

Financial Contagion of the Global Financial Crisis from the US to other developed countries

By

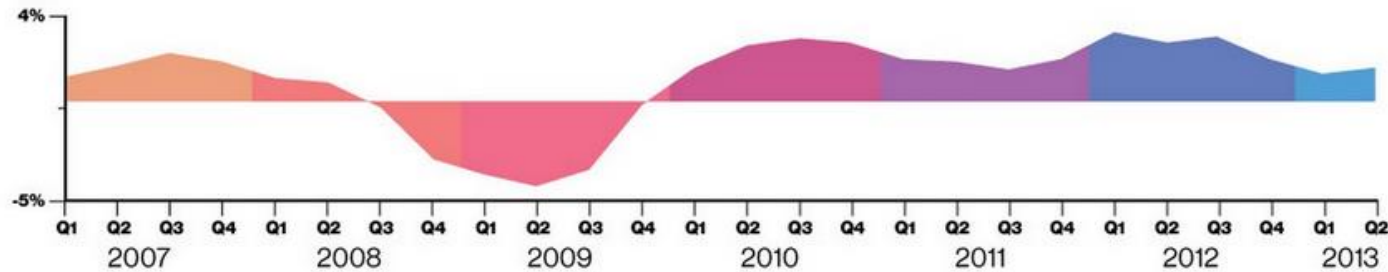
Sirin Tangpornpaiboon 5404641069

Agenda

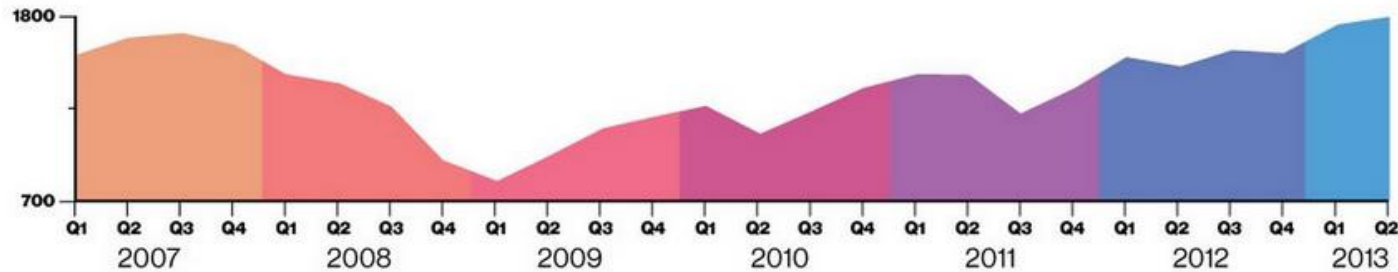
- Background on Global Financial Crisis and Financial Contagion
- Literature review
- Methodology
- Results and analysis
- Policy recommendations and conclusion

Background: Global financial crisis

U.S. GDP change, year-over-year



S&P 500-stock index



“

US crisis is the 'largest financial shock since Great Depression'

IMF, 2008

US Subprime mortgage crisis (2006)



Global financial crisis (2007-2009)



Great recession (2008-2012)

European sovereign debt crisis (2009)

