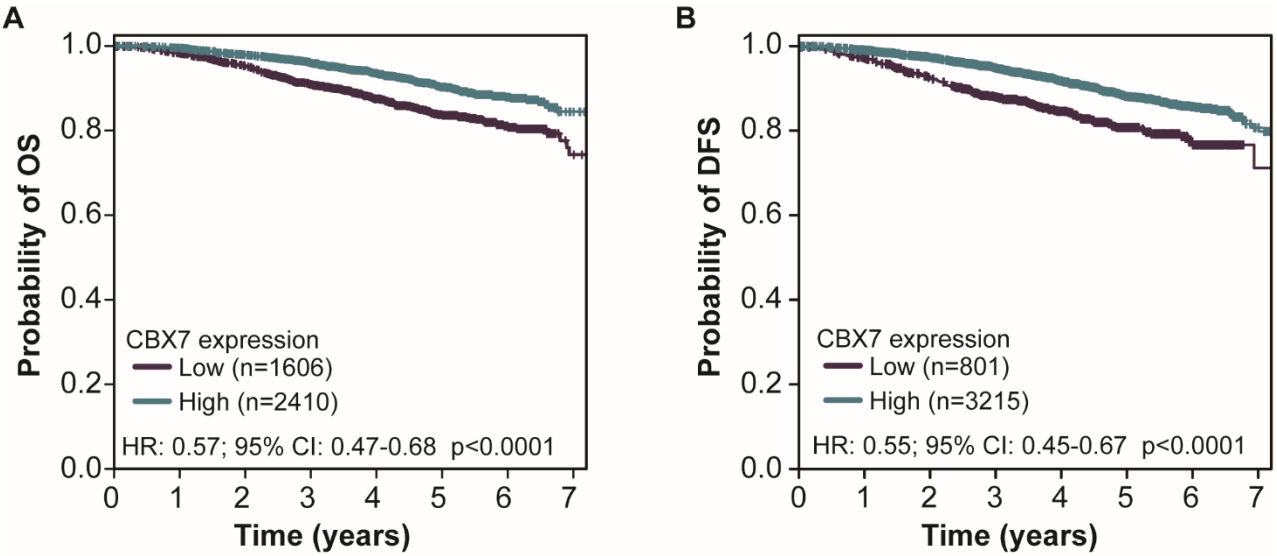
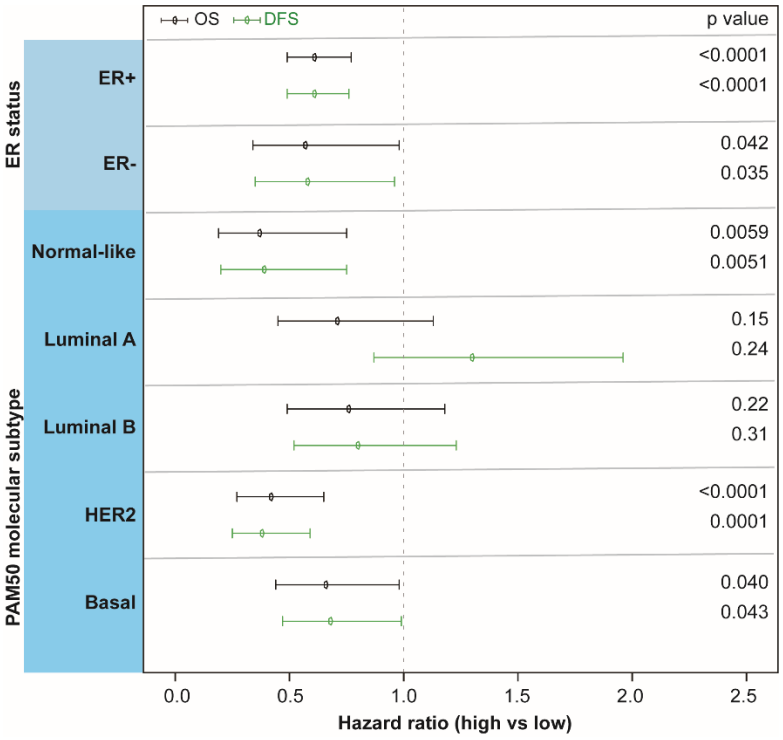
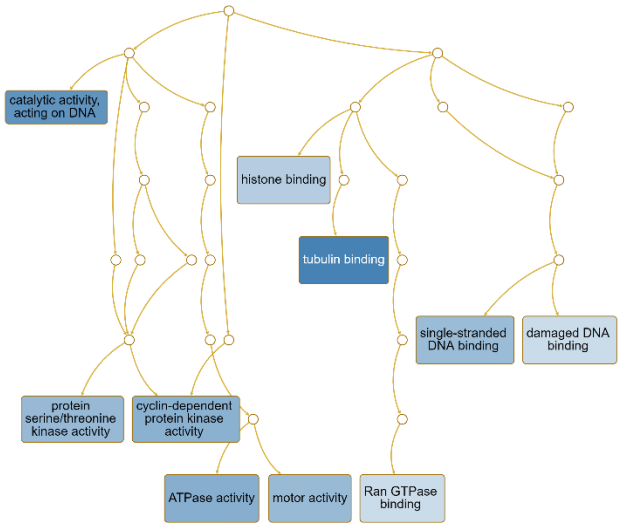
Supplementary Figures and Table



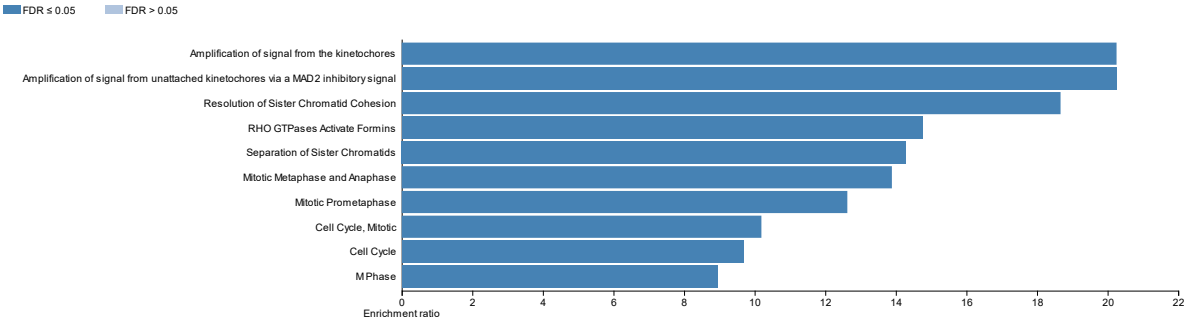
Supplementary Figure 1. Associations of *CBX7* expression with (**A**) overall survival (OS) and (**B**) disease-free survival (DFS) were analyzed in the RNA-seq datasets using bc-GenExMiner.



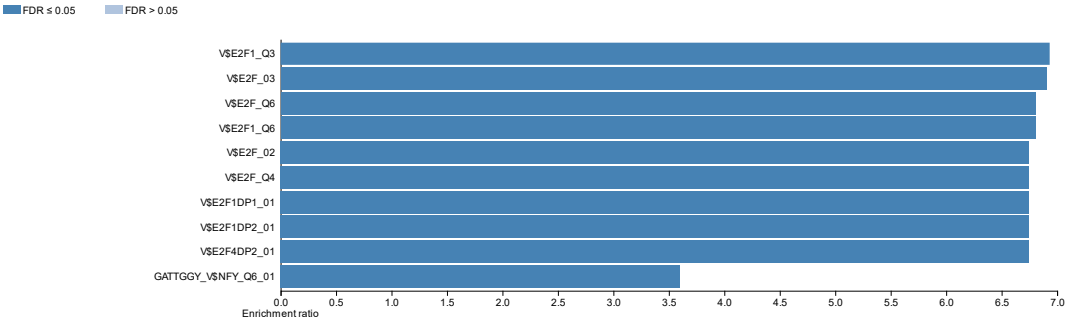
Supplementary Figure 2. The associations of *CBX7* expression with overall (OS) and disease-free (DFS) survivals were analyzed regarding ER status and PAM50 BC molecular subtypes in the RNA-seq dataset using bc-GenExMiner.



