# On the family business stock performance in the MENA region

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Abstract

*This article attempts to explore investment opportunities of family businesses within financial investment landscape in MENA region. Data envelopment Analysis with a specification of Return and Risk is applied to determine the relative performance of a sample consisting of 135 Family Business listed in different MENA Stock Exchanges. Performances are derived using the distance function, highlighting the super performance of Family businesses of the sample with respect to the reference index of Crédit Suisse Family Index and S&P 500 Index. The application of Data Envelopment analysis helps to derive several family businesses benchmarks with higher performance in terms of expected returns and risks.*

*Keywords: Data Envelopment Analysis, Distance Function, Return, Risk*

## Introduction

Often are born small, and grow with the aspirations of their owners. According to the literature, they present a way of managing and controlling performance that is disconnected from what a "modern times" company can present. The family business is often described as a place where strategic decisions are made as the owner aspires to. A decision-making framework that refutes the skills of employees, the reality of the market, processes, and decision-making tools.

Nevertheless, there is consensus in the literature on the superiority of family business when it comes to compare it with those driven by " Managers ". A paradox that has been highlighted in several contributions and in several geographical contexts: United States, France, Spain, etc.

In MENA Region, the lack of contributions, data, and statistics on family businesses, but also the opacity of the management mode of these companies hampers the development of the intellectual contribution and consequently less insights on the performance of MENA family businesses.

At the international level, the academic and professional literature, which deals with the performance framework and the contrast between family and "non-family" enterprises, is dominated by the financial perspective. Indeed, several studies have demonstrated the outperformance of owner-operated businesses compared to those run by managers. Outperformance measured in the literature by financial indicators. These studies have addressed performance with a fundamental approach based on company internal indicators such as ROI ratio and others.

Some explanations of this outperformance have been explored in the academic literature: debt aversion or efficient allocation of equity, dividend policy, etc.,

This article is an attempt to explore the opportunities that family businesses in MENA region can offer in the context of financial investment. It considers the attributes of the rational investor in the modern theory of the financial portfolio, namely expected return and risk.

This contribution is a pioneer in the definition of performance, through a methodological approach that remains unexplored in the literature, particularly in the context of the family business.

The hypotheses to be confirmed or to be rejected in the empirical part of this article are based on the following question: Can the family business stocks in MENA region offers more return and less risk than family businesses un Europe and US?

To answer this question, the data envelopment analysis is applied to a sample of 135 family businesses listed in different MENA Stock Exchanges. The objective of this article is to highlight the performance of family businesses in MENA and not to explain it.

The first part presents the theoretical framework of the analysis of performance under different angles explored in the academic literature (The financial perspective versus the overall performance). The second part explores the financial investment opportunities that family enterprises in MENA can offer through an empirical study of performance. Results are contrasted with two major indexes using family businesses partially or totally in Europe and US, namely Crédit Suisse family index and S&P 500.

## 2-Family Business and performance

### 2-1 State of Art

For decades, the subject of family business has been attracting both the interest of the professional world and the scientific community. The tremendously contributions stem from the need to answer the following question: Is a family business more efficient than other companies?

All contributions on this subject are based on agency theory hypotheses; An enterprise under the control and management of the same person (Owner), would be characterized by a reach for a long-run performance [C. Dailly, M. Dollinger 1992]. This performance is based on a personal interest which is supposed to be in harmony with the temporal term of performance [R.J. Monsen et al. 1968]. A business owner would be interested in a long-term return on investment rather than a short-term return. Which guarantees a maximum company value. This hypothesis relaxes the tensions that can exist in a company, controlled by managers, between members of the board of directors and managers whose interests are different [C. W. Hill, S.A. Snell 1989].

Although the performance of family business has been the subject of several studies, its definition has been tackled under the dichotomy: financial perspective and overall performance. Under the first definition, several studies have demonstrated a strong motivation of family-based enterprises for long-term strategies rather than the need for rapid outcomes, debt aversion [J. Allouche, B. Amann 1995] and a trend towards reinvestment of dividends [MA. Gallo 1994].

Results come in line with the assumptions of agency theory. The more profitable is the company, the greater is its result in the medium and long term. [R.J. Monsen et al. 1968] presents, over the period 1952 to 1963, results of the return on investments between two samples. (i) the first represents enterprises under owner's control and the second (ii), a sample of managerial control. It shows that firms under the control of an owner have a return on investment value that is 75% higher than that of the managerial control sample. [R.J. Monsen 1969] presents the same results as those in the study but adding and explaining that the performance of family business is a result of an optimal financial resource allocation. [D.T. Jaffe 1990] found that 31 family businesses over 47 perform better than the Dow-Jones index.

Several researchers have attempted to explain the financial performance of the family business. Many authors have found explanations in the correlation between capital structure and financial performance. In France, [G. Charreaux 1991] gives two hypotheses to explain the performance of the family business. (i) The convergence of interests (ii) Neutrality: the capital structure has no impact on financial profitability. The results of the study reject the hypothesis (i) and the author concludes that the ownership structure of capital has no relationship with financial performance. However, the study highlights the significant positive gap between economic profitability between family-run and manager-run businesses.

Performance base financial criteria was also present in a contribution by [M.A. Gallo, A. Vilaseca 1996], where the return on equity was utilized. Authors found that equity profit of family enterprises is much higher than that of other companies. This study highlights the capital structure and the dividend distribution policy as explanatory variables for this performance.

Although an abundant part of the literature tackles the performance of the family business from a financial point of view, a limited number of contributions have presented a more comprehensive definition. [C. Dailly and M. Dollinger 1992] examined basic data from a few

family firms and found statically significant growth rates of sales, net margins and operating margins.

In France, [J. Allouche, B. Amann 1995] attempted to distinguish between economic, financial, and social performance and to compare them between family and non-family enterprises. Two samples were studied. They conclude an average performance of family businesses that is much higher than that of non-family businesses. However, the components of the overall average performance do not lead to significant trends.

## 2-2 Performance and efficiency

For decades, the concept of performance attracted lot of attention in the literature. Although the purpose of this article is to shed the light on the performance of the family business, particularly in MENA Region, the general framework of this concept and its definition is of growing importance for the motivation of the methodology applied in the empirical part.

Although academic literature has extensively addressed the notion of performance according to different theories and applications. A consensus on its "generic" definition seems to have emerged in practice. In all areas, performance refers to a combination of inputs and outputs.

Performance of any Decision-Making Unit (DMU) can be measured by the difference of points between the practical reference "Benchmark and the DMU under evaluation. This definition has found support using mathematical modeling tools that have extended the performance illustration in several areas.

In economics, econometric analysis has emerged to answer to the following question: How can performance be measured with its different components (Inputs / Outputs) in a competitive environment?

Linear regression parametric methods have been developed to compare the distance between a point (Competitors) and a target of competitors who are on the so-called regression line.