Source: The Guardian 2008, Business Week

Background

Literature
review

Methodology

Results

Policy
recommendations

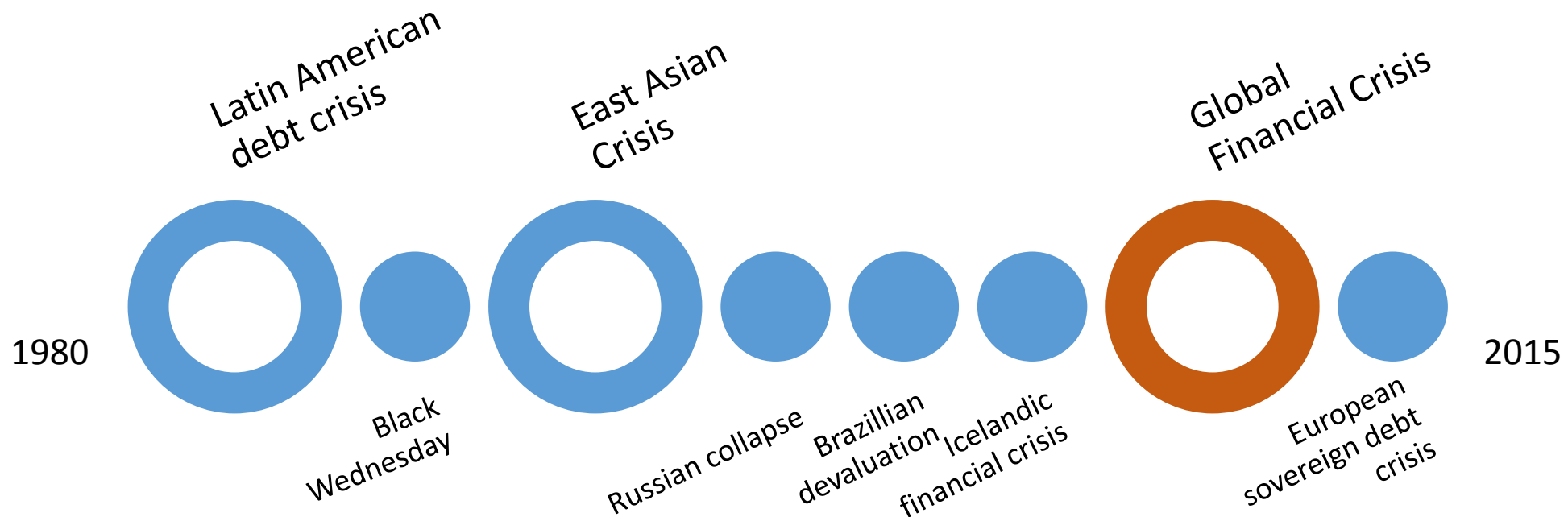
Conclusion

Background: Financial contagion



One striking characteristic of several of these crises was how an initial **country-specific** shock was **rapidly transmitted** to markets of very different sizes and structures **around the globe**.

Forbes and Rigobon, NBER



Background: Financial contagion's causes

Contagion through financial market

- **Investment loss:** Loss of European and other developed countries' multinational firms that have portfolios or invest directly in the US.
- **Liquidity constraint:** US firms and investors facing liquidity constraint withdraw funds from other developed countries.
- **Irrational investors' behaviors:** Investors become more risk averse after the recession and withdraw their funds from the market. Herding behaviors can also be used to explain the behaviors.

Contagion through trade linkages

- **Macroeconomics similarity:** Investors pull out funds from countries with similar macroeconomics conditions because they believe the same problems would arise in those countries as well.
- **Trade spillover:** Currency devaluation improves the crisis country's competitiveness and lessen other countries' competitiveness.

Literature review (Main papers)

Papers	Variables	Methodology	Results
Financial Market Contagion in the Asian Crisis (Baig and Goldfajn)	Nominal exchange rates, stock returns, interest rates, and sovereign spread	Correlation coefficient and VAR analysis	Evidence of financial contagion in stock market but weaker evidence in exchange rates
International Contagion in the Global Financial Crisis (Huang, Lin, and Chen)	Daily stock returns between the US and 26 European countries	Correlation coefficient and EGARCH model	Contagion effect was confirmed and the causes involved are international investment, foreign direct investment, and trade
Financial contagion of the 2008 crisis: is there any evidence of financial contagion from the US to the Baltic states (Kuusk, Paas, Viikmaa)	Stock returns between the US and Baltic states	Correlation coefficient and ARCH-GARCH framework	Contagion effect was confirmed for stock returns but not for volatility

Background

Literature
review

Methodology

Results

Policy
recommendations

Conclusion

Literature review

Papers	Variables	Methodology	Results
The shift contagion effect of global financial crisis and the European debt crisis on OECD Countries (Kazi, Mehanaoui, and Akbar)	Weekly Wednesday to Wednesday returns in percentage terms of benchmark equity indices of 16 OECD countries including that of the U.S.	Multivariate asymmetric dynamic conditional correlation model	Evidence of contagion originated from the US during GFC but not from Greece during Greek sovereign debt crisis
Dynamic correlation analysis of financial contagion: Evidence from Asian markets (Chiang, Jeon, and Li)	Nine Asian daily stock-return data series from 1990 to 2003.	Dynamic conditional-correlation model	Evidence of contagion is confirmed. In the second phase, the correlation remains high, indicating herding behaviors.
Crisis Transmission: Global Financial crisis (Alam)	EMP-based crisis proxy is used for eight countries, which include Argentina, Brazil, Canada, Indonesia, Japan, Korea, Mexico and Russia	VAR and OLS estimation	Wake-up call and Cashin effects were the major contributing transmission channels for Global financial crisis.

Background

Literature
review

Methodology

Results

Policy
recommendations

Conclusion

Methodology

Two methods will be used to analyze financial contagion.

