

Application of New Venture-Capital-Investing Decision-Making-Mechanism in Education¹

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Abstract:

We have theoretically developed New Venture Capital Investing Decision Making Mechanism (NVCIDMM) for joint evaluation of the probability of success of business plans and proposing management teams. Using the efficient market theory we prove that the proposed mechanism is better than the currently used ones. We have administered several business investment games with student in class. The results show that the developed mechanism is better than the existing venture capital decision making mechanisms.

We propose a student run VC fund to be created. It would have the following positive externalities: First: The creation of the student run VC fund would allow in-depth empirical evaluation of the applicability of the proposed NVCIDMM mechanism; Second: The fund is theoretically better methodology for applicable learning by the students. We also substantiate a proposal for creation of university incubators in the same institutions. This will allow the students to participate on both sides of the investment process of venture capital as investors and as entrepreneurs.

Key Words: Venture Capital; VC Investing; Decision Making Mechanism; University Incubator; Student Run Investment Fund;

JEL Codes: G14, G24, C92, C93, D79, I22, D49, D84, D81

"Tell me, and I will forget; show me, and I will remember; involve me, and I will understand."

Confucius

1. Introduction

It is a common misconception that efficient market hypothesis (EMH) requires that investors behave rationally. In fact this is not the case. Actually, irrational investors could produce efficient markets, if four diversification and independence conditions are met. EMH allows that when faced with new information, some of the investors may overreact and some of the investors may underreact. All that is required by the EMH is that investors' reactions be random enough that the net effect on market prices cannot be reliably exploited to make an abnormal profit. Under EMH, the market may, in fact, behave irrationally for a long period of time. Crashes, bubbles and depressions are all consistent with EMH, so long as this irrational behavior is not predictable or exploitable. Fama studies for a long time the Efficient Capital Markets. In Fama (1970), he postulates the EMH and defines three types of efficient markets (EM). In Fama (1991), he clarifies the EMH. EMH asserts that financial markets are "efficient", or that prices on traded assets, e.g. stock prices, already reflect all known information and therefore are accurate in the sense that they reflect the collective beliefs of all investors about future prospects.

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From a social science point of view, Surowiecki (2005) studies the conditions under which a crowd is going to be smart. He states that there are four conditions which characterize smart crowds: (1) diversity of opinion, (2) independence, (3) decentralization and (4) aggregation. We integrate Fama and Surowiecki ideas and postulate 4 conditions which will be necessary and sufficient conditions for a market to be efficient. Based on the EMH we theoretically develop a New Venture Capital Investing Decision Making Mechanism (NVCIDMM) and test its validity using diverse investors in form of students.

The search for more effective decision making mechanism for venture capital (VC) investment decision has resurfaced recently with the internet boom and burst. Khan (1987) assesses the VC investments with noncompensatory behavioral decision models. Fried and Hisrich (1994) look for a model of VC investment decision making. Lumme, Mason and Suomi (1996) examine the returns from information in the VC investments. Zacharakis and Meyer (2000) look at the potential of actuarial decision making models to improve the VC investment decision making mechanism. Aerts, Matthyssens and Vandenbempt (2005) study the screening practices by European business incubators. They find that most incubators do not screen potential tenants on a balanced set of factors, but concentrate either on the characteristics of the tenant's market or on the characteristics of the tenant's management team. However, they found that the tenant survival rate is positively related to a more balanced screening profile. There have been a lot of attempts to build a decision making mechanisms to help VC investment decision making. Based on the existing models we develop our NVCIDMM, as an inclusive solution to build a VC investing decision making mechanism.

The number of student-managed investment funds and university incubators has grown rapidly in recent years. Block and French (1991) as well as Kahl (1997) show the significant educational opportunities at the universities that host such funds and the special learning opportunities that they present for the students. Mian (1997) and Nowak and Grantham (2000) show the other side of the coin. They show the educational opportunities presented by University Technology Business Incubators and the human resource development they unable. Furthermore, there is a spillover effect from the student run fund and the technology incubator to the hosting university and hosting community as a whole. Rothaermel and Thursby (2005-A) show that university sponsored incubators increase the probability of success of member firms, but delays member firms graduation. Rothaermel and Thursby (2005-B) show that knowledge flows from universities to firms enhance incubator firm performance. Hsu et al. (2003) show that there is positive effect of the Incubator on the industrial cluster. Overall, all existing literature supports the fact that student run investment funds and universality incubators are very positive educational tools with nice spillover effects to the local economy. So, we are going to provide theoretical rational why it is advantageous to create a student run VC fund with NVCIDMM, as the investing decision making mechanism.

