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CAN HEURISTIC VALUATION IMPROVE INVESTMENT PERFORMANCE OF INDIVIDUAL INVESTORS?

Mariusz Kicia, Ph.D., Maria Curie-Sklodowska University, Lublin, Poland
mariusz.kicia@umcs.lublin.pl

ABSTRACT

The paper presents concept of simplified valuation models and tests their usefulness in application by individual investors at the Polish stock market over 2000-2013. It is discussed whether it would be rational to combine common fundamental valuation methods of multiples and DCF, preserving the relative simplicity of multiples as well as complexity and consistency of discounted cash flows to provide useful hybrid tool even when individual investors follow behavioral heuristics and simplifications while making investment decisions. Results of experiments indicate that use of proposed valuation methods wouldn't have an unequivocal impact on investment strategy of irrational individual investors with quite a low average improvements of annual returns (from 5,2% to 10,5% extra return) only in about a half of all 415 analyzed stocks. Tests are preceded by results of the survey conducted on 66 experienced and 136 inexperienced individual investors to compare their investment techniques and attitudes. It is shown that rising experience in investment causes investors to follow intuition in risk assessment that may end in overconfidence. 74% of respondents without experience declared that they would measure investment risk in some way while practitioners usually don't use measures but rather sense risk. Inexperienced respondents are more likely to use Fundamental Analysis tools than real investors in practice. Answers also suggest that the more investors are experienced the more often they declare using Technical Analysis tools.

Keywords: individual investor, behavioral finance, investment strategy.

INTRODUCTION

The development of the financial market with increasing number of instruments traded, capitalization, and above all number and variety of market participants should lead to an increase in the degree of efficiency, according to the Efficient Markets Hypothesis (EMH). The implications of EMH are very profound for investors. If the EMH is true, prices are fair and give the return investors deserve. Security prices are exactly what they should be, given what is known at the time. The fact that prices are constantly changing does not contradict this. Prices are simply reacting to new information and constantly being fine-tuned in order to stay up to date. In theory, markets with weak EMH mean that technical analysis is a waste of time. At best, clever fundamental analysis (i.e. examination of drivers of value such as profits, market share, growth etc.) might if accurate predictions could be made independent of past trends. This might be possible if there were talented investors who able to convert new information into securities fair value before the rest of the market could do the same. However, if there is semi-strong EMH, even fundamental analysis would not be productive since share prices would reflect the latest available information. This is because the "instantly up-dated" market – with thousands of decision-makers - will always be ahead of an individual analyst in trying to incorporate the impact of the latest news into securities prices.

If this is the case, paying a portion of investment wealth to a fund manager does not make sense. Better to simply invest in a widely diversified fund (index fund) that tracks a market overall based on random and un-researched selections. The other option is beat the market with insider trading but this possibilities usually are not instant or even if non-public yet information is available ahead of the whole market using them is against the law. If insider trading fails in a long term strong EMH appears as all decision-makers are able to predict correctly even information that is confidential at the moment and incorporate into prices. That is rather uncommon as even developed markets dynamics usually puts them somewhere between semi-strong and strong EMH.

The financial market volatility and efficiency of its functions depends to a great extent on the behavior of the market participants. With the current size of the financial markets and their growing international relationships an individual investor may obviously become less important, although to quite shallow and developing emerging markets individual investors may play a significant role in pricing securities. Even if we assume that the market efficiency provides the same information at the same time to all (or almost all) decision-makers the way it is incorporated into market prices varies not only according to investment strategies, investment horizon but depends on pricing method, risk perception, timing and formal restrictions in potential decisions. In that case individual investors may act different than institutions and if they are a leading group of the market agents an informal and intuitive process of incorporating information into prices can end in speculative bubbles. That's why individual investors are called *quasi rational* or *irrational*. Financial market activity of irrational investors leads to an increase in market volatility. Empirical studies show that only one third of changes in stock prices is a result of changes in fundamental factors that can be considered as drivers of rational expectations. The remaining part of the volatility of stock prices is largely the result of the activity of irrational investors.

Even if strong EMH appears everyone wants to beat the market. To achieve this goal financial market participants are driven by different factors and tools for making financial decisions. None of the tools and methods of analysis however doesn't explain complexity of market volatility. Technical Analysis is based on past volatility only and it does not refer to the basic mechanisms of price discovering as a highly simplified approach. Fundamental factors cannot be considered as the only drivers of market volatility. Behavioral analysis shows that the market asset value often differs significantly from prices considered as fair but it is not a coherent approach although explaining market behavior by the behavior of its participants focuses more and more attention.

The modern theory of finance does not pay much attention to the irrationality of investors. It was assumed that they were an easy prey for other investors who were involved in arbitrage or carrying out speculative transactions focused on mean reversion. On the other hand waves of optimism due to increases of stock market indices and the waves of pessimism due to their declines prevailing among individual investors can be a reason why stock prices diverge from the levels of their fundamental values. If irrational investors are convinced that shares should be bought or sold as soon as possible even against EMH, overestimated stock prices may still rise and underestimated keep falling. The described behaviors induce another kind of financial market risk, the risk of irrational investors that may be persistent. It is observed when even if mispricing of market asset prices appears values are not corrected quickly.

