

Linkage between macroeconomic conditions and inequality in Japan¹

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¹Views expressed in this paper are those of the authors and do not necessarily reflect the official views of the Bank of Japan.

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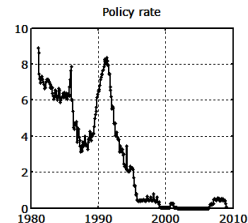
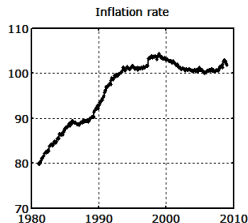
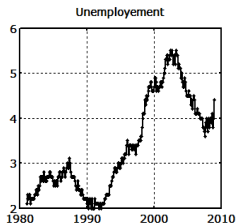
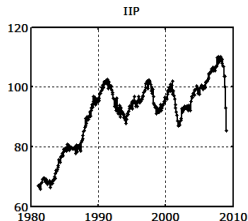
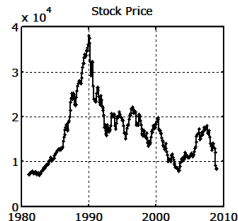
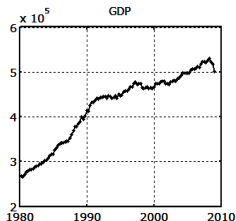
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Outline of the talk

- 1 **Motivation**
- 2 **Literature**
- 3 **Direction and Contribution**
- 4 **Estimation Methodologies**
- 5 **Results**
- 6 **Conclusion**

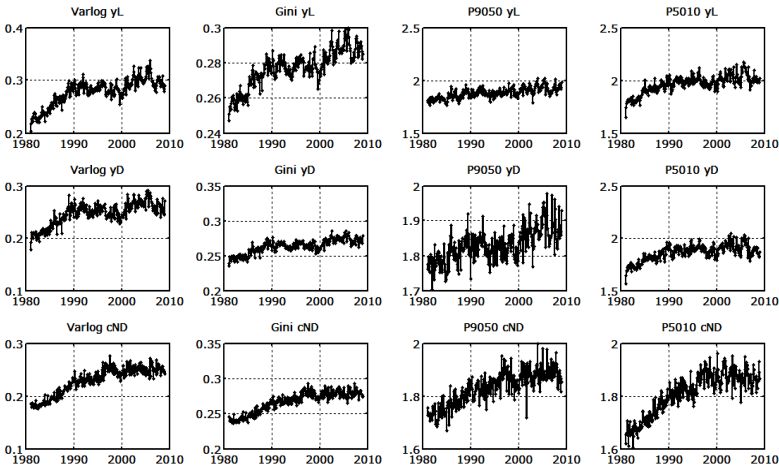
Motivation: macroeconomic variables

- High growth rates during the 1980s followed by slow down in the early 1990s.



Motivation: inequality measures

- High growth rates during the 1980s followed by slow down in the early 1990s.



Motivation: questions we ask in this paper

- **Do inequalities and macroeconomic variables develop independently?**
- **If not, what are channels through which inequality and macroeconomic variables interact?**
- ① **Which component of income reacts differently to macroeconomic shocks or does asset react differently?**
- ② **Did growing inequality during the 1980s cause bubble boom and subsequent financial crisis?**

2. Literature: from macro to inequality.

- **Macro shocks to disposable income inequality**

- ① Skill biased technology change (Acemoglu, 2002)
- ② Difference in adjustment for wage or hours (Carpenter and Rogers, 2004)
- ③ Income composition (Coibion et al., 2014)) : profit vs earnings.
- ④ Distributional policy: countercyclical tax or social security system etc.

- **Macro shocks to consumption inequality**

- ① Difference in asset composition (Saiki and Frost, 2014))
- ② financial segmentation (Coibion et al., 2014)

2. Literature: from macro to inequality.

- 1 **Krueger et al. (2010)** summarize common features of developments in inequality in nine large countries and document that earnings inequality appears to be strongly counter-cyclical.
- 2 **Storesletten et al. (2004)**, using Panel Study on Income Dynamics (PSID), document that the labor market risk is strongly countercyclical.
- 3 **Coibion et al. (2012)** empirically show that a contractionary monetary policy shock widens earning, disposable income, and consumption inequality across U.S. households.
- 4 **Saiki and Frost (2014)** empirically show that unconventional monetary policy has increased income inequality across Japanese households.
- 5 **Gornemann et al. (2014)** theoretically compare impact on inequality of monetary policy shock with TFP shock, and argue that the former shock affect inequality while the latter shock does not.

