

INDUSTRIES STOCK RETURN REACTIONS TO RISK FACTORS: AN EMPIRICAL INVESTIGATION ON THE G-7 COUNTRIES

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Abstract

The main objective of this paper is to add to the limited amount of literature by identifying and examining the extent to which innovations in several key local macroeconomic factors are reflected in the performance of different local industries stock returns across G-7 Countries.

The findings of this study can be beneficial to investors and practitioners by improving their understanding of how local risk factors influence investment returns of different industries. Such an understanding should enable investors and practitioners to make more informed decisions with regard to allocating, timing, and diversifying their investment portfolios.

Keywords: macroeconomics, industry stock returns, financial risk

JEL classification: E17, E43, E44, E47

Asset Pricing Models

The first to explore a set of macroeconomic factors as proxies for undefined state variables.

Macroeconomic factors are strong candidates for risk factors, because it is believed that macroeconomic factors have influenced firm's cash flow and structure of available investment opportunities.

This Paper employs a multifactor pricing model in investigating the response of industry stock returns in developed countries to a set of local risk factors based on the work of Chen, Roll, and Ross (1986).

Two Stream of Researches

Most of the work on this topic has been carried out to investigate the effect of different sets of local risk factors on the returns of either individual or portfolios of stocks regardless of industry type.

Fama (1980), Pearce and Roley (1985), Chen, Roll, and Ross (1986), Hardouvelis (1987), Hamao (1988), Wasserfallen (1989), Poon, and Taylor (1991), Ferson and Harvey (1994), Flannery and Protopapadakis (2002), and Altay (2003)

Industry-Oriented Approach

Studies on industry returns and risk have been very limited in number and scope.

Saunders (1990), Ewing (2002), Grammenos and Arkoulis (2002), and Kavussanos, Markoulis and Arkoulis (2002).

Main Objective

The main objective of this paper is to add to the limited amount of literature by identifying and examining the extent to which innovations in several key local macroeconomic factors are reflected in the performance of different local industries stock returns across G-7 Countries.

The main Question

Whether and to what extent do returns on local industries respond to changes in local macroeconomic risk factors?

Contributions

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The results of this study should provide valuable empirical and practical contributions as follows: the findings of this study should add to the limited research of the impact of local risk factors on the industry returns.

The findings of this study can be beneficial to investors and practitioners by improving their understanding of how local risk factors influence investment returns of different industries. Such an understanding should enable investors and practitioners to make more informed decisions with regard to allocating, timing, and diversifying their investment portfolios.

Methodology

Introduction

- *CAPM suggests that market return is the only relevant factor to influence asset returns.*
- *APT suggests that asset returns are more sensitive to unexpected change in a number of macroeconomic factors.*
- *Considerable amount of studies use unexpected components of macroeconomic factors based on the assumption that efficient markets respond only to unexpected changes;*
- *Univariate ARIMA (auto-regression integrated moving average) models are used for this purpose.*

Steps measurement of the actual values

Test for stationarity

ARIMA (auto-regression integrated moving average)

Subtract ARIMA expected values from actually observed time series to construct the unexpected values.

The Multifactor model

$$r_{it} = \alpha_i + \sum_{j=1}^k \beta_{ij} F_{jt} + \varepsilon_{it}$$

r_{it} = The excess return

Where, $r_{it} = R_{it} - R_{ft}$

R_{it} = The return for industry i at time t

R_{ft} = Risk free interest rate

α_i = The constant term

β_{ij} = Are the betas of the r_{it} on the k risk factors

F_{jt} = Are the risk factors where $j = 1 \dots k$

ε_{it} = The error term, which represents the non-systematic excess return relative to risk factors,

➤ *K local risk factors:*

- Industrial production;
- Inflation rate;
- Changes in expected inflation;
- Term structure;
- Foreign exchange rate;
- Oil price;
- Return on national equity market portfolio.

Data Analysis

Description of data sets and sample period

Two different data sets are used.

The first data set includes monthly industry stock returns for five industries of each country.

The second data set consists of monthly macroeconomic factors.

Monthly returns are measured for January 1985 to December 2004

Empirical Results- See Tables in the research papers down.

Results, Discussions, and Conclusions

The Multifactor Model Results (Local Factors)

The results based on the multifactor model show that local risk factors have a strong explanatory power in accounting for the variations of the monthly industries excess returns in the five countries. Specifically, they explain between 27% and 56% of the return in Canada, between 26% and 73% in Germany, between 35% and 74% in Japan, between 44% and 72% in the U.K., and between 25% and 51% in the U.S. over the period of January 1985 to December 2004.

