THE CHANGE OF INVESTMENTS IN GLOBAL CRISIS: PANEL DATA ANALYSIS

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Abstract

Globalization has shown an active presence mainly in economic, political, social, cultural and technological fields. Transportation, communications, advances in manufacturing and political developments in the last 20 years have accelerated the globalization. Globalization has largely brought free movement of labour, capital and goods. However, globalization's becoming so active lead to not only positive benefits but also some negative ones. Any economic or political crisis which arose anywhere in the world can spread to the whole world in a very short time. The economic crisis becoming effective in 2008 has covered the whole world in a short time because the U.S. dollar is widely used as an international exchange. 2008 global crisis is considered to be the greatest crisis since 1929 Great Depression. The crisis leads to social explosions and social movements in some countries. Dollar rate has experienced a huge drop and international reserves in U.S. dollars have depreciated considerably. The stagnation in the global markets is expected to continue for a long time. The aim of the study is to discover if the collapse of investment banks in United States of America and changes in interest rates in the world have changed the relations between investment and interest rates in United States of America and European Countries. The effect of crisis on relations between investment and interest rates have been investigated using panel OLS, fixed and random effect, panel causality, cross section and dummy variable. The results has displayed that investments and interest rates relations have become different before and after the crisis. The results of the study put forth no significant relation between short term interest rates and investments but global crisis had a negative effect on investments.

Keywords: *Economic Crisis, Investment, Interest Rates*

JEL codes: *E22, E43, G01, G11*

1. Introduction

Globalization has shown an active presence mainly in economic, political, social, cultural and technological fields. In this respect globalization has largely brought free movement of labour, capital and goods. Transportation, communications, advances in manufacturing and political developments in the last 20 years have accelerated the globalization. However, globalization's becoming so active lead to not only positive benefits but also some negative ones. Any economic or political crisis which arose anywhere in the world can spread to the whole world in a very short time.

The financial crisis, crystallized in United States of America (USA) in 2007, first affected the country then dominated European countries and the rest of the world in a short period. US Dollar's being medium of exchange has expedited enlargement of the crisis to the whole world. Thinking sovereignty of Dollar in world market, the dimension of foreign direct investments and activities of multinational companies together, it is inevitable for the crisis to have large-scale effects.

The global stagflation and shrinkage of foreign demand bound to it have been affecting primarily USA, European countries and the countries which are intensely bound to them in exports. Slowdown in USA and European Union (EU) economies has brought along deceleration of global demand and has exposed tumble of growth rates, increase in interest rates, decline in investments and direction of foreign investments to abroad almost everywhere in the world.

Crisis period led the interest rates to ascend up to 18% in Iceland, 16.75% in Turkey, 5.25% in USA, 13.75% in Brazil, 7,4% in China, 7,25% in Australia, 3,75% in Czech Republic, 5.75% in United Kingdom (UK) and 4,25% in EU.[1] As well foreign direct investments has been badly affected by the crisis and in years 2007 to 2008 annual exchange rates has declined from 61% to -65% in Iceland, 16% to 12% in Turkey, 37% to 21% in UK, 25% to 21% in Czech Republic, 17% to 16% in Australia but raised 11% to 12,5% in USA.[2]

Governments have taken consumption increasing measures to vitiate the effects of the crisis. They also have provided incitement credits and kept the interest rates at low rates artificially. However the balances between interest rates and interest rates have been influenced by those efforts. Accordingly, in the study firstly by referring emergence and

[1] Fxstreet.com, World Interest Rates Table. <http://www.fxstreet.com/fundamental/ interest-rates-table> (03.10.2009).
[2] UNCTAD. Foreign direct investment (FDI) Overview, World Investment Report 2009.

evolution of the crisis, its consequences on macroeconomic balances of the countries have been examined. Then theoretical substructure of relations between interest rates and investments has been evaluated. Finally effects of crisis on interest rates and investment balances of USA and European countries have been investigated using panel OLS, fixed and random effect, panel causality, cross section and dummy variable and how the crisis had affected interest rates-investment connection have been put forth.

