Nominal Stability and Financial Globalization

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- Globalization and inflation – what are the links? What is the causation?
    - Lots of literature 1995-2008 suggested that globalization had contained inflation pressures
        - Trade effects
        - Indirect effects on policy
    - FRBD Annual Report 2005

      "By exerting monetary discipline and spurring productivity growth, globalization has led to more stable prices. The U.S. has found itself with tamer inflation and faster growth than would have been possible without globalization."

- Focus globalization in international financial markets
- External gross portfolio positions have increased very substantially over the past 40 years
- Over the same period there's been a substantial fall in the level and volatility of inflation - a shift in the focus of monetary policy towards inflation stabilisation
- **As suggested above, most literature has suggested link from Financial Globalization to low inflation/stable inflation**
- **This paper looks at causation in opposite direction:** Has the increased monetary policy focus on nominal stability (inflation stabilization) resulted in greater financial globalisation – expansion in gross external portfolio positions?

- **Aim:** to provide an investigation of the impact of monetary policy and nominal stability on the size of external asset positions in a general theoretical model where gross external financial positions are *endogenous*

- Preliminary **empirical evidence** suggests that country pairs and time periods with more stable inflation rates had higher cross country financial flows

- **Theoretical Result:** Monetary policy which reduces the variability of inflation leads to a diversification of international portfolios, generating larger gross external assets and liabilities
  - Extremely robust implication of model of endogenous portfolio composition
  - Holds across a wide variety of modelling specifications and parameter variations – supported by some empirical evidence

- Related Literature
  - Globalization and inflation
    - Rogoff 2005
    - Chen Imbs and Scott 2007
    - Borio and Filardo 2007
    - Tytell and Wei 2004
  - Home bias in portfolios
    - Couerdacier et al, 2009
    - Engel Matsumoto, 2009
    - Benigno and Nistico, 2011
  - Determinants of financial globalization
    - Lane and Milesi Ferretti 2008
    - Faruquee Li and Yan, 2004
    - Okawa and Van Wincoop 2010
    - Devereux and Sutherland 2008

- **Empirical Evidence**
  - Panel regressions on relationship between gross positions and inflation variability

$$100 \ln(GP_{i,t}/GDP_{i,t}) = \beta_0 + \beta_1 \sigma_{i,t}(\pi) + \beta_2 Open_{i,t}$$

  - G22 countries, 1970-2007

$$GP = \frac{(Total\ External\ Assets + Total\ External\ Liabilities)}{2}$$

Figure 1: Average of G7 data (excluding Germany)