2. Hypothesis for Four Conditions of Efficient Market

EMH as defined by Fama (1970) and revised by Fama (1991) asserts that financial markets are "efficient", or that prices on traded assets, e.g. stock prices, already reflect all known information and therefore are accurate in the sense that they reflect the collective beliefs of all investors about future prospects. Three forms of efficient markets exist. The *weak* form EMH asserts that all past market prices and data are fully reflected

in securities prices. In other words, technical analysis is of no use. The *Semi-strong* form EMH asserts that all publicly available information is fully reflected in securities prices. In other words, fundamental analysis is of no use. Security Exchange Commission works under the assumption that US stock market should be semi-strong form efficient. The *Strong* form asserts that all information is fully reflected in securities prices. In other words, even insider information is of no use. For semi-strong form efficient markets, the EMH implies that it is not possible to consistently outperform the market - appropriately adjusted for risk - by using any information that the market already knows, except through luck or obtaining and trading on inside information. It further suggests that the future flow of news (that which will determine future stock prices) is random and unknowable in the present.

We as a society put so much trust into the market, because of the efficiency it gives us. It allows us to claim that the current stock price is the correct stock price. It is a fact that different markets have different levels of efficiency. Stock market is the most efficient market. It adjusts to new information for 2 to 5 seconds. The housing market is less efficient. It adjusts to new information for 2 to 5 months. Labor market is inefficient. This is the reason why outsourcing is profitable. At the same time outsourcing is reducing inefficiencies and making the labor market more efficient. The less efficient the market is the easier it is to have a sustainable competitive advantage. There is a general trend in all markets to become more and more efficient.

Based on Fama (1970, 1991) and Surowiecki (2005) we postulate four conditions which will be necessary and sufficient conditions for a market to be efficient. The four conditions that we postulate, and that we are going to theoretically rationalize and test empirically:

1. The market participants have to be diverse.
2. The market participants have to have private information.
3. The market participants should have independent information. There should not be any informational cascades.²
4. There should be an aggregation mechanism, which transfers the individual opinions of market participants into collective decision.

We are going to test if the four conditions we have postulated are necessary and sufficient conditions for a market to be efficient. We believe that using our four conditions for EM we could create a NVCIDMM which is going to outperform currently used mechanisms for VC investments decision making.

The purpose of this study is to test if NVCIDMM is the best decision making mechanism. As we have stated in section 2.1 we assume that the four conditions of EF, could be applied for evaluation if a market is efficient. In order to investigate if we would be able to create NVCIDMM to evaluate projects and management teams, which is going to outperform the existing decision making mechanisms we have developed four hypotheses. With these hypothesis we test how relaxing of one of the conditions of the four necessary and sufficient conditions for efficient markets will influence the decision-

² We define informational cascades in the sense of Bikhchandani, Hirshleifer, and Welch (1992). We are going to see in our empirical part of the paper that the third condition, no informational cascades is the most important (statistically significant) condition of the four.

making power of the mechanism. For this purpose we are going to test the following four hypotheses:

- H1: Relaxing of the first condition, diversity of market participants, will influence the decision made negatively.
- H2: Relaxing of the third condition, independence of market participants, will influence the decision made negatively.
- H3: Average is an acceptable aggregation mechanism.
- H4: All four conditions should be met in order to have the best decision-making mechanism possible.

3. Setup of the Efficient Market Investigation

3.1. Manifestation of the four conditions in real historical situations in the financial markets

Now we are going to present several examples how the four conditions work in practice. We are going to present several examples in different situations in different markets, of how efficient markets obey the four conditions and if a condition is broken, not-obeyed, the market stops being efficient. We would like to start with presenting a corn futures example for each one of the four conditions to clarify them.

First we show an example of the importance of the diversity of market participants. Market participants have to have different educational levels and different specific knowledge about the firm which stock they are trading or about the future price of corn they are betting on. The specific knowledge could be, if the summer is hotter than a given threshold there is going to be less corn produced, so the corn price will go up.

Second we show an example of the importance of the private information of market participants. Everybody has different subset of the whole information. To continue the above example, there are few people who know that the summer is going to be so hotter than usual, so it is going to influence the yields of corn.

Third we show an example of the importance of the independent information of market participants. If there are informational cascades, than people are influenced and their decisions become biased. For example, a TV station could erroneously forecast higher temperatures than the threshold and also bring an expert to explain that 70% of the corn is going to die because of these temperatures. Than the whole corn futures market is going to be biased upwards, because of this informational cascade.