2. Literature: from inequality to macro.

- **Survey by Ostry, Berg, and Tsangarides (2014).**
 - **Inequality foster economic growth.**
- ① Inequality incentivizes harder works (Lazear and Rosen, 1981, Okun, 1975).
-
- **Inequality dampens economic activity.**
- ① A severe inequality aggravates health or human capital of poor (Perotti, 1996; Galor and Moav, 2004; Aghion, Caroli, and Garcia-Penalosa, 1999).
 - ② A higher capital share leads rich to invest more on asset, boosts financial market, and results in financial crisis (Kumof, 2011).
 - ③ Governmental response by supplying easy credit to poor in a rising inequality leads to financial crisis (Rajan, 2010).

2. Literature: from inequality to macro

- 1 **Ostry, Berg, and Tsangarides (2014)**, based on cross-country analysis, document that lower inequality is correlated with faster and more durable growth.
- 2 **Stiglitz (2013)** discusses that inequality fosters financial crisis because people who do not spend much (rich) possess the bulk of wealth in the economy.
- 3 **Bordo and Meissner (2012)**, based on cross-country analysis, document that inequality does not cause financial crisis and that a low interest rate and economic expansion are the only determinants of financial crisis.
- 4 **Rajan (2010)** argues that rising inequality pre-crisis period led to political pressure for redistribution that eventually came in the form of subsidized housing finance and financial crisis.

2. Literature: consumption theory

- **Disagreement bw income and consumption provides information about underlying income process.**
- ① PIH: a permanent component of income affects both income and consumption while temporary component of income shock affects income only.
- ② **Blundell, Pistaferri, Preston (2008)** : partial insurance for both components. Consumption do not respond to permanent income shock by one-to-one.
- **Disagreement in how income and consumption inequality react provides information about how macro variables affect income process.**

3. Direction and Contribution

- **We investigate linkage between inequality and macroeconomic variables (i.e., first moment or aggregate variables) by formulating VARs.**
 - ① Sample period covers both asset price boom and bust.
 - ② Inequality measures include disposable income, income-consumption covariance, and consumption.
 - ③ Monthly series.

- **Our work differs from existing studies in the following aspects.**
 - ① Focus: linkage bw inequality and boom-and-bust cycle in Japan.
 - ② Type of shocks: broad range of macroeconomic shocks including policy rate shocks.
 - ③ Source of change in equality: paying attention to the different role played by permanent income component, transitory income component, or asset.

3. Direction and contribution

- **Some macro variable shock are translated to inequality but opposite does not necessarily hold.**
 - ① Shocks to asset price, iip, and policy rate leads inequality to move cyclically.
 - ② Shocks to asset price has played an important role in increasing consumption inequality during the 1980s.
 - ③ Macrovariables are barely affected by shocks to inequality measures.
- **It is likely that transitory income component is not the key channel of transmission of macroeconomic variables.**
 - ① Under a premise that standard consumption theory holds, responses of transitory income component to macroeconomic shocks are small and insignificant.
 - ② Under alternative consumption theory, response of transitory income component to macroeconomic shocks are insignificant.
 - ③ Shocks to permanent income component or those to asset do seem play a role in the transmission.

Estimation Methodologies

① Data source

- the Family Income and Expenditures Survey (hereafter FIES)

② Sample period

- January 1981 to December 2008.
- January 1981 to January 1999 for sensitivity analysis.

③ Definition of inequality

- Variance of log of disposable income (yD), covariance of yD and cND , and that of nondurable consumption (cND). Series are equalized.
- Variance of yL , and other inequality measures, Gini coefficient, 90/50 ratio, and 50/10 ratio for sensitivity analysis.

- **Benchmark model**

- ① A text book VAR with 5 macro variables; stock price, index of industrial production (IIP), inflation, unemployment, and policy rate, and 3 inequality measures, log variance of disposable income, covariance of disposable income and consumption, and log variance of consumption.

- **Alternative models used for sensitivity analyses**

- ① A VAR that consists of factors. Factors are taken from balanced panel that consists of 81 macroeconomic variables.
- ② Factor augmented VAR similar to Boivin, Giannoni, and Mihov (2009). Factors are taken from balanced panel that consists of 81 macroeconomic variables and 40 inequality variables.
- ③ Structural VAR similar to Altig, Christiano, Eichenbaum, and Linde (2006).

