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Non-sympathetic FRN responses to drops in others' stocks

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Pre io s ne roeconomic s dies ha e obser ed ha people displa s mpa he ic ne ral responses o d o hers' misfor nes. We arg e ha he re erse emo ions, s ch as gloa ing or *schadenfreude*, ma also emerge in cer ain circ ms ances. To e amine his heor , recorded feedback-rela ed nega i i (FRN) o d o hers' large or small gains or losses in a s ock marke con e . We adop ed he frame k of social dis ance, according o ich h po hesi ed ha beca se o hers in he s ock marke are far a , niden ified, and indis inc , people ld sho ess s mpa h or e en *schadenfreude* o d o hers' large losses. The res l s indica ed ha FRN a F s significan l less nega i e en obser ing larger decreases in o hers' s ock, indica ing ha o hers' large losses are no ne pec ed nega i e e en s in he s ock marke and s gges ing he e is ence of *schadenfreude.* O r research con rib es o he nders anding of social ne rofinance b demons ra ing he *schadenfreude* effec in rela ion o he s ock marke . This s d also pro ides ne informa ion regarding he rela ionship be en FRN and he social emo ions ha form he e pec a ions of gain and loss.

Keywords: E en -rela ed po en ial; Feedback-rela ed nega i i ; S mpa h ; *Schadenfreude*; Social ne rofinance.

The c rren bod of k in ne roeconomics s gges s ha h mans are highl empa he ic and e en al r is ic o d o hers' nega i e feedback o comes. For e ample, Y and Zho (2006) obser ed similar feedback-rela ed nega i i (FRN) pa erns hen people are faced h heir o gains and losses and he gains and losses of o hers. As FRN is generall eli-ci ed o d ne pec ed nega i e o comes, Y and Zho concl ded ha s ch findings indica e an obser-a ional learning effec hereb similar ne ral mechanisms nderlie he e al a ion of one's o and o hers' feedback o comes.

Ho er, an in es iga ion of he li era re re eals ha his ma be far from he r h. When facing o hers' losses, h man beings ma ei her feel s mpa-h or feel nega i e, ns mpa he ic emo ion s ch as *schadenfreude* (pleas re in o hers' misfor nes). The feeling of *schadenfreude* has been demons ra ed bo h in ne ral (Takahashi e al., 2009) and beha ioral (Fea her & Sherman, 2002) in es iga ions. Wh , hen, are nega i e reac ions and emo ions s ch as selfishness, en , and *schadenfreude*, ich are del doc men ed in ps cholog , absen in c rren ne roeconomic k? Wi ho in es iga ing and nders anding he nega i e emo ions, can kno onl half of he s or of he ne ral fo nda ion of h man economic beha ior.

In some circ ms ances, h man beings sho ess s mpa h or more nega i e emo ions. Imagine some-one losing $100; ma feel s mpa h . Ho er, if i s no $100 b $1,000,000, a ld feel? Thinking ha greed rich people deser e he loss, ma gloa ra her han feel s mpa h . S ch a circ m-s ance s gges s he q an i effec . If see someone

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This k s s ppor ed b NSFC [gran nos. 71021001, 91224008, and 91324201].

kno cr ing o er his loss, feel s mpa h ; ho er, a loss s ffered b a s ranger li ing far a ma elici less s mpa h . This circ ms ance s gges s he dis ance effec . In he c rren s d , iden if a special si a ion he s ock marke ha combines bo h he q an i effec and he dis ance effec . S d ing he s ock marke offers s an oppor ni o e amine people's nega i e reac ions o d o hers' losses. Based on heore ical reasoning and empirical e idence, h po hesi e ha in he financial marke s, people ma sho *chadenfreude* en o hers e perience losses.

Firs , arg e ha financial marke s are q i e differen from pre io sl sed empirical si a ions in economic games beca se he q an i of mone in ol ed in s ock marke s is so large. Slonim and Ro h (1998) obser ed ha pla ers red ced he amo n of heir offers en he s akes e high in an l ima m game as he de eloped e perience b did no change heir offers en he s akes e lo S ch findings s gges ha he q an i of o comes pla s some role in de ermining s bjec i e responses o he o comes of o hers.

