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*“Vladimir Putin’s war of choice has cost the world immensely,
even under conservative assumptions”¹.*

¹ Ciuriak D., *“The Price of War: Russia’s War on Ukraine Costs \$8.9T at Five-Months”*, C.D Howe Institute, Canada Economy News, August 2022. <https://www.cdhowe.org/node/10406>

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Introduction

The Russian military invasion of Ukraine in 2022 is not only the Europe's largest war in generations but also one of the most economically destructive events of the last years, especially if we consider that it has started in the wake of the Covid-19 pandemic situation which has already left its negative consequences around the world.

The cost of this war, including military and civil dead, millions of refugees, destroyed cities and infrastructures, has spilled over not only the involved countries, which are struggling to cover their losses, but also on the global economy. The UE and U.S. sanctions on Russia have resulted in steep increases of the prices of metals, grain, energy and fertilizer, powering both the existing food crisis and the inflationary wave. The results are backfired both on the global goods and services supply chain, altered due to the critical rising of fuel prices and product shortages, and on central banks' monetary policy, with the US Federal Reserve having raised interest rates of about 50 basis points in the first month of war.

The private sector is suffering as well: in Russia international companies' activities with the country has been restricted through sanctions and bans on trade imposed by those nations condemning the war, with a consequent wave of companies withdrawing from the market.

According to a research of the Yale School of Management, which have tracked the responses of more than 1,000 international companies to Russia's war in Ukraine, the stock market has rewarded companies that have divested. From retailers to services' companies, more than the 80% have taken financial risks to stop their operations, leave the market and sell their Russian assets beyond the limit imposed by international sanctions.

In light of these findings, the aim of this work is to examine whether macroeconomic variables have an impact on the stock market, taking as the specific scenario of the Russian-Ukraine war. This study will contribute to the existing literature updating the database of facts until the end of 2022 and it is innovative in analyzing the effects of macroeconomic variables on the economy, giving detailed insights on what factors have an impact on the stock market and to what extent.

The following dissertation is organized in three main chapters:

- In the first chapter the theory behind the stock evaluation and the literature review will be presented where it has been discussed the impact of macroeconomic variables on financial markets;
- In the second chapter, after a briefly summary of the dynamics underlying the conflict, the economic impact of the Russian-Ukraine conflict will be discussed both on involved countries and the rest of the world, deepening the relationship between the war itself and three relevant macroeconomic variables (Inflation, Oil Prices and National Debt) through a regression model.
- In the last chapter, three research questions will be defined starting from two main hypothesis:

- *Hypothesis 1: The war has an impact on macroeconomic variables, reflected on the stock market.*
- *Hypothesis 2: This impact affects performance in different ways depending on companies' strategical decisions*

To test the first hypothesis will be performed a regression analysis taking historical data of a sample of about fifty listed American companies to check if exists a relation between their stock prices' trend and selected macroeconomic variables. Other “residual” problems affecting the markets in this period, will be isolated through a dummy variable.

Later, on four of them, will be calculated the forecasted target price and the actual one through the Discounted Free Cash Flow method, to make comparisons and see if their performance has reflected the decision to stay or leave the Russian market.

CHAPTER I

THEORY AND LITERATURE REVIEW

The relation between the volatility of stock market returns and macroeconomic variables affecting the economy has been widely analyzed in financial market literature. Among others, several theories including the Efficient Market Hypothesis, the Dividend Discount Model and the Arbitrage Price Theory will be described in the following to better understand the context and the purpose of this research.

1.1 The Efficient Market Hypothesis

The main goal of a valuation model is to show the relationship between two or more variables, but the way we use them will depend on the quality of our information: the model will tell us the most the variable for which our prior information is the least reliable. It was generally believed the idea that markets aggregate information of many investors and that news spreads so quickly to be reflected in security prices, as a natural consequence of investor competition. Among others, looking at short-run correlations in stock prices' series changes, Cootner (1964) elaborated in his empirical work "the Random Walk Hypothesis", according to which "*the stock market has no memory*"² so the way in which a stock price behaved in the past is not useful in predicting how it will change in the future. Paul Samuelson (1965), in his article "*Proof that Properly Anticipated Prices Fluctuate Randomly*"³ stated that in a market with perfect information price changes must be unforecastable if they are properly anticipated, deriving that it fully incorporates the expectations of all market participants. Eugene Fama (1965) was the first to define a market as "efficient" in a paper⁴ that describes it as "*a market where there a large number of rational profit-maximizers actively competing, with each trying to predict future market values of individual securities, and where important current information is almost freely available to all participants...*". He argued that, in an efficient market, competition on average causes a full effect of new information on intrinsic value that is reflected "instantaneously" in actual prices.

The efficient markets hypothesis (EMH) was developed independently in the late 1960s by Samuelson and Fama himself, stating that, given all information that is available to investors, stock prices fully reflect this information in a way to ensure a fairly pricing of securities, based on their future cash flows.

Having that, the rationale for the EMH is the presence of competition summarized in the concept that securities with equivalent risk should have the same expected return. This theory is therefore incomplete without a definition of "equivalent risk" because investors must forecast the riskiness of securities and may do so

² Cootner, P.H., (1964), "*The Random Character of Stock Market Prices*", MIT Press, Cambridge, 1964.

³ Samuelson, P. (1965), "*Proof That Properly Anticipated Prices Fluctuate Randomly*". *Industrial Management Review* Spring, 6, 41-49.

⁴ Fama, E. F., (1970), "*Efficient Capital Markets: A Review of Theory and Empirical Work*", *The Journal of Finance*, Vol. 25, No. 2, 28-30, pp. 383-417

differently, that there is no reason to expect the efficient markets hypothesis to hold perfectly and implying that efficient markets cannot be realized⁵. At this point, an investor's competitive advantage may take several forms of expertise or access to information that is known to only a few people. Alternatively, the investor may have lower trading costs than other market participants and so can exploit opportunities that others would find unprofitable⁶.

The EMH was also categorized into three forms: strong, semi strong and weak, which Fama attributed to the economist Harry Roberts:

1. The strong form of the hypothesis states that the market prices reflect all (private and public) information without any possibility of monopolistic price setting. In the real world, there is no market where the strong form of efficiency exists.
2. The semi strong form suggests that stock prices reflect all past information and all publicly available information, but the private one is hidden from common investors. Efficiency does exist in the market without getting any additional return in case of relying on the past price movement.
3. The weak form suggests that stock prices cannot be predicted via historical prices since the current price of securities is affected by all the past information⁷.

The relevance of the EMH in the modern financial theory is still discussed: Shiller⁸ (2013) called the EMH "half-true" since it perfectly describes trading conditions in the modern stock market, but, on the other hand, there are certain patterns in stock prices, which the EMH fails to explain⁹. Grossman (1976) and Grossman and Stiglitz (1980)¹⁰ argue that the degree of market inefficiency determines the level of effort investors are willing to undertake to collect and trade information, so a market equilibrium will occur only when there are sufficient profit opportunities, so inefficiencies, to offset investors for the costs of trading and collecting information. More recent work by Lo and MacKinlay (1999)¹¹ finds the evidence that short-run serial correlations are not zero and the existence of "too many" successive moves in the same direction enable them to reject the hypothesis that stock prices behave as random walks. They basically affirm that "*financial markets are predictable to some degree, but far from being a symptom of inefficiency or irrationality predictability*". To have an example, if the information available was telling that buying a stock had a positive net present value, investors with that information would choose to buy the stock, so that their attempts to purchase it would then drive up the stock's price. By a similar logic, investors with information that selling a stock had a positive NPV would sell it and the stock's price would fall. Nowadays financial economists still do not agree

⁵ Grossman, S.J. and Stiglitz J.E., (1980), "*On the impossibility of Informationally Efficient Markets*", American Economic Review, 70:3, pp. 393-40. <http://www.jstor.org/stable/1805228>

⁶ Kahneman, D. and Riepe, M.W., (1973), "*Aspects of Investor Psychology*", Journal of Portfolio Management, Summer, 24:4, pp. 52-65

⁷ Shleifer, A., (2000) "*Inefficient Markets: An Introduction to Behavioral Finance*", Oxford Academic, 1 Nov. 2003), <https://doi.org/10.1093/0198292279.001.0001>

⁸ Shiller, R.J., (2013), "*Reflections on Finance and the Good Society.*", American Economic Review, 103 (3): 402-05.

⁹ Degutis A. and Novickytė L. (2014) "*The Efficient Market Hypothesis: A Critical Review Of Literature And Methodology*", Ekonomika, 93(2), pp. 7-23.

¹⁰ *Ibid.* note 4

¹¹ Lo, Andrew W., and Craig MacKinlay A. "*A Non-Random Walk Down Wall Street.*", Princeton University Press, 1999. <http://www.jstor.org/stable/j.ctt7tccx>.

on the validity of EMH. Despite the many progresses in statistical analysis and theoretical models surrounding this theory, the main effect that the large number of empirical studies has had on this debate has been to harden the determination of supporters on both pro and cons sides.

1.2 The Dividend-Discount Model

The arguments about the fair price of a stock have always been of central interest to investors. Williams¹² (1938) was the first to identify that market prices and fundamental values are "*separate and distinct things not to be confused*". In his work he argues that the long-term intrinsic value of an asset is the present value of all future cash flows, i.e., dividends and the future sale price. This model, also called Gordon model¹³, is based on the assumptions of the Law of One Price, which implies that to value any security we must determine the expected cash flows an investor will receive from owning it. This cash flow, that could derive from the total amount received in dividends and in selling the stock, depends on the investor's investment horizon. In a transaction, generally, an investor will be willing to buy a stock at today's price if the current price does not exceed the present value of the expected future cash flows, so if the net present value of the transaction is not negative. Because these dividends or selling price are not guaranteed, to calculate its present value we should discount them at the expected return of other investments available in the market with equivalent risk to the firm's shares, called equity cost of capital, r_E . Said that, an investor would be willing to buy the stock under the following condition¹⁴:

$$P_0 \leq \frac{Div_1 + P_1}{1 + r_E}$$

To sum up, in a competitive market, buying or selling a share of stock must be a zero-NPV investment opportunity.

In this model three concepts must be explained:

- The stock's dividend yield, which is the expected annual dividend of the stock divided by its current price (Div_1/P_0). It is the percentage return the investor expects to earn from the dividend paid by the stock.
- The capital gain, so what the investor will earn on the stock, which is the difference between the expected sale price and purchase price for the stock ($P_1 - P_0$). Usually this capital gain is divided by the current stock price to express the capital gain as a percentage return, called the capital gain rate.
- The Total Return of the stock, that is the sum of the dividend yield and the capital gain rate. It is the expected return that the investor will earn for a one-year investment in the stock and should equal the

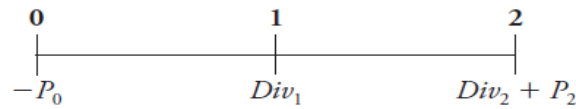
¹² Williams, J.B., (1938), "The Theory of Investment Value.", Harvard University Press, Cambridge, MA.

¹³ Gordon, M. J., Shapiro, E. (1956), "*Capital equipment analysis: The required rate of profit*", Management Science, 3(1), 102–110.

¹⁴ This paragraph is partially relaborated from Berk, J. B., & DeMarzo, P. M., (2017), "*Corporate finance*", Global ed., Boston, Mass., Pearson, pp. 310 - 311

equity cost of capital. In other words, the expected total return of the stock should equal the expected return of other investments available in the market with equivalent risk.

Now let us introduce a multiyear investor, who planned to hold the stock for two or more years, receiving dividends in both year 1 and year 2 before selling the stock, as shown in the following timeline:



Setting the stock price equal to the present value of the future cash flows in this case implies

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2}$$

Even though a one-year investor is not directly affected by the dividend and the stock price in year 2, he will be influenced indirectly by the price at which he can sell the stock at the end of year 1. For instance, let us imagine an investor selling the stock to another one-year investor with the same beliefs. The new investor will expect to receive the dividend and share price at the end of year 2, so he will be willing to pay for the stock.

If equivalent investment opportunities trade simultaneously in different competitive markets, then they must trade for the same price in all markets (if not there would be the arbitrage opportunity).

$$\begin{aligned} P_0 &= \frac{Div_1 + P_1}{1 + r_E} = \frac{Div_1}{1 + r_E} + \frac{1}{1 + r_E} \left(\overbrace{\frac{Div_2 + P_2}{1 + r_E}}^{P_1} \right) \\ &= \frac{Div_1}{1 + r_E} + \frac{Div_2 + P_2}{(1 + r_E)^2} \end{aligned}$$

Thus, the formula for the stock price for a two-year investor is the same as the one for a sequence of two one-year investors. Iterating this process for an arbitrary time horizon N , the Dividend-Discount Model Equation derives comes out:

$$P_0 = \frac{Div_1}{1 + r_E} + \frac{Div_2}{(1 + r_E)^2} + \dots + \frac{Div_N}{(1 + r_E)^N} + \frac{P_N}{(1 + r_E)^N}$$

That is, the price of the stock is equal to the present value of the expected future dividends it will pay. The company can make its dividend increase in three ways:

1. Increasing profits (net income). By investing more today, the firm can increase future profits and dividends. The firm's retention rate, which is the fraction of current profits that the firm retains, is as follows: Profit growth rate = Retention rate * Return on new investment.
2. Increasing the dividend payout rate.
3. Decreasing the shares outstanding.

This growth rate is sometimes referred to as the firm's sustainable growth rate, which is the growth rate the firm can achieve using only retained earnings. Reducing dividends to increase investment will raise the share price if, and only if, new investment has a positive NVP.

Mugoša & Popović¹⁵ (2015) analyzing 199 publicly traded European companies during 2010-2013, tested the significance of the Dividend Discount Model in share price estimate. A comparison was made between price estimates obtained using the DDM formula and the actual share prices. They finally found, with 95% level of confidence, that the Gordon's Growth Model was in fact a reliable measure of stock price valuation in the European equity market even during a period of strong global financial crisis.

Belomyttseva & Grinkevich¹⁶ (2016) discussed the assumptions at the basis of Gordon's model and summarized its merits and demerits. For what regards the required return and dividend on the company's common stock in constant progress, the authors conclude that the basic assumptions on which the model is based is the need to maximize dividends under certain circumstances. In this model, the capital value of the company can be illustrated as an increasing contingent perpetuity based on the projected dividend for the next period, proving that dividends are directly proportional to the share price and that the company should have an effective dividend policy.

1.2.1 Limitations of the Dividend-Discount Model

In overall, the dividend discount model is a very interesting model since it is both intuitive and easy to apply. Nevertheless, it faces many critics due to the limits it poses. The primary argument is the requirement of applicability only to those companies which have a stable and high dividend policy. In addition, due to tax reason, there is a trend in recent corporate practice to make share repurchases instead of paying dividends, consequently reducing the cash flow of dividends is and giving an underestimation of the value of the company by applying the dividend discount model (see, for example, Damodaran¹⁷). Since any forecast of a firm's future dividends is subject to high uncertainty, for every small variation in the assumed dividend growth rate there is a resulting change in the estimated stock price. Kerandi¹⁸ (1993) in doing so tried to establish which estimation of the dividend growth rate is most reasonable. The company's future profits depend on its interest expenses

¹⁵ Mugoša, A. and Popović, S. (2015) "Towards and Effective Financial Management: Relevance of Dividend Discount Model in Stock Price Valuation." *Economic analysis*, 48 (1-2). pp. 39-53.

¹⁶ Belomyttseva, O. & Grinkevich, L., (2016). "A Note on the Gordon Growth Model with Earnings per Share", 10.2991/itsmssm-16.2016.34.

¹⁷ Damodaran A., (2012), "Equity Risk Premiums (ERP): Determinants, Estimation and Implications", Aswath Stern School of Business.

¹⁸ Kerandi, A.M., (1993), "Testing the Predictive Ability of the Dividend Valuation Model on Ordinary Shares", Unpublished MBA Project, University of Nairobi.

(also depending on the amount of the company's debt) while the company's number of shares and dividend payout rate depend on whether the company uses some of its profits to repurchase shares. Because borrowing and repurchase decisions are in charge of the management, it can be hard to make any reliable predictions. The reality is that in some company's dividends grow over time and in others they will not grow at a specified rate until a certain period. Other companies may lower dividends or not pay dividends at all. What this means is that the model can only be applied to those companies with a consistent dividend payment policy at its best. The model only estimates dividends as the return on investment. However, there are several ways to increase the portfolio through investing in stocks, bonds, mutual funds, and other financial products. The model only considers dividend stocks, which means the investor's portfolio may not have the variety needed in an economic downturn.

The Dividend Valuation model have limited use for small companies and start-up that don't pay dividends. Since investors generally invest in mature and stable companies and don't focus on growing companies, they lose a lot of opportunities. Growing companies need more cash on hand for the regular development of their initial activity and for this reason they cannot afford paying dividends, inducing investors in missing this companies¹⁹. One very important shortcoming of DDM is that the model follows a perpetual constant dividend growth rate assumption, that is not ideal for companies with fluctuating dividend growth rates or irregular dividend payments, as it increases the chance of inaccuracy. In addition, the model is not suitable for companies with rates of return below the dividend growth rate.²⁰

In addition, it doesn't take into account non-dividend factors, such as customer retention, intangible asset ownership, brand loyalty which can change the valuation of the company.

The quality of information involved is at the basis of the model's success or failure: if information is accurate, the valuation may be accurate. Moreover, the DDM is influenced by personal bias since investors use their personal assumptions and beliefs in valuing stock²¹ and it is based on too many assumptions: the required rate of return, growth rate and tax rate, but usually most of them are not predictable by investors, reducing the validity of the valuation model.

1.3 The Arbitrage Price Theory

The Arbitrage Price Theory (APT), created by the American economist Stephen Ross (1976), was introduced "as an alternative to the mean variance capital asset pricing model by Sharpe, Lintner, and Treynor"²². It is a one-period model based on the idea that few major macro-factors influence the price of securities so that

¹⁹ Sorensen, E.H & Williamson, P.A., (1985), "Some Evidence on The Values of Dividends Discount Models", Financial Analysts Journal, Nov.-Dec., pp. 60-69

²⁰ Maverick, J.B., (2020), "What Are the Drawbacks the Dividend Discount Model?", updated May 14, <https://www.investopedia.com/ask/answers/042315/what-are-drawbacks-using-dividend-discount-model-ddm-value-stock.asp>

²¹ Michaud, R.O., & Davis, P.L., (1982), "Valuation Model Bias and the Scale Structure of Dividend Discount Returns, Journal of Finance, May, pp. 563-573.

²² Ross, S., (1976), "The arbitrage theory of capital asset pricing", Departments of Economics and Finance, University of Pennsylvania, Journal of Economic Theory, 13, 341-360

investors will “price” these factors and demand for an expected compensation in term of return for the risk associated with them²³. This relation can be expressed by the following equation:

$$ER(x) = R_f + \beta_1 RP_1 + \beta_2 RP_2 + \beta_3 RP_3 + \dots + \beta_n RP_n$$

Where:

ER(x) – Expected return on asset

R_f – Riskless rate of return

β_n (Beta) – The asset’s price sensitivity to factor

RP_n – The risk premium associated with factor

Even if the influencing factors are not explicitly mentioned in the theoretical explanation of the APT, Chen, Roll and Ross²⁴(1986) found a set of macroeconomic variables, examining the validity of the APT in the US stock markets. Their test was based on some proxies that seems to explain unanticipated shifts in securities return, including industrial production, inflation, GNP, investor confidence (measured by a premium on corporate bond) and shifts in the yield curve. This research has underlined these factors to be significant with the APT in explaining the expected stock returns, which implies that APT is valid. They believed that the multi-factor approach of APT captures more risk factors and explains better of the asset returns, therefore, it is more useful than the CAPM. However, as much as the APT is being used, several factors are likely taken in consideration.

To sum up, the model basically relies on four main assumptions:

1. Returns are generated according to a linear factor model.
2. The number of assets is close to infinite.
3. Investors have homogeneous expectations.
4. Capital markets are perfect (i.e., perfect competition, no transaction costs)²⁵.