Results (1)

Response of inequality to macro shocks

- **Some macro shocks affects inequality in a statistically significant manner.**
- ① A positive shock to stock price and IIP increase inequality in disposable income and consumption and covariance.
- ② A positive shock to policy rate decreases inequality in disposable income and consumption and covariance.
- ③ These macroeconomic shocks are translated to inequality mainly by affecting variance in permanent income.
- ④ A shock to inflation and unemployment do not affect inequality.

Summary of results

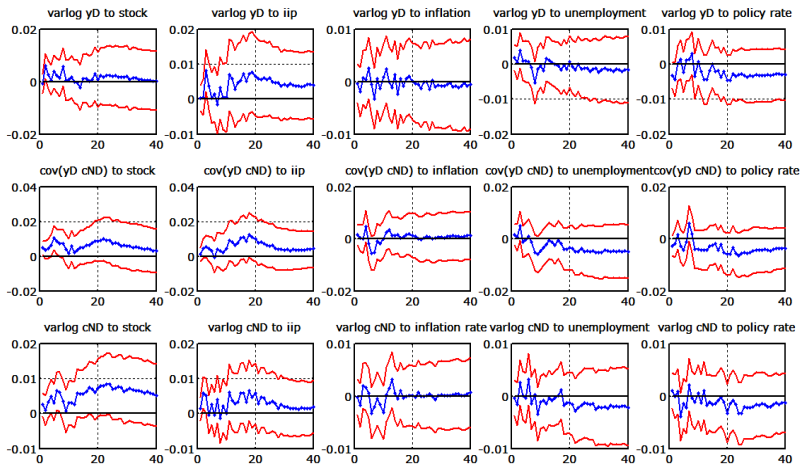
- **Shocks to macrovariables are not the dominant but important shocks to inequality movements.**

Shocks	var yD			cov			var cND		
	I	II	III	I	II	III	I	II	III
stock	.03	-.02	.01	.03	-.05	.04	.08	-.05	.03
iip	.02	.04	.02	.02	.01	.02	.02	.02	.02
unemployment	-.00	.01	.02	-.04	.02	.03	-.00	.02	.02
inflation	.01	.01	.01	.01	.01	-.02	.01	.02	-.00
policy rate	.01	.01	.00	.03	-.02	-.02	.02	.00	.00
varlog yD	.17	-.03	-.13	.09	-.02	-.06	.04	.01	-.01
cov(yD, cND)	.01	.02	-.00	-.02	.08	-.08	.01	.01	.02
varlog cND	-.00	-.01	.03	.01	.00	-.01	.06	.06	-.07
total	.25	.03	-.03	.14	.05	-.09	.24	.07	.00

where I covers 81-90, II covers 91-00, and III covers 01-80.