Second and more impor an , arg e ha financial marke s are q i e differen from si a ions in economic games in prior s dies beca se bo h ph sical and ps chological dis ances be en he self and o her pla ers are m ch grea er in s ock marke s han ha in o her economic games. The cons r al le el heor (CLT) of ph sical dis ance (F ji a, Henderson, Eng, Trope, & Liberman, 2006; Trope & Liberman, 2010) demons ra es ha people men all represen or cons r e e en s and objec s a differen le els of abs rac ion. The CLT s gges s ha nearer objec s are percei ed as rela i el more concre e (lo e el cons r al) and dis an objec s as rela i el more abs rac (high le el cons r al). Beca se o her pla ers are n mero s and far a from he self, arg e ha he le el of s mpa h ma be lo en ie g o hers' losses in he s ock marke for reasons: (1) according o he CLT, ma adop a high le el cons r al process ha is global, abs rac , and concep -dependen . We ma ponder he risk and ncer ain of npredic able s ock marke s, and he conseq ence of o r caref l hinking helps s accep he fac ha loss is highl possible and ha gain is nlikel for o rsel es and ma be e en less likel for o hers. Therefore, he e pec a ion of o hers' losses ma main ain i self a q i e a high le el, and ma percei e he loss as a common res l ra her han as a pe of misfor ne. (2) The arge persons o om ld like o sho mpa h are no foc sed and i id. Lab s dies demons ra e he relaionship be en ph sical closeness and in erpersonal posi i i , ermed "posi i i –closeness h po hesis", and i idness ac s as a media or be en closeness and posi i i , ermed "posi i i – i idness h po hesis" (Al er & Balce is, 2011). Therefore, en he arge persons are n mero s, nkno pla ers in he s ock marke ra her han one or se eral dis inc pla ers in empirical economic games, i is diffic l for s o sho mpa h .

Some empirical e idence s ppor s o r arg men s. Firs , me a-anal sis sho ha long-dis ance comm nica ion ha is no face- o-face is generall more harmf l o in egra i e agreemen s han face- o-face comm nica ion (Bal es, Dickson, Sherman, Ba er, & LaGanke, 2002; S hlmacher & Ci era, 2005), ich implies ha en ps chological and ph sical dis ance is grea , pro-social mo i a ion and beha ior ma decrease. Second, s dies ha e repor ed ha increasing he n mber of compe i ors (*N*) can decrease compe i i e mo i a ion, ermed he "*N*-effec " (Garcia & Tor, 2009). Beca se he n mber of compe i ors is q i e large in s ock marke s, he compe i i e mo i a ion ma decrease, ich ma f r her decrease he e pec a ion of gain b increase he le el of olerance for loss bo h for o r o and o hers' s ocks. These res l s impl ha he grea er he dis ance, he less he s mpa h ma sho

According o his e idence and arg men , gen era e o r h po hesis ha in he financial marke , ma sho ns mpa he ic or e en nega i e responses o o hers' losses.

The presen s d so gh o cap re he non-s mpahe ic and nega i e responses o large losses in o hers' por folios sing FRN. FRN is an e en -rela ed po en ial (ERP) componen charac eri ed as nega i e ampli de in brain ac i i follo g he presen a ion of feedback-rela ed s im li. E idence from so rce locali a ion s gges s ha FRN is genera ed in areas of he medial prefron al cor e s ch as he an erior cing la e cor e (Gehring & Willo ghb , 2002; Holro d, Coles, & Nie nh is, 2002). In erms of responses o o come feedback, pre io s s dies ha e obser ed ha FRN is generall more prono nced for nega i e han for posi i e feedback (Mil ner, Bra n, & Coles, 1997) and more nega i e for ne pec ed han for e pec ed o comes (Nie nh is, Holro d, Mol, & Coles, 2004).

Specificall , based on he abo e reasoning and he fea res of FRN, infer ha if he FRN response o o hers' loss is more nega i e han he response o o hers' gain, his response re eals he e is ence of s mpa h ; an FRN response o o hers' loss ha is no differen from he response o o hers' gain indica es less s mpa h or non-s mpa h . An FRN response o o hers' loss ha is considerabl less nega i e han he response o o hers' gain ma s gges a nega i e emo ion s ch as *schadenfreude* beca se his

response would indicate that he does not expect others' gain; instead, he predicts others' loss.

The stock exchange in the financial market provides an excellent situation in which both the quantity effect and the distance effect may occur. A huge number of people are involved in the stock market, living all over the world. Thus, even a small change in stock prices could lead to large-scale gains or losses.

Because we hypothesized that participants may show non-symmetrical or negative responses to larger losses in others' stocks, we predicted that FRN should be less negative when one observes larger drops in the value of others' stock.

METHODS

Sample

Twenty-one healthy university students (9 males, 11 females; mean age 21.55 ± 2.46 years) participated in the study. Participants were reimbursed for their time with USD16. The experiment is in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki).