The main benefit of the APT is that it can allow investors to build or select portfolios adapted to their needs, to reduce the exposure to changes in security’s return depending on that particular factor. It also considers multiple sources of risk, providing an explanation of what moves stock returns. As the author said, if the CAPM is a "one size fits all" model of investing, the APT is a "tailor-made suit."²⁶

The following literature tried to investigate and test the validity of the APT theory by Ross. For example, Morelli²⁷ (1999) tried to determine how the hypothesis of structural change in Stock Market returns can be investigated within the context of factor analysis, using 257 monthly security returns listed on the London Stock Exchange during the period January 1976 to December 1993. Mazzariello and Roma²⁸(1999) estimated

²³ Goetzmann, N.W., (2003), “*An Introduction to Investment Theory*”, YALE School of Management

²⁴ Chen, N., Roll, R., & Ross, S., (1986), “*Economic Forces and the Stock Market*”, The Journal of Business, vol. 59, n. 3, pp. 383-403.

²⁵ Reinganum, M.R. (1981), “*The Arbitrage Pricing Theory: Some Empirical Results.*”, The Journal of Finance, 36: 313-321.

²⁶ *Ibidem*,

²⁷ Morelli, D., (1999), “*Tests of structural change using factor analysis in equity returns*”, Applied Economics Letters, Vol. 6 Issue 4, p203-207 42.

²⁸ Mazzariello, G., and Roma, A., (1999), “*Stability of Risk Premia in the Italian Stock Market, Economic Notes*”, 28, (1), 73-89

the arbitrage pricing theory (APT) on the Italian Stock Market using the reduced rank regression technique proposed by Bekker et al. (1996). Cheng²⁹ (1996) used a canonical correlation analysis to explore the relationships between security returns and economic factors in UK and US based on a set of economic indicators as systematic influences on security returns. The analysis successfully showed the link between the stock market factors and the economic forces.

At this point, it is to be said that there are still some problems with the model. Shanken³⁰(1982) criticizes the fact that APT as theory has been silent about which are the economic state variables able to influence all assets and that it completely ignores which relevant factors explain the different returns. In addition, it is not determined which economic variables are responsible for the asset prices. Reinganum³¹ (1981) affirms that his results are inconsistent with the APT and according to the Roll and Ross' study, they conclude that although the evidence generally supports the APT, they acknowledged that their empirical tests were inconclusive. Therefore, in real life investors choose to apply CAPM, avoiding the complexity and uncertainty about the APT application³².

1.4 Equity Returns and Macroeconomic Variables

The academic literature demonstrated the existence of relationships between equity returns and different macroeconomic variables, but the debate continues regarding which indicator has a substantial effect on equity markets. The health of the economy is reflected in the corporate equity, so, assuming constant discount rates, every change or event that affects the stock market has a consequent impact on the integrity of the firm and its returns (Fama, 1981)³³.

Comparing US monthly stock returns and inflation during the period 1953-1974, Nelson³⁴ (1976) found a negative relationship in stock returns. Fama (1981), and Solnik³⁵ (1983) also achieved similar results taking empirical tests on the response of stock returns to inflation in the 1980s. Nasser and Strauss³⁶(2000) analyzed macroeconomic factors for Germany, UK and other industrialized countries in Europe: taking quarterly data during the beginning of 1962 and the end of 1995, they found negative coefficients on long term interest rates. Moreover, they understood that German stock prices also have a positive influence on the return of other European stock markets like Holland, France, Italy and the UK.

²⁹ Cheng, Arnold C. S.(1996), "*Economic Factors and Stock Markets: Empirical Evidence from the UK and the US*", International Journal of Finance & Economics, Vol. 1 Issue 4, pp. 287-302

³⁰ Shanken, J., (1992), "*The Current State of the Arbitrage Pricing Theory*", Journal of Finance, Vol. 47, Issue 4, pp. 1569-1574

³¹ Reinganum, M., (1981), "*A Misspecification of Capital Asset Pricing: Empirical Anomalies Based on Earnings Yields and Market Values*". Journal of Financial Economics, 9, 19-46. <http://www.sciencedirect.com/science/article/pii/0304405X81900192>

³² *Ibid.* note 22.

³³ Fama, E.F. (1981), "*Stock returns, real activity, inflation and money*", American Economic Review, Vol. 71, pp. 545-65.

³⁴ Nelson, C. R. (1976). "*Inflation and rates of return on common stocks.*" The Journal of Finance, 31(2), 471-483

³⁵ Solnik, B. (1983), "*The relation between stock prices and inflationary expectations: the international evidence*", Journal of Finance, Vol. 39 No. 1, pp. 35-48.

³⁶ Nasseh, A. and Strauss, J. (2000) "*Stock Prices and Domestic and International Macroeconomic Activity: A Cointegration Approach*", Quarterly Review of Economics and Finance, 40, pp. 229-245.

Among others, Abugri³⁷ (2008), studying Latin American markets, found that in Chile, Argentina, Brazil and Mexico macroeconomic factors such as exchange rate and interest rate have an influence reflected in the US three-month T-bill yield. In the following analysis, the theory behind the impact of macroeconomic volatility on stock market returns takes in consideration some variables: inflation, oil price, exchange rate, interest rate and price level.

1.4.1 Interest Rate

If a company borrows money to expand and improve its business, higher interest rates will affect the cost of its debt. This can reduce company profits and the dividends it pays shareholders. As a result, its share price may drop and, in times of higher interest rates, investments that pay interest tend to be more attractive to investors than stocks.

The relationship between interest rates and stock prices has been widely analyzed by several authors. As already mentioned, the first to argue that there is an inverse relationship between interest rates and stock returns was Fama³⁸, but some years later this argument was analyzed also by Campbell³⁹ (1987), whose results support the effectiveness of the term structure of interest rates in predicting excess returns on the US stock market. Zhou⁴⁰ (1996) rejected the Fama hypothesis since, using regression model, he found that interest rates have an impact on stock market returns but just as a partial effect in the long run. Moreover, his analysis showed how the variation in price-dividend ratios is explained in the major part by the long-term interest rate, suggesting that the high volatility of the stock market is related to the high volatility of long-term bond yields that can be predicted by changing forecasts of discount rates. Lee⁴¹ (1997) investigated the relationship between the stock market and the short-term interest rate working with 3-year regressions. He tried to forecast the excess return between the short-term interest rate and the Standard and Poor 500 index, getting to the conclusion that the relationship is not stable over time but changes from not significant to partially significant. Another part of the literature observed how a change in interest rates produces more liquidity available into the economy that could be channeled in the stock market, driving up the demand and prices of stocks (see for ex. Thorbecke, 1997⁴²). Patelis⁴³ (1997) analyzed how changes in monetary policy can have an impact on the predictability of excess stock returns. He noticed that stock market returns are predictable over a long period, concluding that interest rate policies should also target stock market price movements.

³⁷ Abugri, B. A. (2008). "Empirical Relationship between Macroeconomic Volatility and Stock Return: Evidence from Latin American Markets, *International Review of Financial Analysis*", 17: 396- 410.

³⁸ See previous paragraph.

³⁹ Campbell, J.B. (1987) "Introduction to Remote Sensing". The Guilford Press, New York.

⁴⁰ Zhou, B., (1996), "High-Frequency Data and Volatility in Foreign-Exchange Rates", *Journal of Business & Economic Statistics*, 14, (1), 45-52

⁴¹ Lee, U. (1997). "Stock market and macroeconomic policies: new evidence from Pacific Basin countries." *Multinational Finance Journal*, 1(4), 273-289.

⁴² Thorbecke, W., (1997), "On Stock Market Returns and Monetary Policy", *Journal of Finance*, 52, (2), 635-54

⁴³ Patelis, A., (1997), "Stock Return Predictability and the Role of Monetary Policy", *Journal of Finance*, 52, (5), 1951-72

Some counterarguments to the importance of inflation for the stock market return come, for example, from Bernanke and Gertler⁴⁴ (1999, 2001) who explained how is difficult to predict asset prices due to their volatile nature and suggest to monetary authorities to only change interest rates in reaction to stock-price movements, when they expect such movements to affect inflation. Goodfriend⁴⁵ (2003) also criticizes the absence of correlation between stock-price returns and short-term interest rates, so that it would be difficult for interest rates to target stock-price changes appropriately. Finally, also Bernanke and Kuttner⁴⁶ (2003) note that the sensibility of stock market to interest rate changes is not so significant.

1.4.2 Inflation

Is not so easy to define a precise relationship between inflation and equity prices and “no catch-all” rule can be applied. Since each stock has different characteristics, it should be evaluated through a prudent analysis to plan an investment strategy.

Considering the time period, we could distinguish between long run and short run. In the long run, investors usually buy stocks for hedging against inflation: if we assume an increase in input costs for a business, it's easier to offset losses over a longer period than to compensate them in the short. In addition to that, a well-diversified portfolio also helps to spread any eventual loss through different stocks, reducing the associated risk.

For what concerns the short run, the dynamic is more complicated since an inverse correlation between equity prices and inflation exists: for example, as inflation rises, stock prices fall and vice versa⁴⁷. Fisher (1930)⁴⁸ was one of the first to analyze the consequences of inflation and changes in interest rates. He basically established that the interest rate is divided in two part: the nominal interest rate and the expected rate of inflation. The so-called Fisher effect theorizes a one-to-one relationship between inflation and interest rates in a perfectly predictable world, with real interest rates uncorrelated with the expected rate of inflation and determined entirely by the real factors in an economy, such as the productivity of capital and the investors' time preference. This is an important prediction of the Fisher Hypothesis because, if real interest rates are correlated with the expected rate of inflation, changes in the real rate will not lead to a complete adjustment in nominal rates in response to expected inflation.

⁴⁴ Bernanke, B. S., & Gertler, M. (2001). “Should Central Banks Respond to Movements in Asset Prices?”, *The American Economic Review*, 91(2), 253–257. <http://www.jstor.org/stable/2677769>

⁴⁵ Goodfriend, M., (2000) “Overcoming the Zero Bound on Interest Rate Policy,” *Journal of Money, Credit and Banking*, Blackwell Publishing, vol. 32(4), pp. 1007-1035

⁴⁶ Bernanke, B. S., & Kuttner, K. N., (2003), “What Explains the Stock Market's Reaction to Federal Reserve Policy?”, *Journal of Finance* 60(3): 1221-1257

⁴⁷ “How does inflation affect the stock market?” by Timothy Joubert, <https://www.ig.com/en/trading-strategies/how-does-inflation-affect-the-stock-market-210423>

⁴⁸ Fisher, I., (1930) “*The Theory of Interest.*”, New York: Macmillan.

Many authors tried to test the Fisher effect and most of them underlined the lack of any direct measure of inflationary expectations: over the years, several approaches have been used to derive proxies for the expected rate of inflation⁴⁹.

As already mentioned, Fama (1981)⁵⁰ explains this negative correlation by the positive relationship between stock returns and basic determinants of equity values, such as capital expenditures, average real rate of return capital and productivity of a company.

In accordance with Brandt and Wang's (2003)⁵¹ model, inflation is a key factor influencing investors' risk aversion thus reflected in the expected return on capital and the real discount rate. The value of stocks, on however, is significant to the profits from capital assets, e.g., commodities, labor and capital. Inflation raises both the cost of input assets and output assets. As a consequence, shareholders expected future cash flow rises due to higher selling prices. According to Jareno and Navarro (2009)⁵², the stronger the firm's capacity to shift the panic of inflation to the sales price, the better the stock returns will be.

1.4.3 Oil price

Hamilton⁵³ (1983) was the first scholar to analyze the importance of the energy price changes to the economy. He revealed that oil price increases had contributed to some of the U.S. economic collapse during the period 1948-1972. Moreover, most of the initial studies found negative impact of oil price shock on stock returns: for example, Basher and Sadorsky⁵⁴, applying a multifactor model, found the significant impact of oil prices on 21 emerging stock markets. The interest in oil price fluctuations and their role in the macro-economy was particularly intensified due to a sharp increase in oil price in early 2000 and the following drop in 2008 during the Lehman crisis.

Oil price it's particularly important in those exporting countries where oil represents a major share of total export: based on that has been analyzed how high could be the risk of oil price volatility (Yoshino and Alekhina, 2016)⁵⁵. The main reason for which the oil market is more sensitive compared to other commodities is related to the fact that oil supply and demand have a low-price elasticity, which makes the price of oil fluctuate widely. Therefore, having oil as one of the main input costs for final products, there is a direct impact on the oil exporters' revenues and, consequently, on stock prices calculated as discounted values of expected future cash flows. In sum, the final impact of changes in oil prices can be double: on one hand, as already

⁴⁹ Mishkin, F. S. (1992), 'Is the Fisher Effect for Real? A Reexamination of the Relationship between Inflation and Interest Rates', *Journal of Monetary Economics* 30, 195–215

⁵⁰ *Ibid.* note 29.

⁵¹ Brandt, M. W. and Wang, Kevin Q. (2003), Time-Varying Risk Aversion and Unexpected Inflation, *Journal of Monetary Economics*, Vol.50, pp. 1457-1498.

⁵² Jareno, F. and Navarro, E. (2010), "Stock interest rate and inflation shocks", *European Journal of Operational Research*, Vol.201, pp. 337-348.

⁵³ Hamilton, J. (1983), "Oil and the Macroeconomy since World War II", *The Journal of Political Economy*, 91, 228-248. <https://doi.org/10.1086/261140>

⁵⁴ Basher, S.; Sadorsky p., (2016), "The impact of oil shocks on exchange rates: A Markov-switching approach"², *Energy Economics*, 54, (C), 11-23

⁵⁵ Yoshino, N. and V. Alekhina. (2016), "Impact of oil price fluctuations on an energy exporting economy: evidence from Russia", *Journal of Administrative and Business Studies* 2(4): 156–166.

explained, it influences the company's expected cash flows deriving from costs of final products; an increase in oil prices will lead to lower corporate sales and profits for the firms which in turn will decrease stock prices through dividends. It may also affect stock prices via its effect on the discount rates since it affects the expected inflation rate and expected domestic inflation. For example, a higher price on oil would place an upward pressure on expected domestic inflation which is positively related to the discount rate and negatively related to stock prices. This could also cause the real interest rate to rise which would increase the rate of return required by investors and thereby cause the stock prices to decrease. Aydoğan et al.⁵⁶ (2017) assess the relationship between oil prices and stock markets and show that the correlation between these varies according to whether the country is an oil-exporter or an oil-importer. Having this, stock prices are affected by changes in the price of oil depending on whether the country is a net producer or net consumer of oil and the effect of an increase of the price of oil will have a high negative effect on stock prices for a net oil importing country.

1.4.4 Exchange Rate

Exchange rates have a direct impact on the price and value of stocks in home as well as it abroad. Long-term movements in exchange rates are affected by fundamental market forces of supply and demand.

Dornbusch and Fischer⁵⁷ (1980) found a relationship between stock prices and exchange rates and they defined "the goods market approach" the effect of changes in the exchange rate on the stock prices and on the current account or trade balance. This negative relationship between stock prices and exchange rates depends again on the importance of the international trade for the economy and whether the companies listed on the stock market are importing or exporting companies, as already explained for the oil price. Hence, a depreciation of the domestic currency will lead to higher profits and higher stock prices for those companies that are exporting⁵⁸. Karoui⁵⁹ (2006) also studied how fluctuations in global financial market have and impact on exchange rates and consequently affect the stock prices as well as returns in the domestic stock markets. Hasan and Zaman⁶⁰ (2017) examined the impact of price changes in macroeconomic factors such as exchange rate, on the volatility of stock returns in DSE with the help of a GARCH model. They found that exchange rate had a statistically significant effect on the volatility of DSE.

The global financial crisis of 2007 and of 2012 have shown how the relationship between domestic stock prices and exchange rates caused not only a shift in trade flows but also a large shift in the portfolio cross-border movement of funds. In fact, who faces a major risk for the instability of exchange rates are those firms

⁵⁶ Aydoğan, E. T., Uslu, Ç. L. & Ketenci, N. (2017). "Determinants of Economic Growth in Emerging Countries under Structural Breaks Consideration", *Sosyoekonomi*, 25 (33), 37-58.

⁵⁷ Rüdiger D. & Stanley F., (1980). "Exchange Rates and the Current Account", *American Economic Review*, 70, (5), 960-71

⁵⁸ OpenStax Economics, *Principles of Economics*. OpenStax CNX. May 18, 2016

<http://cnx.org/contents/69619d2b-68f0-44b0-b074-a9b2bf90b2c6@11.330>.

⁵⁹ Karoui, A., (2006). "The Correlation between Fx Rate Volatility and Stock Exchange Returns Volatility: An Emerging Markets Overview", <http://dx.doi.org/10.2139/ssrn.892086>

⁶⁰ Hasan, Md & Zaman, A. (2017). "Volatility Nexus Between Stock Market and Macroeconomic Variables in Bangladesh: an Extended GARCH Approach", *Scientific Annals of Economics and Business*. 64. 232-243.

and individuals holding foreign equities⁶¹. An increasing performance of a foreign country's stock market relative to that of the home country induces a portfolio investor to sell foreign-currency stocks as overweight in foreign currency equities.

The empirical evidence, however, is inconstant in defining how the instability of exchange rate influences the international equity returns. Hau and Rey⁶² (2006) developed a model in which exchange rates, stock prices, and capital flows in equilibrium and jointly determined under incomplete foreign exchange (forex) risk trading. This model explains that on one hand, the investor sells the foreign currency income into local currency, thus securing a neutral position. On the other hand, the foreign currency will depreciate due to the selling of foreign currency into local currency and at the same time the foreign stock market outperforms.

1.4.5 Price level

Though years the level of price variation has become one of the macroeconomic variables that is crucial for managerial and marketing decisions.

Analyzing commodity prices' fluctuations, some authors found that they are most closely connected to currencies since commodity exports bring in foreign exchange. For this reason, any volatility of commodity prices can have a direct impact on the balance of payments. Cashin, Céspedes, and Sahay⁶³ (2002) examined whether 1 price changes in the tradable sector are determinants of movements in developing countries real exchange rate. Hegerty⁶⁴ (2013) found that drops in commodities prices stress West African and Latin American currencies, respectively.

Moreover, every change in commodity prices depends not only on the structural characteristics of the economy but also on the policy framework that is in place in that country.

Céspedes and Velasco⁶⁵ (2011) found a significant impact of commodity price shocks on output and investment that have major consequences on those economies less developed in financial markets. From their analysis it's crucial the role of financial market in the transmission of shocks and its importance in countries subject to commodity price volatility.

De Gregorio and Labbé (2011) found similar findings: building a stochastic general equilibrium model of a small open emerging market economy, they examined the consequences of a commodity price shock on economic activity. To decrease export volatility, they propose a monetary policy rule for the interest rate that reacts to exchange rate changes in the context of a commodity price shock. They also claim that the mix of an

⁶¹ Lakshmanasamy T. (2021). "The relationship between exchange rate and stock market volatilities in India: ARCH-GARCH estimation of the causal effects". *International Journal of Finance Research*, 2(4). 244 - 259. <https://doi.org/10.47747/ijfr.v2i4.443>

⁶² Hau, H. & Rey, H. (2006). "Exchange Rates, Equity Prices, and Capital Flows", *The Review of Financial Studies*, Volume 19, Issue 1, pp. 273–317, <https://doi.org/10.1093/rfs/hhj008>

⁶³ Céspedes, L., Cashin, P., and Sahay, R., (2002), "Keynes, Cocoa, and Copper: In Search of Commodity Currencies", No 2002/223, IMF Working Papers, International Monetary Fund

⁶⁴ Hegerty, S., (2013), "Exchange market pressure, stock prices, and commodity prices in West Africa", *International Review of Applied Economics*, 27, (6), 750-765

⁶⁵ Céspedes, L., Velasco, A. (2012). "Macroeconomic Performance During Commodity Price Booms and Busts", *IMF Econ Rev* 60, 570–599 <https://doi.org/10.1057/imfer.2012.22>

inflation-targeted monetary policy rule together with casual exchange rate interventions can bring more stable inflation and output trends.