Supplementary Figure 3. Gene Ontology (GO) molecular function enrichment analysis of *CBX7* negatively co-expressed genes.



Supplementary Figure 4. Reactome pathway enrichment analysis of *CBX7* negatively co-expressed genes.



Supplementary Figure 5. Transcriptional factors enrichment analysis of *CBX7* negatively co-expressed genes.

Supplementary Table 1. List of *CBX7* co-expressed genes. *CBX7* negetively co-expressed genes were highlighted in pink while *CBX7* positively co-expressed genes were highlighted in green.

Gene symbol	METABRIC			TCGA-BRCA		
	Spearman's Correlation	p-Value	q-Value	Spearman's Correlation	p-Value	q-Value
KPNA2	-0.49	2.06E-117	7.91E-115	-0.62	2.20E-115	7.34E-112
TTK	-0.49	3.30E-113	1.06E-110	-0.60	8.22E-108	1.27E-104
CEP55	-0.51	1.09E-128	7.28E-126	-0.60	2.53E-106	3.16E-103
DLGAP5	-0.52	7.53E-135	9.06E-132	-0.60	1.08E-105	1.14E-102
MCM10	-0.52	9.55E-132	9.58E-129	-0.60	1.71E-105	1.71E-102
MELK	-0.57	1.15E-162	2.07E-158	-0.60	1.18E-104	1.08E-101
TPX2	-0.53	1.31E-135	1.69E-132	-0.59	6.02E-104	5.25E-101
PDSS1	-0.51	6.32E-129	4.57E-126	-0.59	1.14E-103	9.55E-101
KIF20A	-0.51	2.78E-127	1.79E-124	-0.59	1.23E-103	9.86E-101
CCNB2	-0.52	4.45E-133	5.02E-130	-0.59	1.88E-102	1.39E-99
PSMD12	-0.47	4.39E-107	1.03E-104	-0.58	3.45E-100	2.16E-97
NCAPG	-0.49	4.22E-117	1.55E-114	-0.58	4.78E-100	2.90E-97
EXO1	-0.56	3.65E-159	3.30E-155	-0.58	1.02E-99	5.71E-97
CCNA2	-0.54	1.70E-146	3.85E-143	-0.58	1.02E-99	5.71E-97
ERCC6L	-0.46	1.08E-100	2.13E-98	-0.58	4.50E-99	2.44E-96
UBE2T	-0.51	4.74E-124	2.52E-121	-0.58	6.77E-99	3.57E-96
GMPS	-0.50	2.63E-123	1.28E-120	-0.58	8.13E-99	4.07E-96
AURKA	-0.53	2.85E-138	4.68E-135	-0.58	1.64E-97	7.66E-95
KIF18A	-0.43	1.73E-88	2.00E-86	-0.58	1.86E-97	8.49E-95
JPT1	-0.40	8.62E-76	6.03E-74	-0.58	4.09E-97	1.78E-94
SGO1	-0.47	1.74E-106	3.98E-104	-0.58	2.47E-96	1.01E-93
CENPA	-0.55	3.80E-148	1.37E-144	-0.57	3.89E-96	1.56E-93
KIF4A	-0.53	1.37E-137	2.06E-134	-0.57	9.71E-96	3.81E-93
CDK1	-0.47	9.02E-103	1.83E-100	-0.57	2.02E-95	7.80E-93