Rational investors follow the course of events assuming that since the fundamental value of stock follows random-walk process then stabilizing speculation even without irrational investors is risky as relationships between market prices and fundamental factors is not stable. The uncertainty of these compounds is an arena of irrational investors acting as noise traders than reacting to change in fundamentals (Focault, Sraer, Thesmar 2011).

The reason for such a behavior may be a lack of tools that allow individual investors to formally estimate the fair value of instruments that would be a reference value when making investment decisions. That says individual investors do not have the appropriate decision-making tools. They rather use their intuition or simplified calculations due to a problem with obtaining proper information, its interpretation and the time restrictions. Hence, the common practice of their formal valuation method are simple but often unreliable multiples. In the absence of a reference point decision-making becomes emotional and similar to gambling than a planned investment. On the other hand the formulation of comprehensive forecasts and expectations regarding the situation of issuers, predicting revenues, expenses, profits, cash flows etc. exceeds the capacity of most individual investors though is necessary when the most complete and reliable methods of valuation (DCF) is applied by institutional investors.

With all the above problems in mind the question arises whether it would be possible to combine both of these fundamental valuation methods, preserving the relative simplicity of multiples as well as complexity and consistency of discounted cash flows (DCF) to provide useful hybrid tool even when individual investors will follow behavioral heuristics and simplifications while making investment decisions.

The paper presents the concept of such a tool and tests its usefulness in application to still emerging Polish stock market over 2000-2013. The sample of 415 companies listed on the main market of the Warsaw Stock Exchange was the subject of experiments in three variants of the heuristic (simplified) valuation model. Simulations were provided to test whether the use of the heuristic pricing model would improve the performance (average returns on investment) of hypothetical individual investor’s single-asset portfolio. Models were also tested on fundamental data from both stand-alone and consolidated financial statements. The concept of the model and its testing is preceded the review of empirical studies on the investment behavior of individual investors including surveys conducted by the author of the article with 66 experienced and 136 inexperienced individual Polish investors.

INVESTMENT BEHAVIORS OF INDIVIDUAL INVESTORS

General Framework of Behavioral Investing

Activities of bounded rationality investors in financial markets has its theoretical foundations in the behavioral finance. Under this approach, decision depends on the decision making process so it is important to analyze investor’s behavior from the perspective of cognitive psychology, in particular regarding formation of judgments and behaviors that accompany it (Shefrin 2005, Sławiński 2006).

Despite the fact that radical behaviorism opposed to cognitive psychology assumes that the explanation of behavior is not necessary referring to internal mental processes more and more behavioral finance concepts derive from cognitive psychology. Cognitive psychology explains many patterns of behavior that are useful from the financial markets perspective, including especially those which may lead to speculative asset price growth in the securities markets. Such behaviors cover methods of formulating judgments (heuristics) that in a fairly simple way allow for making decisions and solving problems. In psychology, the most important cognitive heuristics include: anchoring, availability, framing and representativeness. These heuristics can be often found in investors' behavior (De Bondt 1998).

Anchoring facilitates decision making under uncertainty by referring potential solutions to a real (or imagined) value which is the point of reference for decision to be taken. Selecting the reference point is an important issue since depending on anchor the same decisions may be considered as profits or losses, causing other heuristics (e.g. mental accounting and adjusting appetite for risk). In financial investment anchoring enforced with availability heuristic (recalling information easily accessible in memory but not necessarily correct at the moment) appears frequently at the moment of security purchasing decision. Perception of current market prices level as reasonable and worth investment can be caused by media, reports already outdated or informal information from people who seem to be reliable (myth of expert). However anchoring lasts even longer when new information that should influence decisions and prices is ignored causing underreaction or sticky prices. That effect takes place even if initial anchor had no rational explanation.

Framing heuristic is observed when decision depends on the context the problem is presented for consideration. In financial investment decisions depend on information collected from stand-alone financial statements (easier in the analysis for individual investor and available in a shorter time) or consolidated statements (detailed yet more complex and requiring more efforts). Valuation Multiples depend on the selection of companies operating with a similar business model in the industry. Since there are no formal rules but only rational justification of competitors' selection it affects results of multiple evaluation. Simplicity of multiples method is fraught with risk of incorrect selection of perspective, because all that might seem to be even a little reasonable for investor is considered rational.

Following heuristic of representativeness while making decision we refer to a similar problems recognized in the past or we succumb to stereotypes. Therefore, it happens that investors are willing to acquire assets at unreal higher and higher prices that are observed in series of daily quotations and thus contribute to an even greater speculative price increases. Therefore, we can say that investors have a tendency to overestimate the near past events and ignore long-term observations. Following representativeness leads often to myopia in assessment.

