Session 3, Part 1
Granular Instrumental Variables

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Identification in macro and finance

- **Goal:** Construct instruments, especially in macro and asset pricing, to measure *causal* linkages (Ramey '16, Stock and Watson '17, Chodorow-Reich '19).
- In this lecture we'll cover one reasonably systematic sources of instruments
  - "Granular Instrumental Variables" (GIVs): G. Koijen JPE '24

Introducing Granular Instrumental Variables

- Idiosyncratic shocks to large firms / countries / industries have a non-trivial impact on economic output (G. '11, di Giovanni and Levchenko '12): they're incompressible "grains" of economic volatility, economies are "granular."
- GIVs use idiosyncratic shocks (e.g. in TFP, demand) as instruments:
  - "Purge" data from aggregate shocks to obtain "purified" idiosyncratic shocks.
  - Optimally aggregate idiosyncratic shocks to obtain the most powerful instrument.
- Examples:
  - Industry-wide spillovers: if a firm expands, how do other firms react?
  - Sovereign - financial sector doom loops.
  - The impact of intermediaries on asset prices.
  - Growth spillovers (micro-to-macro multiplier, Brexit, Chinese slowdown).

Introducing GIVs

- GIVs lower the need for finding unique, one-off events (a tax reform, a China shock) that work only for some countries or some periods.
  - Can find 100 China shocks.
- Bartik instruments allow to estimated cross-sectional / micro effects: e.g., if California receives \$1 more than Oregon, the California's GDP increases by \$$x$ more dollars than Oregon's GDP.
- GIVs estimate aggregate / macro effects.

Notations

- Relative size S_i, $\sum_{i=1}^{N} S_i = 1$.
- For variable X_i:

$$
\begin{aligned}
X_E &:= \frac{1}{N}\sum_{i=1}^{N} X_i : \text{equal weighted},\\
X_S &:= \sum_{i=1}^{N} S_i X_i : \text{size-weighted},\\
X_\Gamma &:= X_S - X_E .
\end{aligned}
$$

Example: Simple model of the "oil market"

- Country i's oil demand is (with S_i relative size)

$$D_{it} = \bar{Y} S_i \left(1 + y_{it}\right), \qquad y_{it} = \phi^d p_t + \lambda_i \eta_t + u_{it}.$$

So, aggregate demand is (with $y_{St} := \sum_i S_i y_{it}$):

$$D_t = \sum_i D_{it} = \bar{Y}\left(1 + y_{St}\right).$$

- Aggregate supply is

$$Y_t = \bar{Y}\left(1 + \frac{p_t - \varepsilon_t}{\alpha}\right), \qquad p_t = \frac{P_t - \bar{P}}{\bar{P}}.$$

- Equilibrium: demand $=$ supply

$$\bar{Y}\left(1 + y_{St}\right) = \bar{Y}\left(1 + \frac{p_t - \varepsilon}{\alpha}\right),$$

i.e.

$$p_t = \alpha y_{St} + \varepsilon_t.$$

- OLS estimate of α in $p_t = \alpha y_{St} + \varepsilon_t$ biased as $\mathbb{E}\left[\varepsilon_t y_{St}\right] \neq 0$.
- Key assumption: $(\eta_t, \varepsilon_t) \perp u_{it}$ (ie. uncorrelated)

Basic example: Inelastic demand (no loop)

- Consumption change to country i is (assume for now $\lambda_i = 1$)

$$y_{it} = \phi^d p_t + \eta_t + u_{it}$$

- Two averages:

$$\begin{aligned} y_{St} &= \sum_i S_i y_{it} = \eta_t + u_{St} \\ y_{Et} &= \sum_i E_i y_{it} = \eta_t + u_{Et} \end{aligned}$$

- Define "Granular Instrumental Variable" (GIV):

$$\begin{aligned} z_t &:= y_{\Gamma t} = y_{St} - y_{Et} = \left(\phi^d p_t + \eta_t + u_{St}\right) - \left(\phi^d p_t + \eta_t + u_{Et}\right) \\ &= u_{St} - u_{Et} = u_{\Gamma t}. \end{aligned}$$

- We extracted the GIV $z_t = u_{\Gamma t}$ – size weighted idiosyncratic shock (minus a small u_E) – from data y_{it}.
- Key assumption: $\varepsilon_t \perp u_{it}$.

