Stock Markets and Government Policies During the Covid-19 Pandemic

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Two Observations

Two stylised facts stimulated my interest towards the theoretical mechanism through which monetary policy affects the market value of equities.

Figure 1. **Relative performance of SOFIX and S&P 500**
The data shows the aftermath of the global financial and economic crisis of 2007-2008. Both indices have been recalculated to start at 100 at the beginning of the period (when S&P 500 was at its pre-crisis maximum).

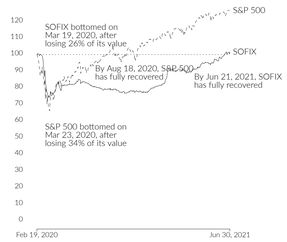

Figure 2. **Relative performance of SOFIX and S&P 500**
The data shows the aftermath of the COVID-19 pandemic. Both indices have been recalculated to start at 100 at the beginning of the period (when S&P 500 was at its pre-pandemic maximum).

Plausible Explanation of the First Observation

The magnitude of the 2007 crash of the Bulgarian Stock Exchange (illustrated with the fast drop of the SOFIX index) and its inability to recover can be explained by three characteristics of asset price bubbles that were very evident in 2007–2008 crash:

- **Upward price movement over an extended range**: in the 7 years from its inception to the pre-crisis maximum, SOFIX increased by 1852%
- **Price implosion**: after reaching its maximum value on Oct 15, 2007, the SOFIX index dropped by 84% in about an year
- **High levels of speculation and marketability**: in 2007, the year of the crash, the SOFIX turnover was higher than the total SOFIX turnover for all the other years in the 2000–2020 period combined e

These characteristics can only be observed in hindsight. Since enough time has passed from the 2007-2008 crash we can use past data about price movement and turnover as evidence supporting the hypothesis that there was a financial bubble that burst in 2007 in the Bulgarian stock exchange market.

Figure 3. **Relative performance of SOFIX and S&P 500**
The data is for the period since the inception of SOFIX to mid-2021. The S&P 500 index has been recalculated to start at 100 at the beginning of the period (when SOFIX was introduced with an index value of 100).

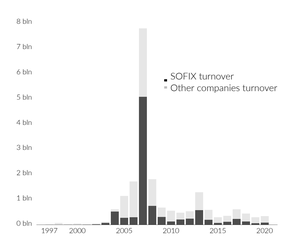

Figure 4. **Bulgarian Stock Exchange turnover by year**
The data is for the 1997-2020 period. The turnover is measured as either the turnover of all the stock-related securities listed on the exchange or the turnover of the SOFIX components.

Possible Explanation of the Second Observation

Given that the cause of the 2020 crash in the Bulgarian stock market was the Covid-19 pandemic, the slower market recovery (in comparison to the United States stock market) may possibly be explained by two factors related to the Covid-19 pandemic and the government responses to it.

1. **Disease severity:** There are different ways to measure how hard a given society was affected by the disease: number of confirmed cases, number of hospitalisations, number of confirmed deaths by Covid-19. Due to differences in measurement, the most reliable measure of the effect of Covid-19 seems to be the excess mortality rate.
2. **Government restrictions intensity:** How much a given government restricted economic activity can be assessed by the Stringency Index, a composite measure of 9 different metrics, measuring the extent of the government response to the Covid-19 Pandemic

Figure 5. **Excess mortality for Bulgaria and the United States**
The data is for all causes and for all age groups and covers the period starting when the S&P 500 index was at its pre-crisis maximum and ending on Jun 30, 2021. The excess mortality is measured as percentage compared to a baseline calculated as the average number of deaths from all causes in the corresponding 2015-2019 period.

Figure 6. **The Stringency Index for Bulgaria and the United States**
The data is for the period starting when the S&P 500 index was at its pre-crisis maximum and ending on Jun 30, 2021. For any given day, the index is calculated as the average score of the nine metrics, each taking a value between 0 and 100 with 100 indicating the strictest measures.

A Macroeconomic Policy Explanation of the Second Observation

Given that the cause of the different performance of the Bulgarian and US stock markets after 2020 crash was unlikely differences in the severity of the Covid-19 pandemic or the government response, the slower market recovery (in comparison to the United States stock market) may possibly be explained by government macroeconomic policy

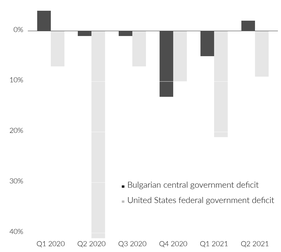

Figure 7. **Fiscal policy in Bulgaria and the United States**
Bulgarian central government deficit and the United States federal government deficit as percentage of GDP for the period from Q1 2020 to Q2 2021

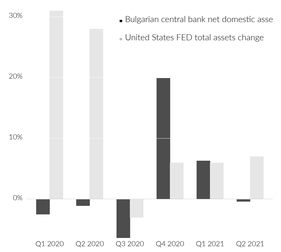

Figure 8. **Monetary policy in Bulgaria and the United States**
Bulgarian central bank net domestic assets change and the United States FED total assets change as percentage of GDP for the period from Q1 2020 to Q2 2021

Ohlson's Model – Present Value of Expected Dividends

$$P_t = \sum_{\tau=1}^{\infty} R_f^{-\tau} E_t[\tilde{d}_{t+\tau}]$$

P_t - the market value, or price, of the firm's equity at date t
d_t - net dividends paid at date t
R_f - the risk-free rate plus one
$E_t[.]$ - the expected value operator conditioned on the date t information

Ohlson's Model – Book Value and Expected Abnormal Profit

$$P_t = y_t + \sum_{\tau=1}^{\infty} R_f^{-\tau} E_t[\tilde{x}^a_{t+\tau}]$$

P_t - the market value, or price, of the firm's equity at date t
y_t - book value at date t
$\tilde{x}^a_t$ - abnormal profit for the period $(t-1, t)$
R_f - the risk-free rate plus one
$E_t[.]$ - the expected value operator conditioned on the date t information

Focusing on Abnormal Profits

$$\begin{aligned} P_t &= y_t + \sum_{\tau=1}^{\infty} R_f^{-\tau} E_t[\tilde{x}^a_{t+\tau}] \\ &= y_t + \sum_{\tau=1}^{\infty} R_f^{-\tau} E_t[\tilde{y}_{t-1+\tau}(r\tilde{o}e_{t+\tau} - \tilde{c}e_{t+\tau})] \end{aligned}$$

$\tilde{x}_t$ - earnings for the period $(t-1, t)$
$\tilde{cc}_t$ - opportunity cost of capital for the period $(t-1, t)$
$r\tilde{o}e_t$ - return on equity for the period $(t-1, t)$
$\tilde{c}e_t$ - cost of equity for the period $(t-1, t)$

Focusing on Return on Equity – DuPont Identity

$$\text{roe} = \frac{\text{net income}}{\text{sales revenue}} \times \frac{\text{sales revenue}}{\text{total assets}} \times \frac{\text{total assets}}{\text{shareholder equity}}$$

roe = profit margin × total asset turnover × financial leverage

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