Last but not least, the corn futures price is an aggregation mechanism for transferring private conclusion into collective opinion. The price is the best aggregation mechanism known to men because. If you believe that a stock is expensive you will sell it, if you believe that a stock is cheap you will buy it. So the current stock price is the aggregate believe of the market (all market participants) for the correct stock price.

We continue with an explanation how the four conditions exhibit themselves in the stock market. Because of the importance of how these four conditions make the stock market efficient, we are going to explain it here. Everybody with few dollars could buy and sell a security. So the first condition, diversity of market participants, is met. It is impossible for a single person to have all the information in the world, so the second condition, private information of market participants, is met. If there is no media attention to a given company usually there is no informational cascades in place, so the third

condition, independence of market participants, is met. Finally, the aggregation mechanism in the stock market is the price. So the fourth condition, existence of aggregation mechanism, is met. We are going to devise a similar to the market mechanism, decision making mechanism for VC investment decision-making.

We proceed with an event study of efficient market reaction to a particular event and an example of how the four conditions of efficient markets were obeyed. Maloney and Mulherin (1998) study of the Challenger tragedy stock market reaction is a very important manifestation of EM, because they collect data, apply the standard Event Study methodology to them and analyze the results. Maloney and Mulherin (1998) showed that the market prices fell instantaneously for the four main suppliers of Challenger parts. In 21 minutes the prices were as follows: for Rockwell International, the producer of the main engine, the price was down by 6%; for Lockheed, the ground support provider, the price was down by 5%; for Martin Marietta, the external fuel tank, the price was down by 3%; and for Morton Thiokol, the producer of the solid fuel buster rocket the price was down by 12%. We could interpret this as percent probabilities of being responsible for the crash. So, the market verdict was that the probability that Morton Thiokol was responsible for the crash was two to four times bigger than for the rest of the space-ship builders. Here is the play of the four conditions. Everybody was aware of the tragedy right away, because the launch was televised. So, everybody could buy the three not guilty stocks and sell the guilt stock. So the first condition, diversity of market participants, was met. Maloney and Mulherin did not find any evidence of insider trading, so the second condition, private information of market participants, was met. Also, Maloney and Mulherin report that the popular as well as the financial press did not have any explanations for the reason of the crash, so there was no evidence of informational cascades in place, so the third condition, independence of market participants, was met. Finally, the aggregation mechanism in the stock market is the price. So the fourth condition, existence of aggregation mechanism, was met. And finally, a senatorial committee after six months has found out that the responsible party was Morton Thiokol. The four rules for EM were met, which proves that when the four rules of EM are obeyed the market will find out the correct information very quickly and very efficiently. We are going to devise a similar to the market mechanism, decision making mechanism for VC investment decision-making. But let us examine several business investment games first.

3.2. Business Investment Games: Jellybeans counting with and without informational cascade of diverse and identical market participants

Treynor (1987) is the first one to look for necessary and sufficient conditions of market efficiency. He oversees a business investment game (BIG), much more well-known as the bean jar experiment. The Jellybeans counting experiment is one of the most famous BIGs. BIGs are produced in controlled lab environment. The classical BIG goes as follows. The instructor goes into class with a sealed jar of jellybeans. She says to the students: Each student could hold the jar for 5 seconds and try to estimate the number of jellybeans in the jar. The student with the closest guess will receive the jellybeans and one extra point for the course. Everybody should write down his/her name and major and the number of jellybeans they believe are in the jar. The instructor collects the students' estimates, averages them and shows to the students that the average is one of the best

guesses which prove that EMH holds. We add two extensions to these BIG, one that contradict the first condition (to test hypothesis 1) and one that contradicts the third condition (to test hypothesis 2). We do the BIG with students from the same major and from different majors; to test the first condition, diversity of market participants. We introduce informational cascades to test the third condition, independence of market participants. We use average as aggregation mechanism.

We run the Jellybeans counting BIGs in 10 senior classes. First we test the validity of condition one that market participants have to be diverse. We run the jellybean counting BIG with students from the same major and with students from different majors. We run the BIG in 5 general classes where we have students from different majors and we run the BIG in 5 specialized classes where we have students from the same major. Then we test the validity of condition three. We produce an informational cascade in the following way: In all ten BIGs we ask the students to point out the best expert in counting in the class (accountant, statistician or mathematician). So, we establish this person as an expert in counting, as an authority in accurate counting. Then we give the so called expert one minute to produce a second guess and we keep the class inactive to create suspense. Then we allow all the students to produce a second guess. The closest guess is going to win, independently if it is the first or the second guess. All the second guesses are public and are posted on the blackboard as public information to facilitate the building of the informational cascade.

