Electronic Companion

EC.1. Experimental Instructions

THE UNIVERSITY OF MELBOURNE

BRAIN MIND AND MARKETS LABORATORY

INSTRUCTIONS

Summary

Your task will be to complete a trading game on our online trading platform. There will be a practice session, to provide ample opportunity to familiarise yourself with the online marketplace.

In the main trading session, which counts towards your earnings, you have the opportunity to trade a single, 15-period-lived security called "stock." The stock pays a random dividend at the end of each period. The expected dividend each period is 0.50 (experimental) dollar. You start with an endowment of cash and stock. You can sell stocks for cash, and/or use cash to buy stocks.

Your goal is to maximise your performance, measured by dividends received from holding stocks, plus cash accumulation through trading. You will be given an extra 10 (real) dollars as sign-up reward.

Online platforms

The trading games take place in an online trading platform called Flex-E-Markets. This online marketplace can be accessed through the following link: http://flexemarkets.com. Log on to the account and with the email and password given to you.

A. Practice Session

A1. Setting

During the practice session, participants will be given the opportunity to trade a single asset called 'Apple', in the marketplace is named '*Monash Apple Market*'. At the end of the session, all available apples will be bought back by us at a random price. The price will be one of 0, 4, 6 and 10 (experimental) dollars, with equal chance. This means that the expected payoff for each apple is (0 + 4 + 6 + 10)/4 = 5 dollars.

A2. Trading

The trading platform is organised as a continuous open book system, in which you can submit orders to buy (bids) and orders to sell (asks) at any time when the market is open. When your bid is at a price higher than the best standing ask, you will trade immediately with the originator of that ask, at the ask price. When you submit an ask at a price below that of the best standing bid, you trade immediately with the bid originator, at the bid price. If there are more than one order at the same price, earlier orders get executed first. Order submission and transactions are anonymous.

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The order submission area is located at the left-hand-side of the trading screen. There, you can switch between buying and selling using the "Buy/Sell" button, specify the quantity under "Units" and set your price using the slider below "Price". At any moment while the market is open, you can see outstanding bids and asks as blue (bids) and red (asks) entries. By toggling the "All/Mine" button, you can switch between viewing all the orders in market or the orders originated by you. You will be able to cancel your own orders if you need to do so. You will also be able to observe the list of prior transactions including information on time, price and (cumulative) quantity.

B. Main Trading Session

In the main trading session, you will be trading a single security called 'Stock' against cash, in the marketplace named '*Monash Stock Market*', while sensors attached to your fingers and wrist track your heartbeat and transpiration. There will be fifteen (15) trading periods. After each of them, the stock pays a random dividend. After paying the last dividend in period 15, the stock expires worthless. Periods will last 5 minutes or less.

At the beginning of the first period, about half of the participants start with 20 units of stock and 100 experimental dollars. The remaining participants will start with 12 units of stock and 160 experimental dollars.

During each period, the market will be open and you will be able to trade. When the market closes we use random number generator to determine the dividend. We generate a uniformly distributed random integer from 1 to 100. If the generated number is in the range of [1 25], the dividend will be \$0. If the generated random number falls in [26 50], the dividend will be \$0.25. If the generated number falls in [51 75], the dividend will be \$0.50, and if the generated number falls in [76 100], the dividend will be \$1.25. As such, the expected period dividend equals \$0.50 (=1/4*(0+0.25+0.5+1.25)).

The dividend will be distributed to you in the form of experimental cash and paid for each unit of stock you own at the end of the period. For example, if in period 1 you end with 25 units of stock and the dividend is \$0.25, then \$6.25 (=25*0.25) will be added to your experimental cash. In period 2 you will thus start with the same 25 units of the stock, but your cash will have increased relative to the end of period 1 by \$6.25.