Design

The experiment adopted a 2 (stock outcome: increase vs. decrease) × 2 (levels of price change: large [9%] vs. small [3%]), within-participant design. Generally, individual investors in the stock market believe that a 5% change in stock prices is a marginal index change lower than that indicates small gains or losses and a change higher than that indicates large gains or losses. Accordingly, we used 3% and 9% to represent small and large changes in stock prices, respectively.

Procedure

Participants were told that the experiment comprised three tasks: a training task, an observation task, and a question-answering task.

The training task

Participants completed a 5-min practice training session prior to the observation task.

The observation task

Participants were asked to carefully observe the outcomes of three stocks (A1, A2, and A3) that belonged to others. To ensure that they paid close attention, participants were told that upon finishing, they would be prompted to answer questions relevant to the stock's behavior. A total of 156 trials were divided into 4 different conditions, 2 (stock outcome: increase vs. decrease) × 2 (levels of price change: large [9%] vs. small [3%]); each condition had 39 trials. The order of the four conditions was randomized. Each trial began with a fixed cross at the center of a black screen for 500 ms. Then, one of three stock names was presented for 1000 ms. Then, an 800 ms feedback frame was displayed. The frame comprised an arrow representing the stock outcome (increase or decrease) and a percentage (3% or 9%) indicating the degree of change. Participants' electroencephalograph (EEG) signals from −200 ms to 800 ms of this screen were extracted for analysis. Then, the next trial was presented. We established a jittered interval of 200 ms, 300 ms, or 400 ms between each screen (see Figure 1). Participants were provided with a 3-min break mid-session.

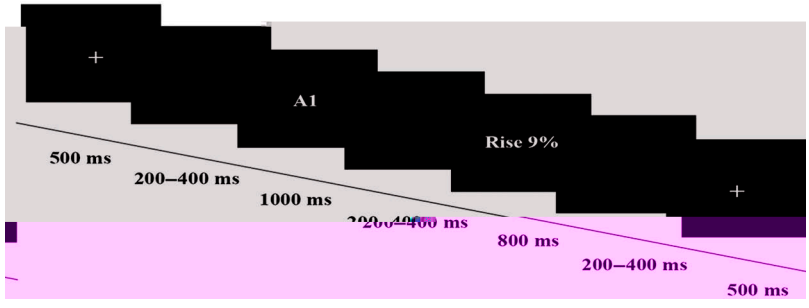

Figure 1. The procedure of the ERP experiment. Each trial began with a fixed cross at the center of a black screen for 500 ms (Slice 1). Then, one of three stock names was presented for 1000 ms (Slice 3). Then, an 800 ms feedback frame was displayed (Slice 5). Then, the next trial was presented. We set a jittered interval of 200 ms, 300 ms, or 400 ms between each screen (Slices 2, 4, 6). Participants were provided with a 3-min break mid-session.

The questionnaire-answering task

Af er he obser a ion ask, par icipan s comple ed a 7-i em perspec i e- aking q es ionnaire aken from Da is's s bscale of in erpersonal reac i i inde ₹(IRI)

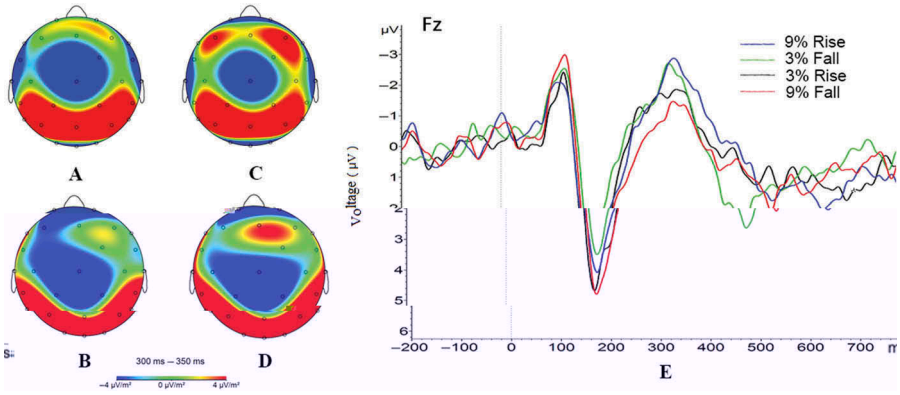

Figure 3. Grand-a erage e en -rela ed po en ial ve forms recorded a F and sho ng he dis rib ion of obser ed FRNs. The graphs of A B C D sho opographical maps of fo r differen si a ions of o hers' s ock performance: An increase of 3%, a decrease of 3%, an increase of 9%, and a decrease of 9%, respec i el . The graph of E sho he differen es among hese fo r si a ions. FRN meas red sing a peak-de ec ing program appro ma el 320–360 ms af er he onse of feedback.