Basic Example: With no loop for now

- Recap, with $z_t := y_{\Gamma t}$, $y_{it} = \eta_t + u_{it}$:

$$\begin{aligned} y_{St} &= \eta_t + u_{St}, \\ p_t &= \alpha y_{St} + \varepsilon_t, \\ z_t &:= y_{\Gamma t} \quad \implies \quad z_t = u_{\Gamma t}. \end{aligned}$$

- We have

$$\begin{aligned} \mathbb{E}\left[\varepsilon_t z_t\right] &= 0: \text{ Exogeneity} \\ \mathbb{E}\left[y_{St} z_t\right] &\neq 0: \text{ Relevance.} \end{aligned}$$

- Given $p_t - \alpha y_{St} = \varepsilon_t$, we have

$$\mathbb{E}\left[\left(p_t - \alpha y_{St}\right) z_t\right] = 0,$$

$$\alpha = \frac{\mathbb{E}\left[p_t z_t\right]}{\mathbb{E}\left[y_{St} z_t\right]}.$$

- We've identified price elasticity α via the GIV $z_t = y_{\Gamma t}$!
- Empirically, take $\hat{\alpha}_T := \frac{\frac{1}{T}\sum_t p_t z_t}{\frac{1}{T}\sum_t y_{St} z_t}$.

What do we need for good precision?

- Proposition (error in GIV estimator): The convergence is $\sqrt{T}\left(\hat{\alpha}_T - \alpha\right) \sim \mathcal{N}\left(0, \sigma_\alpha^2\right)$ with

$$\sigma_\alpha = \frac{\sigma_\varepsilon}{h\sigma_u},$$

$$\sigma_{u_\Gamma} = h\sigma_u, \qquad h := \sqrt{-\frac{1}{N} + \sum_{i=1}^{N} S_i^2}.$$

- h= "Excess herfindahl", in $\left[0, \sqrt{1 - \frac{1}{N}}\right]$.
- So, to achieve high precision, we need
  - high h = a few large firms / countries / industries / banks...).
  - Large idiosyncratic shocks.
- Fortunately, it's typically the case: $h \in [0.2, 0.7]$, and $\frac{\sigma_u}{\sigma_\epsilon} \in [3, 10]$.

Generalizations and objections

- Next slides generalize the idea, and answer questions like:

1. Time-varying size: easy, replace S_i by $S_{i,t-1}$ assuming $S_{i,t-1}u_{it} \perp (\eta_t, \varepsilon_t)$
2. What if the shocks are heteroskedastic?
3. How to reach maximal precision?
   3.1 Do we add precision by adding other combinations of u_i's (answer: no)
4. What if there is a richer factor structure?
5. How to estimate the elasticity of demand?
6. What if you have heterogeneous elasticity of demand?
7. What makes for valid idiosyncratic shocks?
8. Can we check this narratively?
9. What if common shocks are endogenous and come from idiosyncratic shocks?
10. Robustness to misspecification
11. Threats to identification
12. General case with severals loops and channels.

When the u_{it} are heteroskedastic

- When u_{it} are heteroskedastic with variance σ_i^2, but still uncorrelated, we define the "pseudo-equal" weight

$$\tilde{E}_i := \frac{1/\sigma_{u_i}^2}{\sum_j 1/\sigma_{u_j}^2}, \qquad \sum_i \tilde{E}_i = 1,$$