The behavioral finance approach starts to play a significant role in practice of financial investment and is adopted and developed even by the most famous investors like George Soros who's strategy is well recognized as investing in value. He believes in two-way feedback relationship between perception and reality which supports the growth of self-reinforcing and ultimately self-decaying wave of market growth. Moreover, he argues that every market bubble is a complex of trend and misperceptions remaining in interaction with each other. G. Soros first of all noted that traditional economic theories are wrong because they assumed that humans behaved rationally and had access to complete information so that the quality of decision-making depended on knowledge. However, in his view of the Theory of Reflexity humans' behaviors are guided by two interrelated components: the cognitive function and the manipulative function. In this case, the reflexity means that market expectations depend on perception of the situation while the situation itself is – among others – under the influence of market participants' expectations.

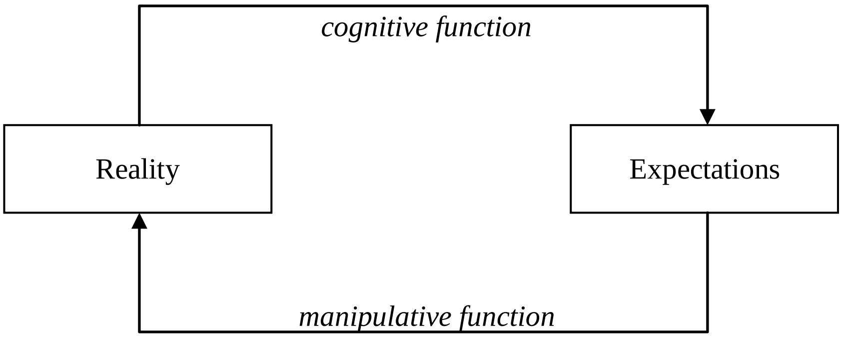

Fig. 1. The idea of George Soros' concept of the reflexivity

The theory applies exclusively to situations that have thinking participants. The participants' thinking serves two functions. One is to understand the world in which they live (the cognitive function). The other is to change the situation to one's advantage (the participating or manipulative function). The two functions connect thinking and reality in opposite directions. In the cognitive function, reality is supposed to determine the participants' views. The direction of causation is from the world to the mind. By contrast, in the manipulative function, the direction of causation is from the mind to the world, that is, the intentions of the participants have an effect on the world. When both functions operate at the same time they can interfere with each other. It means that humans change the situation at the moment they recognize it and make decisions upon the perception. The concept of reflexivity assumes that humans are imperfect in recognizing and evaluating information they perceive. Even if information is impartial itself its perception is subjective and there are as many subjective points of view as many market participants especially when if they don't follow some general formal restrictions or procedures. Cumulated subjective yet similar expectations move away from a rational justification if myopic individual investors are prevailing group of market participants. It is generally recognized that the complexity of the financial markets exceeds our capacity to comprehend it. The main source of difficulties is that participants are part of the situation they have to deal with. Confronted by a reality of extreme complexity we are obliged to resort to various methods of simplification – generalizations, dichotomies, metaphors, decision-rules, moral precepts, etc. These mental constructs take on an existence of their own, further complicating the situation.

Related Research

Empirical researches of investors' activities at the stock market highlight some specific behaviors of individual investors that can affect their portfolios performance. Numerous researches show inclination to follow heuristic thinking and cognitive or emotional biases when investing. The main areas of irrational behavior concern stochastic of price changes, pricing securities, portfolio management strategies and transaction practice (De Bondt 1998). Most individual investors follow a trend. The research provided among American Association of Individual Investors members show that 1% growth of stock market index in a week increases the difference between investors expecting index to continue rising the following week and investors expecting index to fall. Moreover, investors sentiment depends on market performance in previous 100 days (De Bondt 1993) and trend or risk extrapolation for most of investors is only intuitive and naive (Andreassen 1988). Bull market makes investor more bullish, while bear market makes them more bearish.

Similar intuitive processes are observed in capital assets pricing. Only a few individual investors use formal pricing models, while a common practice is using informal information from other investors or financial advisors that may cause availability and anchoring heuristics. Individuals consider as the best investment stocks that recently grew sharply or are highlighted in media (Shiller 1990). They chose also overvalued companies with high price to book value ratio. Most of the individual investors do not use formal strategy rules and most of their decisions are random and often is not planned. Even if formal strategy exists it is being commonly broken (Shefrin i Statman 1997) and average individual investor portfolio is usually weakly diversified (Shefrin 2001, Benartzi and Thaler 2005).