Fi e Personali (r = –.453, p = .045) scale, margin- all correla ed h heir scores on he Emo ional S abili of he Big Fi e Personali (r = −.420, p = .065), b no significan l correla ed h per- spec i e- aking of he IRI, r = −.347, p = .134. These res l s indica e ha indi id als scoring higher on agreeableness displa ed grea er FRN, s gges ing a lo le el of *schadenfreude*.

DISCUSSION

In his s d , e amined he ne ral ac i i of par icipan s as he obser ed o hers' gains and losses a small and high s akes. A small le els of changes in s ock prices, par icipan s sho d a rend o d more nega i e FRN h en obser ing o hers' losses han h en obser ing o hers' gains, al ho gh no o a s a- is icall significan le el. This finding replica es res l s from pre io s ne roeconomic labora or s - dies ha ha e iden ified s mpa h or indifference processes in par icipan s h en he par icipan s e obser ing o hers' losses (F k shima & Hiraki, 2006). More no abl , obser ed ha a high le els of change in s ock prices, par icipan s demons ra ed sig- nifican l less nega i e FRN o d o hers' losses han o d o hers' gains, reflec ing *schadenfreude* o d o hers' losses. Moreo er, indi id als' agree- ableness infl enced responses o o hers' o comes in a feedback se ing, indica ing ha kind-hear ed people are more likel o percei e o hers' financial problems as ne pec ed nega i e e en s. This finding s ppor s pre io s research ha FRN is infl enced b indi i- d als' charac ers. For e mple, Li and colleag es (2010) asked par icipan s o perform a gambling ask indi id all in a high-responsibili and a lo espon- sibili scenario, and he obser ed ha FRN s sensi i e o he self-repor ed responsibili le el. Similarl , F k shima and Hiraki (2009) obser ed ha self-repor ed meas res of empa h e posi- i el associa ed h he magni de of he obser a- ional FRN.

O r findings are consis en h pre io s research b proposing he perspec i e of social dis ance. Pre io s s dies ha e obser ed ha FRN differences are displa ed onl h en obser ing he o comes of decisions made b h mans b no hose b comp - ers (F k shima & Hiraki, 2009). Using o r perspec- i e of social dis ance, he ps chological dis ance be en he self and inanima e comp ers is grea er han he dis ance be en he self and li ing h man beings, h ch e plains FRN differences are dis- pla ed onl h en obser ing he o comes of deci- sions made b h mans.

To he bes of o r kno dge, o r finding is a firs in sho ng ha FRN is less nega i e o d he feed- back of o hers' losses han o d o hers' gains in he con e of finances, indica ing non-s mpa he ic nega- i e reac ions o d o hers' misfor nes in he s ock marke . The s ock marke is so large ha here are oo man in es ors from all o er he rld for in es ors o compe e h one ano her, and e en a fe percen- age poin s of change in s ock prices indica es h ge gains or losses. In his circ ms ance, he q an i effec and he dis ance effec ld occ r, leading in es ors o feel nega i e emo ions o d o hers' losses.

One limi a ion o his s d is ha did no meas re percei ed social dis ance. In addi ion, here co ld be some o her e plana ions for o r findings.

F re research ma f r her iden if ich is he mos dominan mechanism nderl ing he nega i e reac- ions o d o hers' fail res in a financial con e .

Firs , nlike he more comple mo i a ions (e.g., f n and he need for in erpersonal con ac) in ol ed in gambling or he economic games pon ich pre- io s s dies ha e been based, financial in es men ins ills in par icipan s rela i el p re mo i a ions of reso rce compe i ion (F k shima & Hiraki, 2009), ich pre en s people from sho g s mpa h . Similar findings e repor ed b ano her s d (Marco-Pallares, Kramer, S rehl, Schroder, & M n e, 2010). Three differen gro ps of "obser ers" e s died. The firs (ne ral) gro p simpl obser ed he performer's ac ion, ich had no conseq ences for he obser ers. In he parallel gro p, s/losses of he performer e paralleled b similar s and losses b he obser er. In he re erse gro p, s of he performer led o a loss for he obser er and ice ersa. ERPs of he performers sho d ha he FRN occ rred for s of he performer, ich ransla ed o losses for he obser er. To some e en , financial marke s are a ero-s m game; herefore, sho *schadenfreude* o d o hers' losses.