Comparing R2 in all countries where the local market excess return is the only explanatory factor with R2 of the multifactor model, we conclude that the local market excess return is the most important explanatory factor among local risk factors.

A uniform effect on industries stock returns has been found regarding the macroeconomic risk factors.

Table 1

Industrial stock returns reactions to local macroeconomic risk factors for Canada (January 1985 To December 2004)

Industry	Constant	UIP-C	UI-C	DEI-C	UTS (-1)-C	UFX-C	UOG-C	CWMKT-C	N	R ² . adj	DW	R ² MKT
Banks	0.0015 (1.2890)	-0.5469 (-1.0118)	0.14851 (1.6409)	0.1420 (0.0912)	-2.9233 (-0.8296)	-0.0409 (-0.1936)	0.0068 (0.2348)	0.8260 (13.7049) ^{***}	213	0.5038	1.9369	.5042
Chemicals	-0.0009 (-0.6039)	0.2319 (0.3116)	-0.5753 (-0.4616)	-0.2564 (-0.1196)	0.5391 (0.1111)	0.1739 (0.5981)	-0.0344 (-0.8703)	0.7362 (8.7713) ^{***}	213	0.2718	1.8241	.2852
Insurance	-0.0002 (-0.1567)	1.0042 (-1.2015)	-0.1796 (-0.1283)	-0.5805 (-0.2411)	-0.5357 (-0.0983)	0.4715 (1.4437)	-0.1243 (-2.7976) ^{***}	0.8325 (8.9339) ^{***}	213	0.2961	1.9201	.2601
Telecommunications	-0.0007 (-0.7267)	-0.2324 (-0.4645)	-0.3290 (-0.3927)	-1.5983 (-1.1087)	-6.2910 (-1.9285) ^{**}	0.3597 (1.8395) [*]	-0.0077 (-0.2894)	0.8991 (16.1131) ^{***}	213	0.5678	2.805	.5238
Utility	-0.0004 (-0.4247)	-0.3085 (-0.5805)	-0.6194 (-0.6960)	0.4869 (0.3180)	-0.7371 (-0.2127)	-0.1206 (-0.5808)	0.0087 (1.8621) [*]	0.6099 (10.2929) ^{***}	213	0.3667	1.9842	.3825

Note: independent variables are unexpected industrial production (UIP-C), unexpected inflation rate (UI-C), changes in expected inflation (DEI-C), unexpected term structure (UTS (-1)-C),

unexpected foreign exchange rate (UFX-C), unexpected oil prices changes (UOG-C), and capitalization - weighted stock market index represented by SE-300 index (CWMKT-C). T-

values (in parenthesis). N is the number of observations for each local industry. DW is Durbin-Watson statistic.

*, **, *** Denote significance at the 10%, 5%, 1% level respectively.

R² is the coefficient of determination adjusted for degrees of freedom.

Source: elaborated by the author

Table 2

Industrial stock returns reactions to local macroeconomic risk factors for Germany (January 1985 To December 2004)

Industry	Constant	UIP-G	UI-G	DEI-G	UTS (-1)-G	UFX-G	UOG-G	CWMKT-G	N	R ² . adj	DW	R ² MKT
Banks	0.0006 (0.6133)	-0.0329 (-0.2791)	-0.4658 (-0.5386)	1.0528 (0.8826)	-12.3785 (-2.2102)**	-0.2359 (-2.7260)***	0.0297 (1.1523)	1.0263 (24.6066)***	224	0.7398	2.0514	.7217
Chemicals	0.0016 (1.5376)	-0.0309 (-0.2681)	-1.2380 (-1.4643)	0.7359 (0.6309)	2.3795 (0.4345)	0.0243 (0.2878)	-0.0325 (-1.2920)	0.8474 (20.7809)***	224	0.6830	2.0088	.6713
Insurance	0.0002 (0.1658)	0.2631 (1.5474)	-2.8993 (-2.3245)**	0.3064 (0.1781)	-2.5148 (-0.3113)	-0.2458 (-1.9686)**	-0.0003 (-0.0096)	1.2642 (21.0136)***	224	0.6789	2.2430	.6766
Telecommunications	-0.0021 (-0.8140)	0.0805 (0.2913)	1.6588 (0.8172)	-0.1298 (-0.0425)	10.6607 (0.7547)	-0.1543 (-0.7361)	-0.0749 (-1.2506)	0.8793 (8.3940)***	203	0.2660	2.0518	.2757
Utility	0.0014 (1.3336)	-0.0201 (-0.1717)	-0.0761 (-0.0885)	0.2461 (0.2075)	-8.9707 (-1.6106)	-0.0799 (-0.9287)	-0.0017 (-0.0684)	0.5350 (12.8982)***	224	0.4411	1.8989	.4461

