The study has focused on following the effect of previous gain on subsequent choices. In this scenario mental accounting paradigm predicts manifestation of the house money effect based on existence of different mental accounts (current income, wealth and future income) with different reference points and arising utility functions defined over the domain of a separate mental account. The first experiment included the natural decision making situation from the quiz game *The people versus*. Contrary to expectations our results did not reveal the effect of previous gain on risk attitude, proposing the integration of initial gain in wealth mental account. Since we had no access to data concerning contestants' wealth, we provoked the same experimental setting in laboratory which allowed additional information to be collected. Obtained results revealed the shift of the reference point from current income to wealth domain, confirming that participants do not frame initial gains as the house money but tend to integrate them in total wealth. A discussion about the nature of the mental process involved is included.

**Keywords:** quiz game, risk attitude, previous gain, mental account, asset integration
This study was initiated with the aim to provide insight into the decision making under risk under more natural conditions than laboratory setting provides. Data were obtained from the television game show *The people versus 4*, since it seemed that the quiz potentially represents natural experiment in this field. Although inducement of different decision making processes under risk is characteristic of a large number of similar television forms, the quiz *The people versus* appeared particularly suitable source of data because, unlike other game shows, it featured rather simple decision making situation that did not rely on contestant’s general knowledge or use of game strategies.

Due to its specific propositions, the quiz provided an opportunity to follow the effect of previously obtained gain on contestants’ subsequent choices. In *The people versus* a player answers a series of questions each of different value 1000, 5000, 15000 or 30000 RSD5. When a player gives an incorrect answer, he is no longer entitled to answer the questions, still he enters the Gong game, a game of chance in which he has the opportunity to win a certain amount of money. In the Gong game money sums are offered in ascending order, starting from zero up to an amount that equals the value of the question the player made mistake on. Thus if the contestant incorrectly answered the question worth 1000 RSD, then 1000 RSD was the maximum prize that could be won in the Gong game. Typically the value of offers increased gradually from zero up to maximum value of the Gong game, except in the middle of that interval when increments become slower and offers are denser. At any time during the Gong game, the sound that marks the end of the game and loss of a chance to win the money might occur. When the Gong game starts, the contestant has to decide when to stop the game, that is which money offer to accept. Therefore whenever an offer is presented, the contestant confronts the choice between two options: to accept the offer and thus settle for a prize lower than maximum or to reject it and wait for a more valuable one. If the contestant chooses to reject the offer there is a risk that the gong sound will occur in which case he would lose the chance to win any money. Prior to participating in the Gong game, each player randomly chooses between three games, knowing that two of them do contain the gong and one game is gong free.

Before ending their participation in the quiz by falsely answering one of the questions, some contestants have managed to answer correctly the whole round of questions (a total of fifteen), thereby receiving a guaranteed win (GW) of 100000 RSD, which could not be affected by the Gong game’s outcome. This

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4 *The People versus* was made by Celador Advantage Production Company held the license for Serbia where the quiz was aired on RTS 1 between 2002 and 2005 and on B92 in 2009. For the availability of written and video material we kindly thank Ms. Tanja Bojković, former deputy general manager of Advantage Production Company and Mr. Miroslav Damljanović, former entertainment editor on Serbian National Television.

5 RSD is the Serbian currency. Due to inflation 1000 RSD was worth 16.66 EUR at the beginning of the airing period in 2002, decreasing to 10.75 EUR in the final year of airing.
condition led to differences in initial assets between contestants entering the *Gong game* in which they made choices under risk. Described circumstances have provided an opportunity to follow the effect of previous gain on a subsequent choice in a natural setting of the quiz game *The people versus*.

Mental accounting paradigm has offered a comprehensive insight into dynamics of sequential choice and effect of previous gains on following decisions (Thaler & Johnson, 1990). As has been revealed, whether and how the prior gain or loss would affect subsequent choice depended on the way decision maker perceived this previous outcome, that is, in which mental account he would place it. Richard H. Thaler proposed that people tend to frame different components of wealth into different mental accounts: current income, current assets (wealth) and future income (Shefrin & Thaler, 1988). Each of these three types of money representations implies different reference points, so arising utility functions are defined over a domain of a separate mental account. Marginal propensity to consume wealth proved to be significantly different within segregated mental accounts suggesting that choice and risk attitude is frame dependent. According to Thaler’s conclusions supported by experimental findings, people are more willing to spend and are less risk averse when money is represented as current income.