The combination of situational and individual approaches to risk propensity through consideration of individual responses to different risk domains is another interesting and promising stream of research. The work of Weber and Milliman (1997), and subsequent work by Weber et al. (2002) represents an important development in this field. Authors found that while the degree of risk perceived in a situation could vary according to the characteristics of the situation, attitude to perceived risk (the degree to which people find perceived risk attractive) remained stable across situations for a significant portion of their sample. Work in this area (Fagley and Miller, 1997; Weber and Milliman 1997) shows that it is possible to be risk seeking in some areas of one's life and risk averse in others while having a relatively consistent view of risk.

M. Kaustia and S. Knupfer proved that there was a dependence between previous IPO success in Finland and the interest in participating another initial offer. That is an obvious evidence of mental accounting heuristic known as *house-money effect*. Authors stress that although there are still a few empirical evidences of how investors acquire knowledge and capture experience it was discovered that experienced investors usually fall in less behavioral traps than inexperienced stock market beginners (Kaustia and Knupfer 2008).

G. Chen, K.A. Kim, J.R. Nofsinger and O.M. Rui analyzing data provided by Chinese brokerage companies found quite a low effectiveness of Chinese investors’ decisions. Authors prove that investors followed three basic heuristics: disposition effect, overconfidence and representativeness. Moreover, effects of disposition and overconfidence were stronger than compared to American investors and experienced investors were as susceptible to follow heuristics as beginners (Chen et al. 2007).

W.B. Elliott, F.D. Hodge and K.E. Jackson examined how individual investors’ experience may influence not only on portfolio management techniques but also the way information are analyzed and processed. On one hand they proved that experience in financial investment has positive effect on portfolio returns but it wasn’t clear if it influences relationship between the set of information considered as important and portfolio performance. Authors noticed that methods of obtaining, analyzing and integrating information differs with professional and individual investors (Elliot et al. 2008).

Finally, research provided by T.L. Liao analyzing 36 investment strategies at Taipei and Shanghai stock exchanges proved that market overreactiveness is a feature markets with shorter history. The younger the market the lower risk of publishing unexpected negative information and in consequence the more emotional is investors' reaction as well as market volatility. On the other hand, market development covering at least few cycles of economy experiences investors and causes that level of overreactiveness is significantly lower (Liao 2002).

Experienced and Inexperienced Individual Investors in Poland – Evidence from a Survey

Regarding existing differences in behavior of experienced investors and beginners CATI survey was conducted on Polish investors to discover if investment practical experience is correlated with stock market risk perception and tools that investors use to evaluate securities' value. These studies extend the state of knowledge regarding mechanisms of stock exchange, efficiency and rationality of decisions of market participants.

A total of 202 survey's observations registered from 25 August 2008 to 24 June 2010 were analyzed. Out of all observations, 66 were answers by respondents declaring themselves as investors, while 136 left by respondents inexperienced in investing. Both groups of respondents answered identical (in meaning) questions (see Table 1) although literary different as both had a different perspective of their own activities at a stock market (past and possible future). Respondents were asked to indicate on 6-point scale if and how strongly they agree (6 to 4) or disagree (3 to 1) with presented situations or did (would) they act as described in question. Answers from experienced in investing respondents regarded assessment of their own behaviors and attitudes. In case of inexperienced ones they assessed they were asked to imagine how they would behave as stock market investors if there were ones in the future. Confronting answers of both groups identified changes in attitudes and behaviors that appear when beginners become investors. The analyses of similarity in distribution of answers from all selected groups were provided with three standardized to [0;1] scale measures: Clark's coefficient of divergence (Clark 1952), Matusita distance measure (Matsusita 1955) and Walesiak's distance measure (Walesiak 1999).

Table 1. Survey questions on risk and investment analysis – experienced investors and inexperienced respondents

Code	Questionnaire for experienced investors	Questionnaire for inexperienced respondents
Q1	*All shares are the same risky.*	*All shares are the same risky.*
Q2	*I don't use a formal measure of investment risk. I sense it using intuition.*	*I wouldn't use a formal measure of investment risk. I would sense it using intuition.*

Code	Questionnaire for experienced investors	Questionnaire for inexperienced respondents
Q3	*Technical analysis (charts, patterns, trends, indicators etc.) is the best tool to forecast price movements and select assets.*	*Technical analysis (charts, patterns, trends, indicators etc.) would be the best tool to forecast price movements and select assets if I were an investor.*
Q4	*Fundamental analysis (financial results, macroeconomic data and events etc.) is the best tool to forecast price movements and select assets.*	*Fundamental analysis (financial results, macroeconomic data and events etc.) is the best tool to forecast price movements and select assets if I were an investor.*
Q5	*I rely on correlations selecting assets to my portfolio.*	*I would rely on correlations selecting assets to my portfolio.*

Distribution of answers are presented below (see Fig. 2 and Table 2). First of all attention must be paid to unequal gender distribution of participants with males active at the market and females dominating group keeping away from investment. That also reflects the reality of the Polish and also European financial markets dominated by males.