Note: independent variables are unexpected industrial production (UIP-G), unexpected inflation rate (UI-G), changes in expected inflation (DEI-G), unexpected term structure (UTS (-1)-G), unexpected foreign exchange rate (UFX-G), unexpected oil prices changes (UOG-G), and capitalization - weighted stock market index represented by Toronto SE-300 index (CWMKT-G). T- Values (in parenthesis). N is the number of observations for each local industry. DW is Durbin-Watson statistic.

*, **, *** Denote significance at the 10%, 5%, 1% level respectively. R² is the coefficient of determination adjusted for degrees of freedom.

Source: elaborated by the author

Table 3

Industrial stock returns reactions to local macroeconomic risk factors for Japan (January 1985 To December 2004)

Industry	Constant	UIP-J	UI-J	DEI-J	UTS (-1)-J	UFX-J	UOG-J	CWMKT-J	N	R ² . adj	DW	R ² MKT
Banks	-0.0006 (-0.4453)	-0.0587 (-0.4317)	1.7736 (1.3521)	-0.3090 (-0.3083)	-9.2965 (-1.5376)	-0.2308 (-2.1347)**	0.0363 (0.9892)	1.0968 (17.9604)***	224	0.0597 7	2.1039	.5911
Chemicals	0.0001 (0.2046)	0.0921 (1.0828)	-1.1432 (-1.3941)	1.8106 (2.8903)***	9.9309 (2.6275)***	0.0795 (1.1768)	-0.0422 (-1.8358)*	0.9447 (24.7467)***	224	0.7434	2.0471	.7186
Insurance	0.0007 (0.5358)	-0.2791 (-2.2635)**	-0.8442 (-0.71.3)	0.1208 (0.1331)	-13.6707 (-2.4954)***	-0.2961 (-3.0232)***	-0.0397 (-1.1918)	0.9492 (17.1531)***	224	0.5870	1.8802	.5573
Telecommu nications	-0.0011 (-0.5957)	0.0134 (0.0819)	0.6537 (0.4140)	-0.8653 (-0.7173)	13.5079 (1.8558)*	-0.0856 (-0.6578)	0.0931 (2.1026)**	1.1396 (15.5005)***	224	0.5276	2.0689	.5054
Utility	-0.0005 (-0.3376)	-0.0980 (-0.7242)	-2.6185 (-2.0076)**	-0.3963 (-0.3977)	-21.5669 (-3.5875)***	-0.3479 (-3.2362)***	-0.0568 (-1.5533)	0.6009 (9.8968)***	224	0.0354 2	1.8869	.2866

Note: independent variables are unexpected industrial production (UIP-J), unexpected inflation rate (UI-J, changes in expected inflation (DEI-J), unexpected term structure (UTS (-1)-J) unexpected foreign exchange rate (UFX-J), unexpected oil prices changes (UOG-J), and capitalization - weighted stock market index represented by Japan TOPIX index (CWMKT-J). T-

Values (in parenthesis). N is the number of observations for each local industry. DW is Durbin-Watson statistic.

*, **, *** Denote significance at the 10%, 5%, 1% level respectively.

R² is the coefficient of determination adjusted for degrees of freedom.

Source: elaborated by the author

Table 4

Industrial stock returns reactions to local macroeconomic risk factors for UK (January 1985 To December 2004)