(so, in homoskedastic case, $\tilde{E}_i = \frac{1}{N}$) and set the GIV as:

$$\tilde{\Gamma}_i := S_i - \tilde{E}_i,$$

and form the "true" GIV

$$z_t := y_{\tilde{\Gamma}t} = \sum_i \tilde{\Gamma}_i u_{it}.$$

- Everywhere, replace E and $\Gamma = S - E$ by $\tilde{E}$ and $\tilde{\Gamma} = S - \tilde{E}$
- Then $\iota'\tilde{\Gamma} = 0$ and

$$\mathbb{E}\left[u_{\tilde{\Gamma}t} u_{\tilde{E}t}\right] = 0.$$

The above is the optimal GIV

- Recall $y_{it} = \eta_t + u_{it}$.
- Consider another GIV with some weights Γ

$$z_t = \Gamma' y_t$$

  with $\iota'\Gamma = 0$ so as to have $z_t \perp \eta_t$.
- Then, $\sqrt{T}\left(\hat{\alpha}_T - \alpha\right) \sim \mathcal{N}\left(0, \sigma_\alpha^2\left(\Gamma\right)\right)$. We wish find the optimal GIV:

$$\min_{\Gamma} \sigma_\alpha^2\left(\Gamma\right) \text{ s.t. } \iota'\Gamma = 0.$$

- Proposition: The optimum GIV weights Γ is:

$$\tilde{\Gamma} = S - \tilde{E}.$$

- Likewise, GIV is
  - (i) optimally-weighted GMM estimator, optimal combination of all moments $\mathbb{E}_T\left[\left(p_t - \alpha y_{St}\right)\left(u_{it} - u_{jt}\right)\right] = 0$
  - (ii) the MLE (assuming Gaussianity)
- So, "adding other combinations of u_i's" won't help – all other combinations are dominated by $z_t = \tilde{\Gamma}' y_t$.

Enrichment: Add factor structure

$$y_{it} - y_{Et} = \sum_{f=1}^{r} \lambda_i^f \eta_t^f + \check{u}_{it}, \qquad p_t = \alpha y_{St} + \varepsilon_t.$$

- We assume $u_t \perp (\eta_t, \varepsilon_t)$
- We do a factor analysis with $\sum_f \lambda_i^f \eta_t^f$, extract u_{it}^e, form the GIV

$$z_t := \sum_i (S_i - E_i)\, u_{it}^e = u_{\Gamma t}^e.$$

Supply and demand

- Demand y_{it}, supply s_t (in fractional growth terms):

$$\begin{aligned} y_{it} &= \phi^d p_t + \eta_t + u_{it}, \\ s_t &= \phi^s p_t + \varepsilon_t. \end{aligned}$$

  with $\phi^d < 0 < \phi^s$.
- In equilibrium supply = demand: $s_t = y_{St}$, so

$$\begin{aligned} y_{St} &= M \left(u_{St} + \eta_t + \frac{\phi^d}{\phi^s} \varepsilon_t \right), \\ p_t &= \frac{M}{\phi^s} \left(u_{St} + \eta_t - \varepsilon_t \right), \end{aligned}$$

  with $M = \frac{\phi^s}{\phi^s - \phi^d}$.
- We want to estimate both elasticities ϕ^d, ϕ^s, which is equivalent to estimating M and M/ϕ^s.
- Can't do OLS $s_t = \phi^s p_t + \varepsilon_t$, as p_t is correlated with ε_t.

Supply and demand: Constructing the GIV

$$y_{it} = \phi^d p_t + \eta_t + u_{it}, \qquad s_t = \phi^s p_t + \varepsilon_t.$$

- Observe

$$\begin{aligned} y_{St} &= \phi^d p_t + \eta_t + u_{St} = \sum_i S_i y_{it} \\ y_{Et} &= \phi^d p_t + \eta_t + u_{Et} = \sum_i E_i y_{it} \end{aligned}$$

- We form the GIV:

$$\begin{aligned} z_t &:= y_{\Gamma t} = y_{St} - y_{Et}, \\ &= u_{St} - u_{Et} = u_{\Gamma t}. \end{aligned}$$

- The GIV satisfies

$$\begin{aligned} \mathbb{E}\left[\left(\varepsilon_t, \eta_t, u_{Et}\right) z_t\right] &= 0: \text{ Exogeneity} \\ \mathbb{E}\left[p_t z_t\right] &\neq 0: \text{ Relevance.} \end{aligned}$$