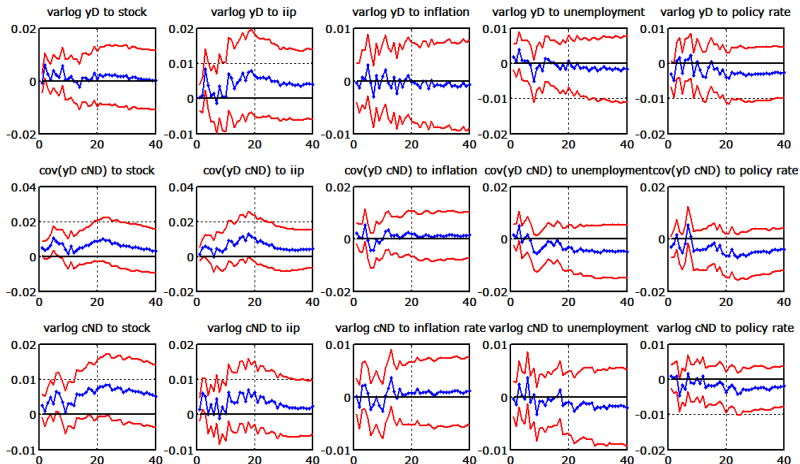
Response of inequality to macro shocks

- Baseline model, Cholesky



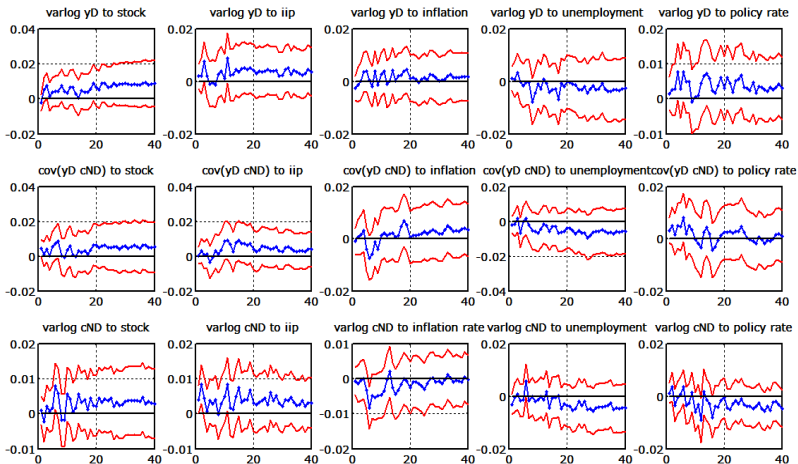
Response of inequality to macro shocks

- Baseline model, Generalized impulse



Response of inequality to macro shocks

- Baseline model, Cholesky, sample ends in Jan. 1999



Identification using standard consumption theory

- Consumption theory provides following identification conditions.

$$\Delta \text{var}(y_D(t)) = \text{var}(v_P(t)) + \text{var}(\Delta v_T(t)) + \varepsilon_{yD}(t),$$

$$\Delta \text{cov}(y_D(t), c_{ND}(t)) = \text{var}(v_P(t)) + \varepsilon_{yDcND}(t), \text{ and}$$

$$\Delta \text{var}(c_{ND}(t)) = \text{var}(v_P(t)) + \varepsilon_{cND}(t) \text{ or}$$

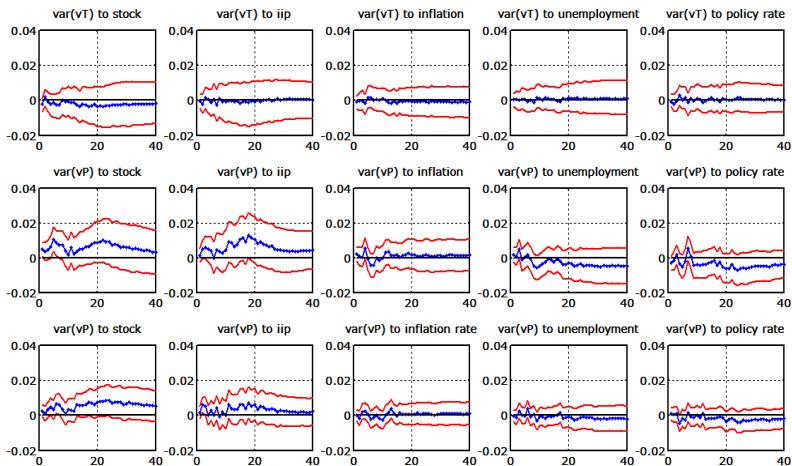
$$\Delta \text{var}(c_{ND}(t)) = \text{var}(v_P(t)) + \text{var}(v_A(t)) + \varepsilon_{cND}(t) \text{ or}$$

where $v_P(t)$ and $v_T(t)$ are permanent shock and transitory shock to income, and $\varepsilon_{yD}(t)$, $\varepsilon_{yDcND}(t)$, and $\varepsilon_{cND}(t)$ are shocks to variance of y_D , covariance, and variance of c_{ND} . $v_A(t)$ is non-income factor that affects consumption inequality such as asset. We further assume v_t is not serially correlated.

- We estimate how $\text{var}(v_P(t))$, $\text{var}(v_T(t))$, and $\text{var}(v_A(t))$ react to macroeconomic shocks.