2. Development and Effects of 2008 Crisis

Economic crises come out because of false decisions in use of credit, overproduction, loss of an important credit provider, legal arrangements of governments, loss of prestige and trade channels.[3] Economic crises create results such as fast shrinkages in production, sudden decreases in prices, bankruptcies, increases in unemployment, declines in wages, collapse of stock markets.[4]

2008 global crisis is considered to be the greatest crisis since 1929 Great Depression and arose due to similar reasons. Developed countries have been struggling with stagnation and talking about slowdown in economic activities since the beginning of 2000s.[5] Financial crisis is associated with reckless loaning practices which resulted in first mortgage funds' getting out of control of government then purchase by the government. An empirical study by Taylor (2009) brought up the crisis was caused by excess monetary expansion and worsened by the unpredictable nature of responses of the governments to the crisis.

Another reason for the crisis is overproduction interconnected with globalization. Especially overproduction of the multinational firms in China and India caused deflation and contributed decrease in residence prices.[6] As well, fast grooving technology firms got into trouble from 1990s on and to come over the trouble and get out of stagnation, interest and tax rates and were lowered in USA. Easy credit facilities increased residential demand besides other things.[7] But increase in residential demand caused rise in house prices from 1997 on.[8]

[3] Chong, John K.S. and Donald R. Escarraz, Finansal Krizlerin Öngörülmesi ve Yönetilmesi (Trans. Osman Uluyol), Girişimcilik ve Kalkınma Dergisi, Vol:4, No:1, June 2009, Çanakkale.
[4] Aktan, Can Coşkun. Ekonomik Kriz Kavramı. <http://www.canaktan.org/yonetim/kriz-yonetim/ekon-kriz.htm> (21.06.2009).
[5] Mishkin, Fredric S. How Should We Respond to Asset Price Bubbles? <http://www.federalreserve.gov/newsevents/speech/mishkin 20080515a.htm> (03.10.2009).
[6] Hagens, Nate. Herman Daly on the Credit Crisis, Financial Assets, and Real Wealth. The Oil Drum, 13.10.2008, <http://www.theoildrum.com/node/4617> (03.10.2009).
[7] Şener, Sefer. Küresel Krizden Çıkış Olacak mı? Yönetim Bilimleri Dergisi, 2009, Pozitif Mat. Vol.7 No.1 pp:27-32.

Along with the slowdown of the money flow from fast growing economies of Asia and oil producing countries to USA,[9] Federal Reserve gradually increased interest rates from 2003 to 2006 so residential credit demand decreased. More expensive credit possibilities caused housing prices to decrease in 2006.[10] Thus debtors keeping on their credits by reloaning them every payment period couldn't repay their loans and the system collapsed. During 2007, lenders had begun foreclosure proceedings on nearly 1.3 million properties, a 79% increase over 2006.[11]

Financial situation was made more difficult by a sharp increase in oil and food prices. Loss in sub-prime funds revived the other risky funds and over-valued housing prices. Bankruptcy of Lehman Brothers of September 15th, 2008 led to panic in international fund market.

Many banks and stock markets all over the world suffered great losses and market value of many firms decreased. Besides, financial institutions couldn't get their equity assets due to locked credit market.[12] Federal Reserve, European Central Bank and some other central banks tried to solve the problem by purchasing the troubled funds from the banks. This was the largest liquidity injection into the credit market, and the largest monetary policy action, in world history.[13]

U.S. consumption accounted for more than a third of the growth in global consumption between 2000 and 2007. In this instance economy of many countries, having trade relations with USA, depended on USA economy. So that shrinkage of demand in USA badly affected these countries. For the first quarter of 2009, the annualized rate of decline in GDP was 14.4% in Germany, 15.2% in Japan, 7.4% in the UK, 9.8% in the Euro area and 21.5% for Mexico.[14] The International Labour Organization (ILO) predicted that at least 20

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[8] Economist. CSI: Credit Crunch, 18.10.2007 <http://www.economist.com/specialreports/displaystory.cfm?story_id=9972489> (03.10.2009).

[9] IMF. Executive Summary. <http://www.imf.org/external/pubs/ft/weo/2009/01/pdf/ exesum.pdf> (03.10.2009).