Supply and demand: OLS approach

- With $M = \frac{\phi^s}{\phi^s - \phi^d}$ and $z_t := y_{\Gamma t} = y_{St} - y_{Et} \implies$ $z_t \perp (e_t^y, e_t^p)$:

$$
\begin{aligned}
y_{St} &= M\left(u_{St} + \eta_t + \frac{\phi^d}{\phi^s}\varepsilon_t\right) \\
&= Mz_t + e_t^y, \\
p_t &= \frac{M}{\phi^s}\left(u_{St} + \eta_t - \varepsilon_t\right) \\
&= \frac{M}{\phi^s} z_t + e_t^p,
\end{aligned}
$$

- We can estimate M and $\frac{M}{\phi^s}$ using OLS and all standard OLS properties apply.
- We can recover ϕ^s and ϕ^d from these OLS estimates, which turns out to be equivalent to the IV estimator.

Supply and demand: IV approach

$$y_{it} = \phi^d p_t + \eta_t + u_{it}, \qquad s_t = \phi^s p_t + \varepsilon_t.$$

- First stage, with $b = \frac{1}{\phi^s - \phi^d}$

$$p_t = bz_t + e_t^p,$$

  and define $p_t^e = b^e z_t$ the instrumented price change.
- Second stage

$$s_t = \phi^s p_t^e + e_t^s.$$
$$y_{Et} = \phi^d p_t^e + e_t^d.$$

- Standard IV inference (including weak instruments tests) can be used in this case.
- We can estimate both elasticities with disaggregated data on either supply or demand.

Heterogeneous exposures: Parametric case

- Parametric heterogeneity: $\phi_i^d = \sum_{\ell=1}^k X_{i\ell t}\dot{\phi}_\ell^d = X_{it}\dot{\phi}^d$, and $\lambda_i = X_{it}\dot{\lambda}$

$$y_{it} = X_{it}\dot{\phi}^d p_t + X_{it}\dot{\lambda}\eta_t + u_{it}, \qquad s_t = \phi^s p_t + \varepsilon_t.$$

1. For each date, run cross-sectional regression

$$y_{it} = X_{it}\dot{y}_t + \check{u}_{it} = \sum_{\ell=1}^{k} X_{i\ell t}\dot{y}_{\ell t} + \check{u}_{it}$$

   and get slopes $\dot{y}_t = (\dot{y}_{\ell t})_{\ell=1\dots k}$ (interpretation: $\dot{y}_t \simeq \dot{\phi}^d p_t + \dot{\lambda}\eta_t$)
2. Form GIV: $z_t := \sum_i S_i \check{u}_{it}$
3. Estimate slopes by instrumenting p_t by z_t

$$\begin{aligned} \mathbb{E}\left[(s_t - \phi^s p_t)\, z_t\right] &= 0 \\ \mathbb{E}\left[\left(\dot{y}_{\ell t} - \dot{\phi}_\ell^d p_t\right) z_t\right] &= 0 \qquad \text{for } \ell = 1\dots k \end{aligned}$$

- Paper has also non-parametric heterogeneity.

What is an idiosyncratic shock?

- Plainly, it's a u_{it} such that $\mathbb{E}_{t-1}[\eta_t u_{it}] = 0$.
- Simple example: "demand shock" or "supply shock": $y_{it} = \lambda_i \eta_t + u_{it}$
- Slightly more subtle: $y_{it} = \left(\lambda_i + \check{\lambda}_{it}\right) \eta_t + v_{it}$, with $\mathbb{E}_{t-1}\left[\left(\eta_t, \eta_t^2\right) \check{\lambda}_{it}\right] = 0$. Then,

$$u_{it} = \check{\lambda}_{it} \eta_t + v_{it}$$

  is idiosyncratic.
- For instance. Take η_t=common bank shock. If the sensitivity of bank i on that can of bank i is higher than expected $\lambda_i + \check{\lambda}_{it}$ rather than λ_i), then the difference ($\check{\lambda}_{it}\eta_t$) is an idiosyncratic shock).
- If we have a "common variance shock" $(u_{it} = \sigma_t v_{it}$ with v_{it} i.i.d., independent of σ_t), u_{it} is still idiosyncratic, even if σ_t is correlated with η_t.

