

## Дискуссионная панель 9

# ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ И МАТЕМАТИЧЕСКИЕ МЕТОДЫ В ЦИФРОВОЙ ЭКОНОМИКЕ

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### STATISTICAL FORECASTING OF STOCK PRICES IN LEBANON BASED ON ADAPTIVE MODELS

Despite its big history and spirited past, the Lebanese stock market today is inactive and is contracting. Historically, Lebanon had a relatively vital capital market in the Middle East before the stock exchange was closed for twenty years due to the civil war (1975–1995). Since its reopening in 1996, the stock market has been shrinking. The establishment of Solidere in late 1990s and the renaissance of commercial banks motivated the stock market for a while before the volatility of the market hold back. However, the research provides a decomposition of the time series using STATISTICA software into seasonal, trend and cyclic components. Moreover, Adaptive forecasting methods are based on intensive analysis of information contained in separate time series, the models describing the structure of the stock price, as a rule, has a very clear meaning and simple mathematical formulation.

Nowadays, there is a lot of methods and models to forecast the future values of the price, like machine learning methods, statistical methods. The statistical methods have proved to be efficient in the study of time-series, and especially, the exponential smoothing methods have become very popular between researchers due to their robustness (Gardner, 2006) [1]. The importance of these methods has been stressed in recent works (Gardner, 2006; Taylor, 2006) [2], and for example, the RiskMetrics document recommends the use of exponential methods to estimate the conditional volatility of financial markets (RiskMetrics, 1996) [3]. The adaptive exponential smoothing (AES) model has the advantage that their parameters vary as the time-series modifies its behavior allowing to forecast sudden variations. As a consequence, the AES method has been used to forecast market volatility (Taylor, 2004) [4] of important stock indexes like the Nikei 225 index of the Japan market (Leung, Daouk, & Chen, 2000) [5]. The exponential smoothing methods were often considered a collection of ad hoc techniques for extrapolating various types of univariate time series. Although exponential smoothing methods were widely used in stock market and industry, they had received little attention from statisticians and did not have a well-developed statistical foundation. These methods have its origin in the 1950s and 1960s with the work of Brown (1959, 1963) [6], Holt (1957, reprinted 2004) [7], and Winters (1960) [8], there are three exponential smoothing techniques named: simple exponential smoothing, Holt's exponential smoothing, and Holt-Winters method.

The data for the three shares SOLA, BYB and HOLC, were collected from the investing.com [9] daily basis from January 2017 till August 2020. The data for each share is analyzed alone and it is divided into two or more parts according to the trend reverse. According

to the length of the time series, we have selected the best methods, the techniques for long time series differ from that of the short ones. In long time series, we have used the decomposition of time series using the software STATISTICA to find the seasonal factor, the adjusted data and the smoothed data given the actual data  $A_i$ , then we use these new data to find the cyclic components, the adjusted cyclic components, the trend component, the forecast value  $F_i$  and the error of forecast  $A_i - F_i$ . After that when the trend reverses in the studied shares, for the short time series we have built another method of forecasting, the Brown's linear model.

The research explores time-series analysis of 3 stocks of Beirut Stock Exchange in three different sectors over the period from 2017 through 2020. It provides daily forecasts and analysis based on exponential smoothing methods and decomposition using STATISTICA software, we deduce the best forecasting methods using MAPE and SSE. Since the profitable strategies are related with the predictable character of the market movement and the forecasting techniques can help with better investment decision making, our study shows the possibility to develop support decision for the Lebanese stock market based on the proposed forecasting methodology.

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## РАЗРАБОТКА ЦИФРОВОЙ СТРАТЕГИИ ПРЕДПРИЯТИЯ КАК ОСНОВНОЙ ЭТАП ЦИФРОВОЙ ТРАНСФОРМАЦИИ БИЗНЕСА

Основным этапом цифровой трансформации бизнес-процессов является разработка цифровых стратегий предприятий. Эффективная стратегия позволит не только повысить эффективность и оптимизировать бизнес, но и завоевать новые рынки.

Начинать проект по разработке стратегии рекомендуется с анализа технологических трендов и специфики индустрии, на основании которого и формируется картина будущего цифрового производства, новых цифровых бизнес-моделей. Следующий этап — оценка цифровой зрелости предприятия, процессов, информационных систем, технологий и компетенций, имеющихся на предприятии. Далее рекомендуется провести оценку экономической эффективности применения новых технологий и определить ключевые KPI.