Although parametric methods enjoyed success in measuring performance in several economic applications, they remain subject to several criticisms concerning the specification of the models.

The first criticism (i) is the interpretation of the performance. Indeed, much of the parametric models used in economic applications for performance measurement shows the average of the competitors as a benchmark, whereas the essence of the performance must be based on the comparison between the unit being evaluated and the best practical or theoretical reference. (ii) A large part of the applications also involves linear relations between inputs and outputs. This assumption is often inappropriate in the practical context of performance measurement. (iii) parametric models have never been able to give an aggregate measure and can integrate several inputs and outputs.

Alternative models based on non-parametric methods have been developed as performance measurement. These include Data Envelopment Analysis. DEA helps assessing the relative performance of a number of competitors operating in the same industry. The origin of this analysis goes back to the work of [Farell, 1957] on the measurement of productive efficiency, which was further developed later in the work of [Charnes, Cooper and Rhodes, 1978]. According to the analysis, a competitor or a company would not perform well if it uses more inputs in its production process than the minimum required to produce an output or if it produces number of products (output) lower than the maximum of inputs used by its benchmark.

Data Envelopment Analysis is based on the identification of references or benchmarks as combinations between different inputs and outputs leading to the efficient frontier. Then, the analysis consists of determining for each competitor (company, or Decision-Making Unit (DMU) a reference on the efficient frontier and the performance results as a distance between the competitor (company, DMU) under evaluation and the reference or the benchmark.

Benefits of this analysis are numerous. It is a non-parametric analysis and therefore does not suppose any functional specification that could exist between inputs and outputs. In addition, it can be used to derive aggregate performance measures (Scores) which make it easier to interpret the results and their use for ranking purposes. The analysis models also allow an infinite number of inputs and outputs.

The performance derived from DEA represents the distance between the competitor (firm) under study and the best reference on the efficient frontier.

DEA method has been extensively applied in the literature to measure the performance of entities in several business areas. It was first applied in [Charnes, Cooper and Rhodes, 1978 and 1981] to assess the efficiency of a US federal resource allocation program for schools. Its application has since become widespread to cover other areas: hospitals, social services, power plants, police units, waste processing plants, public transport companies, etc. Other applications concerned the performabce of banks, investment funds, etc.,

## 3-MENA family business performance

This part is intended to be an empirical part exploring the performance of family business in MENA region. The performance discussed in this section is based on financial criteria through the return on financial investment. It is not a question of exploring and explaining the performance of the family business in MENA but rather an attempt to shed the light on the investment opportunities that can be offered by family businesses in MENA region.

This work is the first to apply DEA for the evaluation of the performance of family businesses in MENA.

DEA has been applied in numerous works to assess financial product. All these contributions remain inspired by the theory of financial portfolios [H. Markowitz, 1952]. For example [Murthi, Choi and Desai 1997] use financial return as output and risk with a series of transaction costs as inputs criteria to measure the performance of mutual funds. A similar approach is used to measure the performance of hedge funds by [Eling 2006] with specified moments Inputs and Outputs. [McMullen and Strong 1998] evaluates the performance of 135 equity funds specifying financial return as output and the risk measured by the standard deviation of returns, investment costs and exit costs such as inputs.

In addition, DEA methods are appropriate in the assessment of financial products performance because they do not require any theoretical reference as supposed by the Capital Asset Pricing Model (CAPM) or the Arbitrage Pricing Theory (APT). This advantage makes it possible to derive asset performances with the same characteristics as the composite reference index.

The contribution of nonparametric DEA methods in financial portfolio applications is commonly recognized, however, several articles in the literature do not consider the essence of modern portfolio theory which is the effect of diversification. Indeed, the construction of the reference or the efficient frontier in these articles does not consider the effect of correlation between financial assets and hence led to biased performance scores.

While there is an abundant literature advocating the use of DEA methods for assessing the performance of financial assets by ignoring the effect of correlations between these assets, very few articles explicitly adopt the fundamental framework of portfolio theory. [Morey and Morey 1999] propose two quadratic programming approaches to evaluate a sample of mutual funds. They use return, risk and correlation between funds as inputs and outputs. [Briec, Kerstens, and Lesourd 2004] propose a general approach and derive performance measure in line with the financial portfolio theory. They use the distance function as a measure in DEA using return and risk with the two-order Co-moments as inputs and outputs. They demonstrate that the performance scores obtained are consistent with the fundamentals of financial portfolio theory and propose a more general framework encompassing the specific measures proposed by [Morey and Morey 1999].

The distance function or called also the shortage function positions a financial asset regarding the efficient frontier and seeks its project onto the efficient frontier in both directions simultaneously, i.e., increase in return and contraction of risk. In addition, [Briec, Kerstens, and Lesourd 2004] demonstrate a duality between the distance function and the indirect utility function of the return-risk model, which is used to assess the degree of investor preferences.

To grasp this duality to indirect utility. [Briec, Kerstens, and Lesourd 2004] propose to decompose the overall performance of financial portfolio between technical and allocation performance. This approach has also been applied in the Return-Risk-Skewness dimensions in [Briec, Kerstens, and Jokung 2007], where the distance function seeks to maximize both the expected return and the skewness coefficient and to minimize the risk. The last development proposes an appropriate performance measure for several classes of financial assets whose returns do not correspond to the normal distribution.

This article uses the distance function as a performance measure in a return-risk model based on a sample of family business stocks listed on different MENA Stock Exchanges.

The dataset consists of 135 companies. Table 1 presents the list of family business stocks along with their respective stock exchanges. The statistics and the performance scores derived in this section are based on monthly stock market prices from January 2014 to February 2017, i.e. 38 price observations for each stock.

To assess the performance of family business stock with the distance function, expected return is considered as output and the risk measured by the variance of returns as input:

• The expected return (Ouput): Arithmetic average of monthly returns over the studied period.

$$R_{it} = \log(\frac{Cours_t}{Cours_{t-1}})$$

$$E(R_i) = \frac{\sum_{t=1}^{37} R_{it}}{37}$$

• Risk (Input): Variance of returns and the covariance between stock returns.

$$Var(R_i) = \sum_{i=1}^{37}\sum_{j=1}^{37}\text{cov}(R_i, R_j)$$

DEA model is used with the distance function as a measure of performance. The benchmark of stocks of family businesses will be identified during the evaluation of each stock. Reference or benchmark would be a combination of all stocks of family businesses according to weights calculated by the program (P1)

The benchmark would be for each stock under evaluation

$$E(R_{bench}) = \sum_{i=1}^{135} x_i E(R_i) \quad \text{and} \quad Var(R_{bench}) = \sum_{i=1}^{135}\sum_{j=1}^{135} x_i x_j \,\text{cov}(R_i, R_j)$$

With $x \in \Re_+ ; \sum_{i=1}^{135} x_i = 100\%$ representing the weights between family business stocks.