Narratively-checked GIV

- Another "check" is extract u_{it},and do a "narrative check": do they really correspond to idiosyncratic shocks?
- Select e.g. top events by $S_i \left| u_{it} - u_{Et} \right|$ (formally, set $z_t = \sum_i S_i \tau \left(u_{it} - u_{Et} \right)$ where $\tau \left(x \right) = x 1_{|x| \geq b}$).
- Consider $\mathcal{N}$ the set of shocks that pass the narrative check. Then, we can construct

$$z_t^{\mathcal{N}} = \sum_{i:(i,t) \in \mathcal{N}} \Gamma_i u_{it}$$

  and just use that one.
- What GIV adds to the traditional narrative approach:
  - By controlling for factors, we can easily identify a list of potential events that may otherwise be masked by aggregate fluctuations.
  - By relying on salient historical events, the estimated elasticities are particular to extreme events if demand/supply curves are non-linear.

Over-identification tests

- Recall
$$z_t = \sum_i S_i \check{u}_{it}, \qquad \check{u}_{it} = u_{it} - u_{Et}$$
- We can construct more instruments, and partition the $i's$ into two sets (e.g. rich vs poor countries), and get $z_{kt} = \sum_{i \in I_k} S_i \check{u}_{it}$ for $k = 1, 2$ and test whether z_{1t} and z_{2t} (and z_t) give the same estimate?

Estimation procedure: User's guide

$$y_{it} = \phi^d p_t + \lambda_{it}\eta_t + u_{it} + mC_{it}^y,$$
$$p_t = \alpha y_{St} + \eta_t^F + m^F C_t^F,$$

1. *Panel regression:* With time fixed effects, get $\check{y}_{it}^e$
$$y_{it} = a_i + b_t + mC_{it}^y + \check{y}_{it}.$$
2. *Factor estimation:* If loadings x_{it} are available, get $\eta_t^{x,e}$ from
$$\check{y}_{it}^e = b_t + x_{it}\eta_t^x + e_{it},$$
In addition, do PCA on $\check{y}_{it}^e$ and collect factors as $\eta_t^{PCA,e}$.
Stack $\eta_t^e := \left(\eta_t^{x,e}, \eta_t^{PCA,e}\right)$.
3. *Multiplier estimation using OLS:* We form $Z_t = y_{\Gamma t}$ and estimate $M = \frac{1}{1-\alpha\phi^d}$ and αM:
$$y_{St} = MZ_t + \beta^y \eta_t^e + C_{St}^y \beta^{C^y} + a_S + \varepsilon_t^y,$$
$$p_t = \alpha M Z_t + \beta^p \eta_t^e + C_t^F \beta^{C^p} + b + \varepsilon_t^p.$$

Estimation procedure

4. Elasticity estimation using instrumental variables: We estimate α using IV, with Z_t as an instrument for y_{St} in

$$p_t = \alpha y_{St} + \eta_t^F + m^F C_t^F.$$

To estimate ϕ^d, we consider the regression

$$y_{Et} = \phi^d p_t + mC_{Et}^y + \lambda_{Et}\eta_t^e + a_E + u_{Et},$$

and we use Z_t as an instrument for p_t.

Robustness to misspecification

- If we keep only some shocks, not others: unbiased, provided $u_{St} = z_t + e_t$ with $z_t \perp e_t$
  - E.g.: $z_t = \sum_{i \in I_t} S_i \left(u_{it} - u_{Et}\right)$, summing over top K firms
- If we assume homogeneous coefficients on elasticities, while they are heterogeneous:
  - We're fine if we control for η_t well (we estimate ϕ_E); we're not fine otherwise
- Suppose we misspecify sizes, e.g. use S° rather than S, and use $z_t = u_{S^\circ t} - u_{Et}$.
  - IV is still valid: $\mathbb{E}\left[\left(p_t - \alpha y_{St}\right) z_t\right] = 0$ still
  - but OLS can be biased $u_{St} = \psi z_t + e_t$, so (recalling $b^p = \frac{1}{\phi^s - \phi^d}$, $M = \frac{\phi^s}{\phi^s - \phi^d}$) $b^{p,e} = b^p \psi$ and $M^e = M\psi$, and $\phi^{s,e} = \frac{b^{p,e}}{M^e} = \phi^s$ is unbiased.