BIRC5	-0.50	3.49E-121	1.50E-118	-0.57	2.34E-95	8.83E-93
BUB1	-0.53	9.33E-140	1.69E-136	-0.57	9.04E-94	3.24E-91
ORC6	-0.46	4.83E-101	9.58E-99	-0.57	1.94E-93	6.83E-91
POLR2D	-0.44	1.94E-91	2.48E-89	-0.57	2.74E-93	9.46E-91
PLK1	-0.50	1.07E-123	5.50E-121	-0.57	8.36E-93	2.79E-90
CENPN	-0.52	1.19E-131	1.13E-128	-0.56	3.08E-92	9.65E-90
PARPBP	-0.43	6.40E-88	7.13E-86	-0.56	4.13E-91	1.26E-88
UBE2C	-0.50	3.13E-120	1.31E-117	-0.56	6.93E-91	2.07E-88
TRIP13	-0.50	3.25E-123	1.54E-120	-0.56	1.68E-90	4.82E-88
FAM83D	-0.56	1.73E-154	7.81E-151	-0.56	3.60E-90	9.90E-88
MAD2L1	-0.41	3.65E-79	2.91E-77	-0.56	1.57E-89	4.19E-87
KIF23	-0.52	9.68E-131	8.32E-128	-0.56	2.88E-89	7.50E-87
ANLN	-0.54	1.37E-142	2.74E-139	-0.56	1.40E-88	3.45E-86
CDC25A	-0.44	8.89E-89	1.04E-86	-0.56	1.44E-88	3.52E-86

DDIAS	-0.49	1.92E-115	6.92E-113	-0.55	6.22E-88	1.40E-85
RAD51AP1	-0.52	4.85E-131	4.38E-128	-0.55	2.08E-87	4.59E-85
CHEK1	-0.56	7.61E-155	4.58E-151	-0.55	1.41E-86	2.97E-84
CSE1L	-0.43	1.01E-85	1.05E-83	-0.55	6.15E-86	1.26E-83
AUNIP	-0.50	3.40E-123	1.57E-120	-0.55	1.22E-85	2.45E-83
CDKN3	-0.47	6.63E-103	1.36E-100	-0.55	3.60E-85	7.15E-83
CKS2	-0.40	1.58E-75	1.08E-73	-0.55	8.17E-85	1.61E-82
KPNA4	-0.45	1.63E-95	2.44E-93	-0.54	1.50E-84	2.91E-82
TICRR	-0.47	1.75E-105	3.90E-103	-0.54	1.52E-83	2.70E-81
DONSON	-0.48	2.27E-110	6.30E-108	-0.54	1.95E-83	3.39E-81
FOXM1	-0.47	2.74E-105	6.04E-103	-0.54	2.21E-83	3.82E-81
STIL	-0.43	5.20E-88	5.83E-86	-0.54	4.36E-83	7.47E-81
HJURP	-0.48	7.30E-113	2.31E-110	-0.54	5.05E-83	8.57E-81
NEIL3	-0.41	1.03E-78	8.00E-77	-0.54	1.40E-82	2.33E-80
STIP1	-0.43	4.17E-88	4.70E-86	-0.54	2.08E-82	3.40E-80
CIP2A	-0.43	2.86E-88	3.27E-86	-0.54	6.97E-82	1.10E-79
CDCA5	-0.54	4.34E-147	1.12E-143	-0.54	2.06E-81	3.15E-79
CDCA8	-0.47	5.54E-107	1.28E-104	-0.54	2.33E-81	3.53E-79
AURKB	-0.49	2.99E-115	1.06E-112	-0.53	7.58E-81	1.13E-78
OIP5	-0.45	1.42E-95	2.14E-93	-0.53	2.19E-80	3.22E-78
CENPE	-0.50	3.24E-120	1.33E-117	-0.53	2.09E-79	2.98E-77
MND1	-0.42	1.43E-82	1.34E-80	-0.53	2.10E-79	2.98E-77