[10] Standard&Poor's. National Trend of Home Price Declines Continues Through the Third Quarter of 2008 According to the S&P/Case-Shiller Home Price Indices, 2008. http://www2.standardandpoors.com/spf/pdf/index/CSHomePrice_Release_ 112555.pdf (03.10.2009).

[11] Mortgage Bankers Association. Delinquencies and Foreclosures Increase in Latest MBA National Delinquency Survey. 05.09.2008, <http://www.mbaa.org/NewsandMedia/PressCenter/64769.htm> (03.10.2009).

[12] Floyd, Norris, "United Panic". The New York Times, October 24, 2008, <http://norris.blogs.nytimes.com/2008/10/24/united-panic> (03.10.2009).

[13] Altman, Roger C. Altman - The Great Crash. Foreign Affairs, Jan-Feb 2009, <http://www.foreignaffairs.org/20090101faessay88101/roger-c-altman/the-great-crash-2008.html> (03.10.2009).

[14] Baily, Martin Neil and Douglas J. Elliott. The US Financial and Economic Crisis: Where Does It Stand and Where Do We Go From Here? Bussiness and Public Policy, June 2009, <http://www.brookings.edu/~/media/Files/rc/papers/2009/0615_economic_crisis_baily_elliott/0615_economic_crisis_baily_elliott.pdf>.

million jobs will have been lost by the end of 2009 due to the crisis mostly in construction, real estate and financial services.[15]

Governments tried to weaken the effects of shrinkage in demand by increasing investments and providing loans to private sector in accordance with financial stimulus packages to overcome such problems.[16] The U.S. executed two stimulus packages, totalling nearly $1 trillion during 2008 and 2009.[17] Council of European Union negotiated on the measures for stabilizing financial sector and transferring credits to real sector.[18] As a result European countries such as Germany, UK, Spain, Netherlands and Italy executed countermeasures for the crisis and European Central Bank injected 99.8 billion Euros in a single day.[19]

3. Theoretic Base of Investment and Interest Rates Relation

In theory, Classics and Keynesians have similar and diverse opinions about relation between investment and interest rates. In Classical Theory interest rate is the price of borrowing or lending. This rate is the real interest rate and determined by demand and supply of loanable funds. Loanable fund supply is formed by the accumulation of the people who have extra income and willing to lend it.[20] On the other hand loanable fund demand is the fund demand of household and firms desiring to invest. Equilibrium of fund market is constituted where fund demand is equal to fund demand and that point determines market interest rate.

Classical economists argue that interest rate is the profit of abandonment desisting from consuming today so saving. Individuals distribute their incomes between their consumption of today and future to maximize their benefits. A positive interest rate provides the individuals to consume more in the future than today. Consequently increases in interest rate direct the individuals to save more so they choose to consume more in the future.

[15] U.S. Department of Labor, Bureau of Labor Statistics. The Employment Situation: January 2008, <http://www.bls.gov/news.release/ pdf/empsit.pdf> (03.10.2009).
[16] BBC. US Congress Passes Stimulus Plan, 14 February 2009, <http://news.bbc.co.uk/2/hi/business/ 7889897.stm> (03.10.2009).
[17] Timothy Geithner and Lawrence Summers, The Washington Post, A New Financial Foundation, June 15, 2009
[18] Council Of The European Union. Brussels European Council 19/20 March 2009 - Presidency Conclusions. <http://www.consilium.europa.eu/uedocs/cms_Data/docs/ pressdata/en/ec/106809.pdf> (03.10.2009).
[19] Newsweek. It Doesn't Exist! 12.06.2008. <http://www.newsweek.com/id/172613> (03.10.2009).
[20] Eruygur Ozan, Klasik Para ve Faiz Teorileri – Toplam Arz – Enflasyon – İşsizlik ve Phillips Eğrisi – Döviz Kuru ve Ödemeler Dengesi. Lecture Notes, 2009, <http://oeruygur.googlepages.com/IKTI102_DERSNOTU_ 10.pdf> (03.10.2009).

Likewise when the interest rates decrease, savings of the individuals decrease too. In other words, saving is a linear function of interest rates.