1. Correlation coefficient
2. VAR analysis

The analysis will focus on two main indicators.

1. Stock returns
2. Real Effective Exchange Rates

Methodology: data overview

Data used are monthly stock returns (2003-2015) and Real Effective Exchange Rates (REER) (1994-2014) from United States, Canada, United Kingdom, Germany, France, Italy, and Spain

Why monthly data?

- To prevent heteroskedasticity problem
- Relationships are still observable even with longer time frame

Why stock returns?

- Other researches use this measure
- Stock indexes did not give meaningful relationship comparing to returns

Why REER?

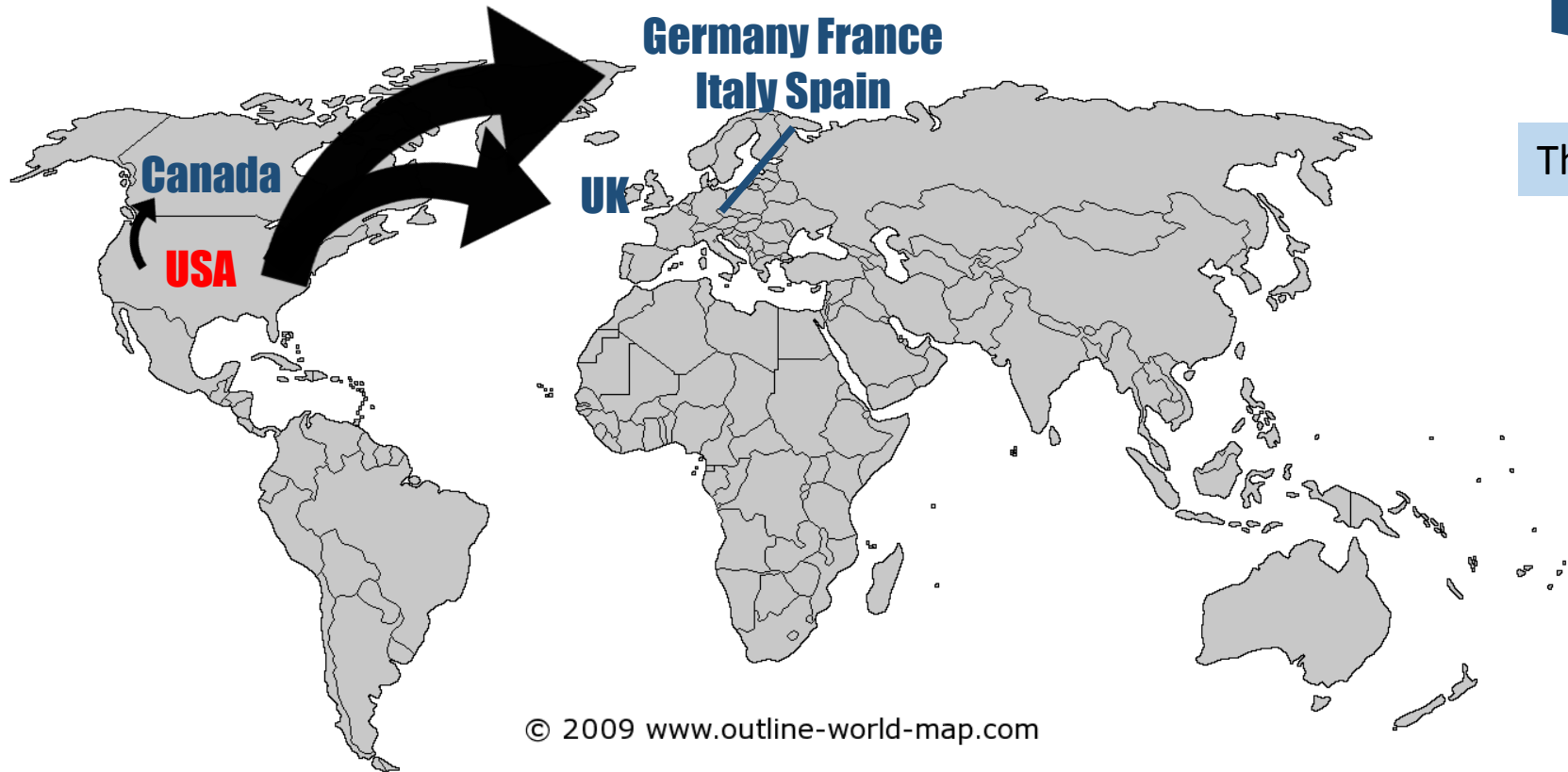
- Measures real purchasing power and competitiveness
- More meaningful than nominal exchange rates

Why developed countries?