P1 represents the applied DEA model with the distance function as a measure of performance

Table 1 : Sample MENA Family Business stocks

| Family Business stok | Stock exchange | Family Business stok | Stock exchange | Family Business stok | Stock exchange |
|---|---|---|---|---|---|
| ALMARAI COMPANY(SAUDI JOINT STOCK COMPANY) | Saudi Stock Exchange - [XSAU] | JEERAN HOLDING CO. (S.A.K.C) | Kuwait Stock Exchange - [XKUW] | PYRAMISA HOTELS, RESORTS & NILE CRUISES CO. SAE | Egyptian Exchange - [XCAI] |
| DELEK GROUP LIMITED | Tel Aviv Stock Exchange - [XTAE] | NEXTCOM LTD | Tel Aviv Stock Exchange - [XTAE] | ENDYMED LTD. | Tel Aviv Stock Exchange - [XTAE] |
| DELTA GALIL INDUSTRIES LTD. | Tel Aviv Stock Exchange - [XTAE] | HAYAT COMMUNICATIONS CO. K.S.C.C | Kuwait Stock Exchange - [XKUW] | NATIONAL ALUMINIUM INDUSTRIAL COMPANY P.L.C. | Amman Stock Exchange - [XAMM] |
| RAMI LEVI CHAIN STORES HASHIKMA MARKETING 2006 LIMITED | Tel Aviv Stock Exchange - [XTAE] | SHANIV PAPER INDUSTRIES LTD. | Tel Aviv Stock Exchange - [XTAE] | EL-AHRAM CO. FOR PRINTING & PACKAGING S.A.E. | Egyptian Exchange - [XCAI] |
| SULTAN CENTER FOOD PRODUCTS CO. (K.S.C.CLOSED) | Kuwait Stock Exchange - [XKUW] | TUNISIE PROFILES ALUMINIUM SA | Bourse de Tunis - [XTUN] | DELTA FOR PRINTING & PACKAGING S.A.E | Egyptian Exchange - [XCAI] |
| CARASSO MOTORS LTD | Tel Aviv Stock Exchange - [XTAE] | ZANLAKOL LTD. | Tel Aviv Stock Exchange - [XTAE] | NATIONAL CHLORINE INDUSTRIES LTD | Amman Stock Exchange - [XAMM] |
| DELEK AUTOMOTIVE SYSTEMS LTD | Tel Aviv Stock Exchange - [XTAE] | REMCO FOR THE CONSTRUCTION OF TOURISTIC VILLAGES S.A.E | Egyptian Exchange - [XCAI] | GULF INTERNATIONAL CHEMICALS COMPANY SAOG | Muscat Securities Market - [XMUS] |
| COMBINED GROUP CONTRACTING CO. (S.A.K.C) | Kuwait Stock Exchange - [XKUW] | MEDSERV PLC | Malta Stock Exchange - [XMAL] | MED PAPER | Casablanca Stock Exchange - [XCAS] |
| ORIENTAL WEAVERS CARPET COMPANY S.A.E. | Egyptian Exchange - [XCAI] | KAFR EL ZAYAT PESTICIDES & CHEMICALS CO. (S.A.E) | Egyptian Exchange - [XCAI] | MANSOURAH POULTRY COMPANY (S.A.E.) | Egyptian Exchange - [XCAI] |

| | | | | | |
|---|---|---|---|---|---|
| SAUDI MARKETING COMPANY (SAUDI JOINT STOCK COMPANY) | Saudi Stock Exchange - [XSAU] | L'ACCUMULATEUR TUNISIEN ASSAD SA | Bourse de Tunis - [XTUN] | BIO VIEW LTD | Tel Aviv Stock Exchange - [XTAE] |
| SANO BRUNO`S ENTERPRISES LTD. | Tel Aviv Stock Exchange - [XTAE] | ABETRANS LTD | Tel Aviv Stock Exchange - [XTAE] | JORDAN CHEMICAL INDUSTRIES CO. LTD | Amman Stock Exchange - [XAMM] |
| SCOPE METALS GROUP LTD. | Tel Aviv Stock Exchange - [XTAE] | UNITRONICS | Tel Aviv Stock Exchange - [XTAE] | SALAM INTERNATIONAL TRANSPORT & TRADING PLC | Amman Stock Exchange - [XAMM] |
| MARIDIVE & OIL SERVICES | Egyptian Exchange - [XCAI] | DELTA FOR CONSTRUCTION & REBUILDING CO. | Egyptian Exchange - [XCAI] | AVERBUCH FORMICA CENTER LTD. | Tel Aviv Stock Exchange - [XTAE] |
| AL-ARABI GROUP HOLDING CO. (K.S.C) | Kuwait Stock Exchange - [XKUW] | HIGHTECH PAYMENT SYSTEMS S A | Casablanca Stock Exchange - [XCAS] | ARAB VALVES COMPANY | Egyptian Exchange - [XCAI] |
| COMPUTER DIRECT GROUP LTD. | Tel Aviv Stock Exchange - [XTAE] | ENGINEERING INDUSTRIES (ICON) | Egyptian Exchange - [XCAI] | BRAINSWAY LTD | Tel Aviv Stock Exchange - [XTAE] |
| MOUWASAT MEDICAL SERVICES COMPANY (SAUDI JOINT STOCK COMPANY) | Saudi Stock Exchange - [XSAU] | MICRODATA S.A. | Casablanca Stock Exchange - [XCAS] | INTERNATIONAL BUSINESS CORPORATION FOR TRADING AND AGENCIES S.A.E | Egyptian Exchange - [XCAI] |
| AL HASSAN ENGINEERING COMPANY SAOG | Muscat Securities Market - [XMUS] | THE GOLD BOND GROUP LIMITED | Tel Aviv Stock Exchange - [XTAE] | INVOLYS SA | Casablanca Stock Exchange - [XCAS] |
| HOD-ASSAF INDUSTRIES LTD. | Tel Aviv Stock Exchange - [XTAE] | CARMIT CANDY INDUSTRIES LTD | Tel Aviv Stock Exchange - [XTAE] | ARAB ELECTRICAL INDUSTRIES PLC | Amman Stock Exchange - [XAMM] |
| QATARI INVESTORS GROUP Q.S.C | Qatar Exchange - [DSMD] | AL BILAD MEDICAL SERVICES P.L.C. | Amman Stock Exchange - [XAMM] | GB AUTO COMPANY SAE | Egyptian Exchange - [XCAI] |
| ISRAEL LAND DEVELOPMENT CO. LTD (THE) | Tel Aviv Stock Exchange - [XTAE] | INTERNATIONAL CO. FOR FERTILIZERS & CHEMICALS S.A.E | Egyptian Exchange - [XCAI] | SHARM DREAMS CO. FOR TOURISTIC INVESTMENT S.A.E | Egyptian Exchange - [XCAI] |