CHAPTER II

THE FINANCIAL IMPACT OF WAR

2.1 The Russia-Ukraine Conflict: a summary

The Russian military invasion of Ukraine, which has become Europe's largest war in generations, still involves millions of people and triggers a large-scale humanitarian crisis.

Begun on the morning of 24th February of this year, with the casus belli of Donbass independence and protection of the Russian population from abuses and genocide by the Ukrainian government, the Kremlin's offensive was first concentrated in the Donbass and then in the eastern part of the country. After an initial period of negotiated talks and Russia's perception of preparing to claim a quick victory in Ukraine, at this stage diplomatic agreements seem to have been put aside: the Ukrainian resistance, the intensification and spread of the conflict are deeply troubling and having a devastating impact all over Europe.

There are three main reasons for Russia's attack on Ukraine:

- the first is that President Putin considers Ukraine as part of his territory and, as such, wants to reintegrate it;
- the second is that he is highly concerned about the idea that Russian people want to rise and replace him with a new leader and a new government form. From a political point of view the conflict could also be a disaster if Russian people, scared of the economic consequences and sanctions immediately applied, take action against Putin;
- the third and also the most important, relies with the fact that Putin wants to be sure that the Ukrainian government of pro-European turn and its willingness to join NATO, which is opposed to Moscow, doesn't result in a greater connection to West countries. For him, removing President Volodymyr Zelensky and exerting huge control on Ukraine economy and citizens seems to be the only way to bring them closer to Russia.

This last point had exactly the opposite effect: Putin's actions to divide the West Europe, the member states of the EU (European Union), the member states of NATO (North Atlantic Treaty Organization) and United States from each other, failed. The immediate consequence of its decision to attack Ukraine has tightened these relations, which have never been so strong since 11th September 2001. The EU has strongly condemned Putin's unprovoked and unjustified military aggression against Ukraine and EU leaders have urged Russia on several occasions to end this war withdrawing all military forces and equipment from Ukraine and fully respect its territorial integrity and independence, with no results.

The causes of Russian-Ukraine conflict, however, have their antecedents in Ukrainian history: between 1932 and 1933, millions of Ukrainians starved to die. Stalin, leading the Soviet Union, decided to take all country and who tried to oppose this decision was shot. Even today this tragedy is one of the reasons for Ukrainians' resentment toward Russians. Large steel settlements were built in the Donbass that attracted the Russian

population and the population has never hidden contrasts with Kiev, believing that since 1991 (when Ukraine declared independence from the USSR) living conditions have deteriorated.

Since 2014 there has been an ongoing conflict in the Donbass region: in that year, there was an insurrection in Kiev against Russian-friendly President Janukovyč and Russia, in response, took the Crimean Peninsula in southern Ukraine. From that moment the mobilization of the Donbass began as well: military groups from the Lugansk and Donetsk regions quickly managed to take control of part of the region, thanks to secret support of Putin who provided money and weapons. Thus the Donetsk People's Republic and the Lugansk People's Republic were proclaimed as independent from Ukraine.

After 13,000 deaths, abandoned cities, and thousands of fleeing civilians, the fighting stopped with the Minsk Accords, signed in 2015 by Russia and Ukraine. The agreements called for the return of rebel regions to Ukraine in exchange for greater autonomy⁶⁶.

However, they were never really respected so much so that now the conflict has flared up again.

2.2 The economic cost of war for the countries

Last February, the Russian invasion of Ukraine triggered another war: the economic-financial war. Financial sanctions have been imposed by the European Union and other important countries as an immediate response and strong condemnation of the Russian atrocities. According to Wiseman⁶⁷, these sanctions “are not only inflicting an economic catastrophe on President Vladimir Putin’s Russia [...]. The repercussions are also menacing the global economy, shaking financial markets and making life more perilous for everyone”.

The strategic aim of these measures is double: in the short-term they try to trigger a liquidity and balance-of-payments crisis, reducing the Kremlin’s financial capacity to finance the war, and in the long-term to damage Russia’s productive capacity and technological industry so that having fewer resources to hand Vladimir Putin couldn’t aspire to invade another country. To weaken the internal front, they impose high economic and social costs on Russian political figures and offer a chance to the West to exert power of control on the Russian financial and technological networks⁶⁸.

At today, the European Commission decided for six packages of restrictive measures against Russia: the first sanctions package was adopted on the 23th of February, in direct response to Russian recognition of the two separatist republics of Donetsk and Lugansk, followed by a second package facing the effective invasion by Russian troops. These first interventions were then followed by a four more packages of sanctions designed to impact oil imports, oil transport services, financial and business services policies, broadcasting, as well as individuals both from Russia that from Belarus, Russian ally and close accomplice in the war against Ukraine⁶⁹. From the beginning of the war, the EU is trying to help Ukraine, supporting the country and its

⁶⁶ Mankoff, J., (2022), “*Russia’s War in Ukraine: Identity, History, and Conflict*”. <https://www.csis.org/analysis/russias-war-ukraine-identity-history-and-conflict>

⁶⁷ Wiseman, P. & Mchugh, D. (2022), “*Economic dangers from Russia’s invasion ripple across the globe*”. AP News. <https://apnews.com/article/russia-ukraine-vladimir-putin-coronavirus-pandemic-business-health>

⁶⁸ “*Are sanctions on Russia working?*”. <https://www.economist.com/leaders/2022/08/25/are-sanctions-working>

⁶⁹ “*EU response to Russia's invasion of Ukraine*”. <https://www.consilium.europa.eu/it/policies/eu-response-ukraine-invasion/>

people together with its international partners, through additional political, financial and humanitarian aids. That's why, it was also decided to support Ukraine militarily: €500 million were allocated to send an equipment to support the resistance, which was followed by other unilateral initiatives. Even countries historically neutral in international politics, such as Finland or Sweden, joined the common front, even going so far asking to be admitted into NATO.

For what concerns United States, its measures are aligned with the EU ones for the majority. The U.S. has lists of banned products that are slightly different: for example, they limited the Russian import of diamonds and fish products, not banned in Europe.

To sum up, these measures, which are continually being updated, are intended to mine Russian economic system from different sides such as the stop to the export of strategic goods and services, considering the high Russia's dependence on Western technologies, the financial and technical assistance, the freezing of main assets and a limitation on entry into the EU of a number of individuals and legal entities.

2.2.1 Financial sanctions against Russia

The financial side was impacted the most since the West decided to target “wealthy individuals, banks, businesses and state-owned enterprises”⁷⁰.

In a first moment, it was limited the access to EU primary and secondary capital markets for the most important Russian banks and companies; this measure was ordered together with a ban on transactions with the Russian Central Bank and a block of its euro and dollar deposits in the Federal Reserve and the ECB, avoiding the possibility of taking measures to limit the depreciation of the ruble.

Suddenly some major Russian credit and financial institutions were removed from the international payment system (SWIFT) to prevent any possible dealings with non-Russian entities and delaying payments to Russia for its oil and gas exports⁷¹.

The UK also excluded major Russian banks like VTB, Otkritie, Novikombank, PSB from the UK financial system, freezing their assets and imposing limits on deposits in UK banks and barred Russian firms from borrowing money.

From the Atlantic side, the U.S. has introduced restrictive measures toward some banking institutions, for example it blocked Russia from making debt payments using the \$600 millions held in US banks so that it makes harder for Russia to repay its international loans.

The most surprising thing is that more than 1,000 foreign companies have “self-sanctioned” Russia, shuttering or curtailing their operations, which has contributed to Moscow's financial isolation from the global economy. Some of them, like McDonald's, PepsiCo and Shell, had a longtime relationship with the country so were faced with untangling complicated deals that will be analyzed later.

⁷⁰ “What are the sanctions on Russia and are they hurting its economy?”. <https://www.bbc.com/news/world-europe-60125659>

⁷¹ Magnani A., (2022), “Petrolio, oro, gas: a che punto sono le sanzioni Ue alla Russia”. <https://www.ilsole24ore.com/art/petrolio-oro-gas-che-punto-sono-sanzioni-ue-russia-AEyWcbiB>

What is estimated for this year is that Russia’s GDP will contract by about 15 %⁷².

2.2.2 Repercussions on Ukraine economy

The total cost of the war for Ukraine is not yet clear, but according to the Prime Minister Denys Shmyhal, the total reconstruction after the war could cost at least about \$750 billion. In addition to the human deaths, according to Euractiv⁷³ reports, Ukraine has lost about 22% of its territory and its economy has been paralyzed, as some cities have been turned into wastelands by Russian bombardment. In a report of World Bank and International Monetary Fund (IMF) has been estimated that “Ukraine's economy will contract by 45% by 2022”: aside from all the rest, the war also devastated productive infrastructure (railways, bridges, ports and roads) making economic activity impossible in most areas⁷⁴. The total level of economic damage depends on how long the war will go on; the World Bank predicts that at the end there will be a slow recovery and a growing threat of widespread poverty. As the report says: “a more severe and protracted war could see poverty rates rise to nearly 30% of the population”. From the West, the actual delivery of aids is going on very slowly: Ukraine has been promised more than 31 billion euros in budget support from other countries, according to calculations by the Kiel Institute for the World Economy, but between February and June only received about €7.6 billion.

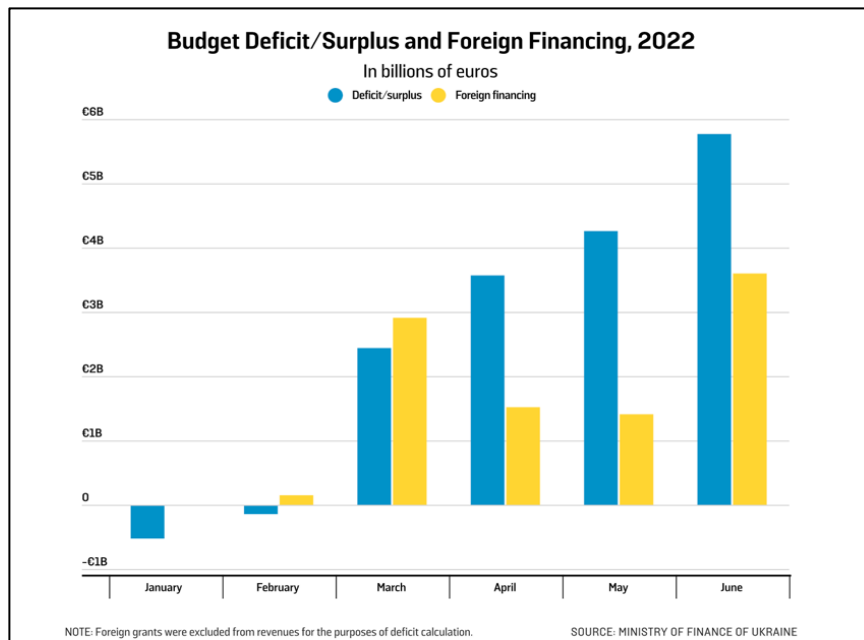


Figure 1: Deficit/Surplus and Foreign Financing of Ukraine.

⁷² “Russian Economy Contracts Sharply as War and Sanctions Take Hold”.

<https://www.nytimes.com/2022/08/12/business/russia-economy-gdp.html>

⁷³ “Ukraine estimates cost of reconstruction at \$750 billion”, (2022). <https://www.euractiv.com/section/europe-s-east/news/ukraine-estimates-cost-of-reconstruction-at-750-billion/>

⁷⁴ World Bank, (2022). “War in the Region”, Europe and Central Asia Economic Update (Spring), Washington, DC.

A prominent problem is that the country's foreign currency reserves are bleeding and, at the end of July, Ukraine asked Eurobond holders for a standstill, because commercial debt service represents an excessive amount for the budget and balance of payments. The current high rate of losses implies that Ukraine risks a financial collapse if aid inflows are not sped up soon⁷⁵.

2.2.3 Economic effects in the rest of the world

The Russian attack to Ukraine is affecting lives of millions citizens inside and outside the country. According to World Bank report⁷⁶, a useful tool to assess the consequences of this kind of events, when traditional outputs aren't available, is to use a proxy of the economic activity⁷⁷. They took the electricity consumption since several studies⁷⁸ have proved its high correlation with economic activity. At the beginning of the conflict, Ukraine experienced a drop in electricity consumption of more than 25%: this information concludes that in the short run, its economic output is decreased by at least the same fraction if the elasticity between electricity consumption and gross domestic product is about one. A very worrying result, considering that could be even larger decrease given the duration of the conflict.

The economic consequences of the war are involving all the borders of Ukraine: "The war's impacts are cascading through the region's strong trade, financial and migration linkages, resulting in considerable economic damage to neighbouring countries⁷⁹". A lot of analysts and politicians have warned about the economic impact of this war even if quantifying it is not an easy work.

The International Monetary Fund expects the world economy to grow 3.2% this year, down from 6.1% last year. Under a "plausible" alternative scenario, which includes a complete cut in Russian gas supplies to Europe by the end of the year and a further 30 % drop in Russian oil exports, the IMF said global growth will slow to 2.6% in 2022 and 2% in 2023, with virtually no growth in Europe and the United States next year⁸⁰.

For what concerns Europe, it imports significant amounts of raw materials from Kremlin-controlled companies: OECD data⁸¹ clearly highlight the high dependence with respect to total energy production, ranging from 30% in Belgium, through 40% and 20% in Germany and Italy to peaks of 60% in Austria, Finland, the Baltics and Eastern Europe. So, at the basis of the European economic fallout there is energy, as Russia is a major supplier of natural gas (30% of the total supply) .

Energy prices have soared all over Europe, driving up fuel costs and rising inflationary pressures, already begun during the pandemic, in a way that predict a slower recovery.

⁷⁵ Repko M., "Ukraine's Economy Will Collapse Without More Aid Now". <https://foreignpolicy.com/2022/08/04/ukraine-economy-collapse-aid/>

⁷⁶ *Ibid.* note 73.

⁷⁷ As explained in the report (p. 38) these are typically non-monetary measures that track very closely the variations in output.

⁷⁸ Ferguson, Wilkinson, and Hill, 2000; Chen, Kuo, and Chen, 2007; Arora and Lieskovsky, 2014.

⁷⁹ *Ibid.* note 74

⁸⁰ "Global Economic Growth Slows Amid Gloomy and More Uncertain Outlook". <https://blogs.imf.org/2022/07/26/global-economic-growth-slows-amid-gloomy-and-more-uncertain-outlook/>

⁸¹ IEA (2019), World Energy Statistics 2019, IEA, Paris, <https://doi.org/10.1787/2e828dea-en>

The situation within the European Union itself is therefore not so uniform: while countries such as Spain, Portugal, and France would be less affected by war's consequences, the same cannot be said for Germany, Austria, Eastern Europe, and Italy. The reasons for these differences rely with the degree of supply diversification: for Germany and Italy, the dependence on natural gas has grown following the closure of coal-fired power plants and has become even more pronounced, in the German case, after former Chancellor Angela Merkel's decision to shut down the remaining nuclear power plants following the 2011 Fukushima disaster⁸².

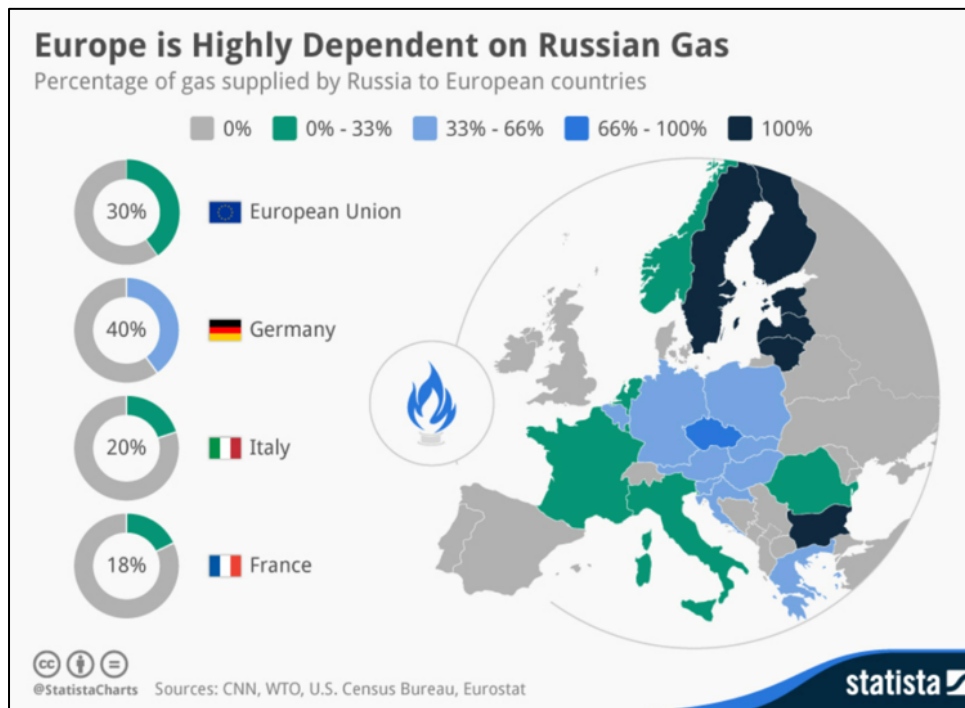


Figure 2: Percentages of Russian supply of gas to European countries

Eastern European countries such as Poland are also bearing high costs of assisting millions of refugees. Other countries such as Egypt, which normally imports 80 % of its grain from Russia and Ukraine, has seen rising food prices and falling tourism revenues from both countries.

Monetary policy has been extraordinarily slow over the past two years, increasing the risk that this inflationary impulse from high commodity prices may prove to be more lasting. Economists are worried about the fact that is not predictable how long energy prices can remain at these levels. What's happening in last months is that governments, particularly in the European Union, are accelerating their plans to reduce dependence on Russian energy, which also means that upward pressure on energy prices will continue⁸³.

2.3 Impact on Macroeconomic Variables

⁸² "La Russia e noi, quanto può fare male uno stop alle importazioni?".

<https://www.econopoly.ilsole24ore.com/2022/04/11/embargo-russia-pil/>

⁸³ "Conflitto Russia-Ucraina: l'impatto economico e geopolitico".

<https://www.capitalgroup.com/intermediaries/it/it/insights/articles/russia-ukraine-conflict-the-geopolitical-and-economic-impact.html>

Among others, Caldara and Iacoviello (2022)⁸⁴ conducted a study to measure the impact of geopolitical events and associated risks on economy from the beginning of the XX century. Their work showed that higher geopolitical risks are associated with higher probability of economic disasters and with larger downside risks to the global economy. Wars destroy human and physical capital, make resources less efficient, hamper international trade and capital flows, and disrupt global supply chains. In addition, changing perceived perceptions about the possible outcomes of adverse geopolitical events can further weigh on economic activity, delaying business investment and tightening financial conditions and consumers' confidence⁸⁵.

Because of Russia's unjustified aggression against Ukraine, the world has been affected by an increase in macroeconomic risks ranging from oil prices to commodity prices, in addition to the worsening of poverty and inequalities. Ferrara, Modigliani and Sahuc (2022)⁸⁶, using Bayesian mixed-data sampling (MIDAS) quantile regressions, tried to quantify macroeconomic risks associated with the war in Ukraine. They exploited information content of a financial stress index the Composite Indicator of Systemic Stress (CISS)⁸⁷, made up of five different sub-indicators such as the foreign exchange market, the equity market and the bond market. Through real-time high-frequency GaR measures, they observed that between February and March there was a considerable shift of the indicator in the euro area, less marked in the US. More precisely, in euro area macroeconomic effects were three times higher compared those in the US, not surprising if we consider that Europe significantly depends on Russia in terms of commodity imports (Bachmann et al. 2022)⁸⁸.