Analysis of sequential choices suggested that initial outcome imposes as the current reference point which affects following choices leading to the house money effect. People are inclined to see relatively unexpected gains as current income, distinct from the rest of their wealth (Thaler & Johnson, 1990). In sequential choices they tend to mentally aggregate the initial income with the payoffs of the following gamble, failing to integrate the asset in personal wealth. Since unexpected endowment is not perceived as personal asset, but is instead framed as house money, after such gain people are more willing to take risk. A range of studies confirmed the presence of the house money effect, that is revealed that the prior gains tend to lead to risk seeking in subsequent choices (Ackert, Charupat, Church, & Deaves, 2006; Karlsson, Romanus, & Gärling, 1996; Romanus, Hasling, & Gärling, 1996; Romanus, Karlsson, & Gärling, 1996; Thaler & Johnson, 1990), with Post, Van den Assem, Baltussen and Thaler (2008) unveiling the effect even in a similar natural context of the quiz *Deal or not deal*. Although the phenomenon had been studied mostly under conditions in which initial gain aroused from decision maker’s choice, the house money effect has been found even when the prior gain was obtained through the payment given to participants at the beginning of the experiment, just as was the case with experimental setting in *The people versus* (Arkes et al., 1994; Battalio, Kagel, & Jiranyakul, 1990; Neilson, 1998; Thaler & Johnson, 1990). Neilson concluded that under these circumstances participants have treated initial payment as the first payoff in the sequence and that this current income was set as a reference wealth.
As results confirmed, participants who have received initial payoff expressed more risk seeking choices than those who have not.

According to these experimental findings, since decision makers do not tend to integrate utility of prizes with personal assets, but tend to see it as house money, contestants in The people versus who won the GW should be more risk seeking in the Gong game than players whose choices are made in absence of the previous windfall.

However the house money effect is not an experimental result that has been obtained without exceptions. Some studies found no evidence of the effect of prior outcomes on following choices (Clark, 2002; Kahneman & Tversky, 1979; Sousa, 2010), while in other cases the effect was only partially confirmed (Chakravarty & Ma, 2009; Gertner 1993; Hsu & Chow, 2013; Kahneman, Knetsch, & Thaler, 1990). A study of decision making in a similar natural context, game show Deal or no deal, found an evidence of contestants integrating prizes with personal wealth (Andersen, Harrison, Lau, & Rutström, 2008). Another recent study also provided an evidence of asset integration in sequential choices and tendency of decision makers to integrate gains with a portion of personal wealth (Andersen et al., 2011).

Discussion of the inconsistency of experimental findings draws the attention to the study of Read, Loewenstein and Rabin (1999) that identified four factors (cognitive capacity limitations, cognitive inertia, pre-existing heuristics and motivation) that determine whether previous outcomes will affect following choice. Thorough analysis of studies of the house money effect would likely reveal which of these factors was prevalent in a particular experimental setting leading to its manifestation or the lack thereof.

**Experiment 1**

**Method**

**Participants.** To reach the optimal sample size, we drew the data from three seasons of the game show The people versus, aired during the period of 2002–2009. Within listed time interval economic parameters (value of domestic currency, personal income, etc.) varied considerably, which could affect the perceived values of the prizes, and consequently the choices of players in described decision making context. Since the data originated from three subsamples different in terms of described macroeconomic parameters, it was necessary to test the possible differences in choices of players coming from these three subsamples, that is, to test the differences in their risk attitudes.

Despite initial concerns, Kruskal-Wallis ANOVA by ranks showed no

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6 $n_1 = 45$, season 2002; $n_2 = 14$, season 2004; $n_3 = 31$, season 2009.
significant differences in average risk coefficients manifested in three subsamples, \( \chi^2(2, N = 90) = 0.34, p = .84 \), so we joined them into a single sample of 90 players.

**Design.** Through data analysis we considered the possibility of risk attitude being affected by the possession of the GW. GW was independent variable with the levels defined by possession and non-possession of the GW at the time the Gong game was played.