- GFC had developed in the US and was spread to other developed countries faster due to high volume of trade

Methodology: correlation coefficient

Correlation coefficient will be used as a measure the degree of co-movement in stock returns and exchange rates.



As the crisis is originated from the US

The source of financial contagion is the US

We measure 6 pairs of countries as followed

- US-Canada
- US-UK
- US-Germany
- US-France
- US-Italy
- US-Spain

Methodology: correlation coefficient

For each country pair, correlation coefficients are measured in 3 different periods.

Stock returns

- Before the crisis (2003-2006) n=48
- During the crisis (2007-2009) n=36
- After the crisis (2010-2015) n=72

Real Effective Exchange Rates

- Before the crisis (1994-2006) n=156
- During the crisis (2007-2009) n=36
- After the crisis (2010-2014) n=59

$\rho_{US,j}^t$ measures correlation coefficient between US and country j

Hypothesis testing

$$H_0: \rho_{US,j}^0 \geq \rho_{US,j}^1$$

$$H_1: \rho_{US,j}^0 < \rho_{US,j}^1$$

- T=0 means tranquil period (Before and after the crisis)
- T=1 means crisis period

Source: CEIC database

Background

Literature
review

Methodology

Results

Policy
recommendations

Conclusion

Methodology: correlation (expected results)

Evidence of financial contagion is expected. We should reject H_0 in favor of H_1 .

Hypothesis testing

$$H_0: \rho_{US,j}^0 \geq \rho_{US,j}^1$$

$$H_1: \rho_{US,j}^0 < \rho_{US,j}^1$$

Correlation coefficient of the country pair during crisis is **not significantly greater** than correlation during tranquil times

Correlation coefficient of the country pair during crisis is **significantly greater** than correlation during tranquil times

No evidence of financial contagion

Evidence of financial contagion

Expected results

- Rejecting H_0 : There exists financial contagion
- Correlation coefficient is significantly higher during crisis period comparing to before and after the crisis

Methodology: VAR analysis

Problems with correlation coefficient analysis

- Correlation coefficient does not take into account the interconnectedness between markets
- During the crisis, it is hard to isolate the magnitudes of shocks originating in one market to another



Why Vector Auto-Regression?

- VAR recognizes endogeneity property of the variables
- VAR allows lagged terms to be included in the model

The models

Stock returns

$$Ret_t = A_0 + A_1(L)Ret_{t-1} + \alpha_t$$

Exchange rates

$$REER_t = A_0 + A_1(L)REER_{t-1} + \alpha_t$$

Ret_t (7×1) is the stock returns vector for the seven countries.

A_0 (7×1) is the vector of constants for the seven countries

A_1 (7×7) is the matrix of interactive stock returns.

α_t (7×7) represents random shock.

Use information of 2007-2009 during the crisis period

Akaike Information Criteria (AIC) is used in finding optimal lagged term as it best fits the data.

Methodology: VAR analysis (expected results)

Stock returns

$$Ret_t = A_0 + A_1(L)Ret_{t-1} + \alpha_t$$

Impulse response functions from the US to other countries should be positive (Move in the **same** direction)