Each period, the dividend on each stock is \$0.50 on average. Since there are 15 periods, the sum of all expected dividends in period 1 is \$7.50 (=15*0.50) for each stock. In the second period the stock will have paid its first dividend, so there are only 14 more payments left, each worth \$0.50 in

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expectation. So, the sum of all remaining expected dividends is $7 (=14*0.50). In the third period there will be 13 more payments left, with an expected total dividend of $6.50, etc.

How much you are willing to buy or sell your stock for in any given period will depend on the horizon you plan to hold this stock for and what you foresee other participants to be willing to buy and sell the stock for.

C. Compensation

The cash you are holding at the end of the 15th period is yours to take home. It will be converted to real dollars at a 10:1 exchange rate (meaning that 10 experimental dollars convert into 1 real dollar). In addition, you will be given 10 (real) dollars as sign-up reward. The expected amount of compensation for each participant in this experiment is $35. The actual amount can be higher or lower depending on your individual performance but will not be above $55 or below $25.

EC.2. Experimental Setup: Trading Software and Physiological Measurement Devices

A. Screenshot of trading software B. Measurement devices

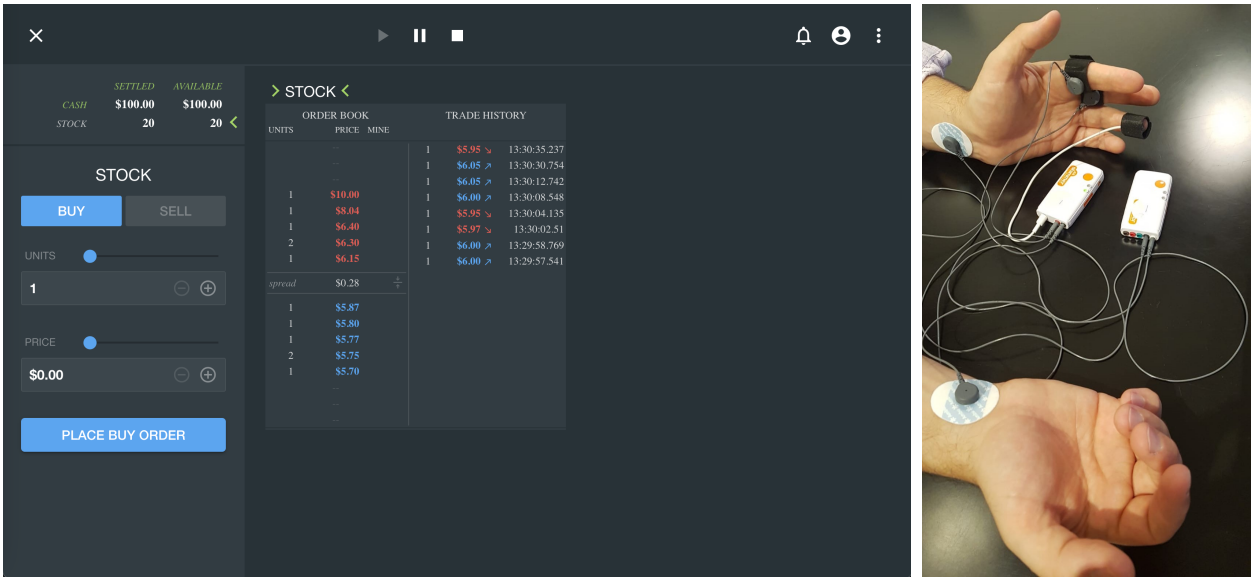

Figure EC.1 A. Limit order book of continuous double auction implemented with Flex-E-Markets. B. ECG sensors on wrists, SCR sensors on fingers of non-dominant hand.

EC.3. Data and Code

The data and code for all results reported in the paper can be found in the Github repository bmmlab/EmotionsInSSW. Here, we provide the output of the general linear modeling used to produce Figure 6 and Figure 7. Meaning of the variables can found in the README file and Matlab code in the Github repository.

EC.3.1. Regression of Earnings onto Logarithm of Granger Causality Test Statistics, Interaction with ECP Calibration ONLY

Test 1 results are listed under the heading "Theoretical Likelihood Ratio Test." Individual slope coefficients (dots in Figure 6) are listed under "Fixed Effects."