RACGAP1	-0.51	5.10E-126	2.97E-123	-0.53	2.12E-79	3.00E-77
NUSAP1	-0.43	2.05E-84	2.00E-82	-0.53	3.27E-79	4.55E-77
CENPI	-0.44	4.38E-91	5.58E-89	-0.53	4.41E-79	6.10E-77
MCM6	-0.45	6.71E-96	1.03E-93	-0.53	4.90E-79	6.72E-77
PLK4	-0.51	4.25E-129	3.20E-126	-0.53	6.76E-79	9.21E-77
KIF2C	-0.49	1.18E-117	4.62E-115	-0.53	7.05E-79	9.55E-77
SPAG5	-0.40	1.12E-75	7.72E-74	-0.53	1.20E-78	1.61E-76
KIF14	-0.46	1.63E-100	3.06E-98	-0.53	3.09E-78	4.07E-76
TBC1D7	-0.48	3.02E-112	9.09E-110	-0.53	4.58E-78	5.97E-76
CKS1B	-0.41	2.13E-79	1.72E-77	-0.52	1.36E-77	1.75E-75
SPC25	-0.48	4.19E-110	1.15E-107	-0.52	6.66E-77	8.24E-75
KIF15	-0.41	1.80E-77	1.36E-75	-0.52	1.28E-76	1.55E-74
SGO2	-0.44	1.65E-90	2.08E-88	-0.52	1.52E-76	1.81E-74
GTPBP4	-0.50	7.73E-123	3.49E-120	-0.52	1.68E-76	1.98E-74
CDC20	-0.49	2.85E-117	1.07E-114	-0.52	2.05E-75	2.32E-73
CCNE1	-0.52	3.15E-132	3.35E-129	-0.52	1.88E-74	2.02E-72
SNRPG	-0.40	3.98E-74	2.61E-72	-0.51	6.48E-74	6.76E-72
CKAP2L	-0.48	6.31E-111	1.81E-108	-0.51	5.98E-73	5.91E-71
POLQ	-0.45	9.97E-98	1.67E-95	-0.51	6.05E-73	5.94E-71
MEMO1	-0.44	6.01E-93	8.04E-91	-0.51	2.21E-72	2.15E-70
CCNE2	-0.44	1.80E-92	2.38E-90	-0.51	1.45E-71	1.36E-69
CBX2	-0.53	2.29E-136	3.18E-133	-0.51	2.00E-71	1.87E-69
CENPF	-0.47	2.95E-106	6.67E-104	-0.51	3.01E-71	2.79E-69

SRPK1	-0.44	5.84E-89	6.84E-87	-0.50	1.22E-70	1.10E-68
RAB5IF	-0.43	1.41E-87	1.52E-85	-0.50	3.15E-70	2.73E-68
PRR11	-0.48	1.74E-111	5.06E-109	-0.50	1.70E-69	1.43E-67
ALG3	-0.44	1.33E-91	1.71E-89	-0.50	1.83E-69	1.54E-67
ASPM	-0.47	4.99E-105	1.09E-102	-0.50	2.02E-69	1.68E-67
PTTG1	-0.45	2.68E-95	3.94E-93	-0.50	3.34E-69	2.76E-67
SPDL1	-0.43	7.73E-85	7.75E-83	-0.50	4.01E-69	3.27E-67
TROAP	-0.46	1.28E-100	2.45E-98	-0.50	1.31E-68	1.05E-66
CDCA3	-0.45	1.48E-96	2.36E-94	-0.50	1.41E-68	1.13E-66
ECE2	-0.52	1.99E-130	1.63E-127	-0.50	1.67E-68	1.32E-66
CENPO	-0.41	8.57E-78	6.56E-76	-0.49	7.78E-68	5.95E-66
CDCA2	-0.46	2.61E-99	4.72E-97	-0.49	1.12E-67	8.42E-66
RPP40	-0.45	2.08E-96	3.27E-94	-0.49	2.09E-67	1.56E-65