Other countries react negatively to the decrease in US stock returns

Exchange rates

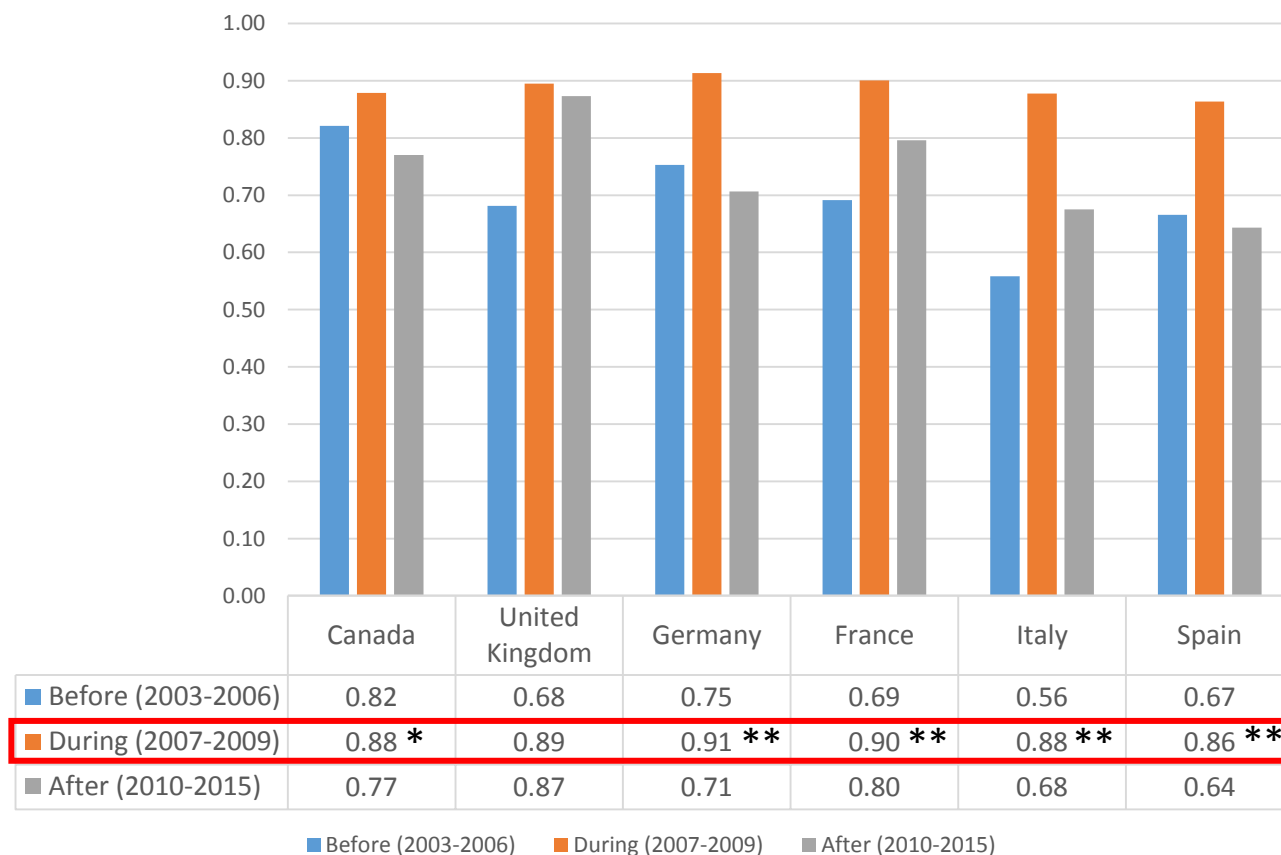
$$REER_t = A_0 + A_1(L)REER_{t-1} + \alpha_t$$

Impulse response functions from the US to other countries should be negative (Move in the **different** direction)

When US depreciated, other countries' currency should appreciate in real terms (negative relationship)

Results: Correlation coefficient of stock returns

Correlation coefficient of stock returns



* Significant at 10% level of confidence ** Significant at 5% level of confidence