4. Results and Discussions

In section 3.1 we have seen three different examples of how when the four conditions are met the markets are efficient and also when the markets are efficient the four conditions are met. Also, we find that the average guesses of the Business Investment Games, set up in section 3 are statistically and economically different for the four different types of BIGs we set up groups for. We present the results in Table 1 for the four groups that we examine: the same major with and without informational cascade and different majors with and without informational cascade. In Table 1 we present the average absolute value of the error and the average standard deviation for the four BIG groups. The average absolute value of the error is the deviation from the correct answer of the average guess. The average guess is our aggregation mechanism. The average absolute value of the error is our proxy for the precision of the proposed decision making mechanism. The average standard deviation is our combined proxy for the diversity of the decision making group.

We observe slightly bigger average absolute value of the error when we have students from the same major and slightly smaller standard deviation. We interpret this as confirmation that the diversity of the group is an important condition in order to produce an EM environment as a base for a good decision making mechanism. This confirms our hypothesis 1.

We deliberately produce an informational cascade by establishing one of the students as expert. The students are influenced by the decisions of their classmates and especially of the so called expert. We receive much bigger average absolute value of the error and much smaller standard deviation when we have presence of informational cascade independent of the fact, if the students are from the same major or from different majors. So, we conclude that presence of informational cascades is a much bigger

influencer than the diversity of the group, i.e. it is much more important to have information cascade free environment than to have as diverse group as possible in order to have an EM environment. Also, we observe that the informational cascades and the sameness of major are reducing the standard deviation, our proxy of reducing the diversity. This confirms our hypothesis 2.

Table 1: Jellybeans counting with and without informational cascade of diverse and identical market participants

Groups	Same major		Different Majors	
	5	5	5	5
Informational Cascade Presence	No	Yes	No	Yes
Actual Number of Jellybeans	487	487	487	487
Average Standard Deviation (Proxy for the diversity of the decision making group)	330.45	123.45	570.73	121.14
Average Absolute Value of the Error (Proxy of the precision of the proposed decision making mechanism)	36.74	125.13	2.80	127.63

We observe that when the four conditions are met, i.e. when we have BIG with students from different majors with no informational cascade present we receive the smallest results for the average absolute value of the error, but the highest standard deviation. This confirms our hypothesis 4, that the diverse groups which are free from informational cascade will be the closest replication to an EM and will produce the best estimate. It also confirms hypothesis 3 that an average is an acceptable aggregation mechanism.

Overall, we conclude that when the four conditions are met we receive the smallest average absolute value of the error, i.e. the best estimation results. So, it would be beneficial to use such an EM decision making mechanism to improve VC investment decision making process.

5. New Venture Capital Investing Decision Making Mechanism

We have seen so far that a decision making mechanism build on the EMH outperforms, the other decision making mechanisms. Here we are going to present our idea how the mechanics of the NVCIDMM should work. The NVCIDMM works as follows: The students gather once a month or a week depending on the intensity of the course. Students listen to 2 or 3 presentations by entrepreneurs in need of investments. Every Student votes, if to perform due diligence process. The vote is an aggregations mechanism. So voting makes the investing decision making mechanism more efficient. Students with relevant experience are assigned to be part of the due diligence process. Special care should be taken to prevent informational cascades. The information of the due diligence process is presented during the next meeting to the rest of the students. Every student submits a price for which they would be willing to invest in the new

enterprise. To this particular point should be taken special attention. There are two approaches here. The first one is there should be a certain percentage of the money, which belongs to the student. For example, 5% five percent of the money should be money of the investing student. The specific percentage should be determined individually for every student depending on their personal wealth, using their financial support application. The percentage should be significant enough, so the student is going to make the best possible decision, but it is not breaking his/her budget. The second approach is the student is investing only student fund money, so his risk-averseness is not influencing the investment decision. Both approaches should be empirically tested. This mechanism will produce a clearing price. The rule is going to be: the investment is going to be undertaken, if and only if the clearing price is bigger than the applying firm valuation price. The students should negotiate a term sheet with the enterprise management. The students are designated to monitor performance and report to the fund. External evaluations in the form of due diligence are performed on a regular basis. Also, the management of the enterprises is encouraged to ask the help of the investment club.

5.1. The Theoretical Advantages of the New Venture Capital Investing Decision Making Mechanism

The NVCIDMM should produce better investment results; because it is build on the principles of efficient markets. In a university setting we should be able to get a diverse group of students which will insure that the first condition is met. Each of the students should be able depending on his / her major to find unique information about a particular firm. This will satisfy the second condition. The students should not be allowed to share investment information, which will satisfy the third condition. NVCIDMM uses the student bid, i.e. the best possible aggregation mechanism, the price. So, we have the fourth condition met. Therefore, in accordance with efficient markets, we would anticipate better investment decisions by the NVCIDMM.