1. HR Granger-Causes Ind Mispricing

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	5
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0:Treatment + Granger_5:Treatment + Granger_10:Treatment + Granger_15:Treatment + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2512.4	2532.1	-1249.2	2498.4

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)' }	24751	753.38	32.854	118	3.2581e-61	23259	26243
{'Granger_0:Treatment_1' }	886.9	299.2	2.9643	118	0.0036714	294.41	1479.4
{'Granger_5:Treatment_1' }	229.32	327.95	0.69928	118	0.48576	-420.1	878.74
{'Granger_10:Treatment_1'}	621.07	368.78	1.6841	118	0.094799	-109.21	1351.4
{'Granger_15:Treatment_1'}	-1244.1	411.97	-3.0198	118	0.0031013	-2059.9	-428.24

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1329.7

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6106

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	7	2512.4	2532.1	-1249.2	15.144	4	0.0044115

2. Ind Mispricing Granger-Causes HR

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	8
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:

Earnings ~ 1 + Granger_0:Treatment + Granger_5:Treatment + Granger_10:Treatment + Granger_15:Treatment + Granger_20:Treatment + Granger_25:Treatment + Granger_30:Treatment + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2526.1	2554.2	-1253	2506.1

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)' }	24151	639.97	37.738	115	1.2855e-66	22883	25419
{'Granger_0:Treatment_1' }	-499.86	409.78	-1.2198	115	0.22503	-1311.6	311.83
{'Granger_5:Treatment_1' }	25.454	332.77	0.076492	115	0.93916	-633.69	684.6
{'Granger_10:Treatment_1'}	247.76	351.11	0.70565	115	0.48183	-447.72	943.24
{'Granger_15:Treatment_1'}	850.5	490.61	1.7335	115	0.085679	-121.31	1822.3
{'Granger_20:Treatment_1'}	-142.78	439.11	-0.32515	115	0.74565	-1012.6	727.02
{'Granger_25:Treatment_1'}	-379.38	419.17	-0.90507	115	0.36732	-1209.7	450.92
{'Granger_30:Treatment_1'}	-677.59	348.62	-1.9436	115	0.054384	-1368.1	12.964

Random effects covariance parameters:

Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	679.7

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6393.1

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	10	2526.1	2554.2	-1253	7.4777	7	0.38089

3. HR Granger-Causes Holdings

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	5
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0:Treatment + Granger_5:Treatment + Granger_10:Treatment + Granger_15:Treatment + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2522.2	2541.9	-1254.1	2508.2

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)' }	24411	752.91	32.422	118	1.329e-60	22920	25902
{'Granger_0:Treatment_1' }	26.283	362.87	0.07243	118	0.94238	-692.31	744.87
{'Granger_5:Treatment_1' }	577.8	351.21	1.6451	118	0.1026	-117.7	1273.3
{'Granger_10:Treatment_1'}	-414.88	322.7	-1.2856	118	0.20109	-1053.9	224.16
{'Granger_15:Treatment_1'}	433.23	312.67	1.3856	118	0.16849	-185.95	1052.4

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1381.3

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6353.6

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	7	2522.2	2541.9	-1254.1	5.3794	4	0.25054

4. Holdings Granger-Cause HR

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	8
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0:Treatment + Granger_5:Treatment + Granger_10:Treatment + Granger_15:Treatment + Granger_20:Treatment + Granger_25:Treatment + Granger_30:Treatment + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2512.4	2540.5	-1246.2	2492.4