2.3.1 War and Energy prices

Shortly after Russia invaded Ukraine, international oil prices spiked to their highest levels since record highs in 2008. To be more concrete, gas price at the Dutch TTF hub, a European benchmark for natural gas trading, just after the beginning of the war, jumped 19% to reach 291.5 euros (\$291.9) per megawatt hour⁸⁹. As already explained, EU sanctions are related to the establishment of a "progressive" stop to zero imports of Russian profitability of the energy sector by 2022. After several months of discussions, on May 30-31 the European Council found the compromise that the ban would apply "only" to imports by sea, with a temporary exception for crude oil delivered by pipeline. According to estimates released in June by the European Council, full

⁸⁴ Caldara, D. and Iacoviello, M. (2022), "*Measuring Geopolitical Risk*", American Economic Review, April, 112(4), pp.1194-1225.

⁸⁵ "*The Effect of the War in Ukraine on Global Activity and Inflation*". <https://www.federalreserve.gov/econres/notes/feds-notes/the-effect-of-the-war-in-ukraine-on-global-activity-and-inflation-20220527>

⁸⁶ Ferrara, L, M Mogliani and J G Sahuc (2022), "*High-frequency monitoring of Growth-at-Risk*", International Journal of Forecasting 38: 582-595.

⁸⁷ Developed by the ECB (Holló et al. 2012).

⁸⁸ Bachmann, R. (2022), "What if Germany is cut off from Russian energy?", VoxEU.org, 25 March.

⁸⁹ "*European gas prices surge as Russian pipeline maintenance fuels fears of a total shutdown*". <https://www.cnn.com/2022/08/22/european-gas-prices-surge-as-russia-announces-nord-stream-1-shutdown.html>

independence from Moscow would take more than six months, meanwhile the price of fuels has further risen which has also led to concerns related to the security of energy supply in the EU⁹⁰.

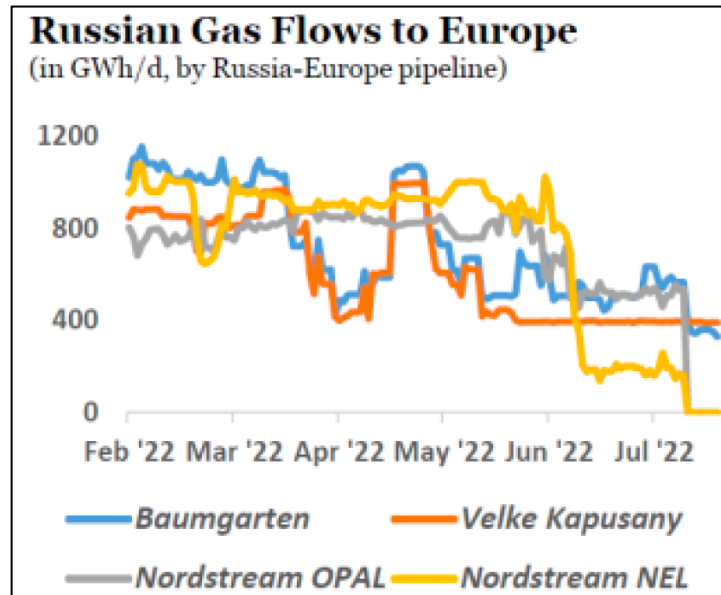


Figure 3: Russian gas flows to Europe ⁹¹

In July EU member states finally agreed to cut usage of Russian gas by 15%; cutting off Russian energy supplies triggered an energy crisis and recession with negative repercussions not only on the continent but also on global energy markets. Many scholars and analysts believe that a possible solution to this crisis could be managed by the access to alternative energy sources and suppliers in addition to the ability to lower household gas consumption. Nevertheless, in the case of total block this approach would be difficult to apply even because insufficient import capacity or transmission constraints are the main factors to reduce the gas redirection during bottlenecks.

As mentioned before, private sector is also self-sanctioning Russia: major multinational energy companies, such as British energy giants BP and Shell and the United States' ExxonMobil, have decided to withdraw from the country even not explicitly required by the sanctions. One of the main reasons is the reputational risk of maintaining relations with Russia, together with the prevision of future sanctions that would have made difficult to conduct normal business operations.⁹²

In particular the U.S. oil giant, ExxonMobil, took a huge hit after the exit from Russia due to the war, writing down USD 3.4 billion and reporting profits per share well below expectations of analysts⁹³.

What is worrying is that European governments are striving to have enough fuel reserves to be used in following months. Shell Chief Executive Ben van Beurden said in a recent conference that Europe could

⁹⁰ European Council, "Energy prices and security of supply". <https://www.consilium.europa.eu/en/policies/energy-prices/>

⁹¹ Sonnenfeld, J. and Tian, S. and Sokolowski, F. and Wyrebkowski, M. and Kasproicz, M., "Business Retreats and Sanctions Are Crippling the Russian Economy". <http://dx.doi.org/10.2139/ssrn.4167193>

⁹² "Sanctions by the Numbers: Economic Measures against Russia Following Its 2022 Invasion of Ukraine".

<https://www.cnas.org/publications/reports/sanctions-by-the-numbers-economic-measures-against-russia-following-its-2021-invasion-of-ukraine>

⁹³ "Exxon profits surge despite \$3.4B hit after exit from Russia over war". <https://mybs.in/2aurPts>

face several winters of gas shortage as a result of the cuts to Russian supplies and that “we have to somehow find solutions”⁹⁴. Rising energy prices is a policy issue for governments around the world that are responding with increasing energy taxes while providing subsidies to energy consumers. The European Union proposed the introduction of a cap, meaning a price limit, beyond which member countries will no longer be willing to buy natural gas forcing suppliers to face a "single buyer" for nearly 600 billion cubic meters per year. After some weeks of discussion, Germany has now accepted the idea to extend the cap to all supplier countries and not only to Russia, clearly specifying the fact that this is a measure whose nature is extraordinary.

2.3.2 War and Inflation

Rising energy costs are pushing up household bills, boosting inflation to the highest level in decades and shortening people's spending capacity. As already mentioned, war's consequences have also impacted foreign economies so that high inflation rates have been registered from the beginning of the conflict, not considering those resulting from the previous, but perduring, pandemic situation.

A study conducted by McKinsey & Company (Figure 4) asked consumers what their top “concern” of today was: contrarily to expectation, COVID-19 that dominated public life in the past two years, is ranked only third. The first in the list of major worries is the rising of prices, cited by 44% of European consumers, followed by war in Ukraine named by almost a quarter of people⁹⁵.

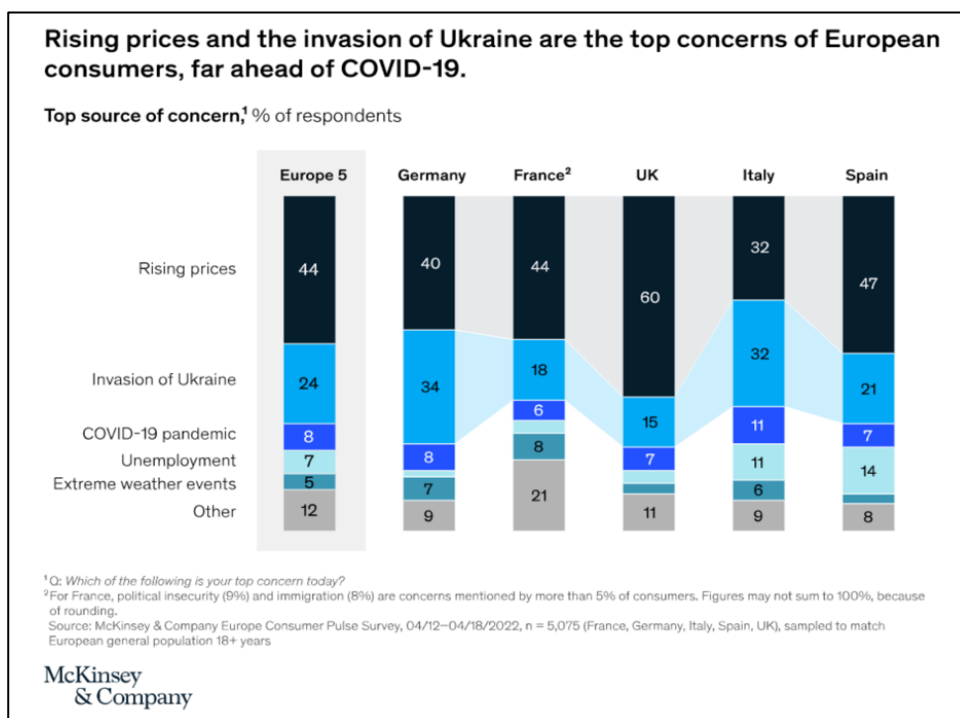


Figure 4: European consumers concerns according to McKinsey&Company report

⁹⁴ “Europe’s gas crisis could last several winters, Shell CEO says”. <https://www.reuters.com/business/energy/europes-gas-crisis-could-last-several-winters-shell-ceo-says-2022-08-29/>

⁹⁵ “9 charts that show how inflation and the Ukraine war are impacting European consumer”.

<https://www.weforum.org/agenda/2022/06/how-inflation-and-the-conflict-in-ukraine-are-impacting-european-consumers>

Moreover, according to the IMF's World Economic Outlook, there are some countries, including the United States, where inflation has strengthened considerably, becoming more broad-based even before the Russian invasion of Ukraine while in other countries this effect is related to the prominence of fuel and war-affected commodities in local consumption baskets⁹⁶. Increases in the prices of fertilizer, grain and particularly the price of bread, naturally risk aggravating those economies that are already collapsing (think about Lebanon, Egypt, Morocco, and Tunisia) and exacerbating already existing humanitarian crises, such as Syria and Yemen which are very close to starvation and therefore most at risk of further problems in food supply. The United Nations Development Programme (UNDP) published a report evidencing that about 51.6 million people fell into poverty in the first three months after the war, living of \$1.90 a day⁹⁷.

As many authors say⁹⁸, there is a risk that higher short-term inflation will become embedded in increasingly unanchored inflationary expectations, and this situation will become persistent, further complicating the task of central banks.

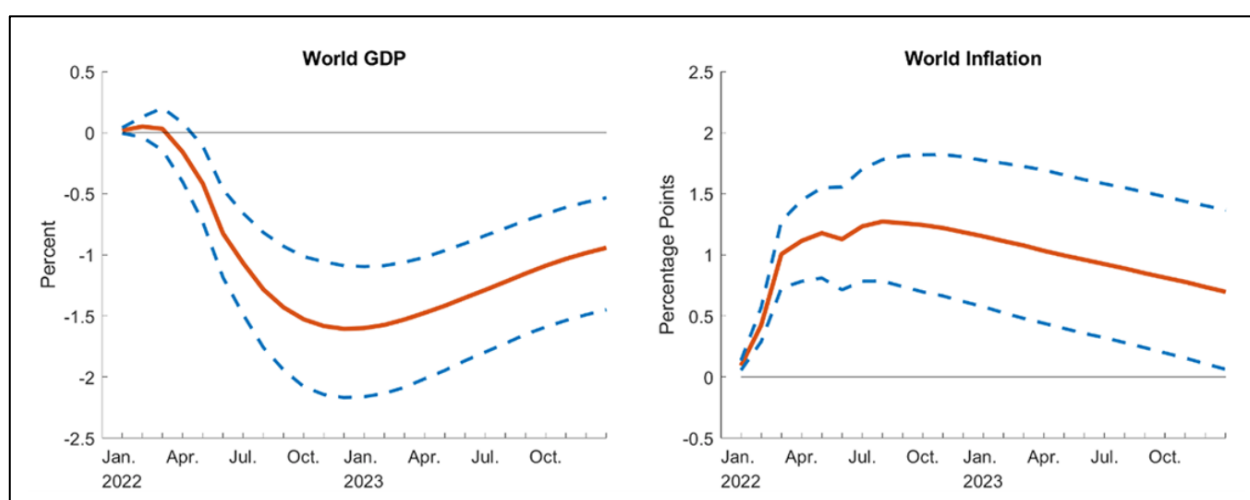


Figure 5: Federal Reserve Board staff's calculations on Inflation

Graphs on Figure 5 represent on the left side the world GDP and on the right side the world inflation between January and April 2022 to analyze the relation between these two variables, using a structural vector autoregression (VAR) model. The increase in geopolitical risks due to the Russian attack on Ukraine is associated to a downward in World GDP that will continue in 2022, reducing the 1.7% of the total global output, and an upward of the global inflation of 1.3% whose effect is expected to diminish at the end of the year. Even with high uncertainty about the extent of the war, inflation is expected to increase and persist longer in 2023 with projections at 2.5% for the advanced economy group and 6.5% for emerging market and developing countries⁹⁹.

⁹⁶ Gourinchas, P.O., (June 2022), "Shifting Geopolitical Tectonic Plates", FINANCE & DEVELOPMENT, <https://www.imf.org/en/Publications/fandd/issues/2022/06/shifting-geopolitical-tectonic-plates-straight-talk#>

⁹⁷ "Inflation plunged 71 million into poverty since Ukraine war". <https://www.aljazeera.com/news/2022/7/7/inflation-pushed-71m-people-into-poverty-since-ukraine-war-undp>

⁹⁸ Cifuentes-Faura, J., (2022), "Economic consequences of the Russia-Ukraine war: a brief overview", Espaço e Economia [Online]. <http://journals.openedition.org/espacoconomia/21807>

⁹⁹ Ibid. note 85

2.3.3 War and National Debt

While advanced economies are raising interest rates to fight inflation, financial conditions are becoming tighter, in particular for emerging market counterparts. Countries' level of deficit, expanded in 2021 due to pandemic factors¹⁰⁰, is characterized by external surpluses for exporters and deficits for importers so that current account balances are at high levels.

Economic difficulties are increasing protests in many countries that are struggling to meet debt repayment obligations. According to the United Nations, more than half of the world's poorest countries are in debt distress or at high risk¹⁰¹.

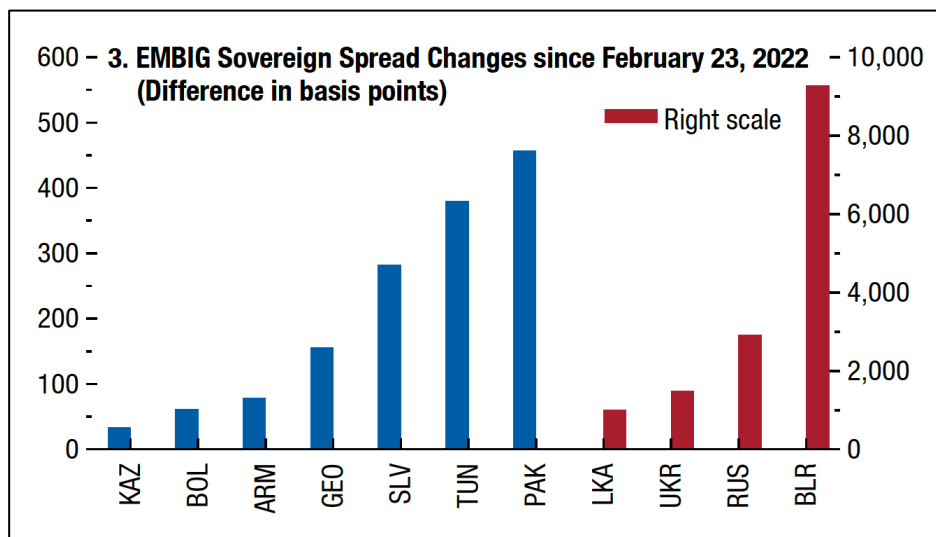


Figure 6: Bloomberg Finance's chart on EMBIG Sovereign Spread changes from the beginning of the war

These challenges emerge at a stage in which low-income countries are struggling on the borrowing front. Rising borrowing costs, declining credit flows, a stronger dollar and weaker growth is pushing countries into even more trouble.¹⁰²

The future path is uncertain not only for the consequences of the war, but also for the path of the pandemic, and the related effects on commodity prices and trade patterns. A lack of confidence toward public leadership could emerge, causing capital outflows, particularly from emerging markets, and simultaneous debt crises. Public budget defaults are pushing governments to fiscal consolidation choices in the medium term to solve high social and defense spending. As a possible lifebelt, the UN exhorts financial institutions to guarantee securities and liquidity to prioritize flexibility and speed of provision of emergency concessional financing.

¹⁰⁰ The main reasons have been the high volume of exports of medical equipment and technologies used for smart working.

¹⁰¹ "Developing Countries Must Be Provided with Debt Relief to Prevent Financial Brink, Preserve Progress, Deputy Secretary-General Tells Development Finance Dialogue". <https://press.un.org/en/2022/dsgsm1718.doc.htm>

¹⁰² "Global Economic Growth Slows Amid Gloomy and More Uncertain Outlook". <https://blogs.imf.org/2022/07/26/global-economic-growth-slows-amid-gloomy-and-more-uncertain-outlook/>

2.3.4 Analysis of war's effects on American stock market

To quantify the impact of the macroeconomic variables, linked to the Russian-Ukraine war and explained in the previous paragraphs, it was decided to apply a regression model that usually define the existence or not of a relation between two or more independent variables (X_i) and a dependent variable (Y), on which the independent variables have a certain degree of influence, as reported below¹⁰³:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \dots + \beta_p x_{pi} + \varepsilon_i$$

To do so, historical data of the were extracted from Yahoo Finance website in the period June 2021 and August 2022. The dependent variable is the S&P 500 index which consists of the largest companies in the United States, representing around the 80% of the total US stock market capitalization, and it's a commonly used benchmark for stock portfolio performance.

The independent variables are:

- the Inflation rate, the Crude Oil prices and the Natural Gas prices, whose prices were taken from the respective futures Crude Oil Oct 22 (CL=F) and Natural Gas Oct 22 (NG=F) and have been rescaled to be comparable between each other.
- the “war”, for which we want to analyze the direct effects on investors’ expectations and on conflict trends in the medium term, has been isolated and introduced as a dummy variable assuming value 0 before and 1 after the beginning of the conflict.

<i>Regression Statistics</i>	
Multiple R	0,903186123
R Square	0,815745172
Adjusted R Square	0,813375335
Standard Error	110,3523129
Observations	316

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	16767136,68	4191784,17	344,219947	7,5741E-113
Residual	311	3787243,849	12177,63295		
Total	315	20554380,53			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 99,0%</i>	<i>Upper 99,0%</i>
Intercept	-5822,383844	416,5256409	-13,9784524	8,62321E-35	-6641,948498	-5002,8192	-6901,9058	-4742,8619
Crude Oil	-40,87909178	12,43381977	-3,287733983	0,001125645	-65,34413832	-16,414045	-73,104194	-8,6539895
Natural Gas	34,38765407	10,12163797	3,397439642	0,000768668	14,4721053	54,3032028	8,15510245	60,6202057
Inflation	1945,925391	77,12407513	25,23110181	3,15757E-77	1794,174431	2097,67635	1746,04062	2145,81016
War	-117,1390904	29,23062244	-4,00741006	7,68847E-05	-174,6538809	-59,6243	-192,89697	-41,381213

¹⁰³ Peck, E. A., Montgomery, D. C., Vining, G. G. (2021). “Introduction to Linear Regression Analysis”. UK. Wiley.

Figure 7: Summary of the regression's results ¹⁰⁴

Running a multiple regression, we can observe (Figure 7) as result that our hypothesis of dependence between the macroeconomic variables interested by the war and the stock market is relevant. As showed in the image, the p-value has relevant levels of significance for the several variables so that the measures of coefficients indicate:

- a negative effect of changes in the oil prices due to a negative crude oil coefficient value;
- a positive effect of changes in the natural gas price (positive coefficient value) probably due to the fact that United States are lesser dependent from Russian gas than European countries;
- a highly positive effect of inflation;
- a strongly negative effect of the War.

These insights aren't so surprising if we think about the previous discussion, confirm in fact the theoretical background between this research.

In a later analysis, it looks appropriate to extend this approach to the 10 different indexes which compose the S&P 500, each of the representing a different sector of the American market. They are the followings: S&P 500 Materials, S&P 500 Industrials, S&P 500 Consumers Discretionary, S&P 500 Consumer Staples, S&P 500 Health, S&P 500 Financials, S&P 500 IT, S&P 500 Utilities, S&P 500 Real estate and S&P 500 Energy.

