Macroprudential Regulation and the Role of Monetary Policy

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Effective Macroprudential Instruments - University of Nottingham

November 14th 2014

Introduction 1/2

- The recent Great Recession has emphasized the linkages between the financial system, banking regulation and real economy.
- Basel Accords - setting the global standards for banking regulation.
- Basel II (and the new Basel III): risk weights on loans are endogenous and may change throughout the cycle.
- Problems with more volatile risk weights:
    - intensify a credit crunch.
    - may amplify an economic downturn (increased procyclicality).

Introduction 2/2

- "We are all macroprudentialists now" - Claudio Borio. What tools can mitigate procyclicality and foster financial stability?
  - Countercyclical Bank Capital Buffers (Basel III proposal); Angelini et al. (2014), Christiensen et al. (2012), among others.
  - Monetary Policy reacting to Financial Imbalances; Curdia and Woodford (2010), De Fiore and Tristani (2013), among others.
  - Interaction between Monetary Policy and Countercyclical Regulation (N'Diaye (2009), Kannan et al. (2012) and Angeloni and Faia (2013)).

Research Focus and Contribution

- Policy oriented paper with microeconomic foundations, a borrowing cost channel, nominal price and wage rigidities.
  - Endogenous risk of firm default.
  - Default costs in the banking sector
  - Role for bank capital, risk shocks and macroprudential policies.
- Should central banks respond to price inflation in periods of financial distress?
  - Our results cast doubt on existing inflation targeting practices by central banks following credit shocks.
- Role of Macroprudential Policy?
  - Significant role for countercyclical regulation following both technology and credit shocks.
  - Targeted approach allows standard monetary policy to focus on the demand channel
  - Augmented Taylor rules can help alleviate wage deflation following credit shocks

The Model

- 5 type of agents: households, a final good firm, intermediate good firms, competitive commercial banks, and a central bank.
- Utility maximising Households consume, hold deposits, demand bank capital and supply differentiated labour to IG firms (via labour aggregator). Also own all firms and the commercial bank.
- Households - Consumption, Savings and Bank Capital Decision
  - Euler Equation,

$$C_t^{-\frac{1}{\varsigma}} = \beta E_t R_t^D \frac{P_t}{P_{t+1}} C_{t+1}^{-\frac{1}{\varsigma}} \tag{1}$$

  - Interest rate on bank capital - no arbitrage condition,

$$R_t^V = \frac{R_t^D}{(1 - \xi_t^V)} \tag{2}$$

- Households demand higher return on bank capital due to default costs ξ_{t-1}^V in the banking sector.

Intermediate Good Firms 1/2

- Similar to Agénor, Bratsiotis and Pfajfar (2014).
- IG firms use homogenous labour supplied by the labour aggregator to produce a distinct good,

$$Y_{j,t} = Z_{j,t} N_t \quad \text{where, } Z_{j,t} = A_t \varepsilon_{j,t} \tag{3}$$

- Each IG firm borrows from commercial bank to pay wages to households: $L_{j,t} = W_t^R N_t$
- Default occurs when the expected value of seizeable output is less than the amount that needs to be repaid to the bank,

$$\chi_t Y_{j,t} < R_t^L L_{j,t}. \tag{4}$$

with χ_t representing the probability of banks recovering collateral.

- Defining $\varepsilon_{j,t}^{F,M}$ as the threshold value below which firms default, the above yields,

$$\varepsilon_{j,t}^{F,M} = \frac{1}{\chi_t A_t} R_t^L W_t^R \tag{5}$$

Intermediate Good Firms 2/2

- Pricing of intermediate goods subject to Calvo (1983) nominal price rigidities. 1st stage: IG producer minimizes the expected cost of employing labour (taking its' effective costs as given),

$$mc_{j,t} = \left(R_t^L W_t^R \right) / Z_{j,t} \tag{6}$$

- 2nd stage: IG firms choose optimal prices - standard NKPC (in log-linear terms),

$$\widehat{\pi_t^P} = \beta E_t \widehat{\pi_{t+1}^P} + \frac{(1-\omega_p)(1-\omega_p\beta)}{\omega_p} \widehat{mc_t} \tag{7}$$

- Marginal Cost and thus inflation depend on the loan rate behaviour, which in turn is determined by the policy rule, bank capital regulation, risk of default and banking sector losses - borrowing cost channel.