Classics hypothesize that the individuals distribute their incomes between their consumption and saving. They argue that people are rational in their economic decisions and endeavour to maximize their benefits. Depending on rationality hypothesis all of the money saved is loaned to the firms in return for gaining of the interest rate. Because the firms employ the money the loaned in investments, savings don't result in a decrease in consumption.

Firms keep on investing as long as their expected profit of investment exceeds the cost of the investment they made. The cost of the investment is on the other hand depend on interest rate. But the interest rate and investment have inverse correlation so when the interest rate increased firms prefer to invest less. Consequently, in classical theory interest rate is the function of savings and investments;

$$S = f(r) \text{ and } I = f(r) \qquad (1)$$

In Keynesian Theory interest rate is determined by the demand and supply of money in money market. In respect of Keynesians, an increase in money supply increase the cash people had and they purchase fund with the extra cash they had. This procedure causes interest rates to decrease while the fund prices are increasing. Decrease in interest rates stimulate investments and increased investments increases income level by multiplier function.[21] On contrary to Classical Theory, because sensivity of investment to interest rate is high in Keynesian Theory, changes in interest rate can affect national income on a large scale. So in Keynesian Theory, income is the function of saving and interest rate is the function of investment;

$$S = f(Y) \text{ and } I = f(r) \qquad (2)$$

Keynesians argue that increase in money supply pulls interest rates to the minimum level but enlargement in money supply can't decrease interest rates lower than the level of liquidity trap. If the economy is in liquidity trap because interest rates can't be lowered more, investments can't be made increase and it's impossible to stabilize the market equilibrium at a higher income level.

[21] Özkazanç, Önder et al. İktisat Teorisi, Anadolu Üniversitesi Yayınları, 2006, Eskişehir, p:229.

In the study it is investigated if the relation between interest rate and investment differ in the periods before and after the crisis due to the fact that the interest rates are lowered continuously and artificially by central banks and many investment banks closed down.

4. Literature Review

Jorgenson (1963) examined investment behaviours according as the Neoclassical Theory arguing that when interest rates increase, investments decrease because the cost of capital goes up. He also tried to determine the relations between capital demand and investment. Furthermore he associated econometric model of investment behaviours with price effect using rent prices and capital services. According to Jorgenson (1972) optimal production and investment policies are highly depended on technology form in investment behaviours theory.

Baillie and McMahon (1981) investigated relations between interest rates and investment in West Germany in years 1960-1978 and argued that investments are less elastic than short term nominal interest rates. Investments also aren't affected from long term nominal interest rates neither when government directly determined the interest rates nor removed all the control over money stock.

Warren (1981) investigated interest rates and investment quantity of OECD countries between 1960-1980 and argued that high interest rates pressurize development of investments by emphasizing interest rates are high, savings and investments are pretty low in 1980s. He also analysed relations between global investments and real interest rates and put forth increases in investments are increasing output level and savings. He indicated that changes in equilibrium of the balance of payments and government policies pressurizing investments are the reason for interest rates being higher in 1980s than previous terms. So he offered firm saving policies, which are causing interest rates to increase, to be loosened to increase investments.

Dupor (2001) analysed investments in sticky price environment using continuous time series. His results displayed passive money policy, just reacting to interest rates in unexpected inflation situation, leading to formation of unique market equilibrium. On the other hand an active policy doesn't form unique equilibrium. Temporary increases in exogenous interest rates create temporary increases in output level and investments.

Yavuz (2001) analysed relations of investment spending and interest rates in Turkey in years 1990-2000 using error correction model. Her econometric study revealed that increases

in interest rates due to financing government spending externalize private sector investments and restrain private investment spending.

Carlstrom and Fuerst (2003) analysed investment spending using Calvo-style sticky price model and stressed role of investment spending in relation of interest rates and investments which they thought disregarded in the literature. Their findings displayed that in prudential policies, scope of investment preferences are limited with regional determinants.

Chetty (2007) investigated effects of interest rates on investments in increased uncertainty, irreversible investment models. In such situations changes in investments affect both cost of capital and lags in obtaining information. Regarding these factors, high interest rates increase cost of capital and decrease investment level. On the other hand, contrary to general theories when interest rates are in increasing trend, firms consider delay cost and make the investments; they plan, in no time so investments increase in result.