Dependent variable, risk attitude, was expressed through the risk coefficient \( r \) (Equation 1) calculated as the ratio of the money offer the player accepted as final \( x_i \) withdrawing thereby from further participation in the Gong game and maximum amount he could win in that Gong game \( x \).

\[
r = \frac{x_i}{x}
\]

For example, risk coefficient for a player who, while competing for the sum of 1000 RSD, accepted the offer of 700 RSD, would be .70. Thus computed values of the coefficient spread along the theoretical interval from 0 to 1, with higher risk coefficient indicating greater risk preference, while lower values of coefficient reflected more cautious risk attitude. Application of standard risk coefficients would have imposed certain limitations such as impossibility of comparing coefficients obtained in Gong games of different maximum value. While preserving the core information on the risk attitude, coefficient formula we designed allowed us to overcome these difficulties.

**Data collection.** Data were collected through the observation of forty episodes of The people versus game show. For each player we noted whether he had won the GW (100000 RSD) or not. In addition we noted the maximum value of the Gong game he played and the sum he accepted, which provided the basis for the calculation of his risk coefficient. Data of players whose game had been interrupted by the gong sound were not taken into account, as it was impossible to predict the level of risk they would have shown if they had the chance to continue the Gong game.

**Results and discussion**

ANOVA showed that there were no significant differences in risk coefficients between players with GW and those without it \( F(1, 88) = 1.72, p = .19 \). Contrary to initial expectations, disposing a safe gain at the time of decision making did not impose as a current reference point, that is reference wealth that governs the valuation of outcomes and decision maker’s risk attitude. The fact that previous gain had no influence on subsequent choices led us to conclusion that

\(^7\) Controlling for the variable that would access the number of money offers the participant received before accepting one of them would provide methodological contribution, unfortunately due to unavailability of necessary data we were unable to include this variable into analysis.
the contestants had not framed initial payoff as initial income, but instead had coded it in a different mental account, that is integrated it in their total wealth. In his later works Thaler (1999) had stressed the same implication of the absence of the house money effect. Note that this further implies the shift of the reference point for valuation of future outcomes from domain of current income to wealth domain.

In order to validate the assumption that the participants had coded previous event separately and had integrated the utility of previous gain with some measure of wealth, it was necessary to carry out an experiment in more controlled conditions which would allow access to data concerning the personal wealth of players.

**Experiment 2**

Designing and conducting a laboratory experiment has enabled us to gather data on subjective measure of wealth expressed through player’s satisfaction with own current financial status. Bearing in mind that the valuation is highly subjective process, we believed that some kind of subjective measure of wealth would reflect value function in a more adequate way than objective criterions (e.g. salary, income per family member, household income, annual personal savings etc.). We wanted to gain an insight into the way one perceives his own financial situation, to obtain data on subjective value attributed to own current wealth. A number of studies successfully used satisfaction with the personal financial status as a measure of financial well-being (Joo, 2008). As has been shown, single item measurements accessing overall financial satisfaction were equally representative as those based on multiple items measuring various components of financial satisfaction (Joo & Grable, 2004).

The house money effect implies that the decision maker defines values of outcomes on the basis of prior gains or losses, excluding the role of personal wealth in value perception. In other words, for sequential choices reference point of value function is presumed to be set in mental account of current income, with outcome values defined over this value domain. If this is the case, than personal wealth should not affect the value perception of outcomes and consequently should have no influence on the choice and risk attitude. Accordingly, in the absence of the house money effect, we expected to find an evidence of risk attitude being shaped by decision makers’ wealth.

While replicating the decision making situation from the quiz as close as possible, we tested the effect of previous gain, this time introducing a new factor: financial status satisfaction, as hypothesized reference that governs the formation of value function which contestants applied while making decision that followed the initial gain.
Method

Participants. Data were collected on a sample of 160 participants, students from the Department of Psychology at the Faculty of Philosophy, University of Belgrade.

Design. Risk attitude was discussed in terms of the effect of two factors: previously obtained GW and financial status satisfaction. Levels of the first factor were defined by possession and non-possession of the GW. Participants provided the information on perceived financial status satisfaction through the self-report, by choosing one of the following four categories: unsatisfactory, satisfactory, good and very good. Risk attitude was expressed by already described risk coefficient ($r$; Equation 1), the ratio of the sum one had accepted ($x_i$) and maximum value of the prize he could win in the given Gong game ($x$).

