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Abstract: @he c j^ [I [ho ijWhj e\ _ji _jo)o[Wh ^_ijeho(j^ [M^WZem I f[d GWha[j =e c c_jj[]
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JEL Codes: < . . (< / - (? / - (? 1 - (? 1 . (? 1 4*

Keywords: Cd\bWj_ed(Ged[o Ahemj^(Ged[jWho Jeb_Yo(Ged[jWh_i c(M^WZem I f[d GWha[j
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- 1* N^[Yeij e\ Z_i_d\bWj_ed h[\b[Yji j^[c ed[jWho Wkj^eh_joxi Yh[Z_X_b_jo*
- 2* Jeb_Yo i^ekbZ X[hkb[i XWi[Z WdZ jhWdi fWh[dj*
- 3* Ged[o c Wha[j %de c_dWb _dj[h[ij hWj[& jWh] [j_d] _i \bWm[Z*
- 4* Ged[o Z[c WdZ_i ijWXb[*
- 5* N^[c ed[o ijeYa_i YedjhebbWXb[*

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¹ @eh \khj^ [h Z_iYkii_edi e\ j^_i fe_dj(i[[Ch[bWdZ % . . . 0&(F[[f[h WdZ Lekia^ % . . . , /&(H[bied % . . . , 4&(WdZ <[bed]_W WdZ Ch[bWdZ % . . . -&*

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N^ [Y^e_Y[_i not X[jm[[d bem[h kd[c fbeo c [dj WdZ ^_]^[h_d\bWj_ed ed j^ [ed[
i_Z[eh ^_]^[h kd[c fbeo c [dj WdZ bem[h_d\bWj_ed ed j^ [ej^ [h i_Z[* I kh Y^e_Y[
b_[i X[jm[[d W temporary_dYh[Wi[e\ kd[c fbeo c [dj_d j^ [fh[i[dj WXel[_ji
deh c Wb b[1 [b_d Yed'kdYj_ed m_j^ W h[jkhd je j^ [deh c Wb b[1 [b WdZ de_d\bWj_ed_d
j^ [\kjh[ed ed[i_Z[(eh(ed j^ [ej^ [h i_Z[(f[h c Wd[dj_d\bWj_ed m_j^ _dj[h c_jj[dj
i fkhji e\ kd[c fbeo c [dj X[oedZ _ji deh c Wb b[1 [b Wk] c [dj[Z 1[ho_b_a[bo Xo Wd
_dYh[Wi[_d j^ [deh c Wb b[1 [b*

N^_i 1_[m YedjhWiji i^Whfbo m_j^ MW c k[bied WdZ Mebemxi %-52,(f*-5.& Z[iYh_fj_ed e\ j^ [
J^_bb_fi Ykh1[Wi i^em_d] uj^ [c [dk e\ Y^e_Y[X[jm[[d Z__[h[dj Z[]h[[i e\ kd[c fbeo c [dj WdZ
fh_Y[ijWX_b_jo*v <kj _j h[i[c Xb[i gk_j[Ybei[bo j^ [fei_j_ed j^Wj kdZ[hb_[i j^ [_d\bWj_ed jWh][j_d]
ijhWj[]_[i WZleYWj[Z Xo c Wdo [Yede c_iji WdZ _c fb[c [dj[Z Xo c Wdo Y[djhWb XWdai WhekdZ j^ [
mehbZ jeZW(Wi <[hdWda[(FWkXWY^ (G_i^a_d(WdZ Jei[d %-555(f*-2& [nfbW_d[_dj[h c i j^Wj [Y^e
<hkdd[hxi %-535a&6

N^_hjo o[Whi W]e(feb_Yo)c Wa[hi WdZ c eij [Yede c_iji ikf fehj[Z uWYj_1_ijv
c ed[jWho feb_Y_[i(m^_Y^ m[h[Z[_d[Z Wi feb_Y_[i m^ei[fkhfei[mWi je a[[f
ekjfkj WdZ kd[c fbeo c [dj Ybei[je j^ [_h u\kbb [c fbeo c [djv b[1 [bi Wj Wbb j_c [i*
Mkf fehj[hi e\ WYj_1_i c X[b_[1[Z j^Wj j^ [h[mWi W bed])hkd jhWZ[e\ X[jm[[d
_d\bWj_ed WdZ kd[c fbeo c [dj ademd Wi j^ [J^_bb_fi Ykh1[s * Ne c Wdo
[Yede c_iji WdZ feb_Yo)c Wa[hi(_j i[[c [Z feii_Xb[j^Wj WYj_1[bo c WdW][Z
c ed[jWho %WdZ _iYWb& feb_Y_[i YekbZ X[ki[Z je c W_djW_d c Wn_c k c [c fbeo c [dj
fh[jjo c kY^ Wbb j^ [j_c [* N^Wj ^Wffo ekjYe c [mWi dej je X[* s Cd i^ehj(j^ [
WYj_1_ij c ed[jWho feb_Y_[i e\ j^ [-52, i WdZ -53, i dej edbo \W_b[Z je Z[b_1[h j^ [_h
fhe c_i[Z X[d[_ji(j^ [o ^[bf[Z je])[d[hWj[_d\bWj_edWho fh[iikh[i j^Wj YekbZ X[
ikXZk[Z edbo Wj ^_]^[Yede c_Y Yeij*

F_a[m_i[(j^Wj WZ1[hi[ikf fbo i^eYai Z[Yh[Wi[fej[dj_Wb Wi m[bb Wi WYjkwB ekjfkj mWi _hij
dej[Z Xo <hkdd[h Wj j^ [M[fj[c X[h -531 M I G = c [[j_d](_d h[WYj_ed je j^ [i[1[h[WdZ fhebed][Z

h[Y[ii_ed e\ -53/)]1* <hkdd[hxi %-531b& fei_j_ed fWf[h Y_j[i Wd [Whb_[h h[fehj Xo <emi^[h %-531(f*.&(m^_Y^ Xh[Wai j^[Zemdjkh_dje jme ijW][i6

N^[_hij ijW][(m^_Y^ X[]Wd_d j^[bWj[\Wbb e\ -53/(mWi bWh) [bo W h[i fed i[je YedijhW_dji fbWY[Z ed W]]h[]Wj[ikf fbo* N^[i[YedZ ijW][(m^_Y^ X[]Wd_d j^[[Whbo \Wbb e\ -530(h[\b[Yj[Z(_d WZZ_j_ed(W h[ZkYj_ed _d j^[]hemj^ e\ Z[c WdZ \eh]eeZi WdZ i[h1_Y[i*