Source: CEIC database

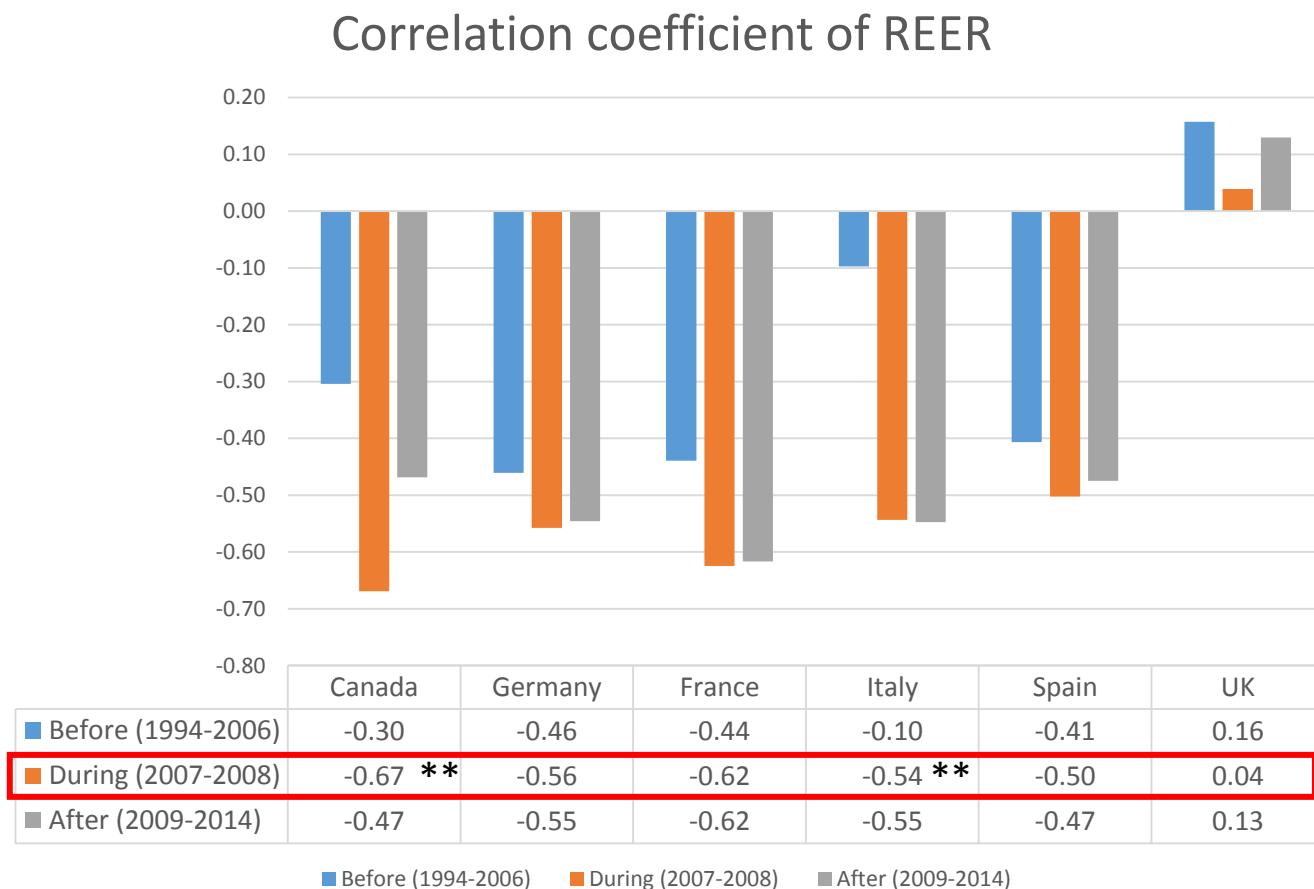
Key findings

- Stock returns in developed countries closely move together. Correlation coefficients are relatively high.
- From the correlation number, the evidence seems to favor the hypothesis of financial contagion.

A statistical test needs to be done to test the correlation coefficient's significance.

- The evidence of financial contagion is strong at 5% level of significance in all countries except UK.
- UK had significantly increased its correlation during the crisis but after, it's correlation remains high.