		Coefficients	P-value			Coefficients	P-value
Materials	Intercept	-727,54533	9,0021E-28	Financials	Intercept	-1038,5888	3,6653E-41
	Crude Oil	5,62110286	0,00195244		Crude Oil	8,99882083	7,8516E-06
	Natural Gas	3,27628205	0,02601087		Natural Gas	1,0626934	0,51010263
	Inflation	228,950715	9,6646E-60		Inflation	304,977239	8,3889E-76
	War	-11,961926	0,0049907		War	-45,387505	8,8309E-20
Industrials	Intercept	-874,96675	1,2849E-43	IT	Intercept	-4703,0266	1,1732E-22
	Crude Oil	-15,69161	6,437E-20		Crude Oil	-40,932684	0,00215373
	Natural Gas	3,09493389	0,01824795		Natural Gas	30,5733537	0,00482444
	Inflation	338,79293	4,591E-107		Inflation	1418,24828	2,2199E-47
	War	-7,727854	0,04102706		War	-103,46044	0,00098454
Customers D	Intercept	-3536,0052	3,4923E-38	Utilities	Intercept	-60,289503	0,12423134
	Crude Oil	-40,859668	2,0287E-08		Crude Oil	-6,3544142	1,0673E-07
	Natural Gas	13,8222315	0,01728797		Natural Gas	9,02164842	6,2186E-19
	Inflation	969,929109	1,6835E-65		Inflation	76,3687189	1,9849E-22
	War	-74,080296	1,2423E-05		War	30,9407891	6,1023E-25
Customer S	Intercept	-33,903055	0,71795422	Real Estate	Intercept	-421,13455	2,5639E-29
	Crude Oil	4,80290761	0,08721521		Crude Oil	-4,7812276	3,0668E-06
	Natural Gas	5,07746071	0,02658885		Natural Gas	1,29396659	0,11507505
	Inflation	140,148231	1,5356E-14		Inflation	137,250966	2,4522E-65
	War	23,5590229	0,0003988		War	5,07982224	0,03247847
Health	Intercept	-267,15887	0,09099004	Energy	Intercept	-337,10435	0,00168418
	Crude Oil	-19,062765	6,4035E-05		Crude Oil	57,7669126	7,3471E-51
	Natural Gas	10,6850236	0,00558762		Natural Gas	23,9267442	3,5837E-18
	Inflation	348,034969	2,8919E-27		Inflation	78,5912919	8,2597E-05
	War	51,1632917	5,4581E-06		War	37,3406221	9,535E-07

Figure 8: Summary of the regressions' results by industry¹⁰⁵

¹⁰⁴ Personal elaboration. Other parts of the regression analysis are available upon request.

¹⁰⁵ Personal elaboration. Other parts of the regression analysis are available upon request.

As expected, running the regression for each of them we have diversified results. For example:

- the crude oil has a negative coefficient on Industrials, IT and Utilities while a positive one on Financials and Energy;
- the natural gas coefficient has quite always positive correlation, since as already explained, America isn't a big importer of Russian gas;
- the only common data is the massive value of the inflation coefficient which impact quite all the industries, of course with a greater impact on Materials, Consumers Discretionary and Health segment.

A clear representation of the results is showed in Figure 8.

2.4 Private sector response to Russian invasion of Ukraine

As mentioned above, so many private companies have also decided to self-sanction Russia after its invasion of Ukraine. The Russian Federation has been always considered an attractive market for international investors, characterized by a large consumer market, low taxes and a cheap, relatively skilled, labour force. Just three days later the beginning of the war, British Petroleum announced the sale of its stake in the Russian oil giant Rosneft, with an estimated cost up to twenty-five billion dollars. Following this example, Shell's C.E.O. declared: "We are shocked by the loss of life in Ukraine, which we deplore, resulting from a senseless act of military aggression which threatens European security" and decided to withdraw from its partnership with Gazprom and the Nord Stream 2 natural-gas pipeline. Exxon did the same few days later¹⁰⁶. These three oil giants have paved the way for the private-sector declaration of war that in the six months, according to Yale School of Management, has seen approximately 300 global companies exiting the Russian market, and another 700 scaling back of business or suspending investments and projects in the country.

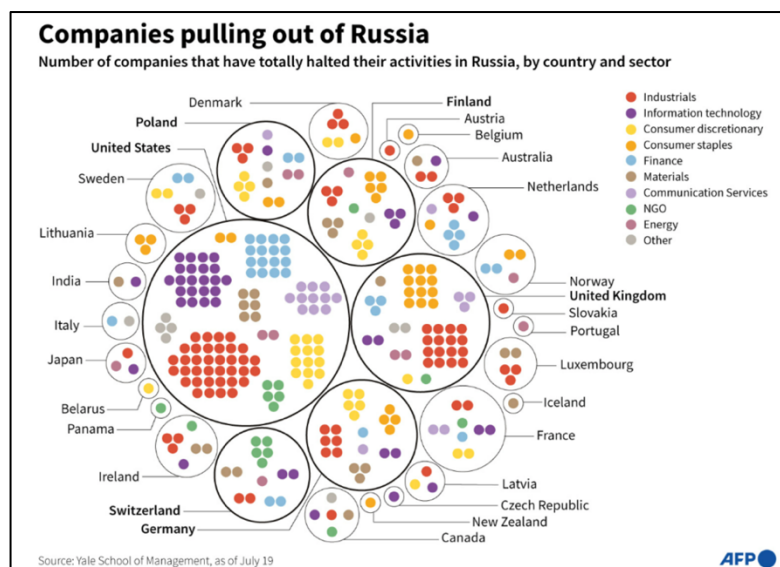


Figure 9: Companies pulling out of Russia

¹⁰⁶ "The Consequences of the Unprecedented Rush of Companies Leaving Russia".

<https://www.newyorker.com/business/currency/the-consequences-of-the-unprecedented-rush-of-companies-leaving-russia>

Data compiled over 1,200 companies' responses by the 24 researchers, team of experts and students at the Yale Chief Executive Leadership Institute have been originally classified in a simple "withdraw" vs. "remain" list and then in five categories using a letter grade scale of A-F for the completeness of withdrawal¹⁰⁷.

To well understand this process and its consequences on the world economy, as it is the main topic of this research, it's useful to cite some real cases.

The American largest fast-food, McDonald's, after paused its operations in Russia at the beginning of the war, on May 16 announced the intention to sell its more than 800 restaurants as "Russian attack [...] isn't consistent with McDonald's values"¹⁰⁸. McDonald's started a "de-Archiving" process, meaning it removed name, logos, menus and branding while remaining trademarks and ensuring its more than 62,000 employees in Russia to get paid until the close of any transaction¹⁰⁹.

Another important American company, Philip Morris, retailing Marlboro cigarettes, is still trying to leave Russia but the operation is very complicated. The company started its business in Russia in 1977, with a state-owned licensing agreement to manufacture Marlboros. At the day of the war's beginning, Philip Morris counted a factory in St. Petersburg and sales offices in more than 100 cities with 3,200 employees.

Renault, the French car manufacturer, decided to sell its major stake in AvtoVAZ, Russia's largest company in the automotive industry, to a state-backed entity, including in the contract the option to buy back it if the company would return to Russia.

On the technological front, Apple, IBM, Intel and Sony suspended their sales in Russia from March and stopped all exports into its Russian sales channel.

H&M, the fashion retailer, had about 170 stores in Russia that closed in March, when the conflict begun. Now, through a "winding down process," as the company said, it will reopen stores for a brief period to sell the leftover inventory before completely exiting the country.

From retail to services sector, McKinsey & Company too said it "will no longer serve any government entity in Russia", suspending current works in Russia and refusing any new one that will be proposed. On this wave also the Big Four accounting firms - Deloitte, EY, KPMG and PwC - leaved the country.

FedEx, one of the world's largest delivery services representing crucial elements of the global supply chain, also suspended shipments to Russia¹¹⁰. Even if is discussed that the motives behind these companies' decisions are purely moral, what is sure is that they've gone beyond what is legally required by international sanctions¹¹¹. During these months, Putin has continued to say that the country is faring just fine, but Russian economy

¹⁰⁷ "Over 1,000 Companies Have Curtailed Operations in Russia—But Some Remain". <https://som.yale.edu/story/2022/over-1000-companies-have-curtailed-operations-russia-some-remain>

¹⁰⁸ "McDonald's says it will sell its Russia business after previously pausing operations due to Ukraine war". <https://www.cnbc.com/2022/05/16/mcdonalds-says-it-will-sell-its-russia-business-after-previously-pausing-operations-due-to-ukraine-war.html>

¹⁰⁹ "Western companies have 50 bad ways to leave Russia". <https://www.reuters.com/breakingviews/western-companies-have-50-bad-ways-leave-russia-2022-05-16/>

¹¹⁰ "Companies Find Leaving Russia Difficult, Though Many Are Trying". <https://www.wsj.com/articles/companies-find-leaving-russia-difficult-though-many-are-trying-11655803801>

¹¹¹ "Some of the Biggest Brands Are Leaving Russia. Others Just Can't Quit Putin. Here's a List.". <https://www.nytimes.com/interactive/2022/04/07/opinion/companies-ukraine-boycott.html>,

seemed to come out devastated from the massive exodus of private companies, even because it was combined with EU sanctions.

2.4.1 Financial implications for companies leaving Russia

In this framework is to be said that, of course, not all global companies have retreated from the country. According to the American business magazine Fortune, around 47 of the world's 200 biggest companies are still doing business in or with Russia¹¹². Associated with the reputational risk of operates in Russia, must be considered major costs, as the risk of nationalization as Russia is pushing to seek more control of the economy. Global companies has been estimated to loss more than \$59 billion from their Russian operations, with more financial pain to come to weaken the economy, according to public statements and securities filings¹¹³. The write-downs and losses reported by leading international companies include a range of industries, from retailers to restaurants, from banks to services: Mc Donald's announced that closing its restaurants in Russia cost \$127m in the first quarter of this year even if Russia and Ukraine businesses represented less than 3% of its operating income last year, Renault too recorded a loss of \$175m after leaving the Russian market for being accused from the Ukraine's president of "financing the murder of children and women". On the same line, oil companies such as Shell and Exxon, expected to lose respectively \$5 and \$3.4 billion, while BP reported a write-down of \$24 billion after suspending its 20% share in the Russian company Rosneft. On the same line, Uber Technologies Inc., the famous ride-sharing company, reported last May a \$182 million write-down on the value of its stake in a Russian joint venture even if in February it was searching for opportunities to accelerate the planned sale of the stake¹¹⁴.

To sum up, according to Yale SoM recent study, financial markets are "rewarding companies for leaving Russia" as the share-price gains for companies exiting the country have "far surpassed the cost of one-time impairments for companies that have written down the value of their Russian assets," authors said.

Indiana University professor Vivek Astvansh obtained different results analyzing the impact of more than 200 corporate announcements of leaving Russia. The study found that investors punished U.S. companies for pulling out of Russia and non-American companies for not withdrawing¹¹⁵.

Estimates predict more write-downs and other accounting charges in the coming months as companies complete their plans to exit the country. Now, let's see if this result is true for a targeted market, as is the American one, and for different sectors, through a regression analysis on prices of biggest companies' share.

¹¹² "47 of the world's 200 biggest companies still haven't left Russia. Now the Kremlin is preparing 'expropriation blackmail,' an expert says". <https://fortune.com/2022/08/14/companies-stay-russia-risk-nationalization-experts-say-putin/>

¹¹³ *Ibid* 107.

¹¹⁴ "How companies exiting Russia are faring". <https://www.economist.com/graphic-detail/2022/05/09/how-companies-exiting-russia-are-faring>

¹¹⁵ "Business Losses From Russia Top \$59 Billion as Sanctions Hit". https://www.wsj.com/articles/business-losses-from-russia-top-59-billion-as-sanctions-hit-11654853400?mod=article_inline

CHAPTER III

METHODOLOGY

3.1 Introduction

After the description of the general context of our research, the following chapter will look at the effects on American companies' stock prices from the beginning of war in Ukraine, according to their decision to exit or not the Russian market. It has been decided to focus on the American stock market to facilitate the analysis and provide more consistent findings, observing their response to changes in the economic environment.

The starting point of this analysis is based on the research of Yale School of Management that, as already mentioned, classified more than 1,000 companies from all over the world, according to their decision to stay or leave Russia. What they found is that “on average the shares of firms that withdrew completely went up by 3.6% between February 23rd and April 19th; those of companies that continued as usual lost 6.8%”¹¹⁶. In addition to this, there is another important finding: companies exiting the Russian market, with a market capitalization under \$2 billion, increased their share price increase by 8.7%, and those with one greater than \$10 billion, saw it rise by 3.8%. On the other hand, shares of comparable companies that decided to still operate in the country declined by 10.6% and 6.9%, respectively.

Under these assumptions, three are the main questions that we want to answer:

1. What effect has the decision to exit or not the Russian market on the company's performance?
2. How much this decision has an impact on their expected stock price?
3. Was the impact justified a prior by the company's fundamentals?

To answer to the first two questions, has been run regressions with the appropriate dummy variable to investigate the effect of the outbreak of the conflict between Russia and Ukraine and, in those cases of companies that decided to stop doing business in Russia, test the consequences this choice on the stock price. The last part of the chapter will take four of the analyzed companies, both staying and leaving the market, that reflect the highest and the lowest impact of the conflict on their stock prices. Starting from the information available, with the Discounted Free Cash Flow method will be calculated the target price of these companies, investigating whether this was hit by the outbreak of the War.

¹¹⁶ Yale School of Management. “*Over 1,000 Companies Have Curtailed Operations in Russia—But Some Remain*”. <https://som.yale.edu/story/2022/over-1000-companies-have-curtailed-operations-russia-some-remain>.

3.2 Dataset description

In the first part, data has been taken from Yahoo Finance, looking at values of historical stock prices between February 2022 and August 2022 so that we can have a global overview of the situation before and after the beginning of the war. To answer the first question, it has been selected a sample of about fifty American companies, included in the S&P 500 index, divided in two groups according to their decision to stay or leave Russia. To be coherent with the result of the II-chapter analysis, together with the already mentioned independent variables (Crude Oil, Natural Gas and Inflation) will be also included, in scale, in the regression, together with the dummy variable representing the permanence in the Russian market, named "Russia". This variable will assume value 0 before the official date in which the company decided to leave the market and 1 after that moment. The exit dates have been taken from the website "Leave Russia"¹¹⁷, a joint project of KSE Institute and a team of Ukrainian IT volunteers proving a list of major companies and world-famous brands that have closed their business in Russia due to the current political situation. The website has tracked their decisions looking at published statements, so it is a reliable source. Are included in the count also companies that have decided to continue operations, proving goods and services, and paying taxes which support and allow the Russian government to continue its war of conquest in Ukraine. For these companies the independent variable "Russia" will assume value 0 before the 23th February (official date of beginning of the war) and 1 after that date.

3.3 Regression results

After running the regression for the sample of companies, we have some important insights to report. Above all it's important to precise that considered only those companies for which the variable "Russia" was significant at the 95% level, so with a p-value of about 0,05. The p value is the minimum level of significance for which the null hypothesis of our analysis is rejected and so used to verify the validity of the hypothesis.

Together with the indirect incidence of the war, considered in the rising prices of commodities, oil and gas we also have to take in consideration other "residual" problems affecting the markets in this period, as already mentioned in the second chapter and that will be isolated through the dummy variable.

For those leaving the market, what is immediately clear is that companies with large market capitalization and strong brands all over the world, such as McDonald's, Apple, IBM, which the Russian market does not represent a great share of the total market, have had a slightly positive effect equal to 1,5% for MCD, 1,4% for AAPL and 1,6% for IBM. This is probably due to the reduction of the reputational risk that comes from their presence in the country, since as we have discussed this is equivalent to directly or indirectly funding the conflict.

Another group of companies, however, including HP, Carnival and Delta Airlines exited Russia with negative consequences, being negative the coefficient of the relative variable. For them the impact has registered

¹¹⁷ LEAVE RUSSIA. <https://leave-russia.org>.

percentage of - 6% for HPQ, - 20% for CCL and - 19% for DAL. The explanation for this effect is related to Russia's importance as a consumer for their products¹¹⁸.

		Coefficients	P-value
MCD exit: 16/05/2022	Intercept	264,029863	1,8874E-13
	Crude Oil	-11,742127	4,4469E-27
	Natural Gas	4,0165302	1,346E-07
	Inflation	7,83982748	0,20240306
	Russia	3,77870766	0,04178052
AAPL exit: 01/03/2022	Intercept	-183,10574	1,2096E-19
	Crude Oil	-13,657817	2,0352E-42
	Natural Gas	1,41291632	0,00531483
	Inflation	80,2293049	8,3228E-55
	Russia	2,35653399	0,00400688
IBM exit: 07/06/2022	Intercept	191,434925	1,1444E-12
	Crude Oil	1,7466925	0,01000449
	Natural Gas	1,39386364	0,00283663
	Inflation	-14,916272	0,00085893
	Russia	2,26883474	0,00572029
HPQ exit: 01/03/2022	Intercept	-46,178977	2,092E-13
	Crude Oil	1,62916707	4,0677E-11
	Natural Gas	0,7363957	1,4878E-05
	Inflation	13,3080742	1,2641E-25
	Russia	-2,0398473	3,0839E-05
CCL exit: 03/03/2022	Intercept	-105,87919	3,4268E-28
	Crude Oil	0,3594924	0,22950432
	Natural Gas	-1,1052826	1,9575E-06
	Inflation	23,9187922	1,6172E-36
	Russia	-3,7099448	1,0517E-08
DAL exit: 25/02/2022	Intercept	-98,070763	3,824E-13
	Crude Oil	1,51036644	0,0024597
	Natural Gas	1,83048753	4,1012E-07
	Inflation	23,7322625	6,7488E-20
	Russia	-7,9740569	2,6877E-12

Table 1: Regressions' results examples of companies exiting the Russian market¹¹⁹

For those staying the market, like General Electric and Morgan Stanley, we have an opposite effect that is reflected in a percentage reduction of about - 7% for GE and - 14% for MS, that derives on one hand from the uncertainty of the economic and political situation in Russia and on the other hand from the already mentioned “reputational risk” of continuing their operations in Russia. For example, Phillips 66 the American multinational energy company presents a coefficient of about -14 -whose significance is confirmed by a p-value of 1,55E-20- with a - 7% on the price that highlights the high impact of U.S. sanctions on companies exporting from the country. On the contrary, companies like Tesla, still doing business in Russia, have increased their performance results of about 10%. Reasons for this escalation lie in the fact that Tesla electric cars are sold unofficially in Russia, while most of its competitors like Audi and Porsche have publicly

¹¹⁸ As mentioned in a Bloomberg article: “In the fourth quarter of 2020, HP was the largest supplier of PCs to Russia with 18% market share, according to research firm IDC.” <https://www.bloomberg.com/news/articles/2022-02-28/hp-inc-says-russia-sanctions-to-cut-profit-by-3-cents-a-share>

¹¹⁹ Personal elaboration. Other parts of the regression analysis are available upon request.

announced the suspension of sales in the country in accordance with EU sanctions. This is also clear if we look at Tesla' supporters which are very loyal to the brand and customized so that they even appreciate the CEO's, Elon Musk, behaviour of being "politically incorrect".

Knowing that, an answer to our first question can be provided. American companies with strong brands, that operates as leader in their industries and for which the Russian market doesn't represent a key market for their businesses, had a positive effect both staying or stopping their sales in Russia.

On the other hand, American companies that have a high bargaining power as suppliers of good and services in Russia, representing a great share of their markets, and whose industry has been highly affected by U.S. sanction and by the "reputational risk" of continuing their businesses in Russia, had negative effects on stock prices.