N^[ikf fbo i^eYai j^Wj jh_]]h[Z ijW][ed[_dYbkZ[(_d <emi^[hxi l_[m(^_)^ [h e_b fh_Y[i(feeh m[Wj^ [h YedZ_j_edi(WdZ j^[WZl [hi[[\\[Yji e\ fh_Y[Yedjhebi* <hkdd[h %-531b(f*-1& Xk_bZi ed <emi^[hxi Wii [ii c [dj Xo c Wa_d] W Z_ij.dYj.ed e\ ^_i emd(m_j^ a[o _c fb_YWj_edi \eh c ed[jWho feb_Yo c Wa_d]6

N^[Z_ij.dYj.ed X[jm[[d W uh[Wb i^eYa Z[Yb_d[v _d ekjfkj WdZ W uYoYb_Y Z[Yb_d[v _d ekjfkj i[[c i je c [_c fehjWdj \eh hWj_edWb feb_Yo c Wa_d]* N^[bWjj[h Yh[Wj[i Wd uekjfkj]Wfv h[Wbbo WXi [dj \he c j^ [\eh c [h* ; Z_ih[]WhZ e\ j^ [jme Z_ij.dYj fheY[ii [i j^ki c W]d_\ [i [ij_c Wj[i e\ j^ [ufej[dj_Wb]Wfv je X[h[c e l [Z Xo [nfWdi_edWho feb_Y_[i* ; d_dWZ[gkWj[WdWboi_i e\ j^ [Z[Yb_d[_d ekjfkj eXi[h1[Z i_dY[He l [c X[h -53/ j^ki h[[d\ehY[i j^ [ZWd] [h e\ _d\bWj_edWho _dWdY_Wb h[i fed i[i ed j^ [fWhj e\ feb_Yo) c Wa[hi*

<hkdd[h %-531b(f*-4&]e[i ed je YedjhWij ^_i emd l_[mi m_j^ j^ei[e\ j^ [uE[od[i_Wd [ijWXb_i^ c [dj(v ik c c Wh_p[Z _d W d[mi fWf[h Whj_Yb[Xo AebZ[d %-531& j^Wj gkej[i QWbj[h B [bb[h WdZ @hWdYe GeZ_]b_Wd_ _d Wh]k_d] \eh W feb_Yo e\ ikijW_d[Z bem _dj[h[ij hWj[i _d j^ [\WY[e\ f[hi_ij[dj [Yede c_Y m[Wad[ii*

N^[MI G=xi %-532(f*/& M[fj[c X[h -532 feb_Yo ijWj[c [dj [Y^e[i <hkdd[hxi [Whb_[h YedY[hdi(ijWj_d] j^Wj u c ed[jWho feb_Yo YWd Yedjh_Xkj[je YoYb_YWb h[Ye l [ho Xkj YWd Ze b_jjb[je h[fbWY[YWfWY_jo beij _d j^ [i^eYai e\ h[Y[dj o[Whi*v N^Wj ijWj[c [dj(Yedjhe l [hi_Wb Wj j^ [j_c [(]hWZkWbbo \ekdZ ikf fehj(_hij(_d j^ [Z[l [bef c [dj e\ h[Wb Xki_d[ii YoYb[c eZ[bi Xo EoZbWdZ WdZ Jh[iYejj %-54.& WdZ Fed] WdZ Jbeii[h %-54/& _d j^ [-54, i WdZ j^ [d(Xo [nj[di_ed(_d H[m E[od[i_Wd c eZ[bi m^ [h[(Wi dej[Z WXel[(j^ [Z_l_d[Ye_dY_Z[dY[Wf fb_[i* Cd Wbb e\ j^ [i[c eZ[bi(fej[dj_Wb ekjfkj(_dij[WZ e\ \ebbem_d] W i c eej^bo)[leb_l_d] jh[dZ(\bkYjkWj[i Wj ^_] ^ \h[gk[dY_[i Wi

i^eYai ^_j j^ [Yede c o \he c j^ [ikf fbo i_Z [(WdZ c ed [jWho feb_Yo i^ekbZ Wbbem WYjkWb ekjfkj je
 \bkYjKwJ [(jee (_d ehZ [h je jhWYa j^ei [c el [c [dji _d fej [dj_Wb* ; i AWbq % . , - 1 (f* - , / & [nfbW_di6

s ijWX_b_p_d] ekjfkj_i dej Z [i_hWXb [_d WdZ e \ _ji [b* Cdi j [WZ (ekjfkj i^ekbZ lWho
ed () \eh) ed [m_j^ j^ [dWjkhWb b [l [b e \ ekjfkj s * N^ [h [_i de h [Wied (_d fh_dY_fb [(
m^o j^ [dWjkhWb b [l [b e \ ekjfkj i^ekbZ X [YedijWdj eh jWa [j^ [\eh c e \ W i c ee j^
jh [dZ (X [Ywki [Wbb a_dZi e \ h [Wb i^eYai Wh [W fej [dj_Wb iekhY [e \ lWh_Wj_ed _d _ji
b [l [b* Cd j^Wj Yedj [nj (feb_Y_ [i j^Wj ijh [ii ekjfkj ijWX_b_jo % feii_Xbo Whek dZ W
i c ee j^ jh [dZ & c Wo] [d [hWj [fej [dj_Wbbo bWh] [Z [l_Wj_edi e \ ekjfkj \he c _ji dWjkhWb
b [l [b WdZ (j^ki (X [ikXefj_c Wb*

Ch [bWdZ % . , . 0a & Z_iYkii [i ^em (i_c_bWhbo (h [Wb Xki_d [ii YoYb [WdZ H [m E [od [i_Wd j^ [eh [i ^ [bf [Z
i^Wf [j^ [@ I G = xi % . , - . & c ed [jWho feb_Yo ijhWj [] o ijWj [c [dj*