Threats to identification

- Threat to identification: if we don't control for common factors $z_t = u_{\Gamma t} + \lambda_\Gamma \eta_t - \lambda_\Gamma^e \eta_t^e$
- Solutions:

1. Over-identification test: with several GIVs (e.g. even-odd)
2. Test for number of factors (Bai Ng '02), or check stability if you add 1 or 2 factors
3. Do narrative GIV: check top $\sim$ 15 events
4. Filter out "sporadic factors"

Sovereign yield contagion

- Default concerns of a sovereign may spill over to other countries in the Euro area if losses are partially shared.
- A simple sovereign default model suggests

$$\Delta r_{it} = \gamma \Delta r_{St} + \lambda_i' \eta_t + u_{it},$$

where

$$\Delta r_{it} = \frac{\Delta y_{it}}{y_{i,t-1}},$$

with y_{it} the yield spread between country i and Germany.
- The size weight is "expected loss under default"

$$S_{i,t-1} = \frac{B_{i,t-1} y_{i,t-1}}{\sum_j B_{j,t-1} y_{j,t-1}},$$

where B_{it} is the government debt of country i.
- If a country suffers \$1 billion loss on its debt because of some idiosyncratic bad news u_{it}, then the market value of aggregate debt of all European governments falls by $M = \frac{1}{1-\gamma}$ billions.

Data

- Sample period: Daily from September 2009 until August 2018.
- Yield data: Thomson-Reuters benchmark yields with a maturity of 10 years.
- Debt data: General government gross debt from Eurostat.

Estimation procedure

- Compute rolling $Var_{t-1}\left(\Delta r_{it}\right)$ using 60 days and

$$\sigma^2_{i,t-1} = \max\left(Var_{t-1}\left(\Delta r_{it}\right), m_{t-1}\right),$$

  where $m_{t-1} = median\left(Var_{t-1}\left(\Delta r_{it}\right)\right)$.
- Panel regression with country and time fixed effects with $E-$weights based on $\sigma^2_{i,t-1}$

$$\Delta r_{it} = a_t + k_i + e_{it}.$$

- Step 2: We extract principal components of the normalized residuals, $\frac{e_{it}}{\sigma_{i,t-1}}$.
- Step 3: Estimate the multiplier $M = \frac{1}{1-\gamma}$

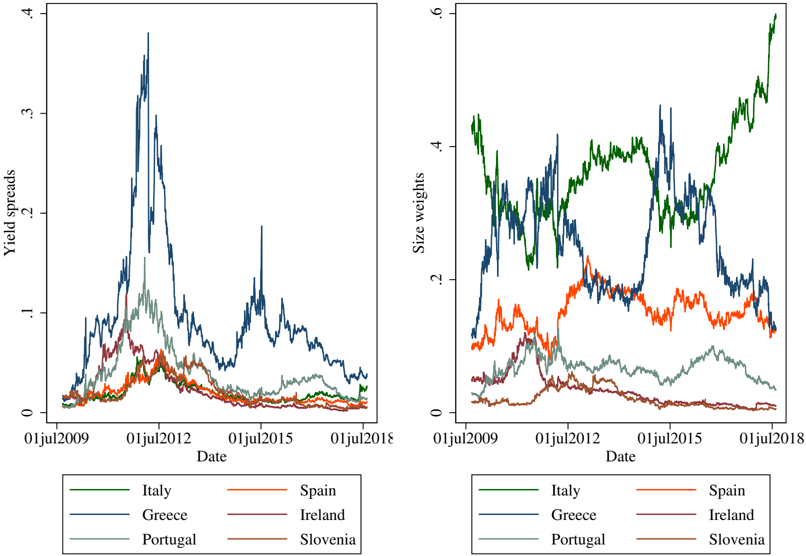
$$\Delta r_{St} = k + M\Delta r_{\Gamma t} + \lambda_S' PC_t + e_t.$$

- To narratively check the shocks, run the panel (size weighted)

$$\Delta r_{it} - \Delta r_{Et} = c + \lambda' PC_t + u_{it},$$

  where u^e_{St} is identical to the residual of the regression of $\Delta r_{\Gamma t} = c + \lambda' PC_t + u^e_{St}$. We report the largest $S_{i,t-1} u^e_{it}$.