		Coefficients	P-value
GE	Intercept	-280,67914	1,8219E-51
	Crude Oil	-2,0720456	1,4204E-05
	Natural Gas	-1,7452526	2,6072E-07
	Inflation	73,8586709	6,6374E-71
	Russia	-7,1570297	5,8943E-11
MS	Intercept	-67,776673	5,4377E-08
	Crude Oil	-3,6584145	7,0883E-13
	Natural Gas	1,40820023	2,6469E-05
	Inflation	34,8634355	3,2487E-34
	Russia	-13,691458	3,575E-27
PSX	Intercept	28,3360485	0,06591817
	Crude Oil	7,24497021	1,6964E-23
	Natural Gas	6,49935927	3,4264E-32
	Inflation	-0,1331883	0,96177116
	Russia	-14,374754	1,55E-20
TSLA	Intercept	-881,93804	6,1711E-20
	Crude Oil	-33,828911	2,595E-19
	Natural Gas	2,92968673	0,19773229
	Inflation	256,28817	2,6637E-36
	Russia	25,7526519	0,00038931

Table 2: Regressions' results examples of companies staying the Russian market¹²⁰

3.4 Discounted Free Cash Flow Model application

Looking at these results and to properly answer the third questions of this research, has been decided to take from the analyzed sample four companies (two staying and two leaving Russia) respectively with the most negative and positive coefficient of the dummy variable representing the war, to make estimates of their target price before and after the conflict to quantify whether their performance deviated from expected forecasts. For

¹²⁰ Personal elaboration. Other parts of the regression analysis are available upon request.

those exiting the market, have been selected BlackRock (BLK)¹²¹, the American investment company, as the one with most negative coefficient, and IBM, leader in the supply of technology appliances, as the most positive. For those continuing operating in the Russian market has been taken one one hand Google (GOOG), the most famous American company leader in search engines, and on the other hand Stryker Corporation (SYK), leader in medical technologies. The focus on technology is not a coincidence, as these companies represent some example of a sector in which Russia exports a lot from U.S.

We have first calculated the target price with the financials' data as of 12/31/2021, using forecasts for the year 2022 and for the next three years an average of the growth coefficients of the previous years. In a second hand, the method has been replicated but replacing calculated forecasts with actual data available from the companies' 2022 quarterly results that, at the moment of the analysis, covered only the first two quarters (January-June). Using the forecasts for the next two quarters, we compared the two prices to see how the effect of the war was reflected in the fundamentals. The assumptions of this approach were:

- that the forecasts were sufficiently accurate;
- that the war had already had an impact on the fundamentals.

3.4.1 Forecasts

The starting point of our forecast has been historical data of Sales, EBITDA, EBIT and Net Income of 2018, 2019, 2020 and 2021, available on Yahoo Finance. To forecast 2022 and the next three years, has been used the Holt and Winters technique. This method captures three aspects of the time series: a typical value (average), a slope (trend) over time, and a cyclical repeating pattern (seasonality).

It is defined by its three order parameters, alpha, beta, gamma where alpha specifies the coefficient for the level smoothing, beta specifies the coefficient for the trend smoothing and gamma specifies the coefficient for the seasonal smoothing. The selected type of seasonality is the additive seasonality, where each season changes by a constant number¹²². The formula for the additive method is:

$$\begin{aligned}\hat{y}_{t+h|t} &= \ell_t + hb_t + s_{t+h-m(k+1)} \\ \ell_t &= \alpha(y_t - s_{t-m}) + (1 - \alpha)(\ell_{t-1} + b_{t-1}) \\ b_t &= \beta^*(\ell_t - \ell_{t-1}) + (1 - \beta^*)b_{t-1} \\ s_t &= \gamma(y_t - \ell_{t-1} - b_{t-1}) + (1 - \gamma)s_{t-m},\end{aligned}\quad 123$$

where k is the integer part of $(h-1)/m$. This parameter ensure that estimates of the seasonal indices used for forecasting are taken from the final year of the sample. The level equation represents a weighted average between the seasonally adjusted observation $(y_t - s_{t-m})$ and the non-seasonal forecast $(\ell_{t-1} + b_{t-1})$ for time t .

¹²¹ This company would have been better analyzed with residual earnings model, but our data were not fully available or reliable.

¹²² Chatfield, C. (1978). "The Holt-Winters Forecasting Procedure". Journal of the Royal Statistical Society. Series C (Applied Statistics), 27(3), 264–279. <https://doi.org/10.2307/2347162>

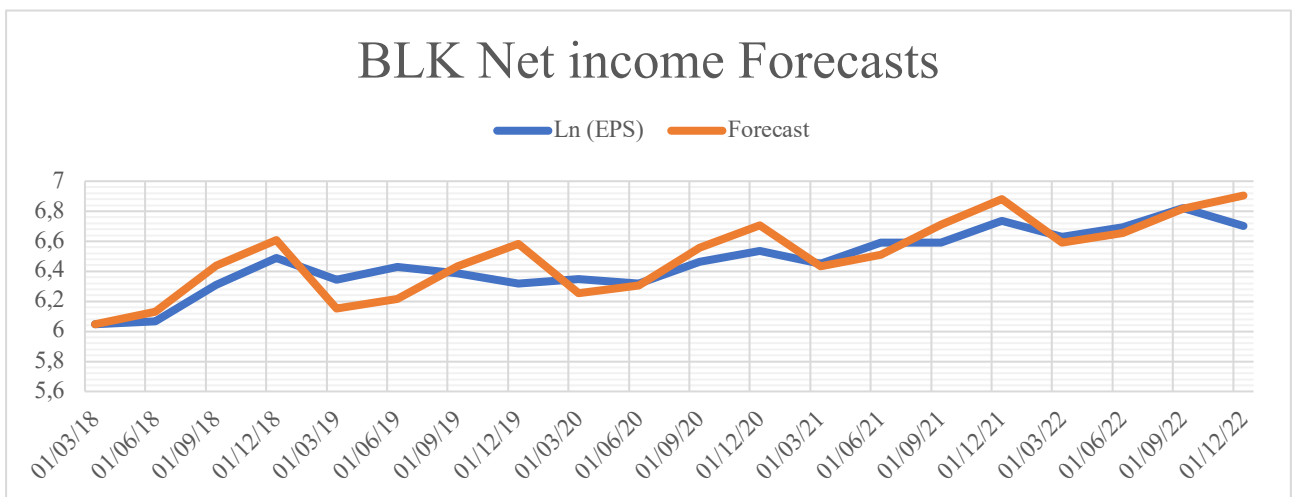
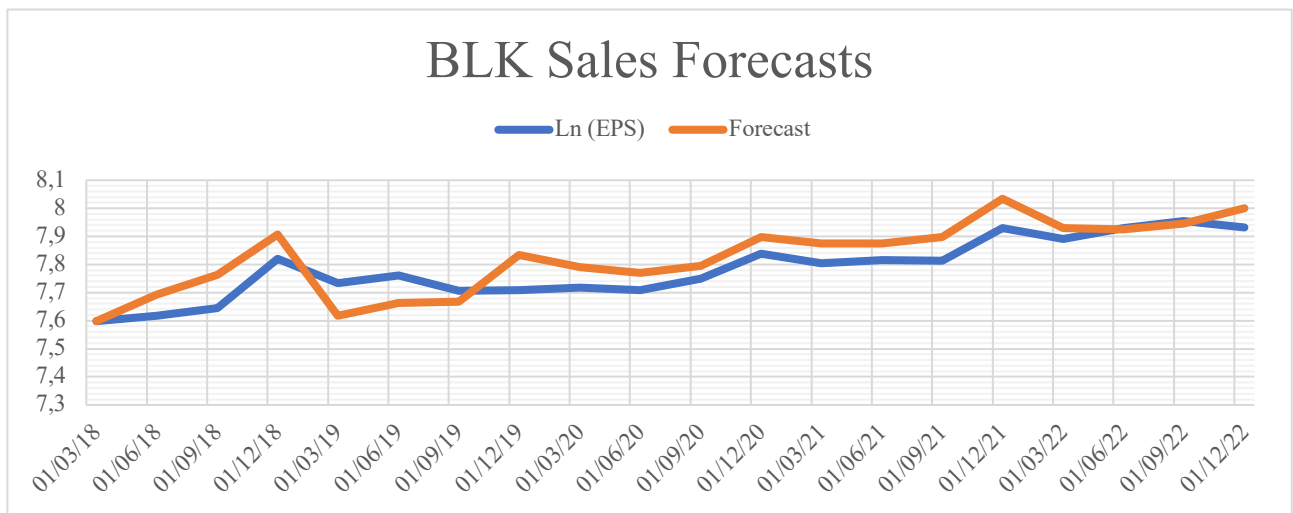
¹²³ Hyndman, R.J., & Athanasopoulos, G. (2018) "Forecasting: principles and practice", 2nd edition, OTexts: Melbourne, Australia. OTexts.com/fpp2

The seasonal equation shows a weighted average between the current seasonal index, $(y_t - l_{t-1} - b_{t-1})$, and the seasonal index of the same season last year (i.e., m time periods ago).

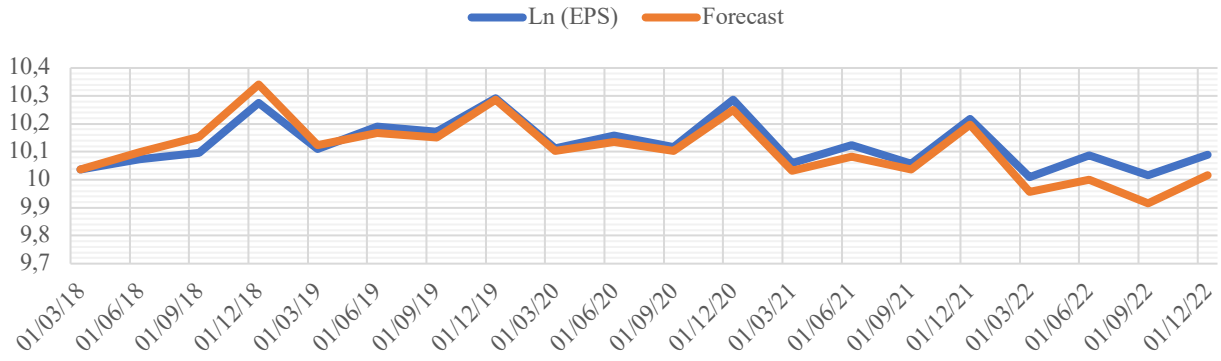
The equation for the seasonal component is often expressed as:

$$s_t = \gamma^*(y_t - l_t) + (1 - \gamma^*)s_{t-m} \quad 124$$

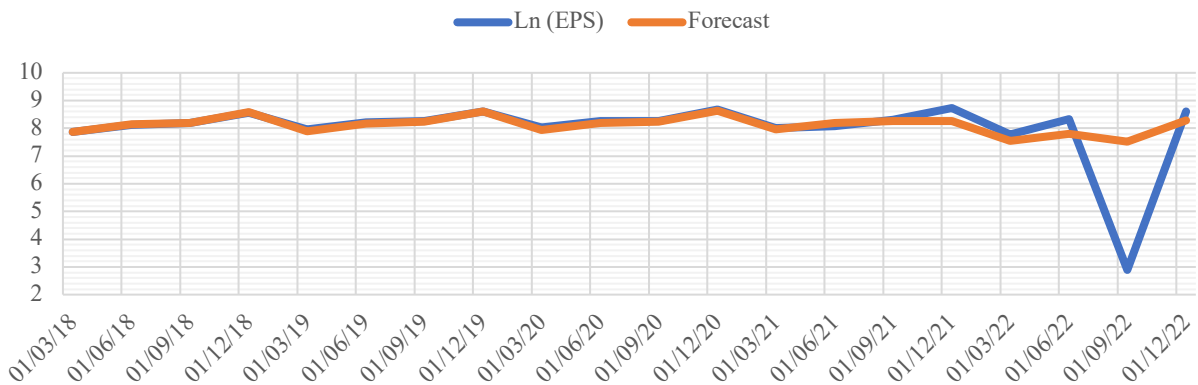
The results of the application of Holt and Winters technique has been summarized on a graph that shows the expected stock prices' movements. Forecast models tend to perform better with sales because they are measures that are less subject to the rules and to the discretion of companies in some budgeting choices, respect to the net income. A summary of Sales and Net Income forecasts is presented below:



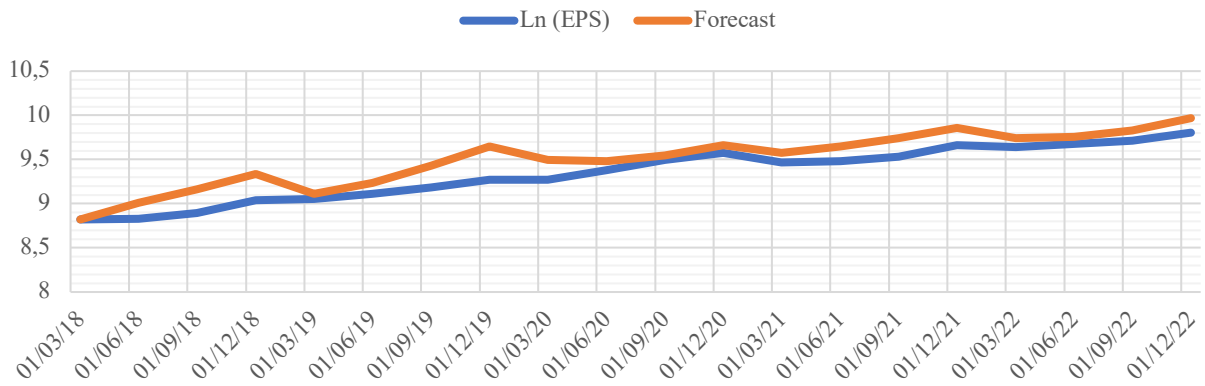
IBM Sales Forecasts

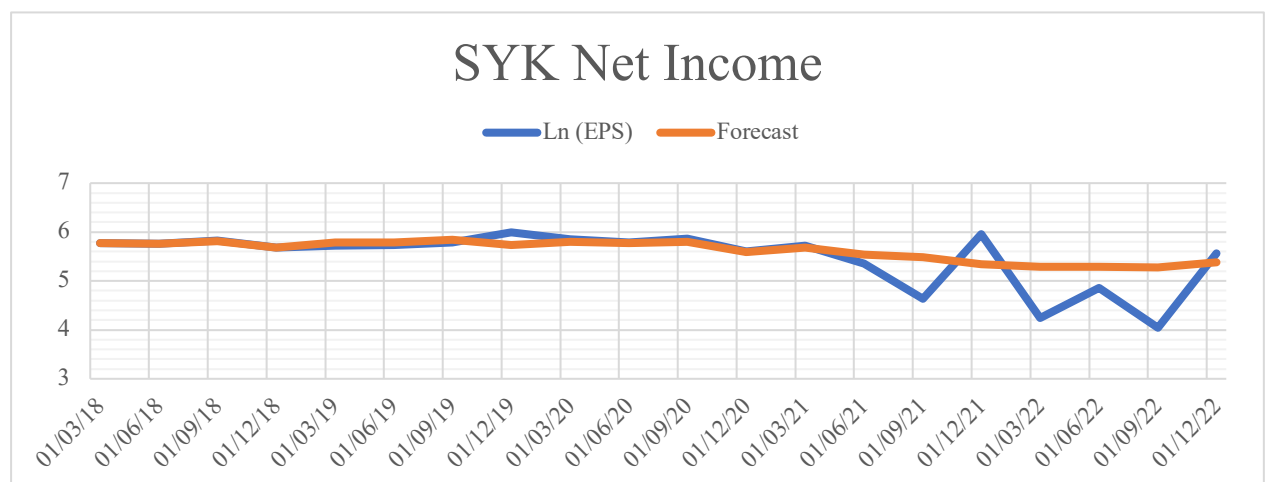
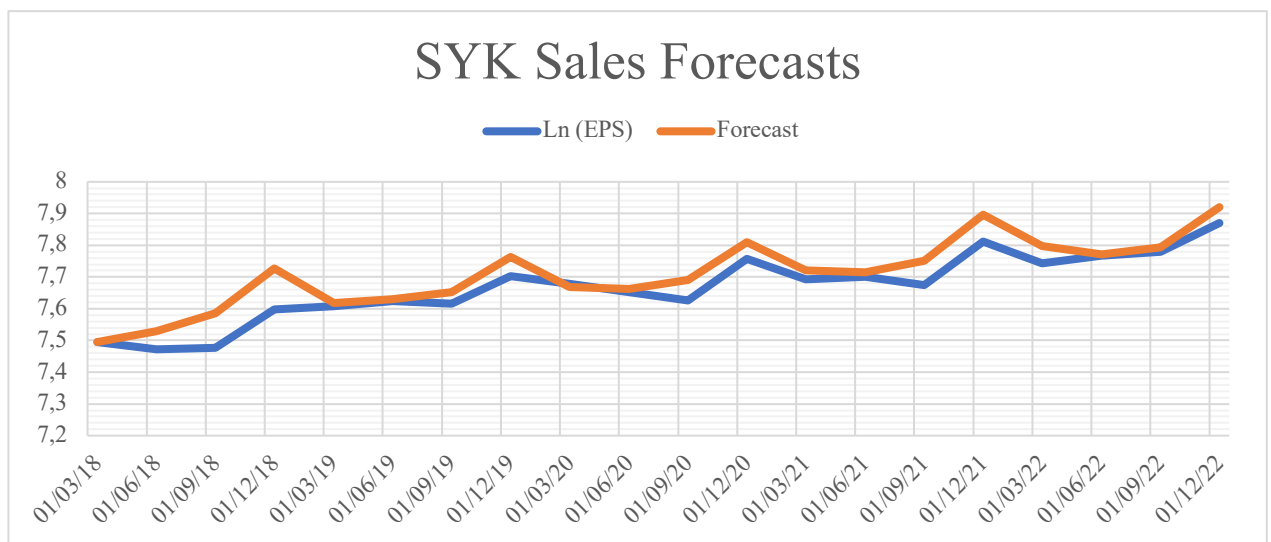
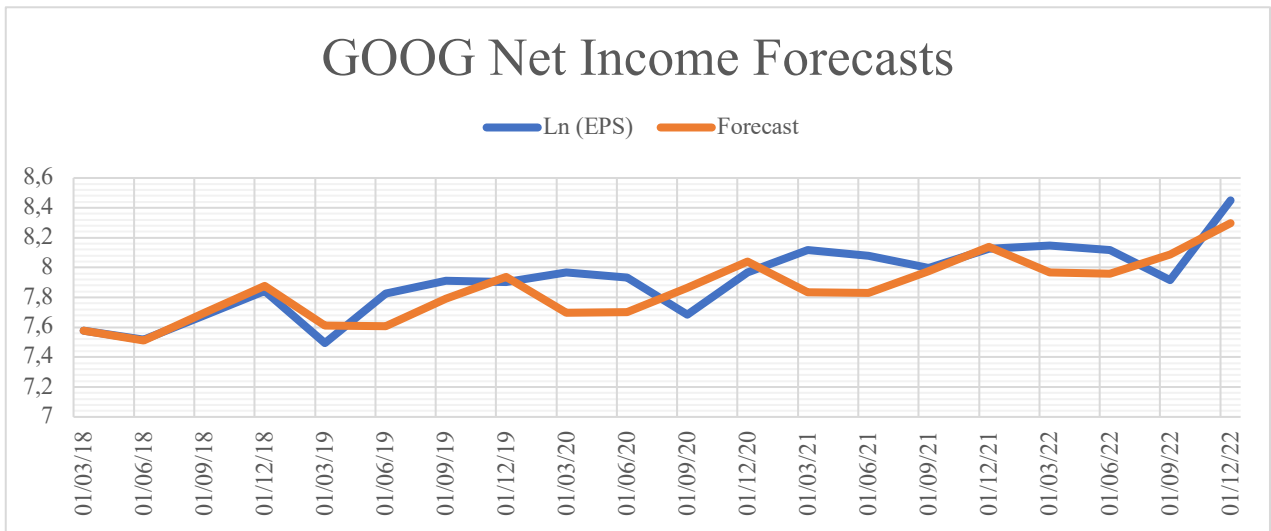


IBM Net Income Forecasts



GOOG Sales Forecasts





3.4.2 Assumptions

Once forecasted our values for the 2022 and for the next three years, as showed above, we have assumed a growth rate equal to the average of the effective growth of the previous three years. The equity cost of capital

used to discount our cash flows has been calculated through the Capital Asset Pricing Model (CAPM) with the formula $ER_i = R_f + \beta_i(ER_m - R_f)$, where R_f is the 5 Year Treasury Bond Yield and it's equal to 3,50%, β_i is the systematic risk that has been taken different for each company and ER_m is the market risk premium equal to 4,34% for U.S.¹²⁵.