N^ [_Z [W j^Wj j^ [Yeiji e \ Z_i_d \bWj_ed Z [f [dZ ed j^ [Yh [Z_X_b_jo e \ j^ [Y [djhWb XWdaxi
Ye c c_j c [dj je fh_Y [ijWX_b_jo mWi _hij hW_i [Z Xo <hkdd [h %-530b & _d ^_i fei_j_ed fWf [h \eh j^ [
M [fj [c X [h -530 MI G = c [[j_d]* N^ [h (<hkdd [h h [i fedZi je Ye c c [dji Xo DW c [i NeX_d ed j^ [
MI G = xi [Whb [h h [Ye c c [dZWj_ed je [dZ _d \bWj_ed j^hek]^ W fhe] hW c e \]hWZkWh h [ZkYj_edi _d
c ed [o]hemj^* NeX_d %-530 (ff* . . 4) 5 & ik c c Wh_p [i W fW_h e \ i_c kbWj_edi (XWi [Z ed jme
Wbj [hdWj_1 [[ij_c Wj [i e \ j^ [J^_bb_fi Ykh1 [ibef [fWhW c [j [h (Xej^ _dZ_YWj_d) j^Wj j^ [MI G = xi
fh [iYh_X [Z feb_Yo mekbZ h [gk_h [W fhebed] [Z f [h_eZ e \ ^_] ^ kd [c fbeo c [dj* Cd j^ [c eh [
f [ii_c_ij_Y YWi [(ukd [c fbeo c [dj_h_i [i ij [WZ_bo \eh [_] ^ j o [Whiv_d [nY^Wd] [\eh c eZ [ij
h [ZkYj_edi _d _d \bWj_ed* <hkdd [h %-530b (f* - , & fhe1_Z [i W l [ho [Whbo h [\ [h [dY [je j^ [FkYWi
%-532 & Yh_j_gk [_d ^_i Yekdj [h) Wh] k c [dj6

N^ [J^_bb_fi Ykh1 [c eZ [bi i^em [Z_d j^ [h [Y [dj fWij h [f [Wj [Zbo Z [l_Wj_edi \he c
eXi [h1Wj_edi ik \ _Y [djbo bWh] [je gk [ij_ed j^ [h [b [lWdY [e \ j^ [bed] [h] hkd
i_c kbWj_ed [n [hY_i [Z Xo NeX_d* <kj j^ [i [bed] [h] hWd] [i_c kbWj_edi Wh [h [Wbbo
c WZ [gk_j [ZkX_eki WdZ fheXWXbo gk_j [_hh [b [lWdj Xo W fhef [hjo e \ [Yede c_Y
ioij [c i h [Y [djbo [c f^Wi_p [Z Xo LeX [hj FkYWi Wj W = Whd [] _]) LeY^ [ij [h
= ed [h [dY [s * N^ [ijhkYjkhWb fhef [hj_i WdZ h [i fed i [fWjj [hdi e \ Wd [Yede c_Y
ioij [c Wh [dej _d lWh_Wdj je Z_ \ \ [h [dj feb_Y_ [i WdZ feb_Yo fWjj [hdi* N^ [c [Y^Wd_YWb
i_c kbWj_ed e \ W feb_Yo fhe] hW c ikXijWdj_Wbbo Z_ \ \ [h [dj \he c feb_Yo fWjj [hdi
fh [lW_b_d] el [h j^ [iW c fb [f [h_eZ ki [Z je [ij_c Wj [j^ [c eZ [b o_ [bZi j^ki b_jjb [
_d \eh c Wj_ed WXekj j^ [Yedi [gk [dY [i e \ j^ [fhe] hW c fhefei [Z* Cd fWhj_YkbWh (j^ [

i_c kbWj_edi e\ W c eZ[b [ij_c Wj[Z eI[h W f[h_eZ e\ WYY[b[hWj_d] _d\bWj_ed fheXWXbo
[nW]]][hWj[i j^ [bed] [h]hkd kd[c fbeoc [dj [\[\Yji e\ Wd Wdj_)_d\bWj_edWho
fhe]hW c *2

<hkdd[h %-54.(ff*- ,)-& h[ijWj[i j^[i[_Z[Wi [l[d c eh[Xbkdjbo6

@_hij WdZ \eh[c eij(m[d[[Z je [c f^Wi_p[j^Wj W d[Y[iiWho WdZ ik\[_Y_[dj YedZ_j_ed
\eh bem[h _d\bWj_ed _i W Yehh[i fedZ_d]bo bem[h hWj[e\ c ed[jWho]hemj^* Q[Z[do
ed j^ [ej^ [h ^WdZ j^Wj W h[Y[ii_ed e\ ik\[_Y_[dj b[d]j^ WdZ Z[fj^ _i W d[Y[iiWho
YedZ_j_ed e\ Wd Wdj_)_d\bWj_edWho fhe]hW c * Q^[j^ [h eh dej j^ [c ed[jWho
h[jWhZWj_ed h[gk_h[Z \eh ekh fkhfei [i jhWdibWj[i _dje W h[Y[ii_ed Z[f[dZi YhkY_Wbbo
ed j^ [Yh[Z_X_b_jo e\ j^ [feb_Y_[i fkhik[Z*

<hkdd[h %-54.(f*- -& YedYbkZ[i Xo gkej_d] AeeZ[h[dZ %-54-(f*- /&6 uN^ [feb_Yo m_bb meha m[bb

edbo _\ j^ [c ed[jWho Wkj^eh_jo [ijWXb_i^ [i W Ye c c_jc [dj je Xh_d] c ed[o]hemj^ Zemd j^Wj _i

Yh[Z_Xb[je j^ [_dWdY_Wb c Wha[ji WdZ j^ [fkXb_Y_d] [d[hWb*v

NeZWα(j^ [_c fehjWdj heb[i fbWo[Z Xo [nf[YjWj_edi WdZ Yh[Z_X_b_jo_d Z[j[hc_d_d] j^ [Yeiji
e\ Z_i_d\bWj_ed Wh[m_Z[bo WYademb[Z][Z* @eh [nWc fb[(_d ekjb_d_d] ^_i ijhWj[]o \eh Xh_d]_d] OM
_d\bWj_ed XWYa Zemd W\j[h _ji . . . - ikh][(@ [Z[hWb L [i[hI [=^W_h D[he c [Jem[bb % . . . (ff*/)1&
b_iji Wi jme e\ j^ [j^h[[u_c fehjWdj b[iiediv b[Whd[Z \he c j^ [[nf[h_[dY[e\ j^ [u^_] ^ WdZ lebWj_b[
_d\bWj_ed e\ j^ [-53, i s j^Wj j^ [fkXb_Yxi [nf[YjWj_edi s YWd fbWo Wd _c fehjWdj heb[v WdZ j^Wj
uj^ [[c fbeoc [dj Yeiji e\ Xh_d]_d] Zemd _d\bWj_ed Wh[b_a[bo je _dYh[Wi[s Wi ^_] ^ _d\bWj_ed
X[Ye c [i c eh[[djh[dY^ [Z_d mW][WdZ fh_Y[i[jj_d]*v Jem[bb % . . . (f*.& Z[fWhji(^em[l[h(\he c
M I G = fh[iYh_fj_edi Xo Z[iYh_X_d] j^ [@[Zxi Z_i_d\bWj_edWho ijhWj[]o _d_j[hc i e\ ^_] ^ [h i[jj_d]i
\eh _dj[h[ij hWj[i(hWj^ [h j^Wd bem[h hWj[i e\ c ed[o]hemj^*

