  - Eurozone proposes EUR 109 bn second bailout of Greece.
  - However: austerity must continue and debt workout needed.
  - Greek politicians dithered and complained; bailout on pause.
2012: Many Eurozone countries downgraded; FR, AT fall from AAA.
   - 1 Mar: Eurozone agrees to EUR 130 bn second bailout of Greece.
   - 10 Mar: Slovak government falls from anger at bailouts.
   - May: Eurozone agrees to EUR 100 bn support fund for Spain.
   - Cyprus asks for a bailout but also argues over terms.

2013: Cyprus bailed out in late March.

2014: ECB tries to stimulate economy; cuts interest rates below 0.

2015: Greece asks for third bailout, but argues over terms.
   - Public rejects bailout terms in referendum; world markets fall.
   - Mid-July: Eurozone agrees to EUR 86 bn third bailout of Greece.

Eurozone has yet to resolve issues wh/led to these problems.
Chinese Stock Market Mayhem of 2015: $E_{\nu_\rho_\sigma}$

- GFC, Euro debt crisis affected China’s top trading partners
- 2008: China rolled out large infrastructure spending.
- 2013: Credit crunch; govt demands that banks lend.
- Bigger problem: China values employment, social stability.
  - This leads to lending to lower-performing borrowers.
- 2015: Growth fell to 7%; property/municipal malinvestment.
- Structural reforms underway; ideal: IPO of SOEs.
- However, stock market participation lagged.
- Many stocks are at record high prices.
- Government needs more participation to sell off SOEs.
Chinese Stock Market Mayhem of 2015: 丰富的疯子

- 21 Apr: People’s Daily proclaims “start of a bull market.”
  - Investors read this as government backing of stocks; heavy buying.
  - Problem: 2/3 of new investors have not even finished high school.
  - People uneducated on investment risks now trading heavily in stocks.

- Regulator CSRC had cut frictions: allowed shorting, index futures.
  - But, CSRC did not police loans for speculation, eased margin trading.

- Mid-June: CSI 300 peaks at 5300; then begins falling.
- 27 June: Surprise PBoC interest rate cut.
- 1 July: CSRC eases collateral, margin rules; exchanges lower fees.
- Shares wh/fell too far were suspended from trading.
- 3 July: CSI 300 has fallen to under 3900: -31%!
- Aggressive confrontations with, threats to short sellers.
- CFFE halts 19 accounts for shorting futures, limits posn sizes.
- Govt assembles “National Team” of firms to prop up market.
The National Team was unsuccessful; the market still fell.
  - Good: govt saw it is not worth trying to prop up markets.
  - Bad: govt not yet trusting in markets, incentives.

Capitalism only works when winners win and losers fail.

Otherwise, like playing poker w/o money: makes no sense.

Perhaps the govt preferred social stability to capitalist purity?

However: that reduces growth, regardless of what it is called.

Furthermore: investors prefer markets w/less govt meddling.
  - IPOs shifted more to HKEx during and after crisis.

CFFE still limits index futures posns; no options trading.
The Dogs That Did Not Bark

- Also interesting: events wh/could have been crises but were not.
  - May offer guidance about allowing for failure w/less destruction.
- Central Clearing Non-Failures
  - CCPs survived crises: LTCM, GFC, Euro debt, China 2015.
  - CCPs survived failures: Refco, Amaranth, Bear Stearns, Lehman.
- Quant Quake of 2007
  - Large losses in quant firms along risk factors; but, S&P 500 stable.
  - More liquid markets: helped avoid this becoming a disaster.
- Citadel Survives: Some funds down 55% at EOY 2008!
  - Investor agreements let them move funds to liquid investments.
- Flash Crash of 2010
  - Not new; mostly reputational; can be eased w/education.
Have we learned how to do better? Yes.

- Risk retention: securitizing firms must hold some of risk.
- Most central banks now also focus on financial stability.
- Some central banks may use non-standard monetary policy.
- Quantitative easing: buying non-govt assets to lower yields.
  - Problem: Assumes quasi-arbitrage possible; just kicks the can.
- Central clearing: Dodd-Frank, EMIR encourage CCPs.
- Bail-Ins: Use CoCos to raise equity, cut debt in crises.
- Recovery tools: devalue FX, let banks fail, save finance sector.
- Increasing fiscal responsibility also helped.
- Capital controls (temp) also seems to help though extreme.
We covered crises! A bit of a bummer, admittedly.
It makes sense to step back and see what we have covered.
Also, we should put all of this in context.
That is what I do in the Coda chapter.
I *highly* recommend reading it. It is eye-opening.