

Correlation between stock market and GDP: empirical evidence from Switzerland

DTFF-HS22 Final Project

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Introduction

The industrial structure of GDP has changed significantly over the past few decades. In the same time span, the stock index has also undergone large changes.

However, changes in stock indices are sometimes out of sync with changes in GDP. A more obvious example is the creation and bursting of stock market bubbles. Exploring the relationship between the stock market and GDP is a breakthrough in the study of such issues.

Purpose

We study the long run equilibrium relationship between stock prices and domestic GDP for the OECD countries. We expect to find higher stock price growth in countries high GDP growth than in countries with low GDP growth.

Data and Model

This study uses quarterly GDP growth rates and stock price from the OECD. The stock price is standardized with 2015=100. This study period is from 1960Q2 to 2022Q3. Also, we removed rows with missing values to keep the data frame tidy.

The original data can be downloaded from here:

[\[Quarterly-GDP\]](#)

[\[Share-Prices\]](#)

Processed data is here:

<https://github.com/Zion-W9/Digital-Tools-for-Finance/tree/main/project/data>

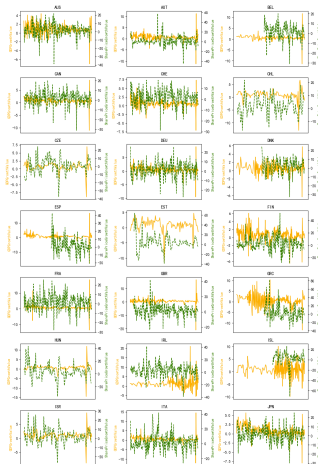
Model

Based on the topics we explored, we constructed the following model:

$$R_{Index} = \alpha + \beta * R_{GDP,t-3} + \varepsilon$$

Among them, R_{Index} is the quarterly growth rate of the stock index, and $R_{GDP,t+3}$ is the quarterly growth rate of GDP. Since the share price may respond to GDP changes in advance, we choose GDP data for three periods in advance.

Figure: Relationship between GDP and stock market



Relationship between GDP and stock market (Cont.)

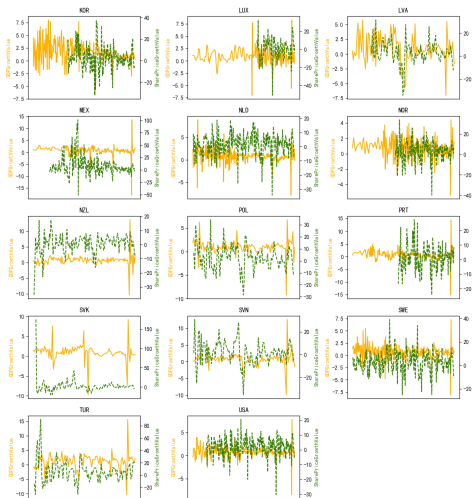


Figure: Relationship between GDP and stock market Continued

Regression Results

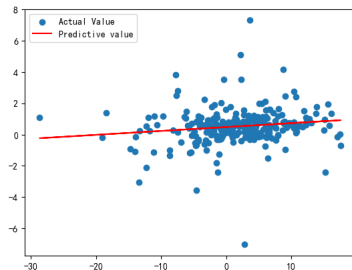


Figure: Regression Results

Switzerland is one of the most important financial markets in the world, with relatively open and transparent market information, making it a reasonable and typical research sample. Therefore, we used Switzerland as an example to perform regression.

Regression Results Analysis

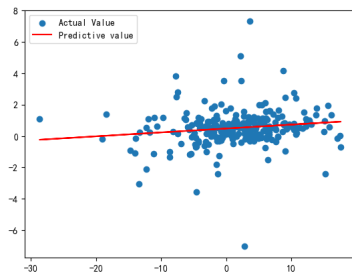


Figure: Regression Results

The following Table 1 [link](#) is the descriptive statistics of the sample. As far as Switzerland is concerned, GDP fluctuates around -7% to 7%, with an average of 0.55% and a standard deviation of 1.23, indicating that Switzerland's GDP growth is relatively stable. In Switzerland, the change in the stock market is greater than GDP, with an average of 1.59%, which is more consistent with the previous conclusion drawn from the chart, that is, the change in the stock market is greater than GDP.