| | | | | | |
|---|---|---|---|---|---|
| E&M COMPUTING LIMITED | Tel Aviv Stock Exchange - [XTAE] | ARAB PESTICIDES & VETERINARY DRUGS MFG. CO. (THE) | Amman Stock Exchange - [XAMM] | HEXABYTE SA | Bourse de Tunis - [XTUN] |
| AL SORAYAI TRADING AND INDUSTRIAL GROUP (SAUDI JOINT STOCK COMPANY) | Saudi Stock Exchange - [XSAU] | SOCIETE CELLCOM SA | Bourse de Tunis - [XTUN] | EXALENZ BIOSCIENCE LTD. | Tel Aviv Stock Exchange - [XTAE] |
| TADIRAN HOLDINGS LTD. | Tel Aviv Stock Exchange - [XTAE] | ABU DHABI NATIONAL CO. FOR BUILDING MATERIALS PJSC | Abu Dhabi Securities Market - [XADS] | JORDAN PIPES MANUFACTURING PUBLIC LIMITED SHAREHOLDING COMPANY (THE) | Amman Stock Exchange - [XAMM] |
| MISR BENI SUEF CEMENT CO. S.A.E | Egyptian Exchange - [XCAI] | JERUSALEM PHARMACEUTICALS CO. LTD. | Palestine Securities Exchange - [XPAE] | TRAVERTINE COMPANY PLC | Amman Stock Exchange - [XAMM] |
| ISSTA LINES LTD. | Tel Aviv Stock Exchange - [XTAE] | THE INDUSTRIAL COMMERCIAL AND AGRICULTURAL(THE) P.L.C. | Amman Stock Exchange - [XAMM] | NEW BODY LINE SA | Bourse de Tunis - [XTUN] |
| NASS CORPORATION BSC | Bahrain Stock Exchange - [XBAH] | LACHISH INDUSTRIES LTD. | Tel Aviv Stock Exchange - [XTAE] | TOGETHER STARTUP NETWORK LTD. | Tel Aviv Stock Exchange - [XTAE] |
| ORIAN SH.M. LTD | Tel Aviv Stock Exchange - [XTAE] | TIMAR SA | Casablanca Stock Exchange - [XCAS] | JORDANIAN REALESTATE COMPANY FOR DEVELOPMENT PLC | Amman Stock Exchange - [XAMM] |
| SALOMON A. ANGEL LTD. | Tel Aviv Stock Exchange - [XTAE] | JORDAN DAIRY P.L.C. | Amman Stock Exchange - [XAMM] | GOLDEN COAST COMPANY S.A.E | Egyptian Exchange - [XCAI] |
| MINAPHARM PHARMACEUTICALS S.A.E. | Egyptian Exchange - [XCAI] | MIDDLE EAST SPECIALIZED CABLES COMPANY | Amman Stock Exchange - [XAMM] | EGYPTIAN MODERN EDUCATION SYSTEMS S.A.E | Egyptian Exchange - [XCAI] |
| HAMAMA MEIR TRADING (1996) LTD | Tel Aviv Stock Exchange - [XTAE] | RS2 SOFTWARE PLC | Malta Stock Exchange - [XMAL] | ATLAS FOR LAND RECLAMATION AND | Egyptian Exchange - [XCAI] |

| | | | | AGRICULTURAL PROCESSING S.A.E | |
|---|---|---|---|---|---|
| SOCIETE DE THERAPEUTIQUE MAROCAINE | Casablanca Stock Exchange - [XCAS] | MANUFACTURE DE PANNEAUX BOIS DU SUD SA | Bourse de Tunis - [XTUN] | MARSA MARSA ALAM FOR TOURISM DEVELOPMENT S.A.E | Egyptian Exchange - [XCAI] |
| DELATTRE LEVIVIER MAROC SA | Casablanca Stock Exchange - [XCAS] | ARGAMAN INDUSTRIES LTD. | Tel Aviv Stock Exchange - [XTAE] | PHARAOH TECH FOR CONTROL AND COMMUNICATION SYSTEMS S.A.E | Egyptian Exchange - [XCAI] |
| AUTOMOBILE RESEAU TUNISIEN ET SERVICES SA | Bourse de Tunis - [XTUN] | RADCOM LTD. | NASDAQ National Market - [XNAS] | EGYPT INTERCONTINENTAL FOR GRANITE & MARBLE (EGY-STON) S.A.E | Egyptian Exchange - [XCAI] |
| KLIL INDUSTRIES LTD | Tel Aviv Stock Exchange - [XTAE] | RAS AL KHAIMAH POULTRY & FEEDING COMPANY PSC | Abu Dhabi Securities Market - [XADS] | INTERNATIONAL COMPANY FOR MEDICAL INDUSTRIES S.A.E | Egyptian Exchange - [XCAI] |
| AMANET MANAGEMENT & SYSTEMS LTD. | Tel Aviv Stock Exchange - [XTAE] | TOP RAMDOR SYSTEMS & COMPUTERS CO. (1990) LTD. | Tel Aviv Stock Exchange - [XTAE] | EL-BADR PLASTIC CO. S.A.E | Egyptian Exchange - [XCAI] |
| G. WILLI-FOOD INTERNATIONAL LIMITED | NASDAQ National Market - [XNAS] | EGYPTIAN TRANSPORT & COMMERCIAL SERVICES CO. EGYTRANS S.A.E. (THE) | Egyptian Exchange - [XCAI] | ARAB COMPANY FOR INVESTMENT PROJECTS | Amman Stock Exchange - [XAMM] |
| KUWAIT COMPANY FOR PROCESS PLANT CONSTRUCTION & CONTRACTING (KCPC) | Kuwait Stock Exchange - [XKUW] | MODERN COMPANY FOR WATER PROOFING S.A.E | Egyptian Exchange - [XCAI] | NATIONAL OIL AND ELECTRICITY PRODUCTION FROM OIL SHALE COMPANY | Amman Stock Exchange - [XAMM] |