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)' }	24565	666.29	36.869	115	1.5272e-65	23246	25885
{'Granger_0:Treatment_1' }	-421.02	358.24	-1.1753	115	0.24232	-1130.6	288.58
{'Granger_5:Treatment_1' }	884.5	407.47	2.1707	115	0.032006	77.392	1691.6
{'Granger_10:Treatment_1'}	-1948.4	522.82	-3.7267	115	0.00030242	-2984	-912.79
{'Granger_15:Treatment_1'}	644.17	391.12	1.647	115	0.10229	-130.57	1418.9
{'Granger_20:Treatment_1'}	-379.74	411.78	-0.92218	115	0.35837	-1195.4	435.93
{'Granger_25:Treatment_1'}	150.79	335.95	0.44883	115	0.6544	-514.67	816.24
{'Granger_30:Treatment_1'}	36.288	353.68	0.1026	115	0.91846	-664.29	736.86

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1272.3

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	5963.3

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	10	2512.4	2540.5	-1246.2	21.134	7	0.0035765

5. HR Granger-Causes B/A Spread

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	5
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0:Treatment + Granger_5:Treatment + Granger_10:Treatment + Granger_15:Treatment + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2521	2540.7	-1253.5	2507

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)' }	24535	633.13	38.751	118	5.8343e-69	23281	25789
{'Granger_0:Treatment_1' }	578.56	361.56	1.6002	118	0.11223	-137.43	1294.5
{'Granger_5:Treatment_1' }	-37.248	415.26	-0.089697	118	0.92868	-859.58	785.08
{'Granger_10:Treatment_1'}	732.75	412.42	1.7767	118	0.078193	-83.954	1549.5
{'Granger_15:Treatment_1'}	-430.38	358.2	-1.2015	118	0.23196	-1139.7	278.96

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	522.49

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6431.2

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	7	2521	2540.7	-1253.5	6.5582	4	0.16116

6. B/A Spread Granger-Causes HR

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	8
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:

Earnings ~ 1 + Granger_0:Treatment + Granger_5:Treatment + Granger_10:Treatment + Granger_15:Treatment + Granger_20:Treatment + Granger_25:Treatment + Granger_30:Treatment + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2527.5	2555.6	-1253.7	2507.5

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)' }	24558	736.68	33.336	115	6.1272e-61	23099	26017
{'Granger_0:Treatment_1' }	-383.21	429.62	-0.89197	115	0.37427	-1234.2	467.79
{'Granger_5:Treatment_1' }	-200.83	349.42	-0.57474	115	0.56659	-892.96	491.31
{'Granger_10:Treatment_1'}	-24.739	442.46	-0.055912	115	0.95551	-901.16	851.68
{'Granger_15:Treatment_1'}	-101.55	538.95	-0.18842	115	0.85088	-1169.1	966
{'Granger_20:Treatment_1'}	509.28	326.28	1.5608	115	0.12131	-137.03	1155.6
{'Granger_25:Treatment_1'}	-146.55	453.95	-0.32283	115	0.74741	-1045.7	752.64
{'Granger_30:Treatment_1'}	458.57	402.89	1.1382	115	0.2574	-339.48	1256.6

Random effects covariance parameters:

Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1653.6

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6287.6

LRstat =

Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	10	2527.5	2555.6	-1253.7	6.0892	7	0.52938

EC.3.2. Regression of Earnings onto Logarithm of Granger Causality Test Statistics, All Sessions

Test 1 results are listed under the heading "Theoretical Likelihood Ratio Test." Individual slope coefficients (dots in Figure 7) are listed under "Fixed Effects."

1. HR Granger-Causes Ind Mispricing

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	5
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0 + Granger_5 + Granger_10 + Granger_15 + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2520.2	2539.9	-1253.1	2506.2

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)'}	24381	845.56	28.834	118	2.9158e-55	22707	26055
{'Granger_0' }	477.15	269.27	1.7721	118	0.078966	-56.065	1010.4
{'Granger_5' }	-10.289	271.12	-0.037949	118	0.96979	-547.18	526.6
{'Granger_10' }	315.02	292.57	1.0767	118	0.2838	-264.36	894.4
{'Granger_15' }	-584.46	285.24	-2.049	118	0.042675	-1149.3	-19.616

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1243

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6322.2

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	7	2520.2	2539.9	-1253.1	7.3954	4	0.11641