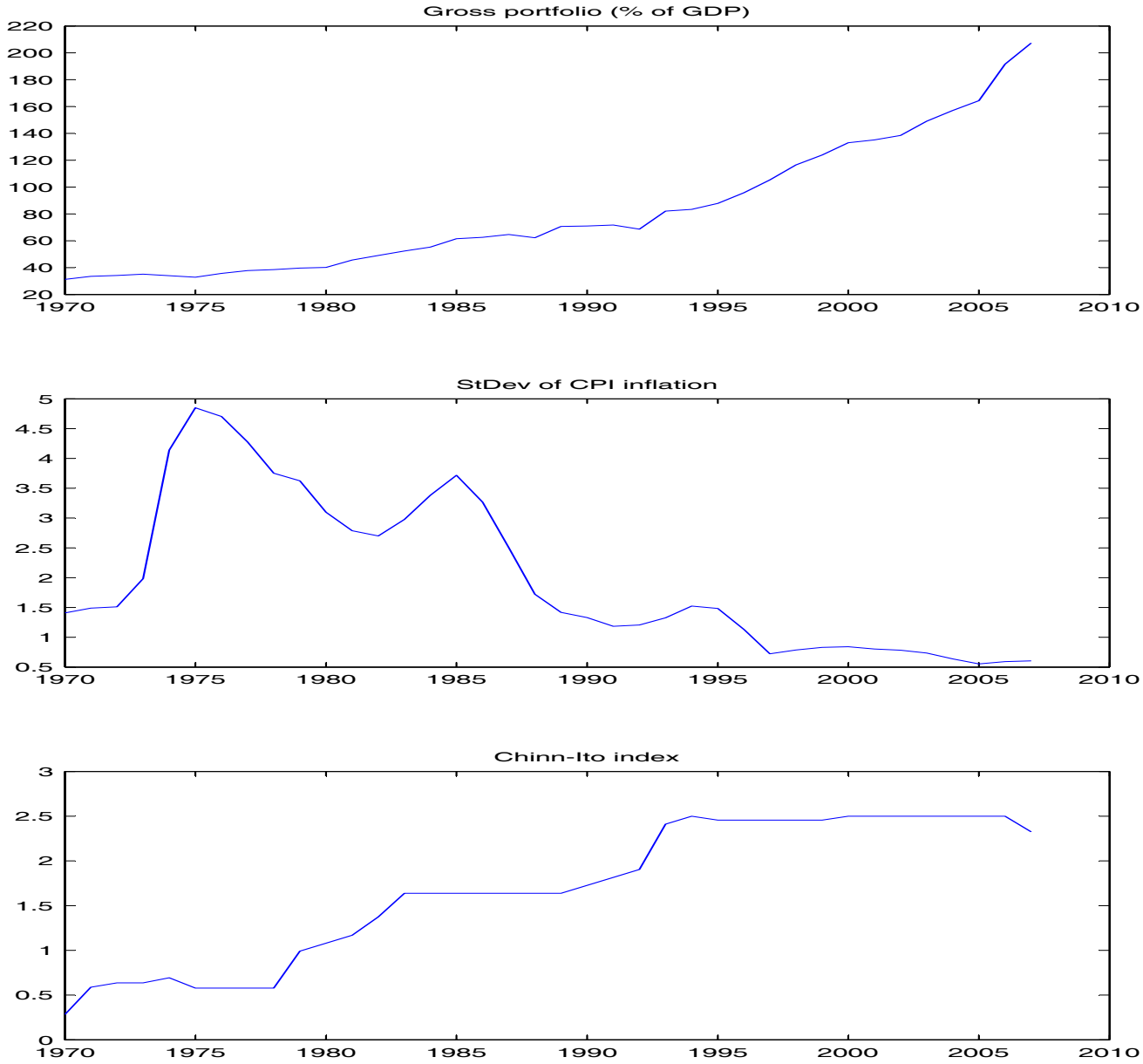


Table 2: Panel regression results

	(1) G7 Total portfolio	(2) G7 Total portfolio	(3) G7 Equities	(4) G7 Debt	(5) G22 Total portfolio	(6) G22 Equities	(7) G22 Debt
Constant	-194.2***	-219.4***	-400.0***	-217.6***	-262.2***	-486.2***	-269.0***
	(30.45)	(8.71)	(14.33)	(7.62)	(12.02)	(15.10)	(10.56)
StDev	-5.12***	-3.20***	-2.06*	-3.45***	-1.11*	-0.72	-1.10*
Inflation	(4.36)	(3.94)	(1.65)	(3.92)	(1.85)	(0.83)	(1.74)
Chinn-Ito	7.20***	2.38	6.18**	1.87	2.77**	2.47	3.17**
Index	(4.18)	(1.36)	(2.32)	(0.98)	(2.14)	(1.33)	(2.33)
Trend	4.41***	6.16***	8.75***	4.42***	7.46***	11.66***	5.82***
	(24.35)	(10.02)	(12.13)	(6.39)	(18.13)	(19.25)	(12.31)
AR coeff		0.92	0.89	0.92	0.91	0.91	0.92
R^2	0.94	0.99	0.99	0.99	0.99	0.99	0.98

- Quantitative implication 1 percent fall in standard deviation of inflation – rise in gross position by 5 percent of GDP

- Over sample, implies rise of 25% of GDP on average

- **The General Model**

- Two-country DSGE model with sticky nominal prices - Calvo contracts
- Differentiated home and foreign goods, produced using labour
- Home bias in preferences
- Stochastic shocks to productivity, tastes and nominal interest rates
- International trade in nominal bonds and equities
- Devereux and Sutherland (2011) approach to solve for equilibrium gross portfolios