To calculate the terminal value which is equal to $TV = (FCF_n \times (1 + g)) / (WACC - g)$, the growth rate has been taken from Yahoo Finance under the Growth Estimates for the Next 5 Years.

Every other data used in the calculation came from the official Financial Statements of the companies subjected to this analysis.

3.4.3 Calculations and Results

From final results, showed in the table below, we can observe that excepted for BlackRock¹²⁶, which actual price is higher than the forecasted price despite its negative correlation with the dummy variable “Russia”, the other three companies analyzed confirm our hypothesis, as the positive and negative nature of their coefficient is reflected in their current performance.

Final results		
Company	Forecasted price	Actual price
BLK	\$ 952,03	\$ 1.011,80
IBM	\$ 161,07	\$ 230,28
GOOG	\$ 240,12	\$ 125,77
SYK	\$ 317,35	\$ 367,30

Table 3: Final results

¹²⁵ Damodaran, A., “Equity Risk Premiums (ERP): Determinants, Estimation, and Implications”, 2022 Edition (March 23, 2022). Available at SSRN: <https://ssrn.com/abstract=4066060> or <http://dx.doi.org/10.2139/ssrn.4066060>

¹²⁶ As already clarified maybe this company would have had a better result if we had available data to apply residual earnings model.

Conclusions

The interest in analyzing to what extent the Russian-Ukraine conflict has having an impact on the world's economy, especially on the stock market, was the aim of this work, in which has been investigated the relationship between macroeconomic variables and firm's financial performance, expressed in the price of their stocks. The starting point has been the theory and the literature review in which the conceptual framework of the topic under analysis was previously investigated. In most of the cases, the literature proved to agree on the existence of a relationship between equity returns and different macroeconomic variables: in particular, was found a negative impact of oil price shocks on stock returns, a positive one between stock returns and inflation and a positive one with commodity prices' fluctuations.

Hypothesis testing was based on the construction of a multiple regression between historical data of the dependent variable "S&P 500", representing the American market, and the independent variables "Oil prices", "Natural Gas" and "Inflation", which were rescaled to make comparisons, and the dummy variable that isolated the "residual" effect of the war.

The results of the analysis confirmed our first hypothesis of dependence between the macroeconomic variables interested by the war and the stock market. The p-value assumed relevant levels of significance for all the independent variables so that the values of the coefficients resulted in a negative effect of changes in the oil prices due to a negative crude oil coefficient value, a highly positive effect of inflation and a strongly negative effect of the War. These insights weren't so surprising compared to the previous discussion, making possible to fully accept the hypotheses formulated as the statistical significance confirmed the theoretical background between this research.

In the later analysis, used to test the second hypothesis, has been taken a sample of fifty American companies diversified according to their decision to stay or leave the Russian market. After running a regression to confirm the significance of the independent variable "Russia", have been taken four of them (two staying and two leaving Russia) respectively with the most negative and positive coefficient of the dummy variable representing the war, to make estimates of their target price before and after the conflict. The selected companies were BlackRock, Stryker Corporation, Google and IBM. To quantify whether their performance deviation from expectations, has been calculated first the target price using the Holt and Winters' forecasts and with actual data available from the companies' 2022 quarterly results.

From final results, has been observed that excepted for BlackRock, which actual price was higher than the forecasted price, despite its negative correlation with the dummy variable "Russia", the other three companies analyzed confirmed our hypothesis, as the positive and negative nature of their coefficient is reflected in their current performance. To conclude, the findings suggest that the market seemed to appreciate more the moral high ground on the reputational effects of doing business with Russia.

To further support the relevance of the results, it is crucial to specify that have been considered only those companies for which the variable "Russia" was significant at the 95% level, so with a p-value of about 0,05

and that the assumptions of this approach were the sufficient accuracy of the forecasts and the acknowledgment that the war has already had an impact on the fundamentals.

This work is obviously not exempt from limitations. The first limitation depends directly on the sample decided to use, the American market, representing the impossibility of generalizing the results to all the other countries. It might be interesting to conduct an analysis between companies belonging to the European market or even to Least Developed Countries. It could also be tailored in several sectors, analyzing which of them has suffered the most or investigating through different dependent variables the companies' behaviours.

Moreover, this analysis does not take into account long-term trends in share prices after Russia's invasion of Ukraine, so establishing a measure of economic losses for the firms' divestment decisions is tricky. Consequently, it is not excluded the validity of other models for the calculation of the impact of the war on stock prices, that could maybe have lead to different results.

The results of this study may be of considerable interest to several company stakeholders to the extent of the identification of a relationship between macroeconomic variables on the one hand and profitability and strategic decision on the other. This is not obvious if we consider that even though reducing performance and recording losses, managers are forced to opt for significant decisions to cope with reputational risks and to deal with external and unpredictable events, as the war is.

Appendix

Multiple linear regression result on the sample of American Companies staying the Russian market

STAY		
Company	War Coefficient	P-value
TSLA	25,75265189	0,000389
SHW	-5,17301764	-35,173018
PSX	-14,37475357	1,55E-20
OGN	-1,103732277	0,029648
NDSN	-3,304176023	0,094072
MNST	-1,502740391	0,213962
MTCH	-16,38456257	1,79E-11
SYK	31,141674264	0,00706847
VZ	-1,393860675	0,021257
GOOG	-13,69145762	3,58E-27
KEYS	-7,544648276	-7,544648
IQV	-6,111736779	0,03829
GE	-7,157029743	5,89E-11
FLT	-9,124262956	0,001238
EFX	1,607586441	0,510174
CTVA	2,56349752	0,000152
CDNS	16,97669838	3,61E-07
BRO	4,134388147	6,67E-07
LNT	2,546224259	4,71E-06
ALGN	-13,42831652	4,31E-12
T	-0,471915234	0,154514
AJG	16,99496224	3,23E-13

Multiple linear regression results on the sample of American Companies exiting the Russian market

EXIT		
Company	War Coefficient	P-value
IBM	2,26883474	0,00572
NKE	-2,464851918	0,162324
DXC	-1,40762777	0,153438
DAL	-7,974056884	2,69E-12
CCL	-3,70994476	1,05E-08
AVY	-7,639608875	0,000235
EMR	0,159873339	0,82311
OMC	0,180954689	0,85525
MAR	5,338540991	0,062168
SBUX	8,855396052	1,15E-13
FMC	5,185102512	0,056635
BLK	-15,84686533	0,007064
EA	-9,12517765	2,4E-05
ETSY	-9,103578711	0,00271
HPE	-0,93274903	3,39E-12
EXPE	-1,477597162	0,712053
PPG	-7,2592348	0,000278
HPQ	-2,03984735	3,08E-05
AAPL	2,35653399	0,004007
MCD	3,778707661	0,041781

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The Russian military invasion of Ukraine in 2022 is not only the Europe's largest war in generations but also one of the most economically destructive events of the last years, especially if we consider that it has started in the wake of the Covid-19 pandemic situation which has already left its negative consequences around the world. According to a research of the Yale School of Management, which have tracked the responses of more than 1,000 international companies to Russia's war in Ukraine, the stock market has rewarded companies that have divested. From retailers to services' companies, more than the 80% have taken financial risks to stop their operations, leave the market and sell their Russian assets beyond the limit imposed by international sanctions.

In light of these findings, the aim of this work is to examine whether macroeconomic variables have an impact on the stock market, taking as the specific scenario of the Russian-Ukraine war. This study will contribute to the existing literature updating the database of facts until the end of 2022 and it is innovative in analyzing the effects of macroeconomic variables on the economy, giving detailed insights on what factors have an impact on the stock market and to what extent.

Two main hypotheses will be tested:

- *Hypothesis 1: The war has an impact on macroeconomic variables, reflected on the stock market.*
- *Hypothesis 2: This impact affects performance in different ways depending on companies' strategical decisions*

To test the first hypothesis will be performed a regression analysis taking historical data of a sample of about fifty listed American companies to check if exists a relation between their stock prices' trend and selected macroeconomic variables. Other "residual" problems affecting the markets in this period, will be isolated through a dummy variable.

Later, on four of them, will be calculated the forecasted target price and the actual one through the Discounted Free Cash Flow method, to make comparisons and see if their performance has reflected the decision to stay or leave the Russian market.

H 1: The relation between the volatility of stock market returns and macroeconomic variables affecting the economy has been widely analyzed in financial market literature. Among others, several theories including the Efficient Market Hypothesis, the Dividend Discount Model and the Arbitrage Price Theory have been presented in the following research to better understand its context and the methodology.

The academic literature demonstrated the existence of relationships between equity returns and different macroeconomic variables, but the debate continues regarding which indicator has a substantial effect on equity markets. The health of the economy is reflected in the corporate equity, so, assuming constant discount rates, every change or event that affects stock market has a consequent impact on the integrity of the firm and its returns (Fama, 1981)¹. In the following analysis, the theory behind the impact of macroeconomic volatility on

¹ Fama, E.F. (1981), "Stock returns, real activity, inflation and money", American Economic Review, Vol. 71, pp. 545-65.

stock market returns takes in consideration some variables: inflation, oil price, exchange rate, interest rate and price level.

Among others, the first to argue that there is an inverse relationship between interest rates and stock returns was Fama², but some years later this argument was analyzed also by Campbell³ (1987), whose results support the effectiveness of the term structure of interest rates in predicting excess returns on the US stock market. Zhou⁴ (1996) rejected the Fama hypothesis since, using regression model, he found that interest rates have an impact on stock market returns but just as a partial effect in the long run. Moreover, his analysis showed how the variation in price-dividend ratios is explained in the major part by the long-term interest rate, suggesting that the high volatility of the stock market is related to the high volatility of long-term bond yields that can be predicted by changing forecasts of discount rates. Another part of the literature observed how a change in interest rates produces more liquidity available into the economy that could be channeled in the stock market, driving up the demand and prices of stocks (see for ex. Thorbecke, 1997⁵).

On the other hand, it's not so easy to define a precise relationship between inflation and equity prices and "no catch-all" rule can be applied. Since each stock has different characteristics, it should be evaluated through a prudent analysis to plan an investment strategy. Considering the time period, we could distinguish between long run and short run. In the long run, investors usually buy stocks for hedging against inflation: if we assume an increase in input costs for a business, it's easier to offset losses over a longer period than to compensate them in the short. In addition to that, a well-diversified portfolio also helps to spread any eventual loss through different stocks, reducing the associated risk. Fisher (1930)⁶ was one of the first to analyze the consequences of inflation and changes in interest rates. He basically established that the interest rate is divided in two parts: the nominal interest rate and the expected rate of inflation. The so-called Fisher effect theorizes a one-to-one relationship between inflation and interest rates in a perfectly predictable world, with real interest rates uncorrelated with the expected rate of inflation and determined entirely by the real factors in an economy, such as the productivity of capital and the investors' time preference. This is an important prediction of the Fisher Hypothesis because, if real interest rates are correlated with the expected rate of inflation, changes in the real rate will not lead to a complete adjustment in nominal rates in response to expected inflation. In accordance with Brandt and Wang's (2003)⁷ model, inflation is a key factor influencing investors' risk aversion thus reflected in the expected return on capital and the real discount rate. The value of stocks, on however, is significant to the profits from capital assets, e.g., commodities, labor and capital. Inflation raises both the cost of input assets and output assets. As a consequence, shareholders expected future cash flow rises due to higher

² See previous paragraph.

³ Campbell, J.B. (1987) *"Introduction to Remote Sensing"*. The Guilford Press, New York.

⁴ Zhou, B., (1996), *"High-Frequency Data and Volatility in Foreign-Exchange Rates"*, Journal of Business & Economic Statistics, 14, (1), 45-52

⁵ Thorbecke, W., (1997), *"On Stock Market Returns and Monetary Policy"*, Journal of Finance, 52, (2), 635-54

⁶ Fisher, I., (1930) *"The Theory of Interest."*, New York: Macmillan.

⁷ Brandt, M. W. and Wang, Kevin Q. (2003), *Time-Varying Risk Aversion and Unexpected Inflation*, Journal of Monetary Economics, Vol.50, pp. 1457-1498.

selling prices. According to Jareno and Navarro (2009)⁸, the stronger the firm's capacity to shift the panic of inflation to the sales price, the better the stock returns will be.

Hamilton⁹ (1983) was the first scholar to analyze the importance of the energy price changes to the economy. He revealed that oil price increases had contributed to some of the U.S. economic collapse during the period 1948-1972. Oil price is particularly important in those exporting countries where oil represents a major share of total export: based on that has been analyzed how high could be the risk of oil price volatility (Yoshino and Alekhina, 2016)¹⁰. The main reason for which the oil market is more sensitive compared to other commodities is related to the fact that oil supply and demand have a low-price elasticity, which makes the price of oil fluctuate widely. Therefore, having oil as one of the main input costs for final products, there is a direct impact on the oil exporters' revenues and, consequently, on stock prices calculated as discounted values of expected future cash flows. In sum, the final impact of changes in oil prices can be double: on one hand, as already explained, it influences the company's expected cash flows deriving from costs of final products; an increase in oil prices will lead to lower corporate sales and profits for the firms which in turn will decrease stock prices through dividends. It may also affect stock prices via its effect on the discount rates since it affects the expected inflation rate and expected domestic inflation. For example, a higher price on oil would place an upward pressure on expected domestic inflation which is positively related to the discount rate and negatively related to stock prices. This could also cause the real interest rate to rise which would increase the rate of return required by investors and thereby cause the stock prices to decrease.

Exchange rates have a direct impact on the price and value of stocks in home as well as it abroad. Long-term movements in exchange rates are affected by fundamental market forces of supply and demand.

Dornbusch and Fischer¹¹ (1980) found a relationship between stock prices and exchange rates and they defined "the goods market approach" the effect of changes in the exchange rate on the stock prices and on the current account or trade balance. This negative relationship between stock prices and exchange rates depends again on the importance of the international trade for the economy and whether the companies listed on the stock market are importing or exporting companies, as already explained for the oil price. Hence, a depreciation of the domestic currency will lead to higher profits and higher stock prices for those companies that are exporting¹². Karoui¹³ (2006) also studied how fluctuations in global financial market have and impact on exchange rates and consequently affect the stock prices as well as returns in the domestic stock markets.

⁸ Jareno, F. and Navarro, E. (2010), "Stock interest rate and inflation shocks", *European Journal of Operational Research*, Vol.201, pp. 337-348.

⁹ Hamilton, J. (1983), "Oil and the Macroeconomy since World War II", *The Journal of Political Economy*, 91, 228-248. <https://doi.org/10.1086/261140>

¹⁰ Yoshino, N. and V. Alekhina. (2016), "Impact of oil price fluctuations on an energy exporting economy: evidence from Russia", *Journal of Administrative and Business Studies* 2(4): 156-166.

¹¹ Rüdiger D. & Stanley F., (1980). "Exchange Rates and the Current Account", *American Economic Review*, 70, (5), 960-71

¹² OpenStax Economics, *Principles of Economics*. OpenStax CNX. May 18, 2016 <http://cnx.org/contents/69619d2b-68f0-44b0-b074-a9b2bf90b2c6@11.330>.

¹³ Karoui, A., (2006). "The Correlation between Fx Rate Volatility and Stock Exchange Returns Volatility: An Emerging Markets Overview", <http://dx.doi.org/10.2139/ssrn.892086>

Though years the level of price variation has become one of the macroeconomic variables that is crucial for managerial and marketing decisions.

Analyzing commodity prices' fluctuations, some authors found that they are most closely connected to currencies since commodity exports bring in foreign exchange. For this reason, any volatility of commodity prices can have a direct impact on the balance of payments. Moreover, every change in commodity prices depends not only on the structural characteristics of the economy but also on the policy framework that is in place in that country. Céspedes and Velasco¹⁴ (2011) found a significant impact of commodity price shocks on output and investment that have major consequences on those economies less developed in financial markets. From their analysis it's crucial the role of financial market in the transmission of shocks and its importance in countries subject to commodity price volatility.

After this theoretical explanation, let's summarize the scenario of our analysis.

The Russian invasion of Ukraine, begun on the morning of 24th February of this year, with the casus belli of Donbass independence and protection of the Russian population from abuses and genocide by the Ukrainian government, triggered another war: the economic-financial war. Financial sanctions have been imposed by the European Union and other important countries as an immediate response and strong condemnation of the Russian atrocities. The strategic aim of these measures is double: in the short-term they try to trigger a liquidity and balance-of-payments crisis, reducing the Kremlin's financial capacity to finance the war, and in the long-term to damage Russia's productive capacity and technological industry so that having fewer resources to hand Vladimir Putin couldn't aspire to invade another country. To weaken the internal front, they impose high economic and social costs on Russian political figures and offer a chance to the West to exert power of control on the Russian financial and technological networks¹⁵.

The financial side was impacted the most since the West decided to target "wealthy individuals, banks, businesses and state-owned enterprises"¹⁶. In a first moment, it was limited the access to EU primary and secondary capital markets for the most important Russian banks and companies; this measure was ordered together with a ban on transactions with the Russian Central Bank and a block of its euro and dollar deposits in the Federal Reserve and the ECB, avoiding the possibility of taking measures to limit the depreciation of the ruble. Suddenly some major Russian credit and financial institutions were removed from the international payment system (SWIFT) to prevent any possible dealings with non-Russian entities and delaying payments to Russia for its oil and gas exports¹⁷.

¹⁴ Céspedes, L., Velasco, A. (2012). "Macroeconomic Performance During Commodity Price Booms and Busts", IMF Econ Rev 60, 570–599 <https://doi.org/10.1057/imfer.2012.22>

¹⁵ "Are sanctions on Russia working?". <https://www.economist.com/leaders/2022/08/25/are-sanctions-working>

¹⁶ "What are the sanctions on Russia and are they hurting its economy?". <https://www.bbc.com/news/world-europe-60125659>

¹⁷ Magnani A., (2022), "Petrolio, oro, gas: a che punto sono le sanzioni Ue alla Russia". <https://www.ilsole24ore.com/art/petrolio-oro-gas-che-punto-sono-sanzioni-ue-russia-AEyWcbiB>

From the Atlantic side, the U.S. has introduced restrictive measures toward some banking institutions, for example it blocked Russia from making debt payments using the \$600 millions held in US banks so that it makes harder for Russia to repay its international loans.

The International Monetary Fund expects the world economy to grow 3.2% this year, down from 6.1% last year. Under a "plausible" alternative scenario, which includes a complete cut in Russian gas supplies to Europe by the end of the year and a further 30 % drop in Russian oil exports, the IMF said global growth will slow to 2.6% in 2022 and 2% in 2023, with virtually no growth in Europe and the United States next year¹⁸.

For what concerns Europe, it imports significant amounts of raw materials from Kremlin-controlled companies: OECD data¹⁹ clearly highlight the high dependence with respect to total energy production, ranging from 30% in Belgium, through 40% and 20% in Germany and Italy to peaks of 60% in Austria, Finland, the Baltics and Eastern Europe. So, at the basis of the European economic fallout there is energy, as Russia is a major supplier of natural gas (30% of the total supply). Energy prices have soared all over Europe, driving up fuel costs and rising inflationary pressures, already begun during the pandemic, in a way that predict a slower recovery. That's why in July EU member states finally agreed to cut usage of Russian gas by 15%; cutting off Russian energy supplies triggered an energy crisis and recession with negative repercussions not only on the continent but also on global energy markets. In addition, major multinational energy companies, such as British energy giants BP and Shell and the United States' ExxonMobil, have decided to withdraw from the country even not explicitly required by the sanctions. One of the main reasons is the reputational risk of maintaining relations with Russia, together with the prevision of future sanctions that would have made difficult to conduct normal business operations.²⁰

In particular, the U.S. oil giant, ExxonMobil, took a huge hit after the exit from Russia due to the war, writing down USD 3.4 billion and reporting profits per share well below expectations of analysts²¹.