XPOT	-0.46	8.51E-99	1.51E-96	-0.49	3.58E-67	2.65E-65
DKC1	-0.42	5.61E-82	5.15E-80	-0.49	1.42E-66	1.02E-64
UHRF1	-0.45	2.16E-94	3.10E-92	-0.49	8.34E-66	5.79E-64
FBXO5	-0.45	1.19E-97	1.97E-95	-0.49	9.14E-66	6.32E-64
EZH2	-0.45	4.49E-94	6.34E-92	-0.49	4.32E-65	2.86E-63
PCLAF	-0.44	2.77E-90	3.42E-88	-0.48	1.42E-64	9.00E-63
DNMT3B	-0.41	1.72E-76	1.25E-74	-0.48	2.85E-64	1.76E-62
RMI2	-0.42	1.18E-81	1.06E-79	-0.48	2.63E-63	1.55E-61
ZWINT	-0.45	1.55E-93	2.12E-91	-0.48	3.58E-63	2.09E-61
PSME4	-0.42	1.35E-83	1.30E-81	-0.48	3.68E-63	2.14E-61
FEN1	-0.45	1.03E-94	1.48E-92	-0.48	3.74E-63	2.17E-61
BLM	-0.40	4.19E-74	2.74E-72	-0.48	4.42E-63	2.55E-61
MASTL	-0.47	1.12E-104	2.37E-102	-0.48	4.48E-63	2.58E-61
CDC45	-0.46	3.62E-98	6.23E-96	-0.48	9.05E-63	5.12E-61
MTFR1	-0.43	1.84E-85	1.87E-83	-0.48	2.19E-62	1.22E-60
PRC1	-0.45	2.51E-95	3.71E-93	-0.48	2.46E-62	1.36E-60
RAD54B	-0.44	3.07E-93	4.14E-91	-0.48	4.46E-62	2.42E-60
E2F3	-0.41	1.07E-79	8.77E-78	-0.47	9.78E-62	5.27E-60
MCM4	-0.45	2.80E-96	4.37E-94	-0.47	3.84E-61	2.01E-59
GINS3	-0.47	1.07E-104	2.31E-102	-0.47	8.68E-61	4.48E-59
WDR12	-0.44	2.06E-89	2.46E-87	-0.47	9.95E-61	5.12E-59
TUBA1B	-0.40	8.07E-76	5.67E-74	-0.47	1.42E-59	6.87E-58
ESRP1	-0.40	2.00E-75	1.37E-73	-0.46	3.81E-59	1.81E-57
CHAF1B	-0.42	5.79E-83	5.50E-81	-0.46	4.30E-59	2.03E-57
CASP3	-0.43	2.31E-86	2.41E-84	-0.46	4.35E-59	2.05E-57
PIMREG	-0.46	2.27E-99	4.15E-97	-0.46	1.36E-58	6.23E-57
CTPS1	-0.44	3.09E-92	4.04E-90	-0.46	3.15E-58	1.43E-56
CMC2	-0.43	2.95E-87	3.17E-85	-0.46	5.34E-58	2.39E-56
NUTF2	-0.45	3.67E-94	5.21E-92	-0.46	7.21E-58	3.20E-56
KIFC1	-0.42	2.01E-80	1.72E-78	-0.46	1.55E-57	6.76E-56
HSPA14	-0.43	4.43E-85	4.46E-83	-0.46	1.98E-57	8.66E-56
TK1	-0.44	8.06E-90	9.83E-88	-0.46	2.71E-57	1.17E-55

NUP93	-0.43	4.76E-87	5.08E-85	-0.46	3.12E-57	1.35E-55
ESPL1	-0.45	2.94E-95	4.27E-93	-0.46	1.08E-56	4.51E-55
ASF1B	-0.41	1.97E-76	1.43E-74	-0.46	1.39E-56	5.76E-55
MRPS17	-0.48	6.12E-112	1.81E-109	-0.45	2.74E-56	1.12E-54
RRP36	-0.47	1.29E-107	3.11E-105	-0.45	2.83E-56	1.16E-54