Answers distribution analysis show that there are no significant differences between experienced investors and inexperienced respondents in cases of market risk perception (Q1), use of Technical Analysis (Q3) and Fundamental Analysis (Q4). 79% of inexperienced group and 87% of investors disagree with statement saying that all shares are the same risky. Only 6% of experienced and 9% of inexperienced strongly agrees. All distance measures confirm that distribution of answers is similar. There are no statistically important (p=0,05) differences between answers of males and females of both groups although Clark's divergence suggests they differ. It is supposed that is only because of a low quota of experienced females participating the survey.

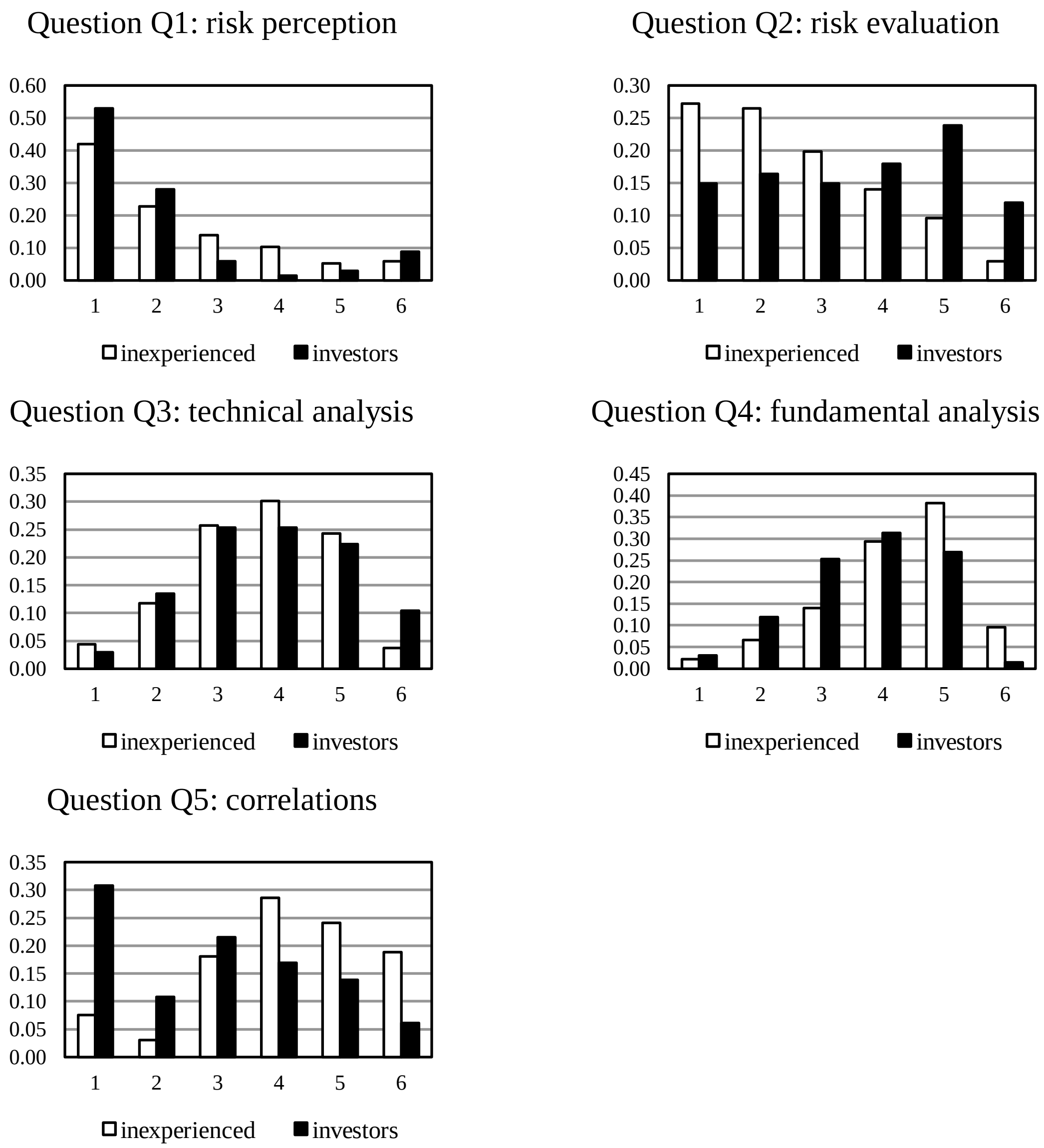

Fig 2. Distribution of answers – investors and inexperienced respondents

Table 2. Respondents' groups and their average notes

Group	N	Q1	Q2	Q3	Q4	Q5
male investors	56	2,02 (1,58)	3,38 (1,56)	3,84 (1,35)	3,82 (1,10)	2,88 (1,68)
female investors	10	1,90 (1,52)	4,40 (1,96)	3,80 (1,14)	3,00 (1,05)	2,70 (1,70)
inexperienced males	52	2,17 (1,63)	2,35 (1,30)	3,56 (1,32)	4,27 (1,12)	4,21 (1,49)
inexperienced females	84	2,35 (1,44)	2,75 (1,50)	3,75 (1,17)	4,15 (1,26)	3,90 (1,59)
Total	202	2,21 (1,53)	2,92 (1,56)	3,73 (1,23)	4,06 (1,17)	3,74 (1,59)

Similar findings are provided when interest in Technical Analysis declared by both groups is taken into account. In that case respondents are even more consistent: 58% of each groups believes that Technical Analysis is or can be a useful tool in stock market investment and 10% of experienced investors and 4% of the remaining group agrees with that sentence unconditionally. Answers suggest that Technical Analysis will be applied more often if investor is better experienced. In that case no important distinctions were found when investor's gender was considered.