Commercial Bank 1/5

- The bank raises funds through deposits and bank capital,

$$L_t = D_t + V_t \tag{8}$$

- Bank's break even condition from lending to IG firms. In default states, bank can either recover collateral ($Y_{j,t}$) with probability χ_t or recover nothing at probability $(1 - \chi_t)$.

$$\int_{\varepsilon_{j,t}^{F,M}}^{\bar{\varepsilon}^F} \left[R_t^L L_{j,t} \right] f(\varepsilon_{j,t}^F) d\varepsilon_{j,t}^F + \int_{\underline{\varepsilon}^F}^{\varepsilon_{j,t}^{F,M}} \left[\chi_t Y_{j,t} \right] f(\varepsilon_{j,t}^F) d\varepsilon_{j,t}^F$$
$$= R_t^V V_t + R_t^D D_t + cV_t, \tag{9}$$

- where $f(\varepsilon_{j,t}^F)$ is the probability density function of $\varepsilon_{j,t}^F$.

- Using the bank's balance sheet equation, the production function, the threshold condition, the break even condition reduces to,

$$R_t^L = (V_t/L_t)\left(R_t^V + c\right) + \left(1 - (V_t/L_t)\right)R_t^D + + \frac{\chi_t A_t \int_{\underline{\varepsilon}^F}^{\varepsilon_t^{F,M}} \left[\varepsilon_t^{F,M} - \varepsilon_t^F\right] f(\varepsilon_{j,t}^F)\, d\varepsilon_{j,t}^F}{W_t^R} \qquad (10)$$

- The lending rate is related to the deposit (policy) rate, the finance premium and the bank capital-deposit rate spread (set as a proportion of the bank capital-loan ratio).
- For probability of default, it is assumed that ε_t^F follows uniform distribution over the interval $\left(\underline{\varepsilon}^F, \bar{\varepsilon}^F\right)$.Thus:

$$\Phi_t = \int_{\underline{\varepsilon}^F}^{\varepsilon_t^{F,M}} f(\varepsilon_t^F)\, d\varepsilon_t^F = \frac{\varepsilon_t^{F,M} - \underline{\varepsilon}^F}{\bar{\varepsilon}^F - \underline{\varepsilon}^F} \qquad (11)$$

Commercial Bank 3/5

- A fraction $(1-\chi_t)$ of banks make a loss since they are unable to retrieve collateral in the default states.
- Households, who invest in bank capital in all banks, know the aggregate level of firm default and can calculate aggregate losses in the banking sector - require a higher return for holding bank capital (ξ_t^V).
- Bank capital must cover for these losses: $\xi_t^V V_t = (1-\chi_t)\left[\int_{\underline{\varepsilon}^F}^{\varepsilon_{j,t}^{F,M}} [\chi_t Y_{j,t}]\, f(\varepsilon_{j,t}^F) d\varepsilon_{j,t}^F\right]$, yielding the bank capital premium rate,

$$\xi_t^V = (1-\chi_t)\frac{L_t}{V_t}\left(\frac{\chi_t A_t}{W_t^R}\right)\left(\frac{\varepsilon_t^{F,M}+\underline{\varepsilon}^F}{2}\right)\Phi_t \qquad (12)$$

- Bank capital requirements (Basel II) can initially solve the market failure associated with losses in the banking sector - reduces loan rate volatility (Admati and Hellwig (2014), Barth et al (2004)). However, dominating effect - risk of default; bank capital default channel.

Commercial Bank 4/5

- The bank must issue an amount of capital which covers a given percentage of loans for IG firms,

$$V_t = \rho^D \vartheta_t \rho_t^C L_t \tag{13}$$

- Basel I The term $\rho^D \in (0, 1)$ denotes the minimum capital adequacy requirements, also known as the Cooke Ratio (set by legislation),
- Basel II-Under the IRB approach where the risk weight is related to the probability of default,

$$\vartheta_t = \left(\frac{\Phi_t}{\Phi} \right)^q \tag{14}$$

- Basel III - capital adequacy ratio moves in response to deviations in loan to GDP ratio, viewed as a good measure for financial risk (BCBS 2011).