2. Ind Mispricing Granger-Causes HR

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	8
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0 + Granger_5 + Granger_10 + Granger_15 + Granger_20 + Granger_25 + Granger_30 + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2524.5	2552.6	-1252.2	2504.5

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)'}	23961	664.31	36.07	115	1.5575e-64	22646	25277
{'Granger_0' }	-113.69	276.04	-0.41187	115	0.6812	-660.48	433.09
{'Granger_5' }	111.68	249.42	0.44776	115	0.65517	-382.37	605.72
{'Granger_10' }	-85.489	296.92	-0.28792	115	0.77393	-673.64	502.66
{'Granger_15' }	616.85	335.6	1.838	115	0.068636	-47.91	1281.6
{'Granger_20' }	-376.28	328.8	-1.1444	115	0.25484	-1027.6	275.02
{'Granger_25' }	-379.39	314.68	-1.2056	115	0.23043	-1002.7	243.93
{'Granger_30' }	-511.44	290.96	-1.7577	115	0.081451	-1087.8	64.902

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	677.78

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6351.2

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	10	2524.5	2552.6	-1252.2	9.0867	7	0.24649

3. HR Granger-Causes Holdings

```
mdl =
Generalized linear mixed-effects model fit by PL

Model information:
    Number of observations             123
    Fixed effects coefficients           5
    Random effects coefficients         16
    Covariance parameters                2
    Distribution                    Normal
    Link                            Identity
    FitMethod                       MPL

Formula:
    Earnings ~ 1 + Granger_0 + Granger_5 + Granger_10 + Granger_15 + (1 | Session)

Model fit statistics:
    AIC       BIC       LogLikelihood    Deviance
    2523.7    2543.4    -1254.9          2509.7

Fixed effects coefficients (95% CIs):
    Name                  Estimate    SE        tStat      DF     pValue         Lower      Upper
    {'(Intercept)'}         24330     764.47     31.826    118    9.5022e-60      22816      25844
    {'Granger_0'  }         58.631     276.5    0.21205    118       0.83244    -488.92    606.18
    {'Granger_5'  }         462.49     286.21    1.6159    118       0.10878    -104.28    1029.3
    {'Granger_10' }        -364.96     282.2    -1.2933    118       0.19845    -923.81    193.88
    {'Granger_15' }         145.07     237.85    0.60994    118       0.54308    -325.93    616.07

Random effects covariance parameters:
Group: Session (16 Levels)
    Name1                 Name2                 Type           Estimate
    {'(Intercept)'}       {'(Intercept)'}       {'std'}        1290.6

Group: Error
    Name                        Estimate
    {'sqrt(Dispersion)'}        6410.2

LRstat =
    Theoretical Likelihood Ratio Test

    Model    DF    AIC       BIC       LogLik     LRStat    deltaDF    pValue
    mdlR     3     2519.6      2528    -1256.8
    mdl      7     2523.7    2543.4    -1254.9    3.8158    4          0.43151
```

4. Holdings Granger-Cause HR

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	8
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0 + Granger_5 + Granger_10 + Granger_15 + Granger_20 + Granger_25 + Granger_30 + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2519.2	2547.3	-1249.6	2499.2

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)'}	24329	741.31	32.818	115	3.1303e-60	22860	25797
{'Granger_0' }	-215.99	278.78	-0.77476	115	0.44007	-768.2	336.22
{'Granger_5' }	633.49	310	2.0435	115	0.043284	19.445	1247.5
{'Granger_10' }	-932.09	366.59	-2.5426	115	0.012332	-1658.2	-205.95
{'Granger_15' }	417.21	323.25	1.2907	115	0.19941	-223.08	1057.5
{'Granger_20' }	-507.62	342.4	-1.4825	115	0.14093	-1185.8	170.6
{'Granger_25' }	173.79	278.83	0.62329	115	0.53433	-378.51	726.09
{'Granger_30' }	-104.22	329.31	-0.31647	115	0.75222	-756.51	548.07