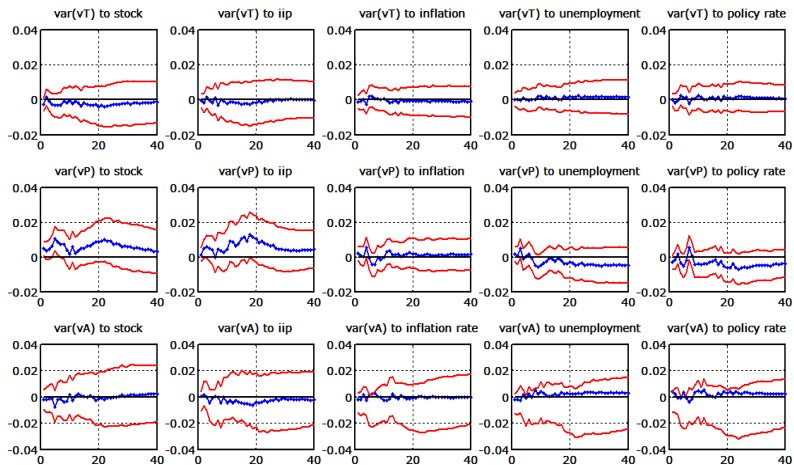
Response of variances to macro shocks

- Baseline model, decomposition using standard consumption theory I



Response of variances to macro shocks

- Baseline model, decomposition using standard consumption theory II



Identification following Blundell, Pistaferri, Preston (2008)

- Model of Blundell, Pistaferri, Preston (2008) provides following identification conditions.

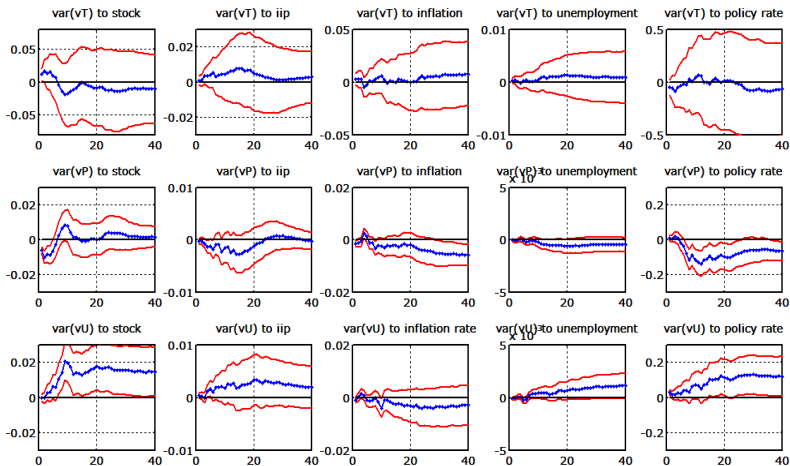
$$\begin{aligned}\Delta \text{var}(y_D(t)) &= \text{var}(v_P(t)) + \text{var}(\Delta v_T(t)) + \varepsilon_{yD}(t), \\ \Delta \text{cov}(y_D(t), c_{ND}(t)) &= \phi \text{var}(v_P(t)) + \psi \text{var}(v_T(t)) + \varepsilon_{yDcND}(t), \\ \Delta \text{var}(c_{ND}(t)) &= \phi^2 \text{var}(v_P(t)) + \psi^2 \text{var}(v_T(t)) + \text{var}(v_u(t))\end{aligned}$$

where $v_P(t)$, $v_T(t)$, $v_u(t)$ is permanent shock to income, transitory shock to income, and shock to higher moment of income process, and $\varepsilon_{yD}(t)$, $\varepsilon_{yDcND}(t)$, and $\varepsilon_{cND}(t)$ are shocks to variance of y_D , covariance, and variance of c_{ND} . We assume v_t is not serially correlated.

- Following Blundell, Pistaferri, Preston (2008), we further assume that ϕ and ψ are 0.6 and 0.06, respectively.
- We estimate how $\text{var}(v_P(t))$, $\text{var}(v_T(t))$ and $\text{var}(v_u(t))$ react to macroeconomic shocks.