Results: Correlation coefficient of exchange rates



* Significant at 10% level of confidence **Significant at 5% level of confidence

Source: CEIC database

Key findings

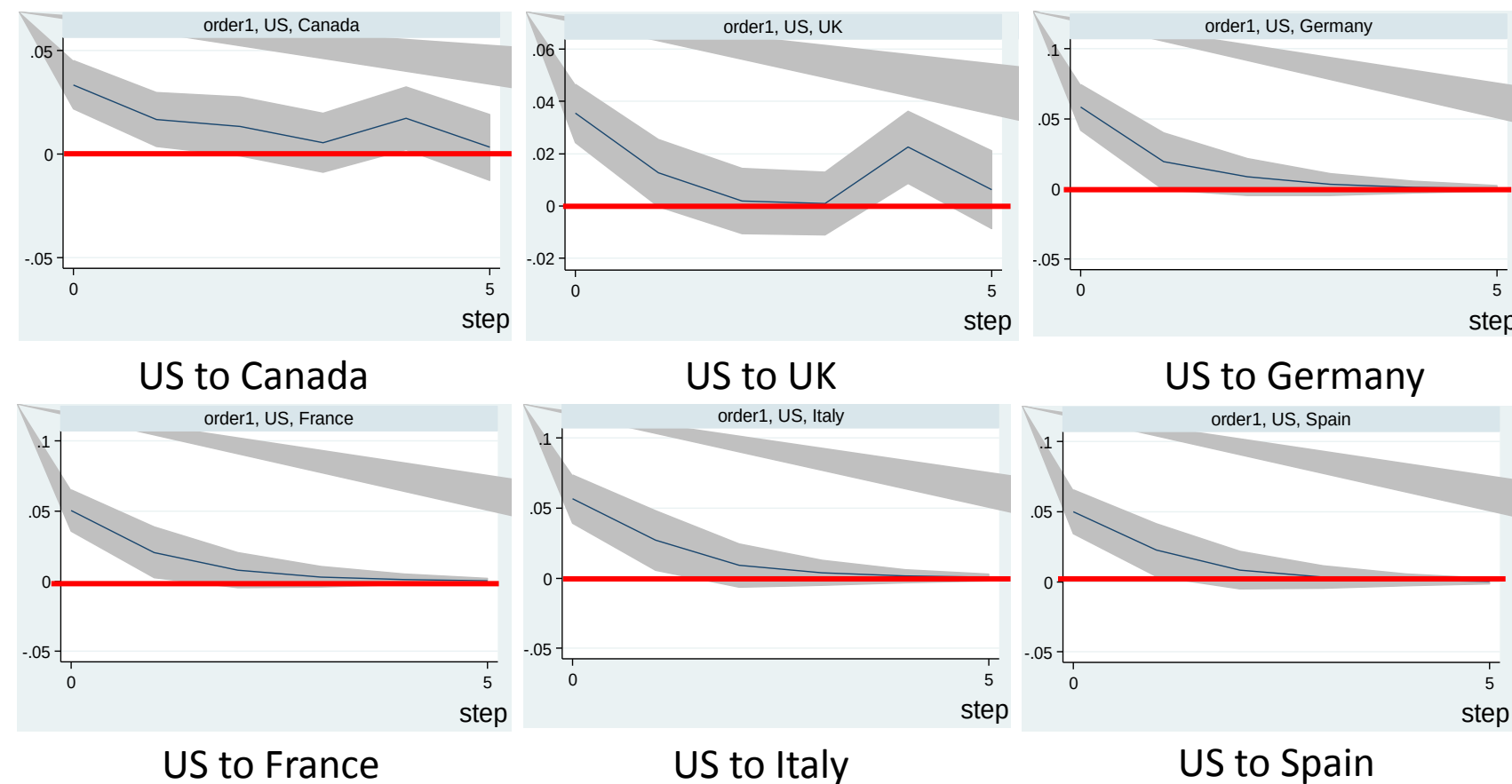
- All countries except UK exhibits findings as expected; REER has negative correlation which means one country's depreciation correlate with other countries' appreciation.
- After the crisis, most countries' co-movements are still high.
- UK's pound appreciates when USD appreciates