| HAMAT GROUP LTD | Tel Aviv Stock Exchange - [XTAE] | A.L.D. ADVANCED LOGISTICS DEVELOPMENTS LTD. | Tel Aviv Stock Exchange - [XTAE] | PORT SAID FOR AGRICULTURAL DEVELOPMENT AND CONSTRUCTION S.A.E | Egyptian Exchange - [XCAI] |
|---|---|---|---|---|---|
| BIRMAN WOOD AND HARDWARE LTD | Tel Aviv Stock Exchange - [XTAE] | ARAB INTERNATIONAL HOTELS PLC | Amman Stock Exchange - [XAMM] | A - ONLINE CAPITAL (A.O.C.) LTD | Tel Aviv Stock Exchange - [XTAE] |
| INTERNATIONAL COMPANY FOR AGRICULTURAL CROPS SAE | Egyptian Exchange - [XCAI] | HAYAT PHARMACEUTICAL INDUSTRIES CO. P.L.C | Amman Stock Exchange - [XAMM] | XTL BIOPHARMACEUTICALS LTD | Tel Aviv Stock Exchange - [XTAE] |
| FITAIHI HOLDING GROUP (SAUDI JOINT STOCK COMPANY) | Saudi Stock Exchange - [XSAU] | CHAM FOODS (ISRAEL) LTD. | Tel Aviv Stock Exchange - [XTAE] | TIKCRO TECHNOLOGIES, LTD. | OTC Bulletin Board - [XOTC] |
| NCA-ROUIBA SPA | Algiers Stock Exchange - [XALG] | PHILADELPHIA PHARMACEUTICALS COMPANY PLC | Amman Stock Exchange - [XAMM] | WIZE PHARMA LTD | Tel Aviv Stock Exchange - [XTAE] |
| FOODCO HOLDING P.J.S.C. | Abu Dhabi Securities Market - [XADS] | CARTIER SAADA SA | Casablanca Stock Exchange - [XCAS] | AL NUKHBA FOR GENERAL CONSTRUCTION CO. | Iraq Stock Exchange - [XIQS] |
| ZVI SARFATI & SONS INVESTMENTS AND CONSTRUCTIONS (1992) LTD. | Tel Aviv Stock Exchange - [XTAE] | ALEXANDRIA NEW MEDICAL CENTER CO. S.A.E | Egyptian Exchange - [XCAI] | EL SEWEDY ELECTRIC COMPANY S.A.E | Egyptian Exchange - [XCAI] |
| ELLOMAY CAPITAL LTD. | NYSE MKT - [XASE] | D.N.A BIOMEDICAL SOLUTIONS LTD. | Tel Aviv Stock Exchange - [XTAE] | JARIR MARKETING COMPANY | Saudi Stock Exchange - [XSAU] |

$$\underset{x,\sigma}{Max} \qquad \sigma$$

$$\sum_{i=1}^{135} x_i = 1$$

$$E(R_{bench}) \geq E(R_i) + \sigma E(Ri) \qquad (P1)$$

$$V(R_{bench}) \leq V(R_i) + \sigma V(R_i)$$

$$\sigma \geq 0; 0 \leq x_i \leq 1 \quad pour \quad i \in \{1 \cdots 135\}$$

Figure 1 describes how the performance of a stock is derived. Firstly, the benchmark for a stock A will be computed as a combination of all inputs and outputs of stocks in the sample. The coordinates of the benchmark are calculated by the quadratic optimization program (P1). Finally, the performance is derived as a proportional distance between stock A and the benchmark with the reference to projection angle. Using the distance function as a measure of performance guarantees an improvement in both directions i.e. increasing return and decreasing risk. In the Figure 1 the benchmark of stock A will be Benchmark C.
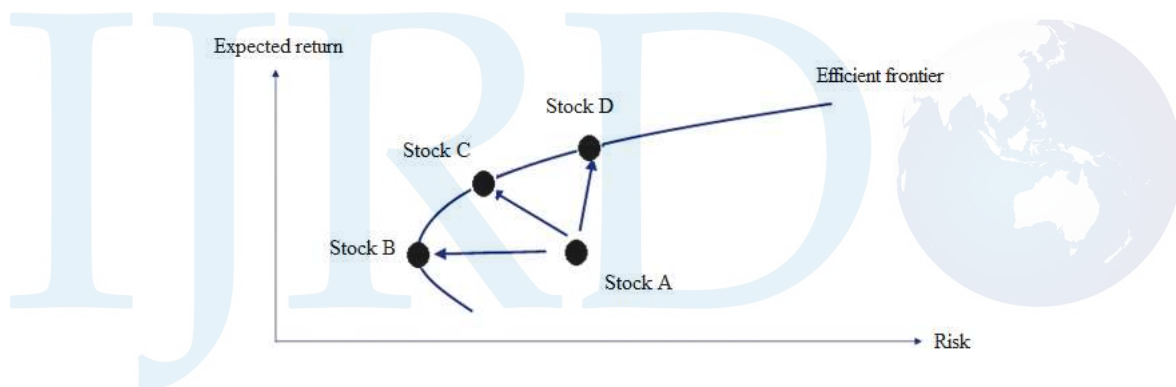


Figure 1 : Projection of Stock A with the distance function

Distance function is used to compute the performance of family business stocks. According to [Briec, Kerstens, and Lesourd 2004], this is the most appropriate function for investment, as it is in line with utility theory. An investor is averse to risk and seeks to both maximize the odd moments (i) Estimated return, skewness ... etc, and to minimize even moments variance of returns, kurtosis , etc,.

The performance measurement in program P1 represents a proportional distance from the position of stock to be evaluated and its benchmark. The closer the value of this performance is to 1, the higher the distance of stock to the efficient frontier. A value close to 0 means that the stock is efficient since it is located right close to the efficient frontier.