- Monetary policy takes the form of a Taylor rule

$$i_{Ht} = \rho i_{Ht-1} + \delta Y_{Ht} + \chi \pi_{Ht} \qquad i_{Ft} = \rho i_{Ft-1} + \delta Y_{Ft} + \chi \pi_{Ft}$$

π: CPI inflation

- A shift towards inflation stabilisation as a policy objective is represented as an increase in χ

- By varying the feedback coefficient on inflation χ, we analyse the relationship between:
  - anti-inflation stance of monetary policy
  - variance of inflation
  - the size of equilibrium gross holdings of equities and bonds

- Semi-analytical solutions - expressions for equilibrium portfolios

$$\tilde{\alpha}_e = \frac{1}{2}\text{corr}\left(\zeta_{y,t}, r^e_{x,t}|r^b_{x,t}\right)\frac{\text{StDev}\left(\zeta_{y,t}|r^b_{x,t}\right)}{\text{StDev}\left(r^e_{x,t}|r^b_{x,t}\right)}$$

$$\tilde{\alpha}_b = \frac{1}{2}\text{corr}\left(\zeta_{y,t}, r^b_{x,t}|r^e_{x,t}\right)\frac{\text{StDev}\left(\zeta_{y,t}|r^e_{x,t}\right)}{\text{StDev}\left(r^b_{x,t}|r^e_{x,t}\right)}$$

$$\Gamma_{y,t+1} = E_{t+1}\sum_{j=0}^{\infty}\beta^j\left(\Delta y_{t+1+j} + \frac{(\rho-1)}{\rho}q_{t+1+j}\right)$$

$$\zeta_{y,t+1} = \Gamma_{y,t+1} - E_t\Gamma_{y,t+1} \quad r^e_{x,t} = r^e_t - r^{*e}_t \quad r^b_{x,t} = r^b_t - r^{*b}_t$$

α_E = gross holdings of Foreign equity by Home

α_B = gross holdings of Foreign bonds by Home

- Two separate effects linking a reduction in inflation variability to an increase in the size of gross portfolio positions:
  - return-income correlation effect
  - return variability effect

Return-income correlation effect: $corr(y_D, r_x^E \mid r_x^B)$

- Agents hold assets to hedge against shocks to relative income
- Extent to which asset *i* is a good hedge depends on the correlation between return on asset *i* and relative income shocks
- An asset which is for example negatively correlated with income shocks is a good hedging instrument – will be held with positive gross position
- The more relative asset returns are correlated (positively or negatively) with income shocks, the more of the asset will be held - larger equilibrium gross holdings

Return variability effect: $\frac{StDev(y_D \mid r_x^B)}{StDev(r_x^E \mid r_x^B)}$

- Size of fluctuations in relative income relative to the size of fluctuations in the return of asset *i* also determines the amount of asset *i* held to hedge against income shocks

- The larger the volatility in income relative to volatility in the return on asset *i*, the larger must be the gross position in asset *i* to provide the desired degree of hedging

- Paper derives some analytical expressions for equilibrium portfolio holdings based on a simplified version of the general model and shows how these depend on the parameters of the monetary policy rule

- Present the results of the general model using a numerical analysis

The link between inflation variability and variability of bond returns:

Real return on bonds $r_H^B = i_H - \pi_H$ $\quad$ $r_F^B = i_F - \pi_F$

- nominal interest rate is riskless
- unanticipated shocks to CPI inflation directly impact on real return on bonds - so all risk comes from CPI inflation
- lower volatility of CPI inflation (high χ) means lower volatility of real bond returns
- lower variability of bond returns requires larger gross positions to provide the desired level of hedging

The link between inflation variability and variability of equity returns:

- Real return on equities depends on profits and thus on the mark-up
- Output prices are sticky (for some firms) but nominal marginal costs are correlated with CPI inflation
- CPI inflation variability means variability in the mark-ups and profit margins
- So stabilising CPI inflation, higher χ, stabilises mark-ups and profits and therefore lowers variability of real returns on equity
- Lower variability of real returns on equity leads to larger gross positions