Regression Results

In order to further explore the relationship between the two, we regressed the model and obtained the Figure [link](#), from which it can be observed that there is indeed a certain correlation between the two.

Regression Results Table

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                                OLS Regression Results
=====
Dep. Variable:                GDPGrowthValue    R-squared:                0.022
Model:                        OLS              Adj. R-squared:           0.018
Method:                      Least Squares     F-statistic:             5.361
Date:                        Sat, 17 Dec 2022   Prob (F-statistic):      0.0214
Time:                        17:35:11         Log-Likelihood:          -391.29
No. Observations:            245              AIC:                     786.6
Df Residuals:                243              BIC:                     793.6
Df Model:                    1
Covariance Type:             nonrobust
=====
                                coef    std err          t      P>|t|      [0.025    0.975]
-----+-----
const                        0.4824      0.079      6.132     0.000      0.327      0.637
SharePriceGrowthValue        0.0250      0.011      2.315     0.021      0.004      0.046
=====
Omnibus:                     59.621    Durbin-Watson:           1.989
Prob(Omnibus):               0.000    Jarque-Bera (JB):        1307.480
Skew:                       -0.102    Prob(JB):                1.21e-284
Kurtosis:                   14.315    Cond. No.                7.50
=====

```

Figure: Regression Results Table

Regression Results

Regarding to the results or regression [link](#), the coefficient of $R_{GDP,t+3}$ is 0.0250, which is significant within the 95% confidence interval, which means that according to our model, for every 1% increase of GDP in $t+3$ period, the stock index will increase by 0.0250% in t period. This result is in line with our expectation. The stock index is positively correlated with the growth of GDP, but the growth rate is much smaller than that of GDP.

Conclusion

Using share price data in the OECD group, we studied the long-horizon relationship between share price growth and GDP growth. Generally, the stock price **increases** when GDP grows in T+3 period and **decreases** when GDP declines in T+3 period. It may indicate the perfect capital market where the share price incorporates the future market information. However, the relationship and magnitude is **not consistent** across all sample countries.

In Switzerland, there is significantly positive between stock price growth and GDP growth. 1% increase of GDP in T+3 periods will cause 0.025% rise of share price in T period.

Source

Get the source of this project from

<https://github.com/Zion-W9/Digital-Tools-for-Finance>

Table 1: Statistical Summary

Table: Statistical Summary

Location	GDPGrowthRate				SharePriceGrowthRate			
	max	min	mean	std	max	min	mean	std
AUS	4.418806	-7.020018	0.837857	1.181453	21.642014	-38.676460	1.704898	7.538439
AUT	11.232721	-11.243786	0.673663	1.447553	57.487021	-45.421095	1.539374	9.111118
BEL	11.731267	-11.397832	0.645568	1.271786	20.089567	-30.939630	1.654958	7.582937
CAN	8.983958	-11.042537	0.759495	1.262450	20.383706	-31.094573	1.672189	6.875763
CHE	7.315925	-7.047209	0.551725	1.234857	17.589432	-28.668096	1.593233	7.103834