$$\rho_t^C = \left(\frac{L_t / Y_t}{L / Y} \right)^{\theta^C} \tag{15}$$

Commercial Bank 5/5

- Using the characteristics of the uniform distribution, and equations (2), (11), (12), (13) , (14) and (15). the lending rate equation (10) reduces to,

$$R_t^L = R_t^D + \left[\rho^D \left(\frac{\Phi_t}{\Phi}\right)^q \left(\frac{L_t/Y_t}{L/Y}\right)^{\theta^C}\right](R_t^V - R_t^D + c) \quad (16)$$
$$+\frac{1}{2}\left(\frac{\chi_t A_t}{W_t^R}\right)\frac{(\bar{\varepsilon} - \underline{\varepsilon})}{2}\Phi_t^2$$

- The probability of default affects the lending rate through: the risk premium channel, bank capital default channel and risk weight channel - financial accelerator effect. Policy rule affects the loan rate through monetary policy cost channel. Countercyclical regulation under Basel III can attenuate accelerator effect.

Central Bank

- The central bank targets the short term refinance rate (R_t^{cb}) according to the following Taylor-type policy rule,

$$R_t^{cb} = \left[\left(R^{cb} \right) \left(\frac{\pi_t^P}{\pi^{P,T}} \right)^{\phi_\pi} \left(\frac{Y_t}{Y} \right)^{\phi_Y} \left(\frac{L_t / Y_t}{L/Y} \right)^{\phi_L} \right]^{1-\phi} \left(R_{t-1}^{cb} \right)^{\phi} \tag{17}$$

  where $\phi \in (0,1)$ is the degree of interest rate smoothing and $\phi_\pi, \phi_y > 0$ coefficients measuring the relative weights on inflation and output deviations from steady state, respectively.

- New term in Macroprudential Taylor Rule: $\left(\frac{L_t / Y_t}{L/Y} \right)^{\phi_L}$; *"lean against the wind"* type of monetary policy, central bank reacting to deviations in credit to GDP ratio.

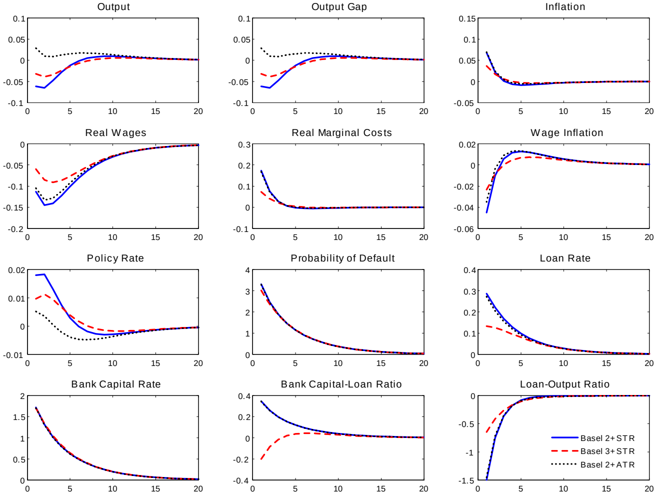
Calibration

- Most parameters within the range of Christiano et al. (2005) and Smets and Wouters (2007).
- Specific parameters unique to this model: probability of bank recovering collateral $\chi = 0.97$; bank capital adequacy ratio, $\rho^D = 0.08$ (consistent with the Basel Accords); elasticity of risk weight with respect to probability of default, $q = 0.05$ (Covas and Fujita 2010).
- For illustration at first: Basel III countercyclical parameter $\theta^C = 10$, weight on loan to output ratio Taylor Rule $\phi_{L/Y} = 0.06$.