What is worrying is that European governments are striving to have enough fuel reserves to be used in following months. Shell Chief Executive Ben van Beurden said in a recent conference that Europe could face several winters of gas shortage as a result of the cuts to Russian supplies and that "we have to somehow find solutions"²². Rising energy prices is a policy issue for governments around the world that are responding with increasing energy taxes while providing subsidies to energy consumers.

Rising energy costs are pushing up household bills, boosting inflation to the highest level in decades and shortening people's spending capacity. As already mentioned, war's consequences have also impacted foreign

¹⁸ "Global Economic Growth Slows Amid Gloomy and More Uncertain Outlook". <https://blogs.imf.org/2022/07/26/global-economic-growth-slows-amid-gloomy-and-more-uncertain-outlook/>

¹⁹ IEA (2019), World Energy Statistics 2019, IEA, Paris, <https://doi.org/10.1787/2e828dea-en>

²⁰ "Sanctions by the Numbers: Economic Measures against Russia Following Its 2022 Invasion of Ukraine". <https://www.cnas.org/publications/reports/sanctions-by-the-numbers-economic-measures-against-russia-following-its-2021-invasion-of-ukraine>

²¹ "Exxon profits surge despite \$3.4B hit after exit from Russia over war". <https://mybs.in/2aurPts>

²² "Europe's gas crisis could last several winters, Shell CEO says". <https://www.reuters.com/business/energy/europes-gas-crisis-could-last-several-winters-shell-ceo-says-2022-08-29/>

economies so that high inflation rates have been registered from the beginning of the conflict, not considering those resulting from the previous, but perduring, pandemic situation. According to the IMF's World Economic Outlook, there are some countries, including the United States, where inflation has strengthened considerably, becoming more broad-based even before the Russian invasion of Ukraine while in other countries this effect is related to the prominence of fuel and war-affected commodities in local consumption baskets²³. As many authors say²⁴, there is a risk that higher short-term inflation will become embedded in increasingly unanchored inflationary expectations, and this situation will become persistent, further complicating the task of central banks. The increase in geopolitical risks due to the Russian attack on Ukraine is associated to a downward in World GDP that will continue in 2022, reducing the 1.7% of the total global output, and an upward of the global inflation of 1.3% whose effect is expected to diminish at the end of the year. Even with high uncertainty about the extent of the war, inflation is expected to increase and persist longer in 2023 with projections at 2.5% for the advanced economy group and 6.5% for emerging market and developing countries²⁵.

To quantify the impact of the macroeconomic variables linked to the Russian-Ukraine war on the stock market, it was decided to apply a regression model that usually define the existence or not of a relation between a dependent variable, in our case the "S&P 500" index representing the American stock market, and four independent variables, that are:

- the Inflation rate, the Crude Oil prices and the Natural Gas prices, whose prices were taken from the respective futures Crude Oil Oct 22 (CL=F) and Natural Gas Oct 22 (NG=F) and have been rescaled to be comparable between each other.
- the "war", for which we want to analyze the direct effects on investors' expectations and on conflict trends in the medium term, has been isolated and introduced as a dummy variable assuming value 0 before and 1 after the beginning of the conflict.

Running a multiple regression, we can observe as result that our hypothesis of dependence between the macroeconomic variables interested by the war and the stock market is relevant. As showed in the image, the p-value has relevant levels of significance for the several variables so that the measures of coefficients indicate:

- a negative effect of changes in the oil prices due to a negative crude oil coefficient value;
- a positive effect of changes in the natural gas price (positive coefficient value) probably due to the fact that United States are lesser dependent from Russian gas than European countries;
- a highly positive effect of inflation;
- a strongly negative effect of the War.

In a later analysis, it looks appropriate to extend this approach to the 10 different indexes which compose the S&P 500, each of the representing a different sector of the American market. They are the followings: S&P

²³ Gourinchas, P.O., (June 2022), "*Shifting Geopolitical Tectonic Plates*", FINANCE & DEVELOPMENT, <https://www.imf.org/en/Publications/fandd/issues/2022/06/shifting-geopolitical-tectonic-plates-straight-talk#>

²⁴ Cifuentes-Faura, J., (2022), "*Economic consequences of the Russia-Ukraine war: a brief overview*", *España e Economía* [Online]. <http://journals.openedition.org/espaoeconomia/21807>

²⁵ *Ibid.* note 85

500 Materials, S&P 500 Industrials, S&P 500 Consumers Discretionary, S&P 500 Consumer Staples, S&P 500 Health, S&P 500 Financials, S&P 500 IT, S&P 500 Utilities, S&P 500 Real estate and S&P 500 Energy. As expected, running the regression for each of them we have diversified results. For example:

- the crude oil has a negative coefficient on Industrials, IT and Utilities while a positive one on Financials and Energy;
- the natural gas coefficient has quite always positive correlation, since as already explained, America isn't a big importer of Russian gas;
- the only common data is the massive value of the inflation coefficient which impact quite all the industries, of course with a greater impact on Materials, Consumers Discretionary and Health segment.

The results of the analysis confirmed our first hypothesis of dependence between the macroeconomic variables interested by the war and the stock market. The p-value assumed relevant levels of significance for all the independent variables so that the values of the coefficients resulted in a negative effect of changes in the oil prices due to a negative crude oil coefficient value, a highly positive effect of inflation and a strongly negative effect of the War. These insights weren't so surprising compared to the previous discussion, making possible to fully accept the hypotheses formulated as the statistical significance confirmed the theoretical background between this research.

H 2: Many private companies have also decided to self-sanction Russia after its invasion of Ukraine. The Russian Federation has been always considered an attractive market for international investors, characterized by a large consumer market, low taxes and a cheap, relatively skilled, labour force. Just three days later the beginning of the war, British Petroleum announced the sale of its stake in the Russian oil giant Rosneft, with an estimated cost up to twenty-five billion dollars. Exxon did the same few days later²⁶. These three oil giants have paved the way for the private-sector declaration of war that in the six months, according to Yale School of Management, has seen approximately 300 global companies exiting the Russian market, and another 700 scaling back of business or suspending investments and projects in the country.

The American largest fast-food, McDonald's, after paused its operations in Russia at the beginning of the war, on May 16 announced the intention to sell its more than 800 restaurants as "Russian attack [...] isn't consistent with McDonald's values"²⁷. McDonald's started a "de-Archiving" process, meaning it removed name, logos, menus and branding while remaining trademarks and ensuring its more than 62,000 employees in Russia to get paid until the close of any transaction²⁸.

Another important American company, Philip Morris, retailing Marlboro cigarettes, is still trying to leave Russia but the operation is very complicated. The company started its business in Russia in 1977, with a state-

²⁶ *"The Consequences of the Unprecedented Rush of Companies Leaving Russia"*.

<https://www.newyorker.com/business/currency/the-consequences-of-the-unprecedented-rush-of-companies-leaving-russia>

²⁷ *"McDonald's says it will sell its Russia business after previously pausing operations due to Ukraine war"*.

<https://www.cnn.com/2022/05/16/mcdonalds-says-it-will-sell-its-russia-business-after-previously-pausing-operations-due-to-ukraine-war.html>

²⁸ *"Western companies have 50 bad ways to leave Russia"*. <https://www.reuters.com/breakingviews/western-companies-have-50-bad-ways-leave-russia-2022-05-16/>

owned licensing agreement to manufacture Marlboros. At the day of the war's beginning, Philip Morris counted a factory in St. Petersburg and sales offices in more than 100 cities with 3,200 employees.

Renault, the French car manufacturer, decided to sell its major stake in AvtoVAZ, Russia's largest company in the automotive industry, to a state-backed entity, including in the contract the option to buy back it if the company would return to Russia.

On the technological front, Apple, IBM, Intel and Sony suspended their sales in Russia from March and stopped all exports into its Russian sales channel.

From retail to services sector, McKinsey & Company too said it "will no longer serve any government entity in Russia", suspending current works in Russia and refusing any new one that will be proposed. On this wave also the Big Four accounting firms - Deloitte, EY, KPMG and PwC - leaved the country.

FedEx, one of the world's largest delivery services representing crucial elements of the global supply chain, also suspended shipments to Russia²⁹.

Even if is discussed that the motives behind these companies' decisions are purely moral, what is sure is that they've gone beyond what is legally required by international sanctions³⁰. During these months, Putin has continued to say that the country is faring just fine, but Russian economy seemed to come out devastated from the massive exodus of private companies, even because it was combined with EU sanctions.

The result is that a range between 250,000 and 600,000³¹ people have risked losing their jobs. Even if employment in the country doesn't depends only on Western and foreign companies, it has a large impact.

In this framework is to be said that, of course, not all global companies have retreated from the country. According to the American business magazine Fortune, around 47 of the world's 200 biggest companies are still doing business in or with Russia³².

The write-downs and losses reported by leading international companies include a range of industries, from retailers to restaurants, from banks to services: Mc Donald's announced that closing its restaurants in Russia cost \$127m in the first quarter of this year even if Russia and Ukraine businesses represented less than 3% of its operating income last year, Renault too recorded a loss of \$175m after leaving the Russian market for being accused from the Ukraine's president of "financing the murder of children and women". On the same line, oil companies such as Shell and Exxon, expected to lose respectively \$5 and \$3.4 billion, while BP reported a write-down of \$24 billion after suspending its 20% share in the Russian company Rosneft. On the same line, Uber Technologies Inc., the famous ride-sharing company, reported last May a \$182 million write-down on

²⁹ "Companies Find Leaving Russia Difficult, Though Many Are Trying". <https://www.wsj.com/articles/companies-find-leaving-russia-difficult-though-many-are-trying-11655803801>

³⁰ "Some of the Biggest Brands Are Leaving Russia. Others Just Can't Quit Putin. Here's a List.". <https://www.nytimes.com/interactive/2022/04/07/opinion/companies-ukraine-boycott.html>,

³¹ Total number of people who are officially registered as unemployed in the country.

³² "47 of the world's 200 biggest companies still haven't left Russia. Now the Kremlin is preparing 'expropriation blackmail,' an expert says". <https://fortune.com/2022/08/14/companies-stay-russia-risk-nationalization-experts-say-putin/>

the value of its stake in a Russian joint venture even if in February it was searching for opportunities to accelerate the planned sale of the stake³³.

To sum up, according to Yale SoM recent study, financial markets are “rewarding companies for leaving Russia” as the share-price gains for companies exiting the country have “far surpassed the cost of one-time impairments for companies that have written down the value of their Russian assets,” authors said.

What they found is that “on average the shares of firms that withdrew completely went up by 3.6% between February 23rd and April 19th; those of companies that continued as usual lost 6.8%”³⁴. In addition to this, there is another important finding: companies exiting the Russian market, with a market capitalization under \$2 billion, increased their share price increase by 8.7%, and those with one greater than \$10 billion, saw it rise by 3.8%. On the other hand, shares of comparable companies that decided to still operate in the country declined by 10.6% and 6.9%, respectively.

Under these assumptions, three are the main questions that we want to answer:

1. What effect has the decision to exit or not the Russian market on the company’s performance?
2. How much this decision has an impact on their expected stock price?
3. Was the impact justified a prior by the company's fundamentals?

To test our hypothesis, it has been taken a sample of fifty American companies diversified according to their decision to stay or leave the Russian market and a regression has been conducted between the already mentioned independent variables (Crude Oil, Natural Gas and Inflation) and the variable “Russia”, which assumed value 0 before the official date in which the company decided to leave the market³⁵ and 1 after that moment.

Looking at our results (Table 1), for those leaving the market, what is immediately clear is that companies with large market capitalization and strong brands all over the world, such as McDonald’s, Apple, IBM, which the Russian market does not represent a great share of the total market, have had a slightly positive effect equal to 1,5% for MCD, 1,4% for AAPL and 1,6% for IBM. This is probably due to the reduction of the reputational risk that comes from their presence in the country, since as we have discussed this is equivalent to directly or indirectly funding the conflict.

Another group of companies, however, including HP, Carnival and Delta Airlines exited Russia with negative consequences, being negative the coefficient of the relative variable. For them the impact has registered

³³ “How companies exiting Russia are faring”. <https://www.economist.com/graphic-detail/2022/05/09/how-companies-exiting-russia-are-faring>

³⁴ Yale School of Management. “Over 1,000 Companies Have Curtailed Operations in Russia—But Some Remain”. <https://som.yale.edu/story/2022/over-1000-companies-have-curtailed-operations-russia-some-remain>.

³⁵ The exit dates have been taken from the website “Leave Russia”³⁵, a joint project of KSE Institute and a team of Ukrainian IT volunteers proving a list of major companies and world-famous brands that have closed their business in Russia due to the current political situation. The website has tracked their decisions looking at published statements, so it is a reliable source. Are included in the count also companies that have decided to continue operations, proving goods and services, and paying taxes which support and allow the Russian government to continue its war of conquest in Ukraine. For these companies the independent variable “Russia” will assume value 0 before the 23th February (official date of beginning of the war) and 1 after that date.

percentage of - 6% for HPQ, - 20% for CCL and - 19% for DAL. The explanation for this effect is related to Russia's importance as a consumer for their products³⁶.

		Coefficients	P-value
MCD exit: 16/05/2022	Intercept	264,029863	1,8874E-13
	Crude Oil	-11,742127	4,4469E-27
	Natural Gas	4,0165302	1,346E-07
	Inflation	7,83982748	0,20240306
	Russia	3,77870766	0,04178052
AAPL exit: 01/03/2022	Intercept	-183,10574	1,2096E-19
	Crude Oil	-13,657817	2,0352E-42
	Natural Gas	1,41291632	0,00531483
	Inflation	80,2293049	8,3228E-55
	Russia	2,35653399	0,00400688
IBM exit: 07/06/2022	Intercept	191,434925	1,1444E-12
	Crude Oil	1,7466925	0,01000449
	Natural Gas	1,39386364	0,00283663
	Inflation	-14,916272	0,00085893
	Russia	2,26883474	0,00572029
HPQ exit: 01/03/2022	Intercept	-46,178977	2,092E-13
	Crude Oil	1,62916707	4,0677E-11
	Natural Gas	0,7363957	1,4878E-05
	Inflation	13,3080742	1,2641E-25
	Russia	-2,0398473	3,0839E-05
CCL exit: 03/03/2022	Intercept	-105,87919	3,4268E-28
	Crude Oil	0,3594924	0,22950432
	Natural Gas	-1,1052826	1,9575E-06
	Inflation	23,9187922	1,6172E-36
	Russia	-3,7099448	1,0517E-08
DAL exit: 25/02/2022	Intercept	-98,070763	3,824E-13
	Crude Oil	1,51036644	0,0024597
	Natural Gas	1,83048753	4,1012E-07
	Inflation	23,7322625	6,7488E-20
	Russia	-7,9740569	2,6877E-12

Table 1: Regressions' results examples of companies exiting Russia³⁷

For those staying the market (Table 2), like General Electric and Morgan Stanley, we have an opposite effect that is reflected in a percentage reduction of about - 7% for GE and - 14% for MS, that derives on one hand from the uncertainty of the economic and political situation in Russia and on the other hand from the already mentioned “reputational risk” of continuing their operations in Russia. For example, Phillips 66 the American multinational energy company presents a coefficient of about -14 -whose significance is confirmed by a p-value of 1,55E-20- with a - 7% on the price that highlights the high impact of U.S. sanctions on companies exporting from the country. On the contrary, companies like Tesla, still doing business in Russia, have increased their performance results of about 10%. Reasons for this escalation lie in the fact that Tesla electric cars are sold unofficially in Russia, while most of its competitors like Audi and Porsche have publicly announced the suspension of sales in the country in accordance with EU sanctions. This is also clear if we

³⁶ As mentioned in a Bloomberg article: “In the fourth quarter of 2020, HP was the largest supplier of PCs to Russia with 18% market share, according to research firm IDC.” <https://www.bloomberg.com/news/articles/2022-02-28/hp-inc-says-russia-sanctions-to-cut-profit-by-3-cents-a-share>

³⁷ Personal elaboration. Other parts of the regression analysis are available upon request.

look at Tesla’ supporters which are very loyal to the brand and customized so that they even appreciate the CEO’s, Elon Musk, behaviour of being "politically incorrect".

		Coefficients	P-value
GE	Intercept	-280,67914	1,8219E-51
	Crude Oil	-2,0720456	1,4204E-05
	Natural Gas	-1,7452526	2,6072E-07
	Inflation	73,8586709	6,6374E-71
	Russia	-7,1570297	5,8943E-11
MS	Intercept	-67,776673	5,4377E-08
	Crude Oil	-3,6584145	7,0883E-13
	Natural Gas	1,40820023	2,6469E-05
	Inflation	34,8634355	3,2487E-34
	Russia	-13,691458	3,575E-27
PSX	Intercept	28,3360485	0,06591817
	Crude Oil	7,24497021	1,6964E-23
	Natural Gas	6,49935927	3,4264E-32
	Inflation	-0,1331883	0,96177116
	Russia	-14,374754	1,55E-20
TSLA	Intercept	-881,93804	6,1711E-20
	Crude Oil	-33,828911	2,595E-19
	Natural Gas	2,92968673	0,19773229
	Inflation	256,28817	2,6637E-36
	Russia	25,7526519	0,00038931

Table 2: Regressions’ results examples of companies staying in Russia³⁸

Knowing that, an answer to our first question can be provided. American companies with strong brands, that operates as leader in their industries and for which the Russian market doesn’t represent a key market for their businesses, had a positive effect both staying or stopping their sales in Russia.

On the other hand, American companies that have a high bargaining power as suppliers of good and services in Russia, representing a great share of their markets, and whose industry has been highly affected by U.S. sanction and by the “reputational risk” of continuing their businesses in Russia, had negative effects on stock prices.

In the final part of the analysis have been taken four companies (two staying and two leaving Russia) respectively with the most negative and positive coefficient of the dummy variable representing the war, to make estimates of their target price before and after the conflict. The selected companies were BlackRock, Stryker Corporation, Google and IBM. To quantify whether their performance deviation from expectations, has been calculated first the target price using the Holt and Winters’ forecasts and with actual data available from the companies’ 2022 quarterly results.

Applying the FDCF method, it has been observed (Table 3) that excepted for BlackRock, which actual price was higher than the forecasted price, despite its negative correlation with the dummy variable “Russia”, the

³⁸ Personal elaboration. Other parts of the regression analysis are available upon request.

other three companies analyzed confirmed our hypothesis, as the positive and negative nature of their coefficient is reflected in their current performance.

Final results		
Company	Forecasted price	Actual price
BLK	\$ 952,03	\$ 1.011,80
IBM	\$ 161,07	\$ 230,28
GOOG	\$ 240,12	\$ 125,77
SYK	\$ 317,35	\$ 367,30

Table 3: Final results

To conclude, the findings suggest that the market seemed to appreciate more the moral high ground on the reputational effects of doing business with Russia.

To further support the relevance of the results, it is crucial to specify that have been considered only those companies for which the variable "Russia" was significant at the 95% level, so with a p-value of about 0,05 and that the assumptions of this approach were the sufficient accuracy of the forecasts and the acknowledgment that the war has already had an impact on the fundamentals.

This work is obviously not exempt from limitations. The first limitation depends directly on the sample decided to use, the American market, representing the impossibility of generalizing the results to all the other countries. It might be interesting to conduct an analysis between companies belonging to the European market or even to Least Developed Countries. It can also be tailored in several sectors, analyzing which of them has suffered the most or investigating through different dependent variables the companies' behaviours.

Moreover, this analysis does not take into account long-term trends in share prices after Russia's invasion of Ukraine, so establishing a measure of economic losses for the firms' divestment decisions is tricky. Consequently, it is not excluded the validity of other models for the calculation of the impact of the war on stock prices, that could maybe have lead to different results.

The results of this study may be of considerable interest to several company stakeholders to the extent of the identification of a relationship between macroeconomic variables on the one hand and profitability and strategic decision on the other. This is not obvious if we consider that even though reducing performance and recording losses, managers are forced to opt for significant decisions to cope with reputational risks and to deal with external and unpredictable events, as the war is.