@_dWbbo(j^ [M I G = fh[\[hh[Z W jhWdi fWh[dj WdZ hkb[i)XWi[Z Wf fheWY^ je c ed[jWho

feb_Yo c Wa_d)(ijhed)bo WdZ \he c j^ [l[ho ijWhj(j^hek)^ _ji WZleYWYo e\ W ijhWj[]o XWi[Z ed fh[)

² N^ [e c_jj[Z j[nj \he c j^ _i gkej[(_dZ_YWj[Z m_j^ [bb_fi[i(ijWj[i c_ijWa[dbo j^Wj FkYWix fWf[h
mWi fh[i[dj[Z Wj j^ [HeI[c X[h -53/ =Whd[.]_L]LeY^ [ij[h =ed[h[dY[ed fh_Y[WdZ mW][
Yedjhebi(m^ [d_d \WYj _j mWi fh[i[dj[Z Wj j^ [; fh_b -53/ Yed[h[dY[ed j^ [J^_bb_fi YkhI[%i[[
<hkdd[h WdZ G [bjp[h -532&*

WddekdY[Z jWh][ji \eh ced[o]hemj^* N^[feb_Yo ijWj[c [dj Wffhel[Z Wj j^[=e c c_jj[[xi \hij
c [[j_d] _d M[fj[cX[h -53/ h[WZi %MI G= -53/(f*3& gk_j[i_c fbo6

Q[X[b_[1[j^[eX[Yj_1[e\ ced[jWho feb_Yo el[h j^[d[nj o[Wh i^ekbZ X[je
h[ZkY[j^[hWj[e\ _d\bWj_ed* Ne WYYe c fb_i^ j^_i(j^[]hemj^ hWj[e\ ced[o \eh j^[
d[nj i_n cedj^i i^ekbZ X[Wj W ij[WZo hWj[e\ WXekj 1 { " *

; i WYjkWb hWj[i e\ ced[o]hemj^ WdZ _d\bWj_ed Yedj_dk[Z je h_i[(j^[=e c c_jj[[[nj[dZ[Z j^[
^eh_ped el[h m^_Y^ _ji fh()WddekdY[Z fbWdi \eh ced[o]hemj^ Wffh_[Z* N^[=e c c_jj[[xi
%MI G= -534a(ff*/)0& feb_Yo ijWj[c [dj fh[iYh_X[i 2 f[hY[dj ced[o]hemj^ \eh -534(j^[d
Yedj_dk[i6

s m[h[Ye c c [dZ h[ZkYj_ed _d j^[W1[hW][hWj[e\ ced[jWho [nfWdi_ed Xo - " W
o[Wh kdj_b W ded_d\bWj_edWho hWj[e\ ced[jWho [nfWdi_ed_i WY^_[1[Z* N^[@[Z[hWb
L[i[h1[i^ekbZ fkXb_Ybo Ye c c_j ced[jWho feb_Yo je j^_i ijWX_b_p_d] bed)]j[hc
ced[jWho Yekhi[_d ehZ[h je \kb_bb _ji b[]Wb h[i fedj_X_b_j_[i kdZ[h j^[@[Z[hWb
L[i[h1[L[\ehc ; Yj e\ -533*

; dZ j^[MI G= Yedj_dk[Z je [c f^Wi_p[j^[WZ1WdjW][i e\ W hkb[i)XWi[Z WffheWY^ je
feb_Yo c Wa_d)([1[d Wj[h bem[h hWj[i e\ _d\bWj_ed m[h[WY^_[1[Z kdZ[h @[Z[hWb L[i[h1[=^W_h c [d
JWkb PebYa[h WdZ ; bWd Ah[[difWd* Id j^[eYYWi_ed e\ _ji .1j^ Wdd_1[hiWho(j^[MI G= %-554(
f*3& [c f^Wi_p[Z j^Wj Wj j^[@[Z(

>[Y_i_edi h[c W_d WZ ^eY* IdY[c [c eh_[i e\ j^[Yeiji e\ _d\bWj_ed \WZ[(eh j^[h[_i
W Y^Wd][_d c [c X[hi^_f WdZ b[WZ[hi^_f(j^[@[Z[hWb L[i[h1[c_] ^j h[jkhd je fWj
feb_Y_[i* s Ne Wle_Z W h[jkhd je j^[i[c _ijWa[d feb_Y_[i(m[m_bb Yedj_dk[je kh][
j^[@[Z[hWb L[i[h1[je Z[1[bef WdZ WZefj ioij[c Wj_Y hkb[i \eh ced[jWho feb_Yo*

; i c Wdo e\ j^[[iiWoi Yebb[Yj[Z _d <ehZe(=eY^hWd[(WdZ NWobeh % . . 0& c Wa[Yb[Wh(De^d
NWobehxi %-55/& Whj_Yb[(u>_iYh[j_ed P[hiki Jeb_Yo Lkb[i _d JhWYj_Y[(v fbWo[Z W ^k][hkb[_d
Yedl_dY_d] [Yede c _iji WdZ _dWdY_Wb c Wha[j fWhj_Y_fWdji j^Wj @[Z[hWb L[i[h1[feb_Yo YWd(WdZ
i^ekbZ(X[c WZ[m_j^ h[\[h[dY[je W X[dY^c Wha fh[iYh_X[Z Xo W h[bWj_1[bo i_c fb[hkb[* <kj m^_b[
j^[@[Z[hWb L[i[h1[xi GWhY^ . . 0 i[c_)Wddkwb h[fehj je =ed]h[ii fh[i[dji j^[_dj[h[ij hWj[

i [jj_d] i fh [iYh_X [Z Xo j^ [NWobeh %-55 /& hkb [WdZ i [1 [hWb 1Wh_Wdji (_j Wbie Wh) k [i % < eWhZ e \

Ae1 [hdehi e \ j^ [@ [Z [hWb L [i [h1 [Moij [c . , . 0 (ff * 0 . & 6

; i X [dY^ c Whai \ eh c ed [jWho feb_Yo (i_c fb [feb_Yo hkb [i ^ W1 [_c fehjWdj
b_c_jWj_edi* I d [e \ j^ [i [b_c_jWj_edi _i j^Wj j^ [i_c fb [feb_Yo hkb [i c [Y^Wd_YWbbo
h [i fedZ je edbo W i c Wbb i [j e \ [Yede c_Y 1Wh_WXb [i WdZ j^ ki d [Y [i iWh_bo WXijhWYj
\ he c c Wdo e \ j^ [\ WYjehi j^ [@ I G = Yedi_Z [hi m^ [d _j Wii [ii [i j^ [Wffhefh_Wj [i [jj_d] e \ j^ [feb_Yo hWj [*