TOP2A	-0.42	2.74E-82	2.55E-80	-0.45	3.90E-56	1.58E-54
SYNCRIP	-0.43	1.26E-87	1.37E-85	-0.45	8.57E-56	3.41E-54
PEX13	-0.50	2.30E-123	1.15E-120	-0.45	1.29E-55	5.12E-54
RIPK2	-0.42	6.33E-82	5.78E-80	-0.45	7.51E-55	2.88E-53
HSPH1	-0.41	2.98E-76	2.15E-74	-0.45	7.16E-54	2.62E-52
NAA15	-0.41	1.18E-76	8.69E-75	-0.45	7.53E-54	2.75E-52
PDCL3	-0.48	1.29E-109	3.43E-107	-0.44	2.46E-53	8.71E-52
DNAJB11	-0.46	1.29E-100	2.45E-98	-0.44	2.99E-53	1.06E-51
UCK2	-0.48	4.85E-109	1.22E-106	-0.44	7.55E-53	2.61E-51
MCM2	-0.41	9.51E-79	7.46E-77	-0.44	3.68E-52	1.22E-50
DNAJC9	-0.42	6.66E-81	5.81E-79	-0.44	4.86E-52	1.60E-50
GAPDH	-0.40	9.11E-76	6.35E-74	-0.44	7.60E-52	2.49E-50
SLC7A5	-0.42	2.00E-80	1.72E-78	-0.43	4.04E-51	1.28E-49
PSMD2	-0.41	4.97E-77	3.70E-75	-0.43	5.37E-51	1.68E-49
CDK4	-0.41	3.97E-78	3.05E-76	-0.43	1.02E-48	2.77E-47
CDCA4	-0.43	7.38E-87	7.84E-85	-0.42	3.19E-47	8.02E-46
E2F2	-0.41	8.62E-79	6.80E-77	-0.42	4.70E-47	1.17E-45
PNP	-0.46	4.23E-98	7.20E-96	-0.42	6.62E-47	1.64E-45
BEND3	-0.41	4.65E-80	3.85E-78	-0.42	9.22E-47	2.26E-45
BYSL	-0.45	7.15E-96	1.08E-93	-0.42	2.28E-46	5.42E-45
CALU	-0.44	4.09E-89	4.86E-87	-0.40	9.86E-44	2.04E-42
C1ORF112	-0.41	1.12E-77	8.47E-76	-0.40	2.52E-43	5.06E-42
AQP9	-0.48	2.43E-109	6.26E-107	-0.40	2.98E-43	5.96E-42
S100A11	-0.45	2.46E-93	3.35E-91	-0.40	6.89E-43	1.34E-41
BCL2	0.44	5.01E-89	5.92E-87	0.40	4.69E-43	9.23E-42
SETBP1	0.49	4.24E-115	1.47E-112	0.40	1.15E-43	2.37E-42
RGS5	0.46	1.20E-99	2.21E-97	0.41	1.77E-44	3.82E-43
CREBRF	0.49	1.16E-114	3.96E-112	0.41	8.00E-46	1.86E-44
RERE	0.44	2.57E-90	3.20E-88	0.42	1.25E-46	3.05E-45
YPEL3	0.47	2.93E-103	6.08E-101	0.42	8.10E-47	2.00E-45
SORBS3	0.40	3.67E-75	2.47E-73	0.42	3.56E-48	9.48E-47
SIK3	0.43	1.84E-88	2.11E-86	0.43	1.71E-49	4.85E-48
STAT5B	0.46	1.23E-98	2.16E-96	0.43	4.12E-51	1.30E-49
CYB5D2	0.42	2.36E-81	2.09E-79	0.44	9.06E-53	3.12E-51
SYNGR1	0.41	1.32E-76	9.66E-75	0.44	5.21E-53	1.81E-51
IDUA	0.41	1.61E-76	1.18E-74	0.45	2.76E-55	1.07E-53
RAMP2	0.43	1.23E-84	1.23E-82	0.45	2.01E-55	7.87E-54