The link between inflation variability and the correlation between relative income and asset returns

- Inflation volatility causes extraneous noise related to monetary factors in the real return on assets
- This partly undermines the hedging efficiency of assets against shocks
- So, a monetary rule which focuses on inflation stabilisation reduces the extraneous noise in the real return on bonds and equities
- This increases the correlation between asset returns (equity and bond) and relative income
- This improves the hedging efficiency of both bonds and equities and therefore increases the size of equilibrium positions in bonds and equities

Results:

- As χ, policy feedback coefficient on inflation, is increased:
  - the variance of inflation falls
  - the absolute size of equilibrium gross positions in equities and bonds increase
- This negative relationship between CPI inflation volatility and size of gross positions is very robust across different model specifications and parameter variations
- Show in some special cases, and then in general case

- Special cases: Say one period ahead pricing at rate 1-κ, and only IID shocks to productivity, no home bias, and linear labor supply

- Case of Equities Only

$$\text{StDev}\left(\zeta_{y,t}\right) = \frac{(\chi/\delta)(\theta-1)(1-\kappa)}{\chi/\delta+\kappa\theta} 2\sigma_a$$

$$\text{corr}\left(\zeta_{y,t}, r^e_{x,t}\right) = 1$$

$$\text{StDev}\left(r^e_{x,t}\right) = (1-\beta)\frac{\kappa(\lambda-1)\theta+(\chi/\delta)[\theta-1+\kappa(\lambda-\theta)]}{\chi/\delta+\kappa\theta} 2\sigma_a$$

$$\tilde{\alpha}_e = \frac{1}{2}\frac{1}{(1-\beta)}\frac{(\chi/\delta)(\theta-1)(1-\kappa)}{\kappa(\lambda-1)\theta+(\chi/\delta)[\theta-1+\kappa(\lambda-\theta)]}$$

- Then Correlation =1 This is always the case with complete markets
- Higher χ reduces standard deviation of relative equity returns
- Higher χ raises standard deviation of relative PV of real exchange rate adjusted income returns
- Then for $\theta>1$ increases the position in foreign equities

- Case of Bonds only is even easier

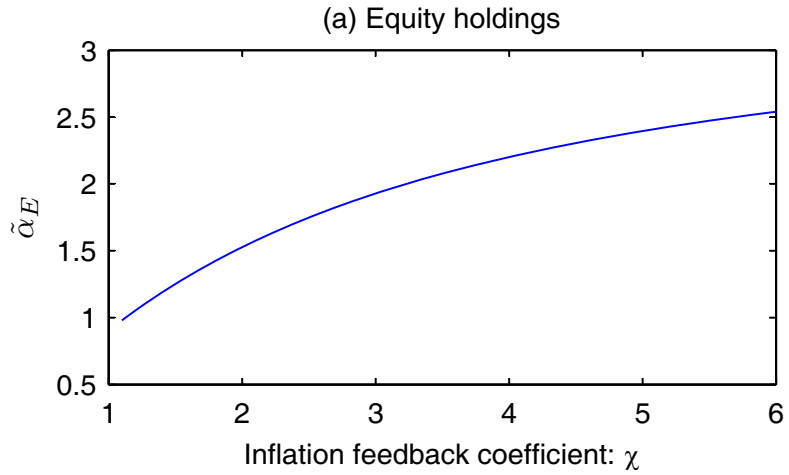
$$\text{StDev}\left(\zeta_{y,t}\right) = \frac{(\chi/\delta)(\theta-1)(1-\kappa)}{\chi/\delta+\kappa\theta}2\sigma_a$$