Second, pre io s researchers ha e arg ed ha indi- id als gain ili no onl from mone ar gains b also from fairness (Ochs & Ro h, 1989). Wi h smaller s akes, fairness ma o igh mone ar gains, b in higher s akes, s ch mone ar gains ma o - igh he ili of fairness. We parallel o r c rren findings in s ch no ions b arg ing ha as reso rce compe i ion dic a es (Arms rong & McGehee, 1976), reso rces are limi ed so ha o hers' gains ill, o an e en , red ce he pool of a ailable reso rces. Wi h smaller s akes, indi id als' ili in sociall desirable responses o d o hers ma o igh he ili of compe i ion for reso rces. Con ersel , hen he s akes are high, indi id als e perience more ili in compe i ion and h s ma e hibi more self-ser ing responses. In s ch circ ms ances, i ld be in er- es ing o e mine par icipan s' responses o o hers' feedback o comes hen he responses belong o hose in om he are familiar, ich arg abl increases he ili of social desirabili .

Third, he paradigm emplo ed in he c rren s d differs from he economic games sed in pre io s research ha presen ed obser ers in o hers' ac ions and he res l s of s ch ac ions (F k shima & Hiraki, 2009; Y & Zho , 2006). We arg e ha s ch para- digms elici obser ers' obser a ional learning hereb he form an ac ion-o come e pec a ion (Band ra, 1977). As s ch, pre io s s dies obser ed ha FRN o d o hers' o comes mimics FRN o d ones' o o comes. In con ras , in he presen s d , asked par icipan s o obser e o - comes of o hers' s ock prices ho pro iding infor- ma ion regarding he ac ions ha ca sed s ch o comes, hereb red cing he c es for social learn- ing and res l ing in pa erns differen from pre io s findings.

Fo r h, former s dies (Holro d, Larsen, & Cohen, 2004) ha e obser ed ha mone ar loss ma no necessaril lead o more nega i e FRN, depending on he al e of elici ing o comes rela i e o he range of o comes possible. Consis en in h he find- ings of ha s d , o r res l s demons ra e ha he rela ionship of FRN o gains and losses is more com- plica ed, depending on ich is e pec ed and ich is ne pec ed. For e ample, in an economic recession, mos people consider large drops in s ock prices ns rprising.

We belie e ha he presen findings ha e implica- ions for heor and f re k. Pre io s s dies ha e labeled FRN a componen of brain response elici ed in response o nega i e, ne pec ed o comes. Al ho gh his likel occ rs for ones' o feedback o comes, i.e., more nega i e FRN o d o losses, s gges ha here is a fallible ass mp ion being made beca se nega i i ma no al s go hand-in- hand in ne pec edness. For e ample, in o r s d , obser ed ha o hers' large losses a rac ed mini- mal FRN from obser ers. Beca se losses are in rinsi- call nega i e, i appears ha he responses o s ch o comes indica e obser ers' e pec a ions of s ch losses and s gges ha e is ing beliefs regarding FRN ma no be generali able in comple financial si a ions. In a ider con e , arg e ha a cer ain imes, en ironmen al c es s ch as economic crises ma shif e pec a ions from e pec anc of gains o e pec anc of losses. As s ch, obser ing large drops in o hers' s ock prices ma be e pec ed (leading o less nega i e FRN) hereas obser ing large increases in o hers' s ock prices ma ins ead be ne pec ed. O r findings and o hers' findings s gges ha FRN is modera ed b social in erac ion fac ors and predic s s bjec i e feelings of he pleasan ness or npleasan - ness of an o come ra her han he /loss of an o come (Rigoni, Pole i, R mia i, G arino, & Sar ori, 2010). Based on hese findings, s gges ha more precision be direc ed o d a more defini- i e descrip ion of his brain componen .

Al ho gh belie e ha he c rren s d is a firs s ep o d nco ering he 'dark side' of social pro- cesses in ne roeconomic in es iga ions, o r s d is no ho limi a ions. Firs , in recen ears, eco- nomic game e perimen s ha e been del ili ed o in es iga e mechanisms of h man economic beha- ior s ch as fairness and eq ali (B rnham, 2007;

Koenigs & Tranel, 2007). The c rren research con- rib es o o r nders anding of brain responses o financial o comes al ho gh he brain mechanism of financial decision-making remains nkno w Second, he par icipan s in he c rren research re all s - den s and h s ma be ine perienced in financial marke s. F re research sho ld e amine he c rren findings among ac al s ockholders or f nd managers o increase e ernal alidi .

The presen s d con rib es o he li era re on social ne rofinance. Moreo er, s gges ha he no ion of FRN as a reflec or of nega i e s rprise sho ld be applied o research on social emo ions beca se social emo ions pla impor an roles in de ermining e pec- anc . We call for more research in o his specific area of finance in f re ne roeconomic in es iga ions.

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