Procedure. Participants were introduced to test situation through written instruction displaying hypothetical decision making situation analogous to one in The people versus (details in Appendix A). Half of the participants were presented with the scenario in which they had already won guaranteed 100000 RSD (GW) prior to Gong game. After reading the instruction each participant would play one Gong game of a certain maximum value (1000, 5000, 15000 or 30000 RSD) under the same rules as in The people versus. The values of the Gong game were randomly assigned to participants, with en even number of participants in each value group. An offer in the Gong game could be accepted by pressing one of the mouse buttons. After finishing the Gong game, the participant was asked to inform about his perceived financial status satisfaction by selecting one out of the four categories offered in the multiple choice question (see Appendix B).

Results and discussion

ANOVA confirmed the outcome of the first experiment: there were no significant differences in risk attitudes between participants who have won the GW and those who have not, $F(1, 157) = .26, p = .61$.

On the other hand, as expected, we found the risk attitude was influenced by the measure of wealth echoed in the perceived financial status. As revealed by ANOVA, increase in financial status satisfaction was followed by successive

Due to unavailability of necessary data, as in the first experiment, it was impossible to test the significance of the number of offers the participant was presented in the Gong game before making final decision.

It should be stressed that in both experiments ANOVA showed no effect of the potential maximum gain size on risk attitude, Experiment 1: $F(3, 86) = 2.18, p = .09$; Experiment 2: $F(3, 155) = 2.72, p = .06$. Also, there were no interactions between maximum gain size and GW or financial status satisfaction, Experiment 1: $F(3, 86) = 0.29, p = .83$; Experiment 2: $F(3, 155) = .20, p = .90$; $F(7, 151) = 1.38, p = .22$. 
growth of average risk coefficient: $r = .60 \ (SD = .43)$, $r = .64 \ (SD = .21)$, $r = .77 \ (SD = .20)$, $r = .84 \ (SD = .15)$, $F(3, 155) = 6.00$, $p = .001$ (Figure 1). However, LSD test indicated that not all of the tested differences were significant. Only the change from evaluating own financial status as satisfactory ($r = .64$) to perceiving it as good ($r = .77$) led to change in risk attitude, $p = .000$. We can conclude that, when considering levels of financial status satisfaction that provoke changes in the risk attitude, there is a tendency towards information simplification in form of clear polarization between two categories that denote negative and positive evaluation of own financial situation.

![Figure 1](image_url)

*Figure 1.* Effect of manifested degree of financial status satisfaction (a – unsatisfactory, b – satisfactory, c – good, d – very good) on mean risk coefficient ($r$), including standard errors.

Participants who perceived their financial status as more favorable tended to manifest higher risk preference, while those who were less satisfied with own financial status expressed more cautious risk attitude.

**General discussion and conclusion**

Conducted with the aim to shed light on the way people make decisions in a natural setting such as a quiz game, the study has focused on following the effect of previous gain on a subsequent choice.

Our results demonstrate much greater plasticity of the reference point
than assumed by behavioral phenomena such as the frame, house money or endowment effect (Thaler & Johnson, 1990). As revealed, decision makers do not define outcome values over current income, instead they tend to integrate it in mental account representing their total wealth and set the reference point in this mental domain.

These results contribute to the growing corpus of findings which draw attention to the subjective nature of valuation of previous outcomes in temporal choices and active role of the decision maker in interpreting these events. As appears, people sometimes translate gains from one mental account to another, and this process might be more active and faster that thought so far. This insight could offer coverage of heterogeneous findings regarding the effect of previous outcomes on following choices. For example, a study of contestants’ choices in the game show Card sharks revealed that, unlike prizes won in current rounds, those won in previous rounds do not tend to influence the risk attitudes, a result which authors considered inconsistent since both gains should affect the final wealth (Gertner, 1993). However, it might be possible that earlier gains were already absorbed in decision maker’s wealth, while recent winnings were yet to be framed as such, meanwhile represented in the domain of current income.