APH1B	0.46	1.92E-98	3.33E-96	0.47	1.41E-59	6.86E-58
DENND6B	0.41	3.49E-76	2.50E-74	0.48	2.76E-62	1.52E-60
MXD4	0.42	1.16E-81	1.05E-79	0.48	6.59E-63	3.76E-61

NTRK2	0.43	1.71E-86	1.80E-84	0.48	8.28E-65	5.35E-63
CBX6	0.46	1.13E-100	2.18E-98	0.48	8.20E-65	5.32E-63
KIF13B	0.41	2.77E-79	2.22E-77	0.49	1.87E-65	1.26E-63
CYBRD1	0.48	1.23E-112	3.82E-110	0.49	1.05E-65	7.20E-64
MYOM1	0.42	3.44E-82	3.19E-80	0.49	4.07E-66	2.87E-64
EFCAB6	0.42	8.92E-83	8.43E-81	0.50	2.56E-68	2.01E-66
MYH11	0.40	5.83E-76	4.14E-74	0.50	1.42E-68	1.13E-66
CST3	0.51	1.17E-124	6.39E-122	0.50	2.08E-69	1.73E-67
NOP53	0.52	6.82E-130	5.35E-127	0.50	6.01E-70	5.13E-68
MEF2D	0.43	1.55E-85	1.59E-83	0.50	2.68E-70	2.36E-68
IGIP	0.45	3.87E-96	5.97E-94	0.50	1.42E-70	1.27E-68
TSPAN7	0.44	1.17E-89	1.41E-87	0.51	2.79E-73	2.82E-71
N4BP2L1	0.40	5.45E-75	3.64E-73	0.52	7.92E-75	8.58E-73
CX3CR1	0.43	1.65E-84	1.63E-82	0.52	3.74E-75	4.12E-73
CCL14	0.41	2.50E-77	1.88E-75	0.52	4.31E-77	5.37E-75
ANKRD29	0.41	4.05E-77	3.02E-75	0.53	3.94E-78	5.16E-76
CLDN5	0.41	2.07E-76	1.49E-74	0.53	9.66E-80	1.40E-77
CIRBP	0.51	8.66E-127	5.39E-124	0.54	3.11E-84	5.88E-82
SRSF5	0.45	6.94E-94	9.64E-92	0.55	5.08E-86	1.05E-83
PNPLA7	0.42	1.13E-81	1.03E-79	0.56	1.54E-88	3.63E-86
XPC	0.48	6.70E-110	1.81E-107	0.56	3.51E-89	8.91E-87
ACACB	0.42	2.47E-84	2.39E-82	0.56	3.27E-89	8.41E-87
PHYKPL	0.43	1.19E-85	1.23E-83	0.56	3.21E-90	8.94E-88
ABTB1	0.46	5.58E-99	9.98E-97	0.56	1.57E-90	4.57E-88
PGM5	0.45	1.06E-93	1.47E-91	0.56	1.12E-90	3.29E-88
ZBTB4	0.55	6.88E-148	2.07E-144	0.57	5.68E-94	2.11E-91
CRY2	0.48	7.13E-108	1.74E-105	0.59	1.60E-100	1.04E-97
TNS2	0.40	1.41E-74	9.27E-73	0.59	1.29E-100	8.65E-98
NISCH	0.46	1.41E-102	2.83E-100	0.59	2.19E-103	1.69E-100
PHF1	0.49	2.99E-114	1.00E-111	0.60	1.16E-104	1.08E-101
VAMP2	0.48	2.27E-109	5.95E-107	0.61	4.46E-109	8.14E-106
RAPGEF3	0.44	6.99E-91	8.82E-89	0.61	2.16E-110	4.80E-107
PIK3IP1	0.45	1.96E-96	3.11E-94	0.64	4.72E-127	3.15E-123
CALCOCO1	0.46	3.69E-100	6.87E-98	0.65	1.99E-131	1.99E-127