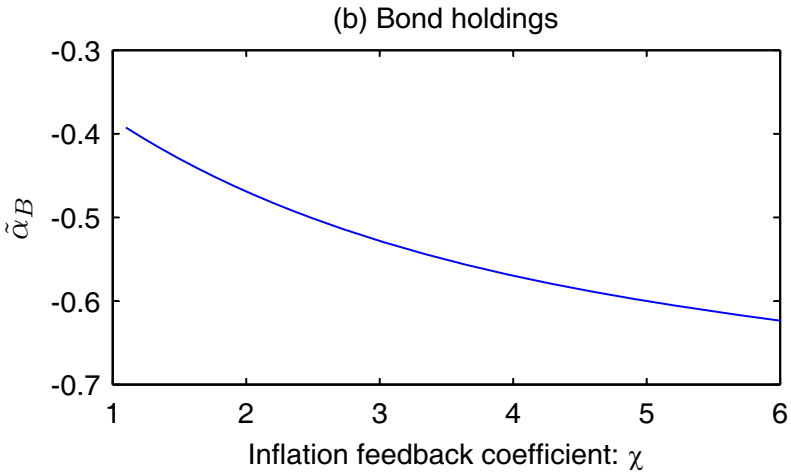
$$\text{corr}\left(\zeta_{y,t}, r^b_{x,t}\right) = 1$$

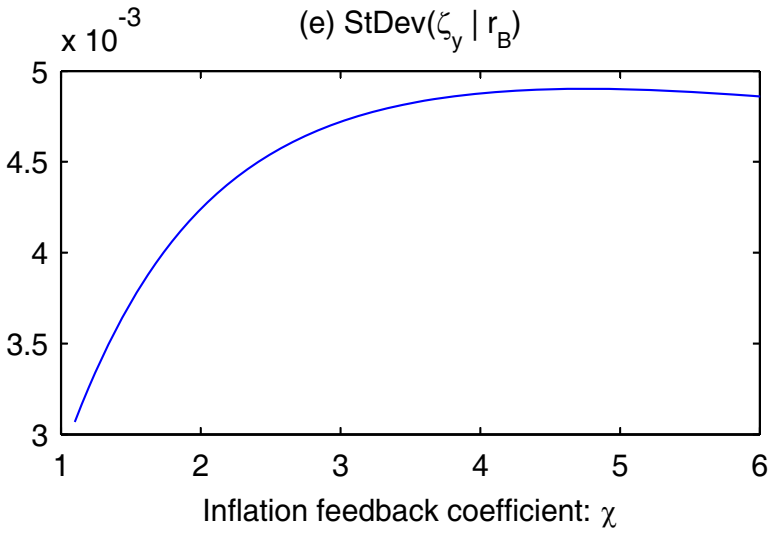
$$\text{StDev}\left(r^b_{x,t}\right) = \frac{\theta(1-\kappa)}{\chi/\delta+\kappa\theta}2\sigma_a$$

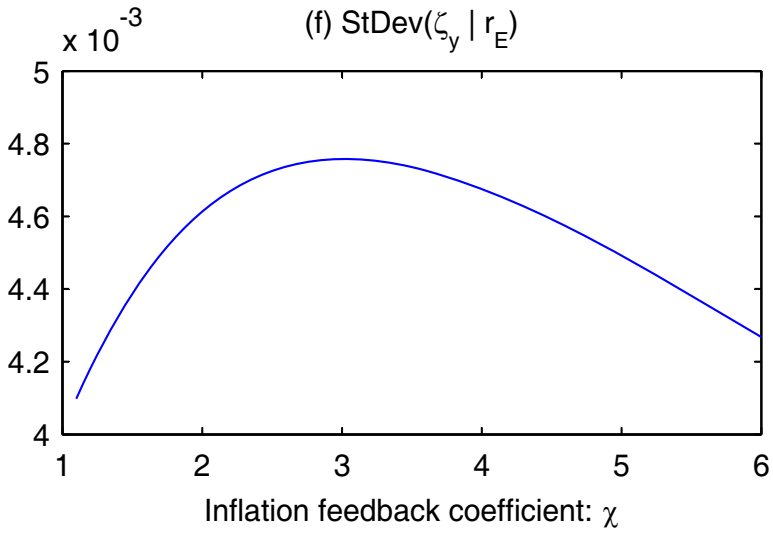
$$\tilde{\alpha}_b = \frac{1}{2}\frac{(\chi/\delta)(\theta-1)}{\theta}$$