5.2. Positive University Spillovers

It is much easier and economically feasible to build student run VC Fund to test the NVCIDMM than to implement it in a real for-profit VC fund. The student run VC fund theoretically should outperform the rest of the VC funds. Even if the student run VC fund returns are disappointing, there are two positive externalities, which will outweigh the losses of the fund. The students which participate in the student run VC fund are going to be better prepared, so this should be consider part of their educational expenses. The NVCIDMM is going to be tested and proved or rejected in practice.

All existing literature supports the fact that student run investment funds and universality incubators are very positive educational tools with nice spillover effects to the local economy. We propose to integrate the student fund and the university incubator as two sides of the same coin, which will unable us to provide the students with better educational outcomes.

Let's come back to the first positive externality. We are going to teach the students two sides of the same coin. We are going to create an Educational Business Incubator, which will show the students an entrepreneur in need of investment. This is a commonly taught subject in business schools. But also we are going to show the students an educational VC Fund, which are investors in need of deal flow. This is rarely taught in

business schools. On one hand, both subjects are going to reinforce each other, on the other they are going to be better integrated when part of the same structure. Also, as Confucius said: "Tell me, and I will forget; show me, and I will remember; involve me, and I will understand."

The educational business incubator suggested place in the curriculum could be as part of an MBA certificate in entrepreneurship or a structured course in enterprise building for regular MBAs. This will give the students a hands-on-experience and would help them to learn by doing. The educational business incubator is going to be a dedicated educational facility to help student entrepreneurs. It needs to be sponsored by alumni entrepreneurs, alumni angels, state and local government, local businesses and alumni in private equity and investment banking. The incubator will allow students to be fully prepared to start their own business and would give them a competitive edge.

Educational VC fund is similar to somewhat popular student investment funds. The suggested place in the curriculum of the educational VC fund is in a MBA certificate in entrepreneurship or in a structured course in VC funding. It will give the MBA students hands on experience and would help them to learn by doing. The fund should be open for all students. It should be empirically tested if the students need to co-invest. The educational VC fund is going to be built on the principles of efficient markets and it is going to be sponsored by alumni entrepreneurs, alumni angels, state and local government and businesses and alumni in private equity and investment banking. The educational VC fund will allow students to be on the giving end of the relationship and feel how the decision-making is made. Participating one year (term) in VC fund and then next starting their own business will help students get a well-rounded view of the new venture investment process.

6. Conclusions

In this article we show theoretically that efficient-markets decision-making mechanism outperforms any other type of decision-making mechanism and can be implemented in VC investment decision making process. We provide several real efficient markets examples and event studies. We also performed several simulations of business investment games, which empirically show that the efficient market mechanism outperforms any other decision making mechanism. We have seen that the most important condition is an efficient market environment free of informational cascades, as tested in hypothesis 2. We have seen that simple average is good enough aggregation mechanism, as tested in hypothesis 3. We have also seen that diversity of market participants also makes a difference, as tested in hypothesis 1. Overall, we have seen that when the four necessary and sufficient conditions for EM, are met we receive a good decision making mechanism based on efficient market theory, as tested in hypothesis 4.

Based on the efficient market theory we developed a new venture-capital-investing decision-making-mechanism (NVCIDMM) to evaluate different business plans and the success of their possible implementations by the proposing entrepreneur management teams. We have used the theoretical rationale of the efficient market theory to theoretically prove that the proposed mechanism would perform better than the currently used mechanisms.

We strongly recommend a creation of a student run VC fund with NVCIDMM to prove the validity of the proposition. The creation of the student run VC fund will have

the following two positive effects. It would allow us to confirm empirically the superiority of the NVCIDMM. Also, it would be theoretically a better way to train students both as VC professionals and as entrepreneurs by involving them in both processes, the process of deciding to whom to give money and the processes of applying for money. So it would be very beneficial both to the university, local community and local businesses as well to the students to establish a university incubator at the same institution. It would allow the students to see both sides of the VC investment process and understand the whole process better by participating in it. It has been theoretically shown and empirically proven that student run investment funds and university incubators have both positive effects on the local economy. We have theoretically and empirically shown that a student run VC fund with NVCIDMM should outperform a regular VC fund. Therefore, we strongly believe that there are a lot of reinforcing of the positive effects of implementing the combination of student run VC fund with NVCIDMM and university incubator. We would like to conclude with the assertion that building a student run VC fund with NVCIDMM in a combination with a university incubator is going to be a positive NPV project for the University and the local community as a whole.

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