CHL	6.665278	-12.951959	0.905039	1.927714	21.824056	-17.105582	1.756754	7.070759
CZE	6.953209	-8.848739	0.627159	1.416782	24.297158	-37.608644	0.918629	9.607779
DEU	9.004695	-9.481134	0.578807	1.366080	25.897645	-27.259745	1.248174	7.810234
DNK	5.776993	-6.312451	0.578683	1.173001	24.147734	-32.588907	2.724747	7.863246
ESP	16.637934	-17.826256	0.802796	1.908249	42.641475	-20.891714	2.022089	9.644056
EST	4.775670	-11.798107	0.972202	2.038534	63.787282	-38.600189	3.964411	15.021136
FIN	6.094493	-6.477614	0.681190	1.510952	51.582402	-29.403193	2.596351	10.345035

Table 1: Statistical Summary (Cont.1)

Table: Statistical Summary (Cont.1)

Location	GDPGrowthRate				SharePriceGrowthRate			
	max	min	mean	std	max	min	mean	std
FRA	18.351564	-13.523350	0.654490	1.862877	25.503985	-27.777780	1.642906	8.156255
GBR	16.608614	-20.991373	0.583703	1.944663	42.213488	-23.731214	1.974376	7.642617
GRC	10.427888	-13.317789	0.664010	2.683935	82.429455	-38.075847	3.418555	17.401837
HUN	11.900000	-14.400000	0.647653	2.032294	43.123207	-35.489609	3.880780	12.070427
IRL	21.018326	-5.529750	1.254536	2.358158	41.199881	-38.845606	2.351390	9.342773
ISL	10.067048	-9.839834	0.916751	2.333316	26.033609	-71.236371	2.704795	12.284945
ISR	9.039196	-8.797409	0.991620	1.574280	28.047522	-26.934116	2.442914	8.484191
ITA	14.476293	-12.101330	0.572454	1.614337	41.689458	-26.205626	1.489691	10.221810
JPN	5.697546	-7.938036	0.866606	1.439967	25.163725	-29.888141	1.600391	8.079274
KOR	8.061462	-6.818022	1.732345	1.976849	37.779478	-32.305365	2.579035	11.191628
LUX	8.319050	-7.017609	0.875735	1.531374	32.698002	-51.003169	0.648093	11.797765
LVA	5.748584	-6.995186	0.885956	2.286839	31.419969	-33.997673	3.032875	9.713881

Table 1: Statistical Summary (Cont.2)

Table: Statistical Summary (Cont.2)

Location	GDPGrowthRate				SharePriceGrowthRate			
	max	min	mean	std	max	min	mean	std
MEX	13.653575	-17.959204	0.887413	1.890981	100.788728	-51.124216	7.691543	18.606206
NLD	8.940364	-7.904426	0.678117	1.530104	18.927776	-34.219933	1.407653	7.523131
NOR	4.434557	-5.414676	0.761621	1.214504	33.991223	-39.924935	3.005149	10.131584
NZL	13.675110	-10.393865	0.653112	1.704997	17.646552	-35.670873	0.519457	6.737128
POL	6.764794	-9.206071	1.013821	1.584297	34.294900	-28.498625	2.329534	10.107595
PRT	14.588001	-15.119497	0.765960	1.823479	27.409212	-24.367060	1.531018	9.085552
SVK	9.207307	-9.739807	0.914681	1.955863	174.737950	-20.295488	2.147537	18.652152
SVN	12.617891	-9.888565	0.677273	2.027889	30.793790	-35.311504	1.928949	10.093353
SWE	7.325353	-8.058830	0.639892	1.406531	39.093618	-25.190601	2.683303	8.703745
TUR	15.649318	-10.371753	1.161359	2.806978	90.295744	-31.817736	5.707367	17.528920
USA	7.854483	-8.484336	0.766620	1.149958	20.519865	-30.435154	1.764790	6.110438

References I

[4, 2, 3, 1]



E. F. Fama.

Stock returns, real activity, inflation, and money.

The American Economic Review, 71:545–565, 1981.



M. Hossain and A. Hossain.

An empirical relationship between share price and economic growth:
New evidence on selected industrial economies.

American Journal of Economics, pages 353–362, 09 2015.



H. Kung and L. Schmid.

Innovation, growth, and asset prices.

The Journal of Finance, 70:1001–1037, 6 2015.



D. Kuvshinov and K. Zimmermann.

The big bang: Stock market capitalization in the long run.

Journal of Financial Economics, 145(2, Part B):527–552, 2022.