Table 2 : MENA family business stocks performance

| FB # | Family business stock | $\sigma^{(*)(**)}$ | FB # | Family business stock | $\sigma^{(*)(**)}$ | FB# | Family business stock | $\sigma^{(*)(**)}$ |
|---|---|---|---|---|---|---|---|---|
| FB 1 | ALMARAI COMPANY(SAUDI JOINT STOCK COMPANY) | 0,9236 | FB 46 | RAS AL KHAIMAH CEMENT COMPANY PSC | 0,9909 | FB 91 | PYRAMISA HOTELS, RESORTS & NILE CRUISES CO. SAE | 0,9800 |
| FB 2 | DELEK GROUP LIMITED | 0,9904 | FB 47 | JEERAN HOLDING CO. (S.A.K.C) | 0,9908 | FB 92 | ENDYMED LTD. | 0,9983 |
| FB 3 | DELTA GALIL INDUSTRIES LTD. | 0,9901 | FB 48 | NEXTCOM LTD | 0,9929 | FB 93 | NATIONAL ALUMINIUM INDUSTRIAL COMPANY P.L.C. | 0,9975 |
| FB 4 | RAMI LEVI CHAIN STORES HASHIKMA MARKETING 2006 LIMITED | 0,9953 | FB 49 | HAYAT COMMUNICATIONS CO. K.S.C.C | 0,9970 | FB 94 | EL-AHRAM CO. FOR PRINTING & PACKAGING S.A.E. | 0,9991 |
| FB 5 | SULTAN CENTER FOOD PRODUCTS CO. (K.S.C.CLOSED) | 0,9990 | FB 50 | SHANIV PAPER INDUSTRIES LTD. | 0,7928 | FB 95 | DELTA FOR PRINTING & PACKAGING S.A.E | 0,9976 |
| FB 6 | CARASSO MOTORS LTD | 0,6689 | FB 51 | TUNISIE PROFILES ALUMINIUM SA | 0,7340 | FB 96 | NATIONAL CHLORINE INDUSTRIES LTD | 0,9928 |
| FB 7 | DELEK AUTOMOTIVE SYSTEMS LTD | 0,9903 | FB 52 | ZANLAKOL LTD. | 0,6919 | FB 97 | GULF INTERNATIONAL CHEMICALS COMPANY SAOG | 0,9882 |
| FB 8 | COMBINED GROUP CONTRACTING CO. (S.A.K.C) | 0,9896 | FB 53 | REMCO FOR THE CONSTRUCTION OF TOURISTIC VILLAGES S.A.E | 0,9931 | FB 98 | MED PAPER | 0,9882 |
| FB 9 | ORIENTAL WEAVERS CARPET COMPANY S.A.E. | 0,3616 | FB 54 | MEDSERV PLC | 0,7152 | FB 99 | MANSOURAH POULTRY COMPANY (S.A.E.) | 0,9970 |
| FB 10 | SAUDI MARKETING COMPANY (SAUDI JOINT STOCK COMPANY) | 0,9486 | FB 55 | KAFR EL ZAYAT PESTICIDES & CHEMICALS CO. (S.A.E) | 0,9960 | FB 100 | BIO VIEW LTD | 0,9759 |
| FB 11 | SANO BRUNO`S ENTERPRISES LTD. | 0,8490 | FB 56 | L'ACCUMULATEUR TUNISIEN ASSAD SA | 0,9974 | FB 101 | JORDAN CHEMICAL INDUSTRIES CO. LTD | 0,9926 |

| # | Company | Score | # | Company | Score | # | Company | Score |
|---|---------|-------|---|---------|-------|---|---------|-------|
| FB 12 | SCOPE METALS GROUP LTD. | 0,6597 | FB 57 | ABETRANS LTD | 0,9975 | FB 102 | SALAM INTERNATIONAL TRANSPORT & TRADING PLC | 0,9970 |
| FB 13 | MARIDIVE & OIL SERVICES | 0,9877 | FB 58 | UNITRONICS | 0,4560 | FB 103 | AVERBUCH FORMICA CENTER LTD. | 0,6921 |
| FB 14 | AL-ARABI GROUP HOLDING CO. (K.S.C) | 0,9945 | FB 59 | DELTA FOR CONSTRUCTION & REBUILDING CO. | 0,6434 | FB 104 | ARAB VALVES COMPANY | 0,9953 |
| FB 15 | COMPUTER DIRECT GROUP LTD. | 0,6263 | FB 60 | HIGHTECH PAYMENT SYSTEMS S A | 0,7099 | FB 105 | BRAINSWAY LTD | 0,9979 |
| FB 16 | MOUWASAT MEDICAL SERVICES COMPANY (SAUDI JOINT STOCK COMPANY) | 0,9264 | FB 61 | ENGINEERING INDUSTRIES (ICON) | 0,9488 | FB 106 | INTERNATIONAL BUSINESS CORPORATION FOR TRADING AND AGENCIES S.A.E | 0,9981 |
| FB 17 | AL HASSAN ENGINEERING COMPANY SAOG | 0,9967 | FB 62 | MICRODATA S.A. | 0,9741 | FB 107 | INVOLYS SA | 0,9974 |
| FB 18 | HOD-ASSAF INDUSTRIES LTD. | 0,9932 | FB 63 | THE GOLD BOND GROUP LIMITED | 0,9225 | FB 108 | ARAB ELECTRICAL INDUSTRIES PLC | 0,9857 |
| FB 19 | QATARI INVESTORS GROUP Q.S.C | 0,9118 | FB 64 | CARMIT CANDY INDUSTRIES LTD | 0,9951 | FB 109 | GB AUTO COMPANY SAE | 0,9983 |
| FB 20 | ISRAEL LAND DEVELOPMENT CO. LTD (THE) | 0,8354 | FB 65 | AL BILAD MEDICAL SERVICES P.L.C. | 0,9944 | FB 110 | SHARM DREAMS CO. FOR TOURISTIC INVESTMENT S.A.E | 0,9982 |
| FB 21 | E&M COMPUTING LIMITED | 0,3625 | FB 66 | INTERNATIONAL CO. FOR FERTILIZERS & CHEMICALS S.A.E | 0,9988 | FB 111 | HEXABYTE SA | 0,9954 |
| FB 22 | AL SORAYAI TRADING AND INDUSTRIAL GROUP (SAUDI JOINT STOCK COMPANY) | 0,9960 | FB 67 | ARAB PESTICIDES & VETERINARY DRUGS MFG. CO. (THE) | 0,9911 | FB 112 | EXALENZ BIOSCIENCE LTD. | 0,9996 |
| FB 23 | TADIRAN HOLDINGS LTD. | 0,0891 | FB 68 | SOCIETE CELLCOM SA | 0,9953 | FB 113 | JORDAN PIPES MANUFACTURING PUBLIC LIMITED SHAREHOLDING COMPANY (THE) | 0,9991 |