The tendency of gradual incorporation of gains and losses in wealth has been noted before (Kahneman et al., 1990), with more recent studies revealing that the house money effect can be rather short termed and that decision makers are more risk prone only immediately after obtaining a gain, while in subsequent choices the effect diminishes (Chakravarty & Ma, 2009; Eil & Lien, 2014; Hsu & Chow, 2013). Our study is yet another evidence of decision maker’s capability of fast adjustment of the reference point in sequential choices.

Our and similar findings emphasize the importance cognitive factors as one of suggested moderators of the effect of prior gains in sequential decisions (Read, Loewenstein, & Rabin, 1999). Given the nature of the experimental procedure in our study, we believe that the absence of the house money effect can be attributed to the fact that not only the previous gain (winning of GW) was temporally distant from the following decision, but the period between these two events was rich in content that additionally engaged cognitive capacities of participants (answering quiz questions).

Taking into account the complexity and dynamics of external world and limited cognitive resources to deal with it, it seems efficient to interpret new information upon the arrival. This particularly concerns sequential choices which carry a large amount of information about previous outcomes. In such environments where there is a constant flow of new information one cannot hold indefinite amount of data. In terms of mental accounting paradigm this implies that at one point incoming data about prior outcomes should be integrated in wealth and stored in a long term mental account. It remains for future research.
to disclose the pace of mental process of asset integration and further explore
cognitive factors determining it. Considering the nature of sequential choices,
the research should focus on determinants such are temporal distance of
previous gain or events that occur between decision sequences that contribute
to information load, encouraging decision maker to store information about the
previous gain in wealth domain.

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Appendix A
Instruction used in Experiment 2

Imagine participating in a game of chance which puts you in a position to win 1000 RSD. According to your discretion, you can try to win the entire amount or you can satisfy with winning a certain part of it.

Starting from zero, in ascending order, one after another, the offered amounts of money will be displayed on the screen, up to the maximum of 1000 RSD. At any moment this series could be interrupted by a sound signal, which would mark the end of the game and loss of the chance to win the money. It is up to you to decide which of the offers you will accept. Each amount offered will remain on the screen for a few seconds and you can accept it by clicking the right mouse button. If you choose not to do so, the next amount will appear on the screen or the sound signal will occur.

Before starting the Gong game, you will get the opportunity to choose randomly between one of the three games offered. Two Gong games contain the gong, while the third one does not.
Appendix B

Question used for collection of data on financial status satisfaction

Please answer the following question by circling one of the choices:
How would you describe your financial status?
A. unsatisfactory
B. satisfactory
C. good
D. very good
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ISPITIVANJE EFEKTA IGRANJA NOVCEM KAZINA U TELEVIZIJSKOM KVIZU – MENTALNO RAČUNOVODSTVO I INTEGRACIJA SREDSTAVA

U istraživanju je proučavan uticaj iznenadnih dobitaka na odluke koje ih slede. U ovakvim uslovima paradigma mentalnog računovodstva predviđa da će se ispoljiti efekat igranja novcem kazina (eng. house money effect). Ovaj efekat podrazumeva veću sklonost riziku nakon početnog dobitka i zasniva se na postojanju različitih mentalnih računa (trenutni prihod, imetak i budući prihod) koji imaju različite referentne tačke i različite funkcije korisnosti. Prvi eksperiment je uključio prirodnu situaciju odlučivanja sa kojom su se susretali takmičari u televizijskom kvizu Sam protiv svih. Uprokos početnim očekivanjima, analiza podataka nije otkrila uticaj prethodnog dobitka na ishod odluke i odnos prema riziku, što je vodilo zaključku da u ovakvoj situaciji donosioci odluke početni dobitak integrišu u mentalni račun imetka. Budući da podaci o imetku učesnika u kvizu nisu bili dostupni, kako bi se proverila pretpostavka o integraciji dobitka, ista eksperimentalna situacija je izazvana u laboratorijskim uslovima uz istovremeno prikupljanje podataka ove prirode. Rezultati drugog eksperimenta sugerišu da se u uslovima prethodnog dobitka referentna tačka zaista pomera iz domena trenutnog prihoda u domen imetka. Razmotrena je priroda mentalnih procesa koji su u osnovi ove pojave.

Ključne reči: televizijski kviz, odnos prema riziku, prethodni dobitak, mentalni račun, integracija sredstava