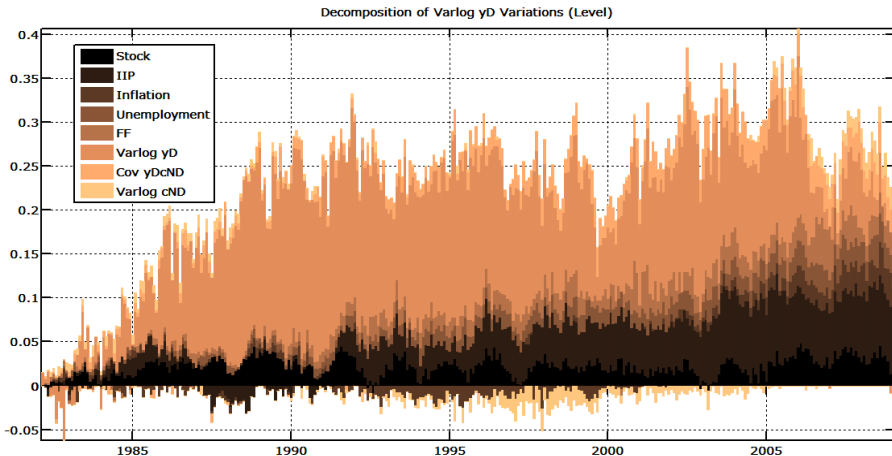
Response of variances to macro shocks

- Baseline model, decomposition following Blundell, Pistaferri, Preston



Contribution of macroeconomic variables to Inequality

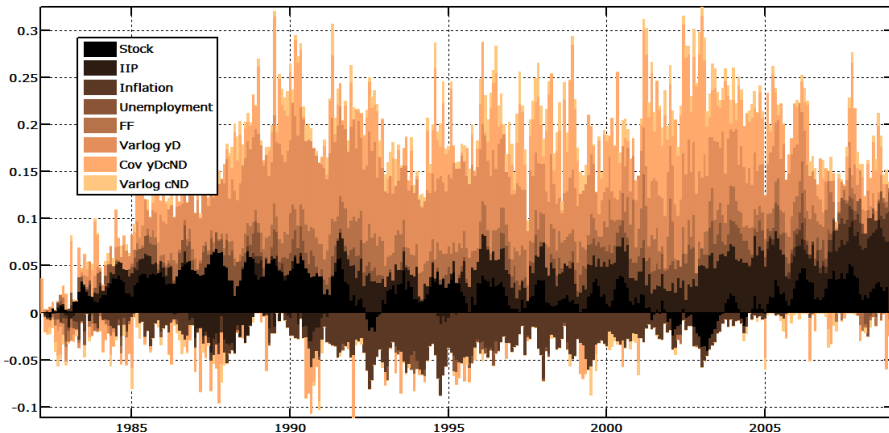
- Decomposing $\text{varlog } yD$, baseline model



Contribution of macroeconomic variables to Inequality

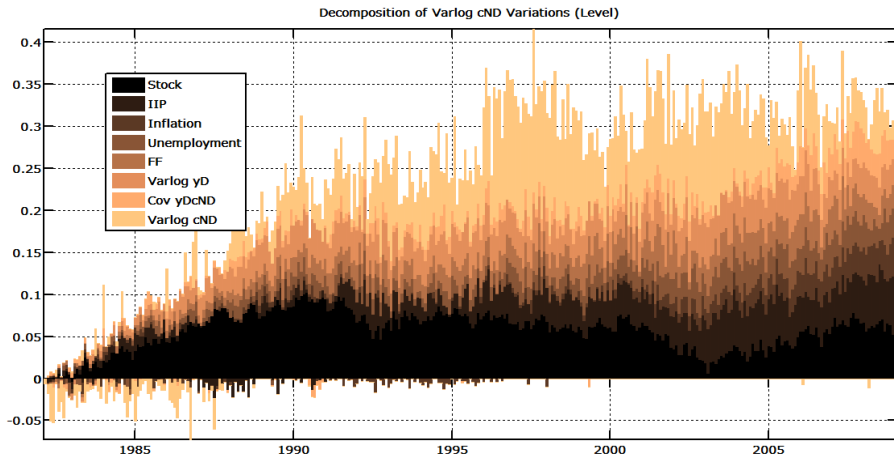
- Decomposing cov $yDcND$, baseline model

Decomposition of Cov $yDcND$ Variations (Level)