A statistical test needs to be done to test the correlation coefficient's significance.

- It appears there are less evidence of contagion in exchange rates comparing to stock returns.
- The evidence is strong at 5% level of significance in only Canada and Italy

Results: VAR analysis (stock returns)

Imposing shock of 1 standard deviation from the US to other countries



Key findings

- All initial shocks have positive direction meaning negative stock returns from the US caused negative returns in other countries.
- In the long run the impact wears off and become zero.
- For UK, the long run impacts still cause returns to jump even after initial shock.
- The magnitude of impact is 0.05 which is quite large since the mean stock returns is around 0.02-0.04 in all countries.

The evidence supports financial contagion from US to other countries

Source: CEIC database

Background

Literature
review

Methodology

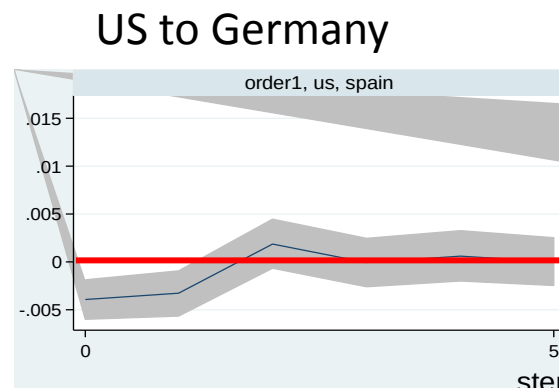
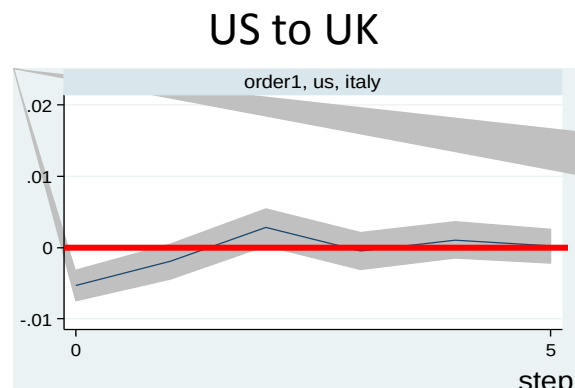
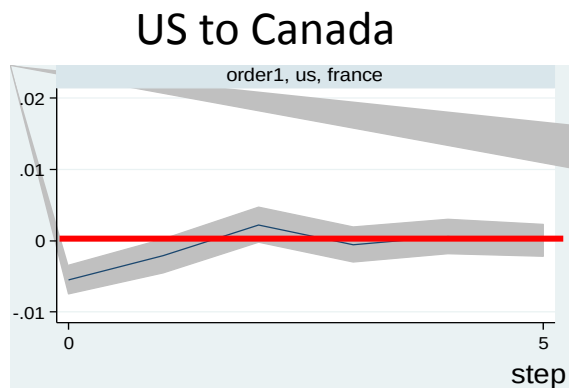
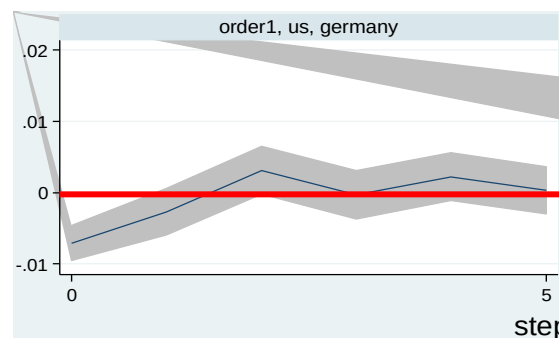
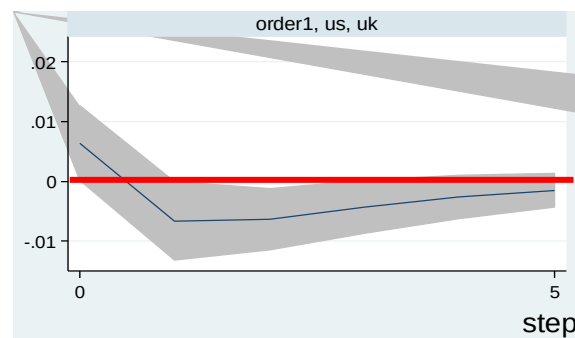
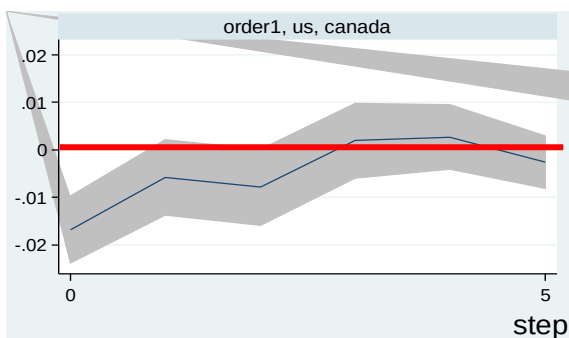
Results

Policy
recommendations

Conclusion

Results: VAR analysis (exchange rates)

Imposing shock of 1 standard deviation from the US to other countries



Key findings

- All initial shocks (except UK) have negative direction meaning a depreciation from the US caused appreciation in other countries.
- In the long run the impact wears off and become zero.
- For UK, the currency appreciates after some times passed (response is slower)
- The magnitude of impact for Canada is the greatest while Germany is the lowest.

The evidence supports financial contagion from US to other countries

Source: CEIC database

Background

Literature
review

Methodology

Results

Policy
recommendations

Conclusion

Policy recommendations

Financial contagion makes the country vulnerable to external shocks when the countries are becoming more globalized and integrated.

We need to design a policy that maximizes benefit of globalization while minimizing risks

Capital control

- Government can mitigate the cost of volatile capital inflows
- Market will be less vulnerable to external shocks and excessive risk taking behaviors are curbed

Risk management

- Improvement in supervision and regulation of financial markets and institutions are a priority to improve the country's fundamentals

Manage investors' behaviors

- Credible policy action to sooth the market sentiments should be the priority when the contagion is caused from panic and herding behaviors



To minimize the risk of financial contagion, all developed countries should **work together** to develop a sound architecture to improve supervision and regulation of their financial markets and institutions. It must be based on a **through understanding** of the **causes and consequences of contagion** in financial markets.

Conclusion

		US-Canada	US-UK	US-Germany	US-France	US-Italy	US-Spain
Correlation coefficient	Stock returns	*		**	**	**	**
	Exchange rates	**				**	
VAR analysis	Stock returns	0.04	0.04	0.06	0.05	0.05	0.05
	Exchange rates	-0.015	0.008	-0.008	-0.007	-0.007	-0.004

- In the cases of developed countries, evidence of financial contagion is particularly strong in stock market comparing to exchange rates
- Impulse response functions indicated strong impact in both stock returns and exchange rates
- All countries should work together to curb the effects of financial contagion

Q&A

Background

Literature
review

Methodology

Results

Policy
recommendations

Conclusion