<hkdd [h %-54 / (ff * 5) - , & Wdj_Y_fWj [i WdZ fhe1_Z [i j^ [ej^ [h i_Z [e \ j^ _i Wh) k c [dj (\ he c j^ [

MI G = 1_ [mfe_dj6

N^ [_Z [W j^Wj Y [djhWb XWdai i^ ekbZ ubeea Wj [1 [hoj^ _d] v WdZ u \ b [n_Xbo WZ^ kij je
Y_hYk c ijWdY [iv ij_bb _dZi c kY^ ioc fWj^o WdZ ^Wi Wd_djk_j_1 [Wff [Wb* < kj (e \
Yekhi ((deXeZo YWd beea Wj [1 [hoj^ _d] * ; jj [dj_ed _i kdWle_ZWXbo i [b [Yj_1 [WdZ
] k_Z [Z Xo ie c [fh_eh YedY [fj_ed* s N^ [Yedi [gk [dY [i e \ W ijhWj [] o e \ u \ b [n_Xb [WZ^ kij c [dj je fh [1W_b_d] Y_hYk c ijWdY [iv Wh [^] ^bo i [di_j_1 [je j^ [h [b_WX_b_jo e \ j^ [feb_Yo c Wa [hix Z [jW_b [Z ademb [Z] [e \ j^ [[Yede c o si h [i fed [i jhkYjkh [* s < kj_d if_j [e \ Wbb j^ [YbW_c i je ikY^ ademb [Z] [(_c fb_Y_jbo hW_i [Z Xo WZ1eYWj [i e \ WYj_1_ij feb_Yo c Wa_d] (m [Ze dej fei [ii j^ [h [gk_h [Z Z] [h [[e \ ademb [Z] [* N^ [fkhik_j e \ \ b [n_Xb [WZ^ kij c [dji s X [Ye c [i j^ ki W if [YkbWj_1 [] Wc [* ; jj [c fji je e \ \ i [j i^ eYai Wh [jhWdibWj [Z m_j^ ikXi jWdj_Wb_b_a [b^ eeZ _dje [\ \ [Yji h [d \ ehY_d] j^ [i^ eYai ef [hWj_d] ed j^ [[Yede c o

; dej [mehj^o] Wf h [c W_di (j^ [h [\ eh (X [jm [[d j^ [MI G = xi WdZ @ [Z [hWb L [i [h1 [xi Yed _Z [dY [_d

j^ [ki [e \ c ed [jWho feb_Yo hkb [i* ? 1 [d Z [[f [h Z_iW] h [[c [dji Wff [Wh (^em [1 [h (e1 [h j^ [

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\ eh ikYY [ii \ kb c ed [jWho feb_Yo c Wa_d] *

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_dj [h [ij hWj [jWh] [j_d] _i \ kdZW c [djWbbo \ bWm [Z* N^ [MI G = xi ijhed] fh [\ [h [dY (\ he c 1 [ho ijWhj

_d -53 / (\ eh c ed [o] hemj^ e1 [h _dj [h [ij hWj [i Wi _dZ_YWjehi e \ j^ [ijWdY [e \ c ed [jWho feb_Yo mWi

fh[iW][Z Xo <hkdd[h WdZ G [bjp[hxi %-52& [nfbWdWj_ed \eh j^ [Ah[Wj > [fh[ii_ed(m^_Y^ Z\\[hi
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Wbbem_d] j^ [XheWZ c ed[o ijeYa WdZ j^ [fh_Y[b[l [b je Z[Yb_d[Xo c eh[j^Wd ed()]j^_hZ \\he c -5.5
j^hek]^ -5// (ed Wd _dj[bb[YjkWb lWYkk c Wj j^ [@[Z b[\j Xo j^ [Z[Wj^ e\ <[d^W c_d Mjhed]*
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bem _dj[h[ij hWj[i Wi W i_]d e\ ik_Y_[dj c ed[jWho [Wi[WdZ_]deh[Z j^ [YedjhWYj_ed_d j^ [c ed[o
ijeYa Wi W i_]d e\ [njhWehZ_dWho c ed[jWho j_] ^jd[ii* <hkdd[h WdZ G [bjp[h %-524(f*/04& j^ [h[\eh[
i[[j^ [Ah[Wj > [fh[ii_ed Wi [nY[fj_edWb edbo _d _ji b[d]j^ WdZ i[l[h_jo WdZ dej_d _ji \kdZW c [djWb
YWki[* Cd j^[_h l_[m(_j Wff[Whi Wi `kij ed[YWi[W c ed] c Wdo _d m^_Y^ j^ [uki[e\ i^ehj]j[hc
_dj[h[ij hWj[i Wi Wd _dZ_YWjeh e\ c ed[jWho feb_Yo [nfbW_di m^o j^ [@[Z[hWb L[i[h1[h[]WhZi _ji
feb_Yo Wi Yekdj[h]YoYb_YWb Z[i f_j[j^ [\WYj j^Wj j^ [c ed[jWho XWi[WdZ j^ [c ed[o ikf fbo %Ykhh[dYo
fbki Z[c WdZ Z[fei_ji&]hem Wj W]h[Wj[h hWj[Zkh_d] f[h_eZi e\ [Yede c_Y [nfWdi_ed WdZ W bem[h
hWj[Zkh_d] h[Y[ii_edi*v <hkdd[h %-531a(f*- .& [bWXehWj[i ed j^_i fe_dj_d ^_i GWhY^ -531
M I G= fei_j_ed fWf[h6

; d _dj[h[ij jWh][j feb_Yo c_ib[WZi c ed[jWho Wkj^eh_j_[i WdZ c Wdo if[YjWjehi je
X[b_[l[j^Wj [nfWdi_l[%eh h[ijh_Yj_l[& WYj_edi ^Wl[X[[d _dj_Wj[Z m^ [d dej^_d]
^Wi X[[d Zed[eh [l[d mehi[(m^ [d WYjkWbbo h[ijh_Yj_l[c [Wikh[i ^Wl[X[[d
_djheZkY[Z* ; Z[Yb_d[_d _dj[h[ij hWj[i h[ikbj_d] \\he c \\Wbb_d] Yh[Z_j Z[c WdZ
feii[ii[i de [nfWdi_edWho c [Wd_d] WdZ i_c fbo h[\b[Yji ed[Wif[Yj e\ j^ [ed]e_d]
Z[\bWj_edWho fheY[ii* Cji _dj[hfh[jWj_ed Wi Wd [nfWdi_l[WYj_ed Xo j^ [@[Z_i W
ZWd][heki _bbki_ed eXijhkYj_d] j^ [ki[\kb Wffb_YWj_ed e\ WYjkWbbo [nfWdi_l[
feb_Y_[i*