Contribution of macroeconomic variables to Inequality

- Decomposing varlog cND, baseline model



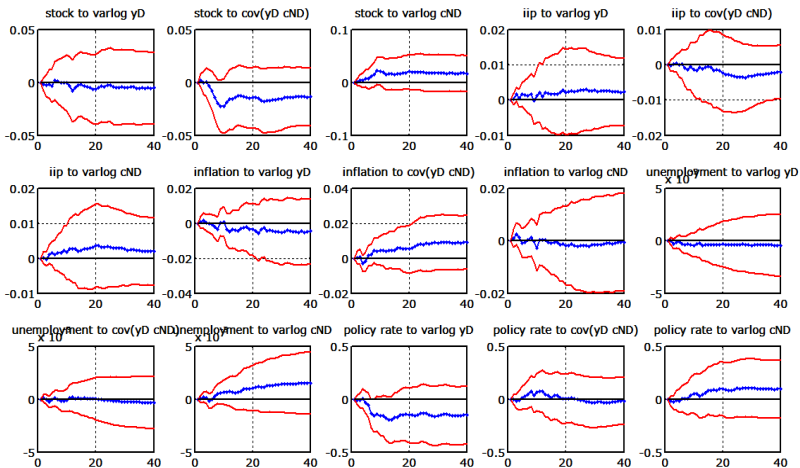
Results (2)

Response of macro to inequality shocks

- **Inequality shocks do not affect macro variables.**
- ① Inequality shocks do not affect macroeconomic variables in statistically significant manner in baseline model.
- ② Under the alternative model, a positive shock to inequality do not affect macro variables except that it lowers policy rate.
- **The bulk of variations in macroeconomic variables are attributed to macro shocks and not to inequality shocks.**