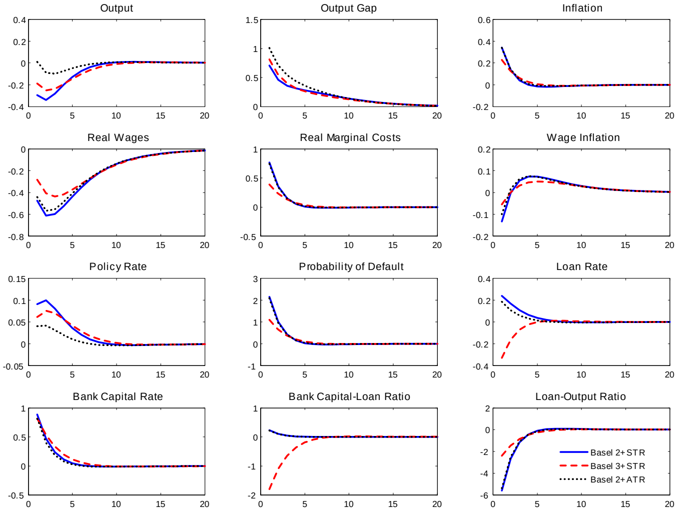
Simulations

- Examinations of 3 different regimes:
  - Basel II+Standard TR ($\theta^C = 0, \phi_L = 0$, solid blue)
  - Basel III + Standard TR ($\theta^C = 10, \phi_L = 0$, dashed red)
  - Basel III + Augmented TR ($\theta^C = 0, \phi_L = 0.06$, dotted black)

Adverse Financial Shock



Adverse Supply Shock



Discussion

- Countercyclical rule may be a more effective tool in stabilizing the financial variables and inflation (via borrowing cost channel)
- Output can be further stabilized using a policy rate tool reacting modestly also to deviations in the loan-output ratio.
- However, a rise in output increases inflationary pressures (standard demand channel); Trade off between output and inflation with a borrowing cost channel.
- What should be the role of financial regulation and monetary policy?

Monetary Policy, Macroprudential Policy and Welfare

- Aim: Minimize a central bank loss function $Loss_t = \frac{\lambda_p}{k_p} var(\widehat{\pi_t^P}) + (\varsigma^{-1} + \gamma)\, var(\widehat{Y_t^g}) + \frac{\lambda_w}{k_w} var(\widehat{\pi_t^W})$ subject to policy rules $(\phi_\pi, \phi_Y, \phi_L$ and $\theta^C)$.

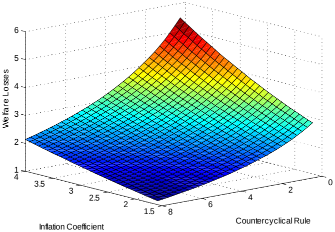
Optimal Policy	ϕ_π	ϕ_Y	ϕ_L	θ^C
Credit Shocks	0.5	5	0.9	10
Supply Shocks	1.05	0	0	10

- With a more standard loss function $Loss_t = \frac{\lambda_p}{k_p} var(\widehat{\pi_t^P}) + (\varsigma^{-1} + \gamma)\, var(\widehat{Y_t^g})$

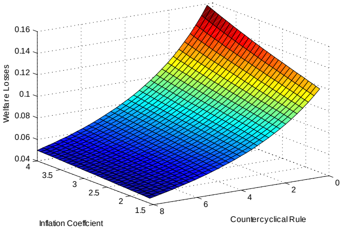
Optimal Policy	ϕ_π	ϕ_Y	ϕ_L	θ^C
Credit Shocks	0.1	3.2	0	10
Supply Shocks	3.3	0	0	10

Relationship Between ϕ_{π}, θ^{C} and Decomposition of Welfare Losses - Credit Shocks

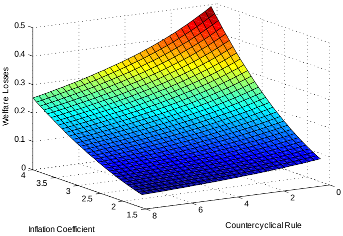
Total Losses



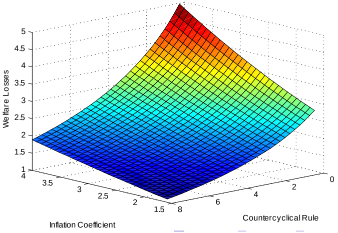
Price Inflation Losses



Output Gap Losses

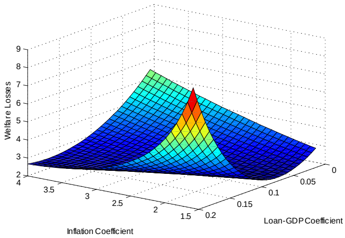


Wage Inflation Losses

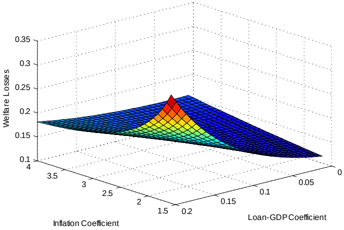


Relationship Between ϕ_π, ϕ_L and Decomposition of Welfare Losses - Credit Shocks