N^ [M I G= Wbie Wh]k[Z \h[gk[djbo j^Wj _dj[h[ij hWj[jWh][j_d] fheY[Zkh[i c WZ[_j Z__Ykbj
\\eh j^ [@[Z je X[]_d bem[h_d] _dj[h[ij hWj[i Wi Xki_d[ii WYj_l_jo m[Wa[d[Z Wj j^ [edi[j e\
h[Y[ii_edi WdZ je X[]_d hW_i_d] _dj[h[ij hWj[i je fh[l[dj_d\bWj_ed \\he c h_i_d] Wj j^ [ijWhj e\
[Yede c_Y h[Ye l[h_i* Cd[hj_W Whek dZ Xki_d[ii YoYb[jkhd_d] fe_dji mWi \\ebbem[Z Xo e l[h[h[WYj_ed
bWj[h ed(][d[hWj_d] W uijef)]ev fWjj[h d e\ c ed[jWho feb_Yo j^Wj W c fb_ [Z \bkYjkWj_edi _dij[WZ e\
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ijWX_b_p_d] j^ [Yede c o* ; i Q_bb_W c Jeeb [%-55,(f*2/& [nfbW_di(j^ [fheXb[c e _dj[h[ij hWj[
i c eej^_d] _i Xej^ [Yede c_Y WdZ feb_j_YWb6

N^ [fheXb[c j^ [@ [Z \WY[i _d a[[f_d] ced[o] hemj^ ed jhWYa _i ed[e _ji emd
c Wa_d] t _ji feb_Yo e \ c W_djW_d_d] j^ [\ [Z[hWb \kdZi hWj[_d W l[ho dWhhem XWdZ*
s N^ [dWhhem \ [Z \kdZi XWdZ ^Wi Xej^ [Yede c_Y WdZ feb_j_YWb Z_iWZlWdjW] [i*
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ie c [j_c [i ^Wi Z_\Ykbo_d WZ^kij_d] j^ [hWj[gk_Yabo [dek]^ je a[[f ced[o
] hemj^ \ he c X[Ye c_d] fheYoYb_YWb* s N^ [feb_j_YWb fheXb[c s _i j^Wj [l[hoed[
ademi j^Wj j^ [@ [Z _i Z_h[Yjbo WdZ _c c [Z_Wj[bo h[ifedi_Xb[\eh Y^Wd] [i _d j^ [
 \ [Z[hWb \kdZi hWj[WdZ Wb c eij Wi Z_h[Yjbo h[ifedi_Xb[\eh c ed[o c Wha[j hWj[i j_[Z
Ybei[bo je j^ [\kdZi hWj[* s J[efb[ZWcW] [Z Xo W hWj[Y^Wd] [^Wl [W f[h[Yjbo
dWjkhWb h[WYj_ed 8 um^o c [9v s N^ [@ [Z ^Wi de mWo je Wdim[h ikY^ W gk[ij_ed
X[YWki [j^ [j_c_d] e \ j^ [@ [Zxi hWj[Y^Wd] [i _d _d^ [h[djbo WhX_jhWho*

=h_j_Yi e \ j^ [MI G=xi fh[\ [hh[Z Wbj[hdWj_l [je \ [Z[hWb \kdZi hWj[jWh] [j_d] t i [jj_d] fh()

Wddekdy[Z jWh] [ji \eh j^ [] hemj^ hWj[e \ j^ [ced[jWho XWi [_dij[WZ t e \ j[d Wh] k[j^Wj j^_i Y^Wd] [

mekbZ Wbbem \eh ^Whc \kb WdZ Wle_ZWXb[leWj_b_jo_d c Wha[j hWj[i e _dj[h[ij* <hkdd[h %-54-(

f*34& WYademb[Z] [i(Xkj j^ [d ZemdfbWoi j^ [h[b[lWdY[e \ (j^ [i [YedY[hdi6

OdZ[h W feb_Yo e \ ced[jWho Yedjheb ed] e_d] i^eYai Wh[kdWle_ZWXbo WXiehX[Z WdZ
h[\b[Yj[Z Xo _dj[h[ij hWj[i* N^ _i m_bb_dZ [[Z fheZkY[ie c [leWj_b_jo* <kj j^ [
dWjkh[e \ j^_i leWj_b_jo d [[Z X[c eh [YWh[\kbb [nWc_d[Z* NhWdi_jeho i^eYai m_bb
X[h[\b[Yj[Z Xo W leWj_b] fWjj[hd e \ i^ehj[ij WdZ i^ehj hWj[i m_j^ b_jjb(\ Wdo(
if_bbe l[h je _dj[hc [Z_Wj[eh bed] j[hc hWj[i* J[hc Wd[dj i^eYai Wbie W\ [Yj _dj[h[ij
hWj[i WdZ Yedjh_Xkj[je] [d[hWj[cel [c [dji el[h j^ [m^eb[j[hc ijhkyjkh[* N^ [
YhkY_Wb YedZ_j_ed h[gk_h_d] ekh Wjj[dj_ed Wj j^_i fe_dj _i j^ [\WYj j^Wj j^ [i [
cel [c [dji _d _dj[h[ij hWj[i] [d[hWj[Z Xo f[hc Wd[dj i^eYai ef[hWj_d] X[oedZ j^ [
ced[o c Wha[j YWddej X[h[cel [Z Xo Wd _dj[h[ij jWh] [j feb_Yo* N^ [bWjj[h Yedl[hji
j^ [i [i^eYai _dje f[hc Wd[dj WYY[b[hWj_edi %eh Z[Y[b[hWj_edi& l_W ced[jWho
WYYec ceZWj_ed _dje Yehh[ifedZ_d] WYY[b[hWj_edi %eh Z[Y[b[hWj_edi& _d j^ [fh_Y()
b[l [b WdZ c WjY^_d] WZ^kijc [dji _d j^ [b[l [b e \ dec_dWb _dj[h[ij hWj[i* N^ [
kdY[hjW_djo WXekj j^ [j_c_d] WdZ cW] d.jkZ[e \ ced[jWho WYYec ceZWj_ed(
Wk] c [dj[Z Xo j^ [kdY[hjW_djo e \ W Y^Wd] [_d feb_Yo(j[dZi ^em[l[h je fheZkY[W
bWh] [h leWj_b_jo e _dj[h[ij hWj[i _d h[ifedi[je f[hc Wd[dj i^eYai kdZ[h Wd _dj[h[ij
jWh] [j_d] h[]_c [j^Wd kdZ[h W h[]_c [e \ ced[jWho Yedjheb* N^ [ieY_Wb Yeij e \
leWj_b] i^ehj hWj[i h[\b[Yj_d] ed] e_d] jhWdi_jeho i^eYai i[[c i _d co `kZ] c [dj
i c Wbb Ye c fWh[Z je j^ [ieY_Wb Yeij _c fei[Z ed j^ [[Yede c o Xo j^ [Wbj[hdWj_l [
feb_Yo*