Fundamental Analysis application as investment tool distinguish respondents. Average answers of both groups show that. It seems that investment practice verifies beliefs of beginners that stock market forecasts situation in the economy, financial results and macroeconomic data are simply reflected in security prices. Beginners becoming investors are faced with failure: Fundamental Analysis is more difficult than expected and if semi-strong or strong EMH is true it may be useless. Measures of similarity show that along with gaining experiences difference between males and females attitudes may appear: experienced men are more likely to use Fundamental Analysis.

Experienced and inexperienced investors distinct most in declarations of using correlation as one of investment tools. Correlation indicates that investor is familiar with portfolio theory and diversification. The high percentage of positive declarations of inexperienced investors (71% would use it and 19% always) is not surprising. Positive answer in this case may be considered as protecting self-esteem. Even if portfolio theory is known to inexperienced individuals most of them definitely don't know how to use correlation and how labor-intensive is using the theory in practice in that case. What is not surprising then is the fact that only one out of three experienced investors admits the use of correlation in practice and only 6% does it always or almost always.

The most interesting part of results was found when investment risk measurement was considered. Rising experience in investment causes investors to follow intuition in risk assessment. 74% of beginners and respondents without experience declared that they would measure investment risk in some way. Practitioners don't use measures but rather sense risk.

That is opinion of 54% of that group and in 12% it happens always or almost always. In comparison only 3% of beginners agree with that. Intuitive investing seems to be a common practice of individual investors.

HEURISTIC VALUATION – FROM DISCOUNTED CASH FLOWS TO MULTIPLES

Methods of using multiples as well as discounted cash flows to estimate fair value of stocks are widely documented in both literature and practice of the financial markets. For institutional investors or investment recommendations they are common performing evaluative functions, being a subject of negotiations in M&A transactions and rational reference being in line with formal investment strategy. The use of both methods at the same time is justified as they may present different values due to different underlying factors and procedures of valuation.

DCF valuation has the most solid fundaments in theory of finance and furthermore all other methods of valuation originate from the analysis of discounted cash flows. The advantage in the use of DCF valuation comes from the fact that it is the only method by which it is possible to estimate economic value of the company only based on potential cash flows that are expected to appear in a long term and by this it forces long term forecasting of all investment ventures. At the same time a long perspective of forecasts incorporates quite a huge level of risk that forecasts are incorrect. Moreover, often a large part of the value is accounted as residual value that is sensitive to changes of parameters.

Multiples should be considered as a supplement of DCF valuation and represents a relative value that should be achieved by security if all important factors (Earnings, Book Value, EBIT, EBITDA or other) were incorporated in its price to the extend the market does it with competitors with a similar business model. Reflecting current sentiment of the market is its biggest advantage of this method as well as ease in calculate even by individual investors. Selection of comparable public listed competitors may be a serious problem though. It may be impossible to achieve especially at the very stage of market development when cross-country comparison is not justified. The method doesn’t include different profiles of risk and growth rate of company and its current value is estimated basing only on history or short term forecast. Nevertheless this is most common procedure of simple valuation.

In mergers and acquisitions (M&A), sellers and buyers normally base their price calculations on multiples of EBITDA, a figure often used by investors to analyze a company's value. EBITDA is extremely important in M&A transactions, and especially so for the determination of the purchase price. However, like all other estimation tools, EBITDA has inherent limitations and dangers (Kicia 2009).

The term is not formally defined by general accounting standards. While the theory behind multiples based on EBITDA may be sound, in practice reliance on these by sellers and buyers alike is often quite flawed. Additionally, the use of EBITDA in estimating value in small or family-owned business transactions creates difficulties in the negotiation process because of the limited availability and quality of financial statement information.

EBITDA is used in M&A transactions, in both binding and non-binding offers, in order to determine the purchase price that will be paid. In non-binding offers the use of EBITDA does not present a problem since the purchase price included is not enforceable against the parties in an eventual disagreement. However, in binding offers, EBITDA can be problematic for either side of the transaction when the EBITDA of the company is higher or lower than expected.