Kurozumi and Zandweghe (2008) argued that investment activities and disequilibrium stimulate interest rates by prudential money policies against possible prospective inflations. In long term nominal interest rates should be increased more than the increases in interest rates, because increases in real interest rates raise consumptions and investments. Furthermore policies towards investments are more crucial because interest rate policies based on consumption are limited.

Balaylar and Duygulu (2009) emphasize that capital flow to developing countries are intended for speculative activities rather than real investments and they don't contribute to bring high inner interest rates down because they are aimed at short term benefits. A considerable portion of inner savings are transferred to abroad due to exogenous interest rate payments so that financial freedom assure capital flow from developing countries to developed ones instead of developed countries to developing ones.

5. Method

5.1 Data Set

The real GDP growth rate (RGDP), short term interest rate (STIR), long term interest rate (LTIR) and gross fixed capital formation (GFC) are collected from Eurostat[22] database. Crisis dummy is used as CRISIS and the countries have been investigated in two groups. Using such a distinction has two bases. First, some countries have short term interest rate

[22] Eurostat, <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home>.

data, but some others have long term interest rate data. So the countries with short term interest rate data and the ones with long term interest rate data are investigated in separate groups. Second, while short term interest rate data is covering 1999-2008 period, long term interest rate data covers 1999-2007 period. Due to these two reasons grouping countries has been necessary.

5.2 Econometric Method

Primarily, it is necessary to determine if the variables used in the study are stationary or not. Therefore in the study, assume common unit root process developed by Levin, Lin and Chu (LLC) (2002) and assume individual unit root process developed by Im, Pesaran and Shin (IPS) (2003) are performed. The results are summarized in Table 1.

Table 1: LLC and PP Fisher Tests (With Individual Intercept)

Variables	LLC	IPS W Stat.
GFCGR	-4.37[a]	-2.18[b]
STIR	-7.44[a]	-3.31[a]
LTIR	-3.66[a]	0.74
RGDP	-2.16[b]	-0.52
It is used Akaike information criteria. a and b significant in 1% and 5%,		

The results of LLC and IPS displayed that all levels of variables are stationary. So that variables can be used in equations and causality tests.

Panel data has both cross section and period dimensions. Here countries are the cross section dimension and years are the period dimension. Both countries and the years have individual effects on estimated. These individual effects can be shown on the equation 3.

$$y_{it} = \alpha_i + \lambda_t + x_{it}' \beta + \varepsilon_{it} \qquad (3)$$

"i" units display individual and "t" units display period. "α" displays dummy variable for countries and "λ" for years.

First of all, relations between long term interest rate and investment are investigated using equations estimated with Panel OLS, cross section fixed effect and cross section-period fixed effect and cross section-period fixed effect to investigate relations between interest rates and investments. Results are summarized in Table 2.

Table 2: Investment-Long Term Interest Rate (1999-2007)

Dependent	**GFCGR***		**GFCGR**
Independent	**Panel OLS**	**Cross Section Fixed Effect**	**Cross Section-Period Fixed Effect**
RGDP	0.03[a] (13.97)	0.03[a] (12.87)	0.02[a] (3.75)
LTIR	-0.01[a] (-2.74)	-0.01[a] (-4.42)	-0.003 (-0.38)
C	0.03[b] (2.05)	0.05[a] (3.06)	0.03 (0.55)
R^2	0.57	0.74	0.51
DW	1.66	2.19	2.33
a and b significant in 1% and 5%, t statistics in parentheses, GLS weight is cross-section weight.			

Table shows that investment growth and real GDP growth have a positive and significant relation. In this instance RGDP and GFCGR headed in the same direction and investment is affected from the chances in the GDP. Panel OLS and cross section fixed effect equations display that long term interest rate and investment have a negative and significant relation in accordance with the theory but the third equation has no statistical significiancy.

Investment decisions are usually given considering long term interest rates but data set covering 2008 in the study hold short term interest rates of the countries. Therefore short term interest rate and investment equations including crisis dummy variable are displayed in Table 3.