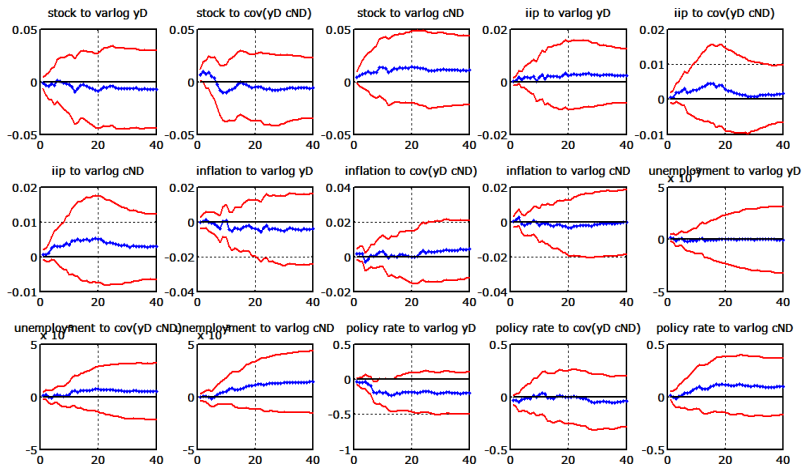
Response of macro to inequality shocks

- Baseline model, Cholesky



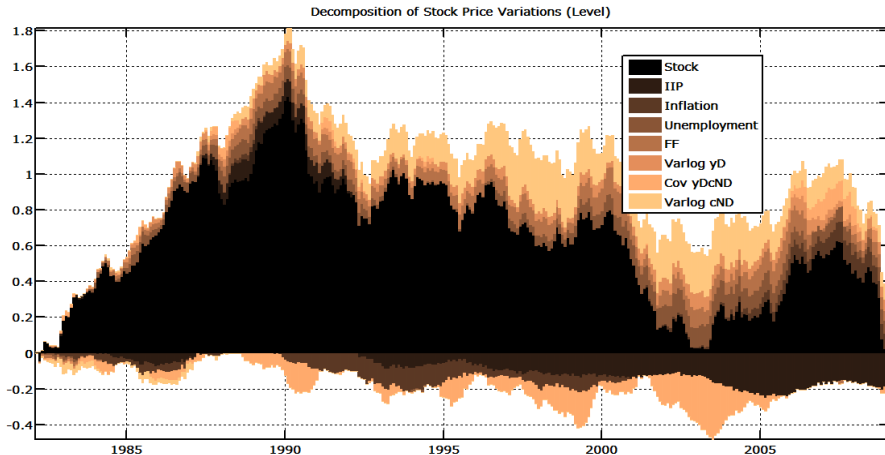
Response of macro to inequality shocks

- Baseline model, Generalized Impulse



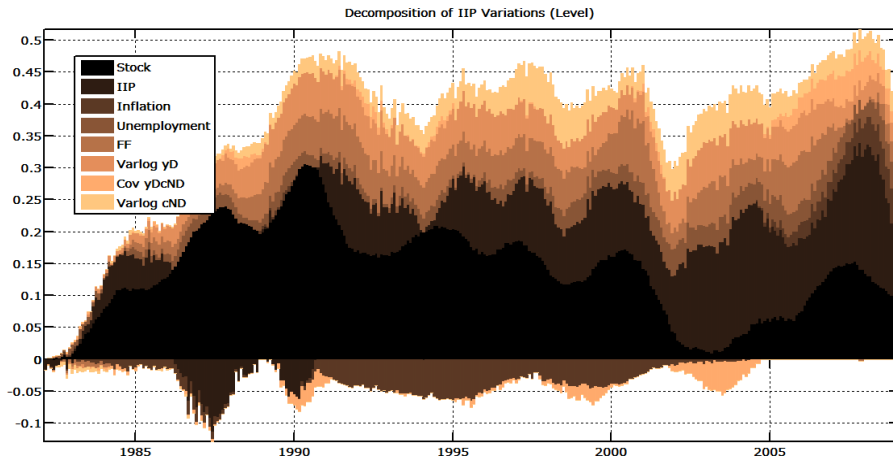
Contribution of inequality to macroeconomic variables

- Decomposing stock price variations to shocks



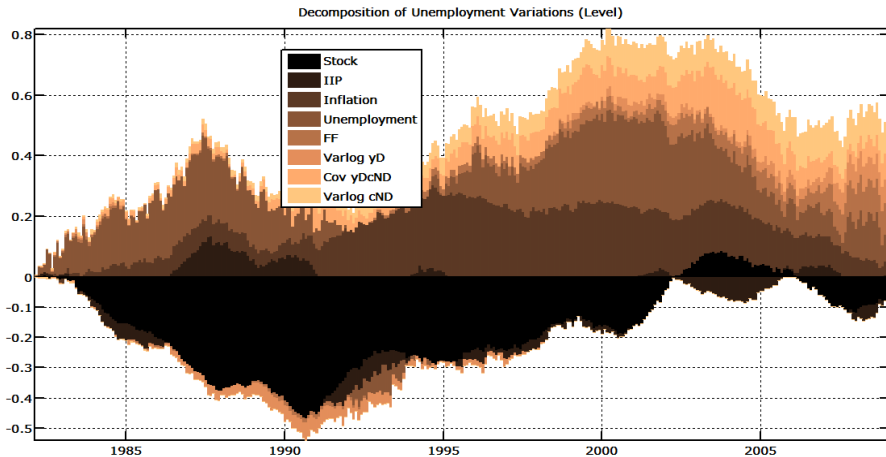
Contribution of inequality to macroeconomic variables

- Decomposing IIP variations to shocks



Contribution of inequality to macroeconomic variables

- Decomposing unemployment variations to shocks



3. Our findings:

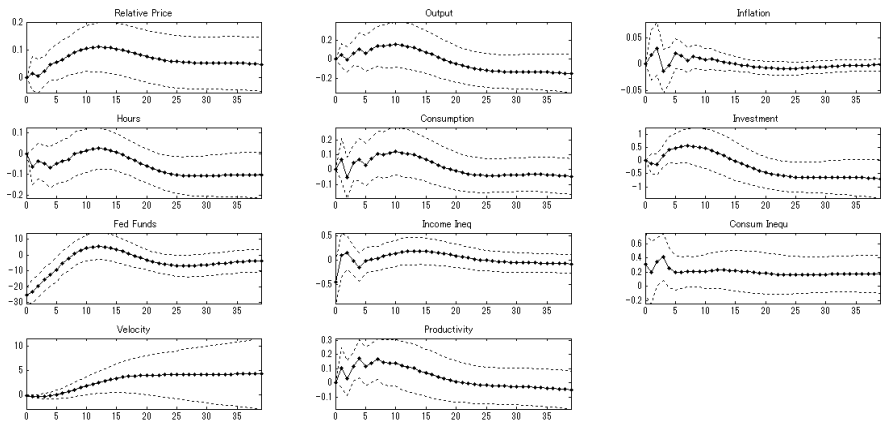
- Shocks to some macroeconomic variables significantly affect inequality.
- Shocks to stock, iip, and policy rate affect inequality mainly by changing variance in permanent income.
- Macroeconomic shocks are an important driver of income and consumption inequality.

- Shocks to inequality do not affect macroeconomic variables significantly.
- Inequality shocks are not a important driver of macroeconomic variables.

Thank you

Response of inequality to FF shock

• ACEL



Response of inequality to FF shock

- FAVAR