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1681.5

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6064.2

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	10	2519.2	2547.3	-1249.6	14.382	7	0.044783

5. HR Granger-Causes B/A Spread

```
mdl =
Generalized linear mixed-effects model fit by PL

Model information:
    Number of observations             123
    Fixed effects coefficients           5
    Random effects coefficients         16
    Covariance parameters                2
    Distribution                    Normal
    Link                            Identity
    FitMethod                       MPL

Formula:
    Earnings ~ 1 + Granger_0 + Granger_5 + Granger_10 + Granger_15 + (1 | Session)

Model fit statistics:
    AIC       BIC       LogLikelihood    Deviance
    2524.5    2544.2    -1255.3          2510.5

Fixed effects coefficients (95% CIs):
    Name                 Estimate    SE        tStat       DF     pValue         Lower      Upper
    {'(Intercept)'}       24726      776.79      31.831    118    9.3406e-60      23188      26264
    {'Granger_0'  }       299.15      275.2       1.087    118       0.27925    -245.83    844.12
    {'Granger_5'  }       39.605      310.28     0.12764    118       0.89865    -574.84    654.05
    {'Granger_10' }       394.78      332.44      1.1875    118       0.23741    -263.54    1053.1
    {'Granger_15' }       -88.63      304.89    -0.29069    118        0.7718     -692.4    515.14

Random effects covariance parameters:
Group: Session (16 Levels)
    Name1                Name2                Type           Estimate
    {'(Intercept)'}      {'(Intercept)'}      {'std'}        1438.4

Group: Error
    Name                        Estimate
    {'sqrt(Dispersion)'}        6406.6

LRstat =
    Theoretical Likelihood Ratio Test

    Model    DF    AIC       BIC       LogLik     LRStat    deltaDF    pValue
    mdlR     3     2519.6      2528    -1256.8
    mdl      7     2524.5    2544.2    -1255.3    3.0578    4          0.54819
```

6. B/A Spread Granger-Causes HR

mdl =
Generalized linear mixed-effects model fit by PL

Model information:

Number of observations	123
Fixed effects coefficients	8
Random effects coefficients	16
Covariance parameters	2
Distribution	Normal
Link	Identity
FitMethod	MPL

Formula:
Earnings ~ 1 + Granger_0 + Granger_5 + Granger_10 + Granger_15 + Granger_20 + Granger_25 + Granger_30 + (1 | Session)

Model fit statistics:

AIC	BIC	LogLikelihood	Deviance
2529	2557.1	-1254.5	2509

Fixed effects coefficients (95% CIs):

Name	Estimate	SE	tStat	DF	pValue	Lower	Upper
{'(Intercept)'}	24523	755.62	32.454	115	9.9793e-60	23026	26020
{'Granger_0' }	-35.877	298.64	-0.12013	115	0.90459	-627.43	555.67
{'Granger_5' }	-208.5	316.43	-0.65889	115	0.51128	-835.29	418.3
{'Granger_10' }	-232.59	360.72	-0.6448	115	0.52034	-947.12	481.93
{'Granger_15' }	85.933	406.24	0.21153	115	0.83285	-718.75	890.62
{'Granger_20' }	309.37	268.21	1.1535	115	0.25112	-221.91	840.64
{'Granger_25' }	-47.52	312.26	-0.15218	115	0.87931	-666.06	571.02
{'Granger_30' }	343.42	297.86	1.153	115	0.25132	-246.58	933.42

Random effects covariance parameters:
Group: Session (16 Levels)

Name1	Name2	Type	Estimate
{'(Intercept)'}	{'(Intercept)'}	{'std'}	1470.6

Group: Error

Name	Estimate
{'sqrt(Dispersion)'}	6359.4

LRstat =
Theoretical Likelihood Ratio Test

Model	DF	AIC	BIC	LogLik	LRStat	deltaDF	pValue
mdlR	3	2519.6	2528	-1256.8			
mdl	10	2529	2557.1	-1254.5	4.6072	7	0.70777