Table 3: Investment-Short Term Interest Rate (1999-2008)

Dependent	**GFCGR***		**GFCGR***
Independent	**Panel OLS**	**Cross Section Fixed Effect**	**Cross Section-Period Fixed Effect**
RGDP	0.02[a] (11.18)	0.02[a] (7.91)	0.02[a] (5.44)
STIR	0.002 (1.36)	0.001 (0.50)	-0.0004 (-0.22)
C	-0.01 (-0.53)	-0.01 (-0.31)	0.03 (1.26)
CRISIS	-0.004 (-0.19)	-0.004 (0.21)	---
R^2	0.59	0.67	0.69
DW	1.63	1.93	2.04
a and b significant in 1% and 5%, t statistics in parentheses, GLS weight is cross-section weight.			

As seen in table, income has a positive and significant effect on investment but no significant relation between short term interest rate and investment is determined. Sign of CRISIS dummies is negative which show crisis has a detractive effect on investment but it is statistically meaningless. Table 4 show effects of years in that cross section-period fixed effect model which point out that year 2008 has a negative effect on investments.

Table 4: Period Effect

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Effect	0.02	0.01	**-0.03**	**-0.08**	**-0.02**	0.03	0.02	0.06	**-0.01**

The evidences obtained up to this point demonstrate that long term interest rate and investment have a negative relation, income and investment have a positive relation and finally crisis has a negative effect on investments.

Table 5: Economic Growth Equation

Dependent	Independent Variables			
RGDP	0.13***GFCGR**	-0.10***STIR**	-2.37***CRISIS**	4.19***C**
	(5.84)[a]	(-2.50)[a]	(-4.12)[a]	(9.66)[a]
R^2:0.67 DW:1.68				
a significant in 1%, t statistics in parentheses, GLS weight is cross-section weight.				

When effects of investment, short term interest rate and crisis on economic growth are investigated, it can be concluded that investments have a positive and statistically significant effect on RGDP but the crisis has a negative and statistically significant effect on it.

Causality relations between the variables have been investigated with the method developed by Holtz-Eakin et al (1988). In respect of the method, first, difference should be determined to remove fixed effect then equation should be estimated using instrument variable to solve simultaneity problem. In the study GMM method is used and second lags of variables have been used as instrument variables. J stat. display that instrument variables are acceptable.

Table 6: Causality Relationships

Reason	→	Result	Causality	J stat
GFCGR(-1)[c]		**RGDP**	Yes	0.01
STIR(-1)[b]		**RGDP**	Yes	0.01
RGDP(-1)		**GFCGR**	No	0.66
STIR(-1)[a]		**GFCGR**	Yes	0.66
Instriman variables are GFCGR(-2), RGDP(-2), and STIR(-2). a, b and c significant in 1%, 5% and 10%.				

Results of causality tests display that investment and interest rate have Granger causality towards economic growth.

6. Conclusion

The study presents that investment growth and real GDP growth have a positive and significant relation. Investment is affected by the changes in GDP, and long term interest rate has negative and significant relations with investment. The results of the study put forth no significant relation between short term interest rate and investment. The study provides support for the negative relation between long term interest rates and investments and

considering the variables in cross section-period fixed effect model global crisis had a negative effect on investments. It can be concluded that investments have a positive and statistically significiant effect on RGDP but the crisis has a negative and statistically significiant effect on it.

Appendix

RGDP	Real GDP Growth Rate (%), Percentage Change on Previous Year.
STIR	Short-Term Interest Rates, Three-Month Interbank Rates, Annual Average (%).
LTIR	Long-Term Interest Rates, 10-Year Government Bond Yields, Secondary Market. Annual Average (%).
GFCGR	Gross Fixed Capital Formation (Investments) Growth Rate; Millions of Euro (From 1.1.1999)/Millions of ECU (Up to 31.12.1998).

COUNTRY GROUP 1 (1999-2008)	**COUNTRY GROUP II (1999-2007)**
Bulgaria	Belgium
Czech Republic	Denmark
Denmark	Germany
Estonia	Ireland
Latvia	Greece
Lithuania	Spain
Hungary	France
Poland	Italy
Romania	Cyprus
Slovakia	Hungary
Sweden	Malta
United Kingdom	Netherlands
	Austria
	Poland
	Portugal
	Slovakia
	Finland
	Sweden
	United Kingdom

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