| FB# | Company | Score | FB# | Company | Score | FB# | Company | Score |
|---|---|---|---|---|---|---|---|---|
| FB24 | MISR BENI SUEF CEMENT CO. S.A.E | 0,5349 | FB69 | ABU DHABI NATIONAL CO. FOR BUILDING MATERIALS PJSC | 0,9993 | FB114 | TRAVERTINE COMPANY PLC | 0,9974 |
| FB25 | ISSTA LINES LTD. | 0,7126 | FB70 | JERUSALEM PHARMACEUTICALS CO. LTD. | 0,9931 | FB115 | NEW BODY LINE SA | 0,9974 |
| FB26 | NASS CORPORATION BSC | 0,9900 | FB71 | THE INDUSTRIAL COMMERCIAL AND AGRICULTURAL(THE) P.L.C. | 0,9984 | FB116 | TOGETHER STARTUP NETWORK LTD. | 0,9997 |
| FB27 | ORIAN SH.M. LTD | 0,8334 | FB72 | LACHISH INDUSTRIES LTD. | 0,8946 | FB117 | JORDANIAN REALESTATE COMPANY FOR DEVELOPMENT PLC | 0,9972 |
| FB28 | SALOMON A. ANGEL LTD. | 0,9111 | FB73 | TIMAR SA | 0,9985 | FB118 | GOLDEN COAST COMPANY S.A.E | 0,8347 |
| FB29 | MINAPHARM PHARMACEUTICALS S.A.E. | 0,6858 | FB74 | JORDAN DAIRY P.L.C. | 0,8230 | FB119 | EGYPTIAN MODERN EDUCATION SYSTEMS S.A.E | 0,9961 |
| FB30 | HAMAMA MEIR TRADING (1996) LTD | 0,9958 | FB75 | MIDDLE EAST SPECIALIZED CABLES COMPANY | 0,9973 | FB120 | ATLAS FOR LAND RECLAMATION AND AGRICULTURAL PROCESSING S.A.E | 0,9987 |
| FB31 | SOCIETE DE THERAPEUTIQUE MAROCAINE | 0,9952 | FB76 | RS2 SOFTWARE PLC | 0,9971 | FB121 | MARSA MARSA ALAM FOR TOURISM DEVELOPMENT S.A.E | 0,9980 |
| FB32 | DELATTRE LEVIVIER MAROC SA | 0,9982 | FB77 | MANUFACTURE DE PANNEAUX BOIS DU SUD SA | 0,9989 | FB122 | PHARAOH TECH FOR CONTROL AND COMMUNICATION SYSTEMS S.A.E | 0,9960 |
| FB33 | AUTOMOBILE RESEAU TUNISIEN ET SERVICES SA | 0,9977 | FB78 | ARGAMAN INDUSTRIES LTD. | 0,9300 | FB123 | EGYPT INTERCONTINENTAL FOR GRANITE & MARBLE (EGY-STON) S.A.E | 0,9866 |
| FB34 | KLIL INDUSTRIES LTD | 0,7747 | FB79 | RADCOM LTD. | 0,4118 | FB124 | INTERNATIONAL COMPANY FOR MEDICAL INDUSTRIES S.A.E | 0,9995 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FB 35 | AMANET MANAGEMENT & SYSTEMS LTD. | 0,8589 | FB 80 | TOP RAMDOR SYSTEMS & COMPUTERS CO. (1990) LTD. | 0,6731 | FB 125 | EL-BADR PLASTIC CO. S.A.E | 0,9983 |
| FB 36 | G. WILLI-FOOD INTERNATIONAL LIMITED | 0,9972 | FB 81 | EGYPTIAN TRANSPORT & COMMERCIAL SERVICES CO. EGYTRANS S.A.E. (THE) | 0,9991 | FB 126 | ARAB COMPANY FOR INVESTMENT PROJECTS | 0,4829 |
| FB 37 | KUWAIT COMPANY FOR PROCESS PLANT CONSTRUCTION & CONTRACTING (KCPC) | 0,9848 | FB 82 | MODERN COMPANY FOR WATER PROOFING S.A.E | 0,9983 | FB 127 | NATIONAL OIL AND ELECTRICITY PRODUCTION FROM OIL SHALE COMPANY | 0,8837 |
| FB 38 | HAMAT GROUP LTD | 0,6873 | FB 83 | A.L.D. ADVANCED LOGISTICS DEVELOPMENTS LTD. | 0,6348 | FB 128 | PORT SAID FOR AGRICULTURAL DEVELOPMENT AND CONSTRUCTION S.A.E | 0,8768 |
| FB 39 | BIRMAN WOOD AND HARDWARE LTD | 0,6873 | FB 84 | ARAB INTERNATIONAL HOTELS PLC | 0,8292 | FB 129 | A - ONLINE CAPITAL (A.O.C.) LTD | 0,9612 |
| FB 40 | INTERNATIONAL COMPANY FOR AGRICULTURAL CROPS SAE | 0,9940 | FB 85 | HAYAT PHARMACEUTICAL INDUSTRIES CO. P.L.C | 0,9622 | FB 130 | XTL BIOPHARMACEUTICALS LTD | 0,9971 |
| FB 41 | FITAIHI HOLDING GROUP (SAUDI JOINT STOCK COMPANY) | 0,9964 | FB 86 | CHAM FOODS (ISRAEL) LTD. | 0,9503 | FB 131 | TIKCRO TECHNOLOGIES, LTD. | 0,9920 |
| FB 42 | NCA-ROUIBA SPA | 0,9925 | FB 87 | PHILADELPHIA PHARMACEUTICALS COMPANY PLC | 0,7698 | FB 132 | WIZE PHARMA LTD | 0,0000 |
| FB 43 | FOODCO HOLDING P.J.S.C. | 0,7507 | FB 88 | CARTIER SAADA SA | 0,6325 | FB 133 | AL NUKHBA FOR GENERAL CONSTRUCTION CO. | 0,9950 |
| FB 44 | ZVI SARFATI & SONS INVESTMENTS AND CONSTRUCTIONS (1992) LTD. | 0,7489 | FB 89 | ALEXANDRIA NEW MEDICAL CENTER CO. S.A.E | 0,9907 | FB 134 | EL SEWEDY ELECTRIC COMPANY S.A.E | 0,6645 |
| FB 45 | ELLOMAY CAPITAL LTD. | 0,9972 | FB 90 | D.N.A BIOMEDICAL SOLUTIONS LTD. | 0,9995 | FB 135 | JARIR MARKETING COMPANY | 0,9979 |

*(*) A score of σ close to 0 means that the stock is efficient in the return-risk dimensions.*

*(**) A score of σ close to 1 means that the stock is far from the efficient frontier and hence inefficient. The stock needs to be improved by  σ with respect to its initial return-risk position*

Table 2 presents the performance scores of the data envelopment analysis with the distance function. We note that only one family business stock that is efficient with a score of zero: FB 132 (WIZE PHARMA LTD). This result suggests that FB 132 lies on the efficient frontier and that there is no other stock having less risk with greater return than FB 132. In contrast, the analysis suggests that several stocks are not efficient in return-risk dimensions. For example, stock number 42 (NCA-ROUIBA SPA) with an efficiency score 0,9925. Indeed, Family business stock 42 needs to improve simultaneously its return and risk by 99,25% with respect to its benchmark.

For purpose of investment recommendations, one should advice to invest on benchmarks instead of individual assets. For example, an investor seeking an increase in return and a decrease of risk could invest on benchmark presented in table 3 instead of investing on FB 42. This benchmark guarantees a simultaneous increase of return and decrease of risk by 99,25% with respect to the initial return-risk of FB 42