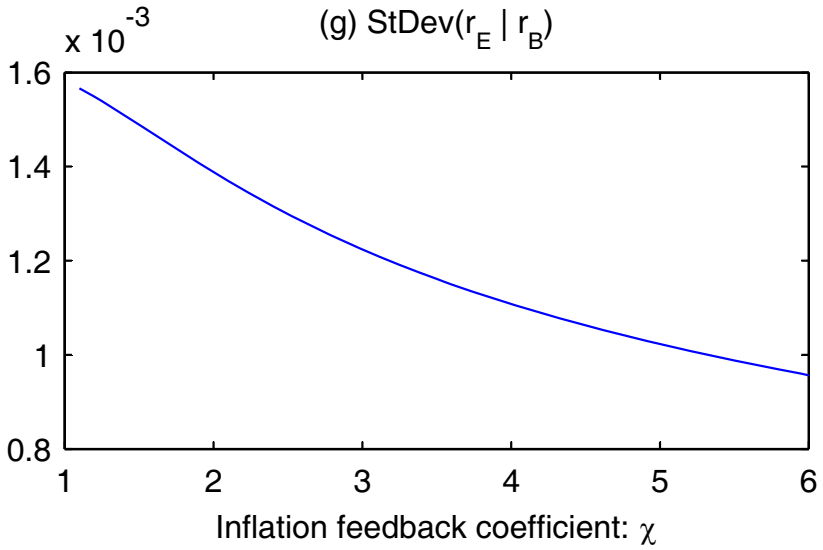
Benchmark Model: General Case

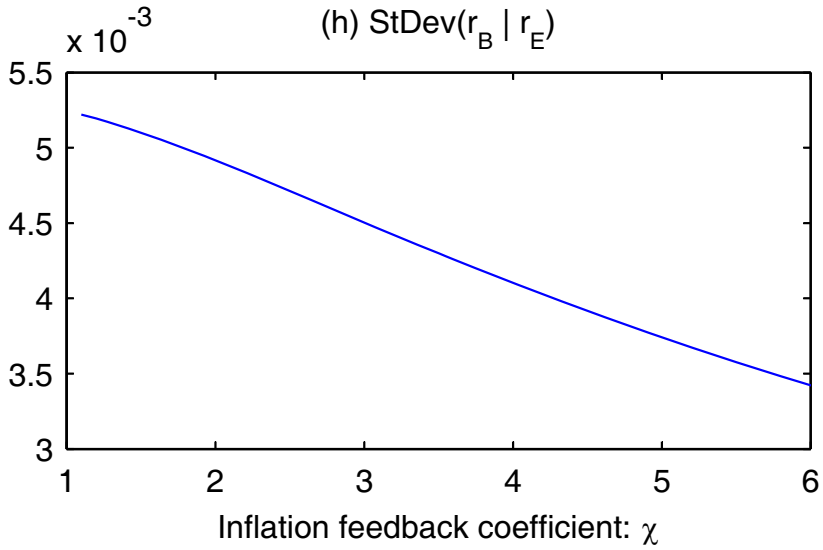


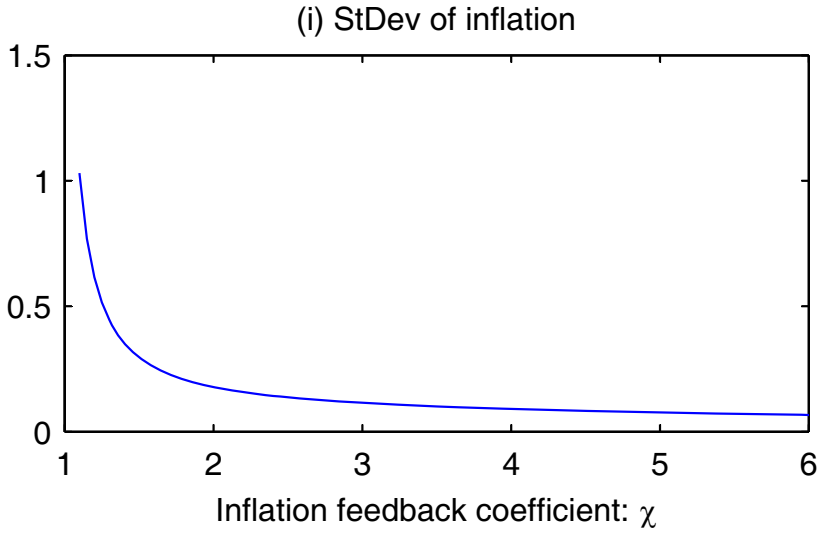


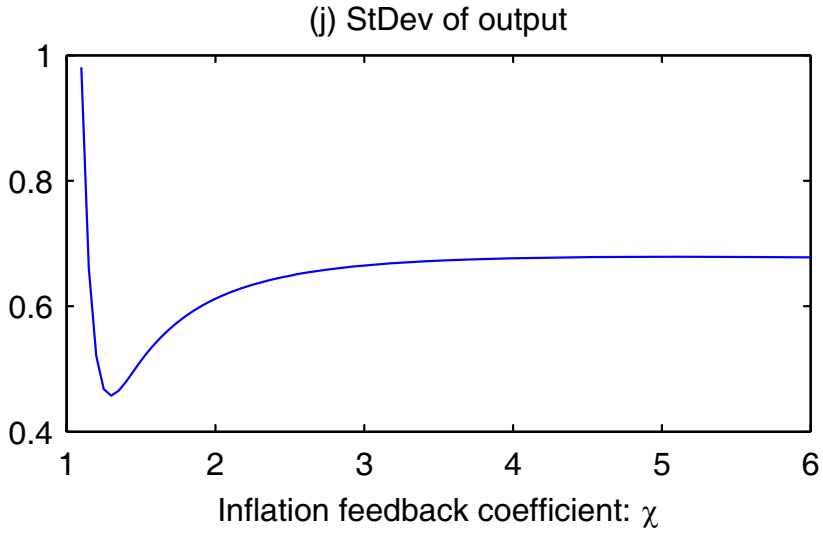




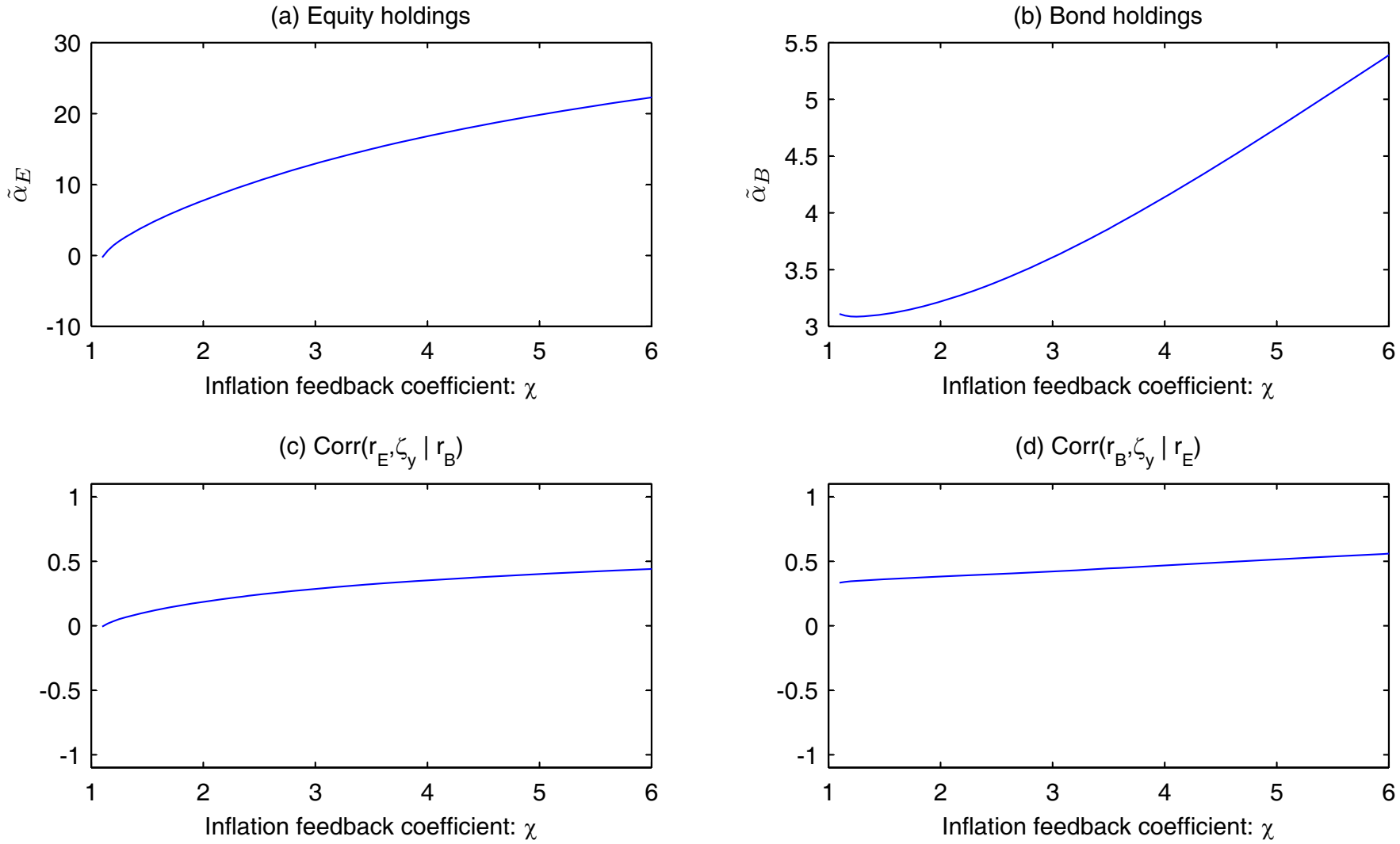

(g) StDev(r_E | r_B)
x 10^-3
1.6
1.4
1.2
1
0.8
1
2
3
4
5
6
Inflation feedback coefficient: χ


(h) StDev(r_B | r_E)
x 10^-3
5.5
5
4.5
4
3.5
3
1
2
3
4
5
6
Inflation feedback coefficient: χ


(i) StDev of inflation
1.5
1
0.5
0
1
2
3
4
5
6
Inflation feedback coefficient: χ


(j) StDev of output
1
0.8
0.6
0.4
1
2
3
4
5
6
Inflation feedback coefficient: χ

Extended Model: Incomplete Markets



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- This is case of Devereux and Sutherland (2008)

- In all cases, higher inflation stability reduces conditional variance of relative returns
- But Impact on conditional variance of innovations in relative income can go either way
- The results do not require that standard deviation of relative income innovations are increasing
    - Evidence on this is mixed – more below

Summary of Results:

- With sticky nominal prices, a monetary policy which stabilises inflation reduces the variability of real asset returns which increases equilibrium gross positions in equities and bonds – *variability* effect

- Stabilising CPI inflation tends to increase the correlation between asset returns and income – *correlation* effect – this reinforces the variability effect

- These results are found to be robust across a wide range of model specifications and parameter variations

- Plausibility
  - Lower Variability in relative asset returns
    - Bonds – fall in exchange rate volatility among major currencies
    - Equities – some evidence of increase in cross country correlation in equity returns – fall in relative return volatility
  - Rise in relative output volatility?
    - Heathcote and Perri 2002
    - Stock and Watson 2003
    - Some evidence goes other way
    - But results still hold even if relative output volatility falls

Conclusions

Paper makes a theoretical case for link between stable monetary policy and financial market globalization

No welfare consequences – monetary policy is not optimal

Empirical evidence is suggestive but not conclusive

Intuitive plausibility – hard to think of equivalent growth in global gross positions with monetary policies of the 1970's?