Industry	Constant	UIP-UK	UI-UK	DEI-UK	UTS (-1)-UK	UFX-UK	UOG-UK	CWMKT-UK	N	R ² . adj	DW	R ² MKT
Banks	0.0025 (2.3966)**	0.0852 (0.8383)	-1.6830 (-1.7242)*	-0.1365 (-0.2762)	1.6429 (0.5025)	-0.0497 (-0.5375)	-0.0247 (-0.9937)	1.1922 (23.36)***	224	0.7231	1.8859	.7103
Chemicals	-0.0009 (-0.7605)	-0.1374 (-1.1790)	0.9298 (0.8306)	-0.6708 (-1.1834)	-0.1625 (-0.0433)	-0.0335 (-0.3167)	0.0333 (1.1655)	1.0423 (17.8098)***	224	0.5975	1.9541	.5888
Insurance	-0.0021 (-1.3798)	-0.1571 (-1.0735)	1.1806 (0.8398)	0.5047 (0.7090)	-1.7037 (-0.3618)	-0.0714 (-0.5363)	-0.0140 (-0.3914)	1.2333 (16.7804)***	224	0.5716	1.8136	.5632
Telecommunications	-0.0001 (-0.0698)	0.1412 (0.9500)	1.0131 (0.7095)	0.4720 (0.6528)	0.8044 (0.1682)	0.1870 (1.3832)	-0.0730 (-2.0027)**	1.0124 (13.5623)***	224	0.4594	1.8591	.4566
Utility	-0.0007 (-0.6670)	-0.0099 (-0.0962)	-0.1622 (-0.1632)	0.1764 (0.3506)	-9.0903 (-2.7317)***	0.0325 (0.3461)	0.0307 (1.2108)	0.6818 (13.1278)***	224	0.4462	2.1542	.4414

Note: independent variables are unexpected industrial production (UIP-UK), unexpected inflation rate (UI-UK), changes in expected inflation (DEI-UK), unexpected term structure (UTS (-1)-UK), unexpected foreign exchange rate (UFX-UK), unexpected oil prices changes (UOG-UK, and capitalization - weighted stock market index represented by UK FTA index (CWMKT-UK).

T- Values (in parenthesis). N is the number of observations for each local industry. DW is Durbin-Watson statistic.

*, **, *** Denote significance at the 10%, 5%, 1% level respectively.

R² is the coefficient of determination adjusted for degrees of freedom.

Source: elaborated by the author

Table 5

Industrial stock returns reactions to local macroeconomic risk factors for USA (January 1985 To December 2004)

Industry	Constant	UIP-USA	UI-USA	DEI-USA	UTS (-1)-USA	UFX-USA	UOG-USA	CWMKT-USA	N	R ² . adj	DW	R ² MKT
Banks	-0.0001 (-0.0743)	-0.6178 (-0.9007)	-2.7200 (-1.6597)*	1.8876 (1.0648)	-8.9090 (-1.6186)	0.2177 (1.6861)*	-0.0334 (-1.0611)	0.9668 (13.5024)***	224	0.5111	2.2818	.5046
Chemicals	-0.0001 (-0.1222)	0.5025 (0.7982)	2.1838 (1.4517)	-0.3507 (-0.2155)	5.3364 (1.0562)	-0.1443 (-1.2177)	-0.0072 (-0.2511)	1.0092 (5.3538)***	224	0.5153	2.3570	.5192
Insurance	0.0003 (0.2255)	-0.1747 (-0.2588)	0.3597 (0.2246)	-0.1296 (-0.0749)	-10.1239 (-1.8016)*	0.2240 (1.6638)*	-0.0452 (-1.5105)	0.9405 (12.2499)***	182	0.4815	2.3802	.4762
Telecommunications	-0.0018 (-1.3881)	-0.2846 (-0.4200)	-1.6747 (-1.0342)	-0.1188 (-0.0678)	6.0207 (1.1071)	-0.0113 (-0.0887)	-0.0124 (-0.4008)	0.7975 (11.2719)***	224	0.3814	1.9972	.3982
Utility	-0.0021 (-1.8645)*	0.1886 (0.3230)	0.8194 (0.5872)	0.1539 (0.1020)	-20.0915 (-4.2872)***	-0.0554 (-0.5046)	-0.0103 (-0.3842)	0.4352 (7.1383)***	224	0.2533	1.9793	.2213

Note: independent variables are unexpected industrial production (UIP-USA), unexpected inflation rate (UI-USA), changes in expected inflation (DEI-USA), unexpected term structure (UTS (-1)-USA), unexpected foreign exchange rate (UFX-USA), unexpected oil prices changes (UOG-USA), and capitalization-weighted stock market index represented by S&P500 index (CWMKT-USA).

T- Values (in parenthesis). N is the number of observations for each local industry. DW is Durbin-Watson statistic.

*, **, *** Denote significance at the 10%, 5%, 1% level respectively. R² is the coefficient of determination adjusted for degrees of freedom

Source: elaborated by the author

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