Table 3: Benchmark of NCA-ROUIBA SPA stock

| Family business benchmark for FB 42 | Weights |
|---|---|
| MEDSERV PLC | 8,10% |
| AL BILAD MEDICAL SERVICES P.L.C. | 7,71% |
| FOODCO HOLDING P.J.S.C. | 6,62% |
| RAMI LEVI CHAIN STORES HASHIKMA MARKETING 2006 LIMITED | 6,41% |
| RADCOM LTD. | 6,07% |
| NASS CORPORATION BSC | 5,82% |
| COMBINED GROUP CONTRACTING CO. (S.A.K.C) | 5,78% |
| JEERAN HOLDING CO. (S.A.K.C) | 4,70% |
| SHANIV PAPER INDUSTRIES LTD. | 4,56% |
| CARMIT CANDY INDUSTRIES LTD | 4,52% |
| ARAB ELECTRICAL INDUSTRIES PLC | 3,58% |
| BIRMAN WOOD AND HARDWARE LTD | 3,25% |
| MANSOURAH POULTRY COMPANY (S.A.E.) | 2,50% |
| THE INDUSTRIAL COMMERCIAL AND AGRICULTURAL(THE) P.L.C. | 2,40% |
| ARAB PESTICIDES & VETERINARY DRUGS MFG. CO. (THE) | 2,31% |
| ABU DHABI NATIONAL CO. FOR BUILDING MATERIALS PJSC | 2,30% |
| NEW BODY LINE SA | 2,27% |
| NATIONAL CHLORINE INDUSTRIES LTD | 2,21% |

| | |
|---|---|
| EL SEWEDY ELECTRIC COMPANY S.A.E | 1,94% |
| TADIRAN HOLDINGS LTD. | 1,80% |
| PORT SAID FOR AGRICULTURAL DEVELOPMENT AND CONSTRUCTION S.A.E | 1,56% |
| ENDYMED LTD. | 1,49% |
| A - ONLINE CAPITAL (A.O.C.) LTD | 1,44% |
| MICRODATA S.A. | 1,41% |
| INTERNATIONAL BUSINESS CORPORATION FOR TRADING AND AGENCIES S.A.E | 1,15% |
| JORDAN DAIRY P.L.C. | 1,01% |
| ZANLAKOL LTD. | 0,77% |
| EGYPT INTERCONTINENTAL FOR GRANITE & MARBLE (EGY-STON) S.A.E | 0,66% |
| JORDAN PIPES MANUFACTURING PUBLIC LIMITED SHAREHOLDING COMPANY (THE) | 0,55% |
| MANUFACTURE DE PANNEAUX BOIS DU SUD SA | 0,54% |
| MIDDLE EAST SPECIALIZED CABLES COMPANY | 0,54% |
| SULTAN CENTER FOOD PRODUCTS CO. (K.S.C.CLOSED) | 0,53% |

The rest of the analysis will focus on the opportunity of investing on family business stocks in the MENA region. Results of performance computations helped to derive 135 family business benchmarks. These references can serve as proxies of family business stock indexes in the MENA region.

Returns of all family business benchmarks are contrasted with other indexes covering other family business financial investment in Europe and US. Crédit suisse family index was launched to track the family investment opportunities in the Europe region while S&P 500 presents the performance of American stocks.

Table 4 : Return-risk average FB MENA versus CS Family and S&P 500

| | CS Family Index | S&P 500 | Average FB MENA Benchmark |
|---|---|---|---|
| Expected Return | 0,30% | 0,81% | 1,94% |
| Risk | 0,11% | 0,09% | 0,04% |

We do not report all 135 MENA family benchmarks. Table 4 presents the expected return and risk for the CS family index, S&P 500 index and the average FB MEAN benchmark. The latter is obtained as average of weights of 135 MENA family business derived references. On may notice the superiority of MENA FB index regarding other indexes in return-risk dimensions.

This result is confirmed, in view of the monthly return performances over 37 return observations of the sample.
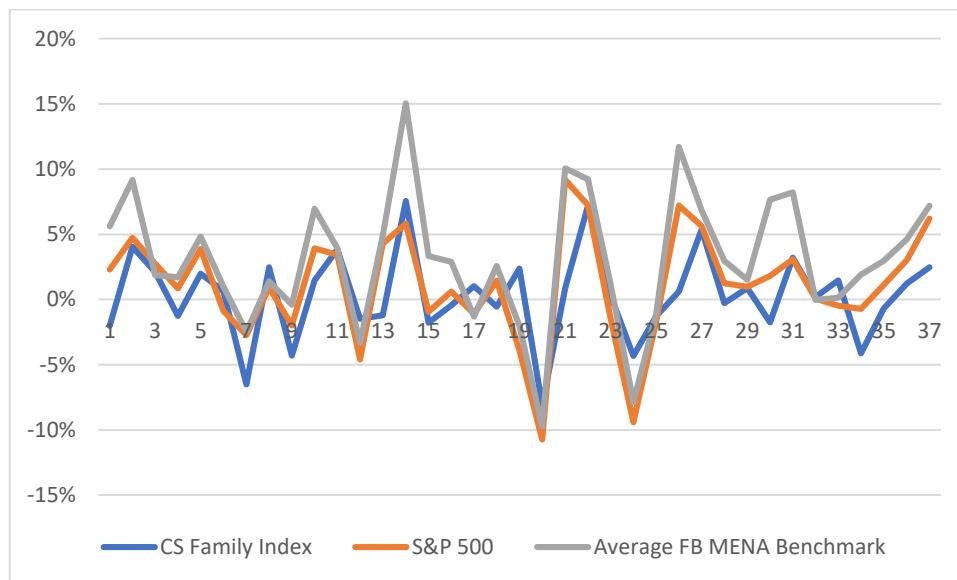


Figure 2 : Monthly returns : MENA FB average reference versus CS Family and S&P indexes

Figure 2 presents the monthly of MEAN average family business benchmark contrasted with CS family and S&P 500 indexes. Approximately during all the 37 months of the studied period, MENA average family business index exhibits higher return than other indexes. This result suggests that family business stocks present good investment opportunities in the MENA region and probably more than in developed countries.

## Conclusion

Academic literature on the performance of family businesses in general has demonstrated through empirical studies the outperformance compared to those of non-family companies. Performance measured, mainly in the literature by financial indicators. The different studies tackle the performance with a fundamental approach based on internal company indicators such as ROI ratio and others.

In attempts to explain the performance of family businesses, several articles explored different parameters: debt aversion or efficient allocation of capital, dividend distribution policy, etc.

The financial perspective in this literature remains predominant and its analysis focused solely on a parametric approach based on internal indicators of family companies. This article proposes another framework for analyzing the performance of family businesses in MENA region. An analysis approach that is distinguished both by the financial investment environment that integrates return and risk and the methodology of performance analysis.

The empirical part demonstrates based on large sample size of family businesses in MENA, the superiority of their performances compared to S&P 500 Index and CS Family Index.

Data envelopment analysis approach, known under the mnemonic DEA in conjunction with the distance function as a performance measure, is applied to derive the various performance scores of the firms in the sample.

This approach has several advantages. (i) It does not assume any function between Inputs / Outputs criteria, (ii) it presents the performance as a score representing a distance between the company whose performance is to be evaluated and its benchmark. (iii) It has scores integrating an unlimited number of Inputs / Outputs. (iv) Derived performance scores allow ranking entities. (v) The analysis can be used to derive appropriate benchmarks from the performance appraisal framework.

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