; i dej[Z WXel[WdZ Wi B[jp[b % . , .0& [nfbW_di _d c eh[Z[jW_b(H[m E[od[i_Wd c eZ[bi ikY^ Wi AeeZ\h[_dZ WdZ E_d]xi %-553& fhe1_Z[Yedj[c fehWho h[]ijWj[c [dji e\j^ [jhWZ_j_edWb ced[jWh_ij fh_dY_fb[i ed j^ [ijWX_b_jo e\j^ [\h[[c Wha[j [Yede c o(j^ [fh_c Who _c fehjWdY[e\ ced[jWho feb_Yo _i ijWX_b_p_d] j^ [W]h[]Wj[de c_dWb fh_Y[b[l [b(WdZ j^ [Z_ij_dYj_ed X[jm[[d i^eYai je W]h[]Wj[ikf fb(m^_Y^ W\ [Yj Xe j^ j^ [WYjkWb WdZ dWjkhWb hWj[i e\ ekjfkj(WdZ i^eYai je W]h[]Wj[Z[c WdZ(m^_Y^ b[WZ je]Wfi X[jm[[d j^ [WYjkWb WdZ dWjkhWb b[l [bi e\ ekjfkj* B[jp[b % . , .0(f*0& Wbie [nfbW_di ^em(Xo ki_d] W ced[jWho feb_Yo hkb[kdZ[h m^_Y^ j^ [de c_dWb _dj[h[ij hWj[jhWYai c el[c [dji _d [gk_b_Xh_k c h[Wb _dj[h[ij hWj[t j^ [h[Wb _dj[h[ij hWj[j^Wj mekbZ fh[lW_b _d j^ [c eZ[bxi h[Wb Xki_d[ii YoYb[Yeh[t j^ [Y[djhWb XWda YWd efj_c Wbbo jkhd uel[h j^ [Z[j[h c_dWj_ed e\ h[Wb lWh_WXb[i je j^ [kd\ [jj[h[Z ef[hWj_ed e\ j^ [fh_Y[ioij[c v WdZ j^ [h[Xo c W_djW_d uj^ [ekjfkj]Wf s [gkWb je p[he*v AWbq % . , -1(f*- , /& [c f^Wi_p[i j^_i fe_dj Wi m[bb6 efj_c Wb ced[jWho feb_Yo _d j^ [H[m E[od[i_Wd c eZ[b _c fb_[i j^Wj de c_dWb _dj[h[ij hWj[c kij jhWYa c el[c [dji _d j^ [dWjkhWb h[Wb hWj[e\ _dj[h[ij*

Q^_b[<hkdd[h(G[bjpp[h(WdZ ej^ [h M I G= c [c X[hi mekbZ ikh[bo Wf fh[Y_Wj[j^ [[b[]WdY[e\ j^_i j^ [eh[j_YWb h[ikbj Wi m[bb Wi j^ [ced[jWh_ij Wh]k c [dji \eh _j(j^ [o c _]^ ij_bb [nfh[ii ZekXji WXekj j^ [WX_b_jo e\ j^ [@ [Z[hWb L[i[h l[(_d fhWYj_Y[(je c [Wikh[WdZ jhWYa fh[Y_i[bo c el[c [dji _d j^ [[gk_b_Xh_k c h[Wb hWj[* Me c [_dZ_YWj_ed e\ j^_i _i]_l [d Xo j^ [M I G=xi h[ifedi[je =ed]h[ii_edWb j[ij_c edo Xo @ [Z =^W_h ; bWd Ah[[difWd %-55/(f*- -&(m^_Y^ Wdj_Y_fWj[i j^ [H[m E[od[i_Wd fhefei_j_ed Xo Wh]k_d] j^Wj

I d[_c fehjWdj]k_Z[feij _i h[Wb _dj[h[ij hWj[i(m^_Y^ ^Wl[W a[o X[Wb_d] ed bed] [h]hkd if[dZ_d] Z[Y_i_edi WdZ _d\bWj_ed fheif[Yji* Cd Wii[ii_d] h[Wb hWj[i(j^ [Y[djhWb _iik[_i j^ [_h h[bWj_edi^_f je Wd [gk_b_Xh_k c _dj[h[ij hWj[(if[Y__YWbbo j^ [h[Wb _dj[h[ij hWj[b[l [b j^Wj(_d c W_djW_d[Z(mekbZ a[[f j^ [[Yede c o Wj _ji fheZkYj_ed fej[dj_Wb el[h j_c [* LWj[i f[hi_ij_d] WXel[j^Wj b[l [b(^_ijeho j[bbi ki(j[dZ je X[WiieY_Wj[Z m_j^ ibWYa(Z_i_d\bWj_ed(WdZ [Yede c_Y ijW]dWj_ed t X[bem j^Wj b[l [b m_j^ [l [djkhWb h[iekhY[Xejjb[d[Yai WdZ h_i_d] _d\bWj_ed(m^_Y^ kbj_c Wj[bo [d][dZ[hi [Yede c_Y YedjhWYj_ed* GW_djW_d_d] j^ [h[Wb hWj[WhekDZ _ji [gk_b_Xh_k c

b l [b i ^ e k b Z ^ W 1 [W i j W X _ b _ p _ d] [\ [\ [Y j e d j ^ [[Y e d e c o (Z _ h [Y j _ d] f h e Z k Y j _ e d j e m W h Z i _ j i b e d)] j [h c f e j [d j _ W b *]

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; d M I G = f e i _ j _ e d f W f [h X o Q _ b b _ W c J e e b [[b W X e h W j [i (X [\ e h [Y e d Y b k Z _ d] % J e e b [- 5 5 / (f f * 4 1) 2 & 6

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N ^ [M I G = x i W h] k c [d j i W] W _ d i j k i _ d] W d _ d j [h [i j h W j [h k b [j e j h W Y a c e l [c [d j i _ d

j ^ [[g k _ b _ X h _ k c h [W b h W j [W d j _ Y _ f W j [j ^ [Z _ \ \ Y k b j _ [i j ^ W j J e m [b b % . , - 4 (f * 0 & Z [i Y h _ X [i m _ j ^