YIELD DYNAMICS AND SIZE WEIGHTS



Estimation results

- Adding more PC's (up to 5) does not change the results.

	Δr_{St}	Δr_{St}	Δr_{St}	Δr_{St}
Z_t	1.442	1.299	1.215	1.251
	(63.89)	(46.50)	(43.60)	(44.19)
PC_{1t}		0.00171	0.00208	0.00192
		(8.47)	(10.50)	(9.70)
PC_{2t}			0.00246	0.00240
			(12.46)	(12.23)
PC_{3t}				-0.00143
				(-5.94)
N	2307	2307	2307	2307
R^2	0.639	0.650	0.672	0.677

t statistics in parentheses

Interpretation

- We find a multiplier $M = \frac{1}{1-\gamma} \simeq 1.25$ and hence a spillover parameter $\gamma \simeq 0.2$
- Interpretation:
  - Suppose that Italy suffers a bad shock that makes its debt likelier to default, and the market value of its debt falls by 1 billion euros.
  - The aggregate debt of all European governments falls by 1.25 billion
  - The spillover is an extra 0.25 billion of expected losses in European sovereign debt markets (could be cash-flow or discount rate news)

Narrative check

- Largest shocks (top 3 for Greece; largest for Italy and Portugal)
  - March 12, 2012: Greece announced Friday that its private-sector creditors will take part in a historic restructuring of the government's debt, setting the stage for the nation to secure more bail-out money and skirt a messy default.
  - July 10, 2015: The Greek government submitted its highly anticipated plan for the country's economic overhaul to bailout authorities.
  - June 29, 2015: Greek banks are closed and will stay shut for the week, after the country's debt crisis took a dramatic turn.
  - May 29, 2018: Italy appointed a former IMF official as interim prime minister, with the task of planning for snap polls and passing a budget. Investors believe it will deliver an even stronger mandate for anti-establishment, eurosceptic politicians, casting doubt on the Italy's future in the euro zone.
  - July 6, 2011: Portugal received a blow Tuesday as Moody's Investors Service downgraded its sovereign-debt rating to junk status, saying the country, like Greece, will likely require further aid.

One can use GIVs to do much more

- Impact of 100 "China shocks": there are lots of idiosyncratic foreign export shocks, look at their impact, generalizing Autor et al. '13
- Do firm-specific hiring and investment spill over to peer firms operating in the same product market?
- Foreign inflows and their impact on the exchange rates (Camanho, Hau Rey '22) / on GDP...
  - ... and then impact of exchange rates on trade (GIV with idiosyncratic demand shocks by large investment funds)
- What's the impact of an increase concentration (via GIV on Herfindahl) on wages, employment? (Schubert and Stansbury '22)
- If there is an export boom, what's the impact on the exchange rate, and the rest of the economy? (Use export shocks to large firms)
- What's the impact on flows into the stock market on aggregate valuations? (using idiosyncratic demand shocks, G.-K. '22)

One can use GIVs to do much more

- With idiosyncratic shocks to investment demand: impact on the interest rates, and can do impact of a change in the interest rate on investment...How much do country-specific shocks spill over in the Euro area?
- Impact of shocks to financial intermediaries on asset prices.
- How much do constraints of financial intermediaries (e.g., broker dealers) matter for asset prices?
- ...

Conclusion on GIV

- GIV: A simple idea with potentially many applications.
- Allows to
  - estimate new things
  - Step towards systematically constructing instruments
    - Lowers the need for finding unique, one-off events (a tax reform, a China shock) or painstaking narrative analyses
    - Fairly general source of instruments, when none were available