EBITDA forecasts is also one of the crucial parameters in DCF valuation as discounted cash-flows usually begin in healthy and profitable operating results. The aforementioned disadvantage of DCF valuation for all investors is its sensitivity to assumptions and forecasts. If DCF value is calculated on 20 years of forecast what is the quality of that forecast? Are we really able to estimate them correctly and if not maybe we should simplify the method and limit forecast up to forthcoming 2-3 years followed by estimated residual value. This approach would be promising for individual investors that are unable to discover future of valued companies due to lack of time, asymmetric information and computational problems.

Let us assume that we need a method that takes into consideration also behavioral nature of individual investors:

1. Representativeness and availability: investors predict next quarter results depending on information that is provided in last four quarterly financial statements. Their predictions cover revenues, EBIT and EBITDA profitability, rotation cycles of inventories, short-term receivables and current liabilities.
2. Myopia: investors are not able to provide a long term prediction. Instead of that they can simply incorporate a growth rate of revenues observed by comparing last four quarters (from Q_{-1} to Q_{-4}) to preceding four quarters (from Q_{-2} to Q_{-5}) and with stable EBIT profitability.
3. Framing: investors estimate company (share) fair value depending on stand-alone financial statements (usually announced earlier) or consolidated financial statements (usually announced later). Anchoring may appear when investors stick to values obtained from stand-alone statements even if consolidated statement is announced.
4. Investors need a simple method of estimating residual value of the company as they understand that a short term forecast is not enough to justify its value. The residual value can be obtained by a simple multiple of the last observed cash-flow or balance sheet values.
5. Risk free rate is observed as government debt YTM and credit risk margin at market level for similar companies.
6. All public companies are traded with the same beta equal to 1 as investors are not able to calculate their proper value. As a matter of fact in 90% of market reports and recommendations in Poland beta equal to 1 is assumed.
7. Investors are not able to estimate CAPEX and depreciation correctly without detailed information from the valued company so they assume that when CAPEX is done it will appear in company profitability or growth of revenues. Assuming CAPEX equal to depreciation simplifies procedure as in residual period.
8. Residual cash flows growth rate (g) is 0%.
9. Non-operating assets are equal to long-term investment assets and net debt is calculated depending on values observed in last announced financial statement (anchoring).

Assuming the above three alternative models of equity value were tested:

Model I. DCF proxy with simplified assumptions but still most complex calculations

$$EV_{QT} = \sum_{i=1}^{3} \frac{FCF_{QT-1} \cdot (1+er)}{(1+WACC)^i} + RV_{QT} + NOA_{QT-1} - ND_{QT-1}$$
$$RV_{QT} = \begin{cases} \dfrac{FCF_{QT-1} \cdot (1+er)}{(1+WACC)^3 \cdot WACC}, if\ FCF_{QT-1} > 0 \\ 0{,}99 \cdot RV_{QT-1} + 0{,}01 \cdot \dfrac{FCF_{QT-1} \cdot (1+er)}{(1+WACC)^3 \cdot WACC}, if\ FCF_{QT-1} \leq 0 \end{cases} \quad (1)$$

where:

EV_{QT} – equity value forecasted for quarter T
RV_{QT} – residual value forecasted for quarter T
FCF_{QT-1} – free cash flow of the last quarter
er – expected FCF growth rate (respecting assumption 2)
WACC – Waged Average Cost of Capital as in DCF (respecting assumptions 5-6)
NOA_{QT-1} – Non-Operating Assets as in statement for quarter T-1
ND_{QT-1} – Net debt as in statement for quarter T-1

Model II. DCF proxy with simplified calculation of residual value

$$EV_{QT} = \sum_{i=1}^{3} \frac{FCF_{QT-1} \cdot (1+er)}{(1+WACC)^i} + RV_{QT}$$
$$RV_{QT} = \begin{cases} TFA_{QT-1} + CA_{QT-1} - LR_{QT-1}, if\ FCF_{QT-1} > 0 \\ 0{,}99 \cdot RV_{QT-1} + 0{,}01 \cdot \left(TFA_{QT-1} + CA_{QT-1} - LR_{QT-1}\right), if\ FCF_{QT-1} \leq 0 \end{cases} \quad (2)$$

where:

EV_{QT} – equity value forecasted for quarter T
RV_{QT} – residual value forecasted for quarter T
FCF_{QT-1} – free cash flow of the last quarter
er – expected FCF growth rate (respecting assumption 2)
TFA_{QT-1} – Tangible Fixed Assets for quarter T-1
CA_{QT-1} – Current Assets for quarter T-1
LR_{QT-1} – Liabilities and Reserves for quarter T-1
WACC – Waged Average Cost of Capital as in DCF (respecting assumptions 5-6)
NOA_{QT-1} – Non-Operating Assets as in statement for quarter T-1
ND_{QT-1} – Net debt as in statement for quarter T-1

Model III. EBITDA x10 multiple

$$EV_{QT} = max\{0; 10 \cdot EBITDA_{QT-1} + NOA_{QT-1} - ND_{QT-1}\} \quad (3)$$

where:

EV_{QT} – equity value forecasted for quarter T
$EBITDA_{QT-1}$ – EBITDA value observed for quarter T-1
NOA_{QT-1} – Non-Operating Assets as in statement for quarter T-1
ND_{QT-1} – Net debt as in statement for quarter T-1

All proposed above heuristic valuation models were tested for improvement of potential investment results of hypothetical individual investors. First, for all but financial companies listed at The Warsaw Stock Exchange main market valuation procedures were applied for all available quarters. Financial data for the sample of 415 companies listed in 2000-2012 was provided by Notoria Service. Out of all valued companies for the next step were qualified only these with at least 12 quarterly valuations (reference fundamental values according to Model I, II and III separately for at least 3 years). For all periods with reference values of all selected companies 500 hypothetical transaction (open and close dates) were randomized and annual return for each transaction was calculated. The average annual return and standard deviation represented a distribution of possible returns for investors without fundamental reference value.

The same procedure was repeated but another 500 transactions were filtered by values provided by tested models for the date of transaction. That said if market price was higher than a heuristic fair value the company was recognized as overvalued and hypothetical investor cancelled buying. The average annual return and standard deviation represented a distribution of possible returns for investors with fundamental reference value provided by Model I, II and III respectively.

Comparing results of both samples for all companies it was analyzed if investors using heuristic models can improve their results of random investing. The same procedures were provided using stand-alone and consolidated financial statements.

RESULTS AND DISCUSSION

Results of experiments (see Table 3) indicate that the use of proposed valuation methods wouldn't have an unequivocal impact on investment strategy. With rather low average improvements of annual returns (from 5,2% to 10,5%) for about a half of all analyzed companies (from 43% to almost 56%) it rather confirms at least semi-strong EMH of Polish stock market in 2000-2012.

Table 3. The results of testing procedures

Test number	I	II	III
	IV	V	VI
Financial statements	stand-alone	stand-alone	stand-alone
	consolidated	consolidated	consolidated
Initial sample of companies	415	415	415
	415	415	415
Applied model of valuation	I	II	III
	I	II	III
Companies qualified for step II	288	178	181
	238	226	172
Companies with improved results using model	52,0%	50,0%	43,0%
	54,2%	55,6%	44,9%
Average increase of returns (standard deviation)	5,3% (6,0%)	5,2% (5,1%)	8,5% (14,6%)
	10,3% (14,2%)	5,8% (6,5%)	7,2% (6,5%)
Average decrease of returns (standard deviation)	-9,5% (14,2%)	-7,2% (7,1%)	-15,2% (19,1%)
	-8,6% (13,8%)	-7,7% (12,8%)	-13,3% (19,0%)
No. of stocks with increased results (difference in returns statistically significant, α=0,05)	20	7	10
	24	10	11
Average increase of returns with statistically significant improvement	15,4%	11,3%	20,2%
	28,3%	15,5%	14,7%
No. of stocks with decreased results (difference in returns statistically significant, α=0,05)	33	7	31
	23	11	22
Average increase of returns with statistically significant improvement	-26,6%	-14,1%	-32,8%
	-23,0%	-26,5%	-27,5%

Experiments show that it is possible to improve results with additional information on fair price levels but if we consider individual investors with random strategy of selection securities over the analyzed period valuation will not separate stocks to exact winners and losers. Almost the same number of investors would improve their portfolio results as those who face downgrading their effectiveness. Possible average decrease in average return is in almost all cases higher than average increase for opposite securities. The one case is experiment IV with Model I and the use of financial information from consolidated statements.

In general, all the results indicate that simplifying valuation in a proposed methods may provide better results the less simplification if provided into the procedure of valuation based on discounted cash flows. The more it is consistent with complex DCF the better market tracking it may provide as better net results were provided by Model I on consolidated statements than most simplified multiple-based Model III. This result is not surprising if we mind that individual investors usually are not the group influencing market prices due to their capital dispersion. They could impact market prices in a long time if a large enough group of individuals would behave in the same way or would use the same analytical tools suggesting buying or selling at almost the same moment. Herding effects that appear in that circumstances could cause waves of growth or decline to the market. Shallow markets with rather low turnover, illiquidity and lack of rational investors may be a good example confirming that it is easier to manipulate prices. At the developed markets reality is different. Institutional investors both domestic and foreign with large capital allocated to the market induce trends or cease them and while fair price is defined by formal methods of valuation they may vary in assumptions of forecasts but usually represent comparable level of value. Individuals with their beliefs and intuitions have no other choice but accept market level even if they were sure their method of simplified valuation as well as forecasts were correct. Extra returns are consequence of timing and quality of forecasts than methods of incorporating them into prices established by the market.

Although presented results of experiments do not seem optimistic for individual investors and their strategies for the market are satisfactory. Among others they confirm that the Polish stock market is effective in at least semi-strong level of EMH as other most developed markets.

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