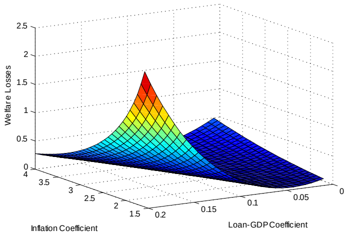
Total Losses



Price Inflation Losses



Output Gap Losses



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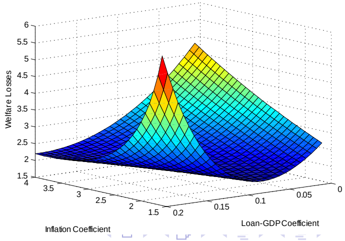
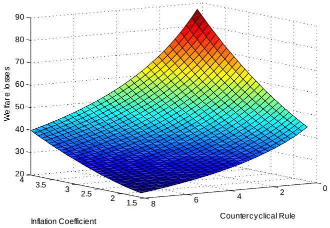


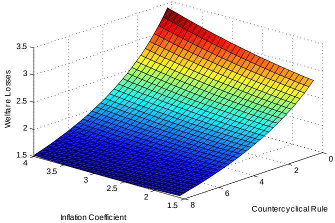
Monetary Policy, Macroprudential Policy and Welfare

Relationship Between ϕ_π, θ^C and Decomposition of Welfare Losses - Supply Shocks

Total Losses



Price Inflation Losses



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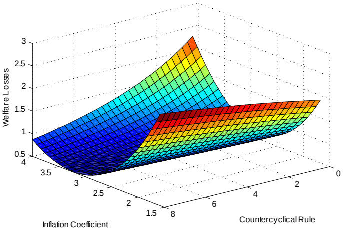
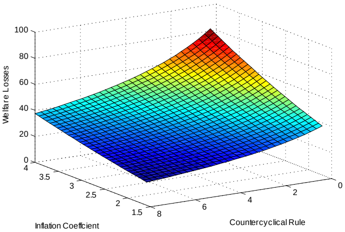
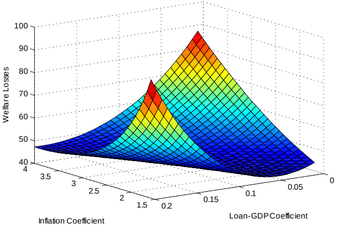


Wage Inflation Losses

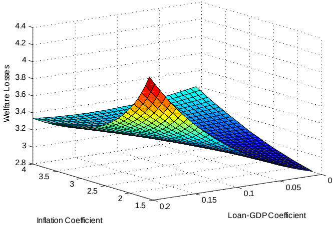


Relationship Between ϕ_π, ϕ_L and Decomposition of Welfare Losses - Supply Shocks

Total Losses



Price Inflation Losses



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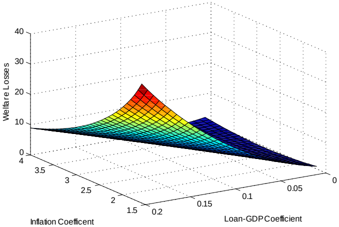
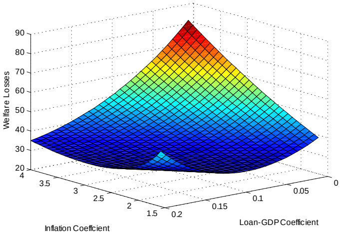


Wage Inflation Losses



Conclusion

- Probability of default impacts the loan rate through multiple channels: bank capital default channel, risk premium channel and risk weight channel. Also provides an acceleration mechanism in the model. CCR moderates accelerator effect.
- Borrowing cost channel links between the financial sector and real economy and is affected by credit frictions, regulatory requirements and monetary policy.
- Credit Shocks: CCR can achieve the anti-inflation target of MP. In this state, central banks should react mainly to GDP and financial indicators and less to price inflation. Standard Inflation Targeting TR - welfare detrimental.
- Supply Shocks: CCR can restore the traditional hawkish stance of monetary policy, which in combination yield the lowest welfare losses. No role for a "lean against the credit cycle" monetary policy.