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C d Y e d j h W i j j e J e e b [% - 5 5 / & (^ e m [l [h (J e m [b b % . , - 4 (f * - - & k b j _ c W j [b o [n f h [i i [i Y e d \ _ Z [d Y [_ d j ^ [

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c ed[jWho [nfWdi_ed kdj_b W ded_d\bWj_edWho hWj[s _i WY^_[l[Z*v <kj j^[_ hWj_edWb[\eh j^[_]][d[hWb
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⁴ DW c [i De^Wdd[i WdZ LeX[hj LWiY^ [h[]kbWhbo fhe l_Z[Z c ed[o c kbj_fb[h \eh[YWiji je ikf fehj
MI G= Z_iYkii_edi l_W fei_j_ed fWf[hi j^hek]^ekj j^ [[Whbo)je) c_Z]-54, i* N^[_h h[i[WhY^ ed j^_i
jef_Y Ykb_c_dWj[i _d W c ede]hWf^6 LWiY^ [WdZ De^Wdd[i %-543&*

\eh W c eZ_YWj_ed ^[YWbbi uG .)MNv %fhedekdY[Z uG . c_dki MNv& j^Wj ikXjhWYji i c Wbb j_c [Z[fei_ji \he c G . * Jeeb[%-55.& j^[d YWbbi \eh W \khj^[h c eZ_YWj_ed(Wbie ik)] [ij[Z Xo Gejb[o %-544&(j^Wj WZZi _dij_jkj_edWb c ed[o c Wha[j c kjkWb \kdZ i^Wh[i WdZ dW c [i j^_i fh[\hh[Z c ed[jWho W]]h[]Wj[uGSGv \eh u c ed[o p[he c Wjkh_jo*v Jeeb[%-550(f*-,0& jhWY[i j^[eh]Wd_p_d] fh_dY_fb[X[^_dZ GSG XWYa je j^ [[c f_h_YWb Z[_d_j_ed e\ c ed[o ik]] [ij[Z Xo @h_[Z c Wd WdZ MY^mWhjp %-52/&6 uYkhh[dYo fbki Wbb Wii[ji Yedl[hj_Xb[ed Z[c WdZ WdZ Wj fWh %j^Wj _i(m_j^ekj f[dWbjo&*v

N^ki(m^_b[j^ [MI G= Yedi_ij[djbo \Wleh[Z W feb_Yo m_j^ j^ [c ed[jWho XWi[Wi _ji _dijhk c [dj(j^ [=e c c_jj[[ijhk]]b[Z je _dZ Wd Wf fhefh_Wj[XheWZ[h c ed[jWho W]]h[]Wj[\eh ki[Wi Wd _dj[h c [Z_Wj[jWh][j(im_jY^_d] e1[h_j_c [\he c G- je G . WdZ j^[d GSG* LWiY^ [%-55.(f*53& bW c [dji(uWj W gk_Ya]bWdY[(j^ [X[^Wl_eh e\ lWh_eki c ed[jWho W]]h[]Wj[i _d j^ [h[Y[dj fWij _i gk_j[X[m_bZ[h_d]*v N^_i fheXb[c t e\ _dZ_d] j^ [uh_] ^jv c ed[jWho W]]h[]Wj[t m_bb X[h[jkhd[Z je X[bem*

N^ek]^ _j mWi YWij _d j[h c i e\ j^ [c ed[jWho XWi[c eh[\h[gk[djbo j^Wd W XheWZ[h c ed[jWho W]]h[]Wj[(j^ [MI G=xi fh[\hh[Z c ed[jWho feb_Yo hkb[h[i[c Xb[i @h_[Z c Wdxi %-52,& c eh[Ybei[bo j^Wd NWobehxi %-55/&(dej edbo X[YWki[_j \eYki[i ed j^ [c ed[o ijeYa _dij[WZ e\ j^ [_dj[h[ij hWj[Xkj Wbie X[YWki[(WfWhj \he c _iik[i h[bWj_d] je j^ [jhWdi_j_ed \he c _d\bWj_edWho _d_j_Wb YedZ_j_edi je fh_Y[ijWX_b_jo _d ij[WZo ijWj[(_j [iY^[mi Wdo \[[ZXWYa \he c [Yede c_Y YedZ_j_edi je _ji fh[iYh_X[Z feb_Yo WYj_edi* N^ [MI G=xi Wh]k c [dji W]W_dij j^ [ki[e\ W c eh[WYj_l_ij \[[ZXWYa hkb[[Y^e @h_[Z c Wdxi Wi m[bb* @h_[Z c Wd %-52,(f*43& [c f^Wi_p[i j^Wj X[YWki[u c ed[jWho Y^Wd][i ^Wl[j^ [_h [\[\Yj W\j[h W Yedi_Z[hWXb[bW] WdZ e1[h W bed] f[h_eZ WdZ j^Wj j^ [bW] _i hWj^[h lWh_WXb[(v Z[fWhjkh[i \he c ^_i YedijWdj c ed[o]hemj^ hWj[hkb[Wh[c eh[_b_a[bo je X[Z[ijWX_b_p_d] j^Wd ijWX_b_p_d]* M_c_bWhbo(MI G= c [c X[hi \h[gk[djbo Wh]k[Z j^Wj feb_Yo c Wa[hi

bWYa j^ [j_c [bo_d\eh c Wj_ed WdZ Z[jW_b[Z ademb[Z][e\ j^ [[Yede c oxi ijhkYjkh[j^Wj mekbZ Wbbem
j^ [c je ikYY[ii\kbb_o_c fb[c [dj c eh[WYj_l_ij feb_Y_[i*

<hkdd[h %-54.(ff*-2)3& ki[i j^ [_dYe c fb[j[_d\eh c Wj_ed Wh]k c [dj je [nfbW_d m^o
c ed[jWho feb_Yo i^ekbZ \eYki ed Yedjhebb_d] c ed[o]hemj^ (_dij[WZ e\ de c_dWb _dYe c [eh j^ [
fh_Y[b[1 [b Z_h[Yjbo6

Ged[jWho Yedjheb_i dej [n[hY_i[Z \eh_ji emd iWa[* Cj_i Wd _dijhk c [dj ki[Z je
_d\bk[dY[j^ [X[^W1_eh e\ j^ [fh_Y[b[1 [b eh e\ j^ [de c_dWb]hemj^ dWj_edWb
fheZkYj* ; ijhWj[]o e\ c ed[jWho Yedjheb c Wd_fkbWj[i Wd _dj[h c [Z_Wj[c W]d_jkZ[
Wi W c [Wdi je _d\bk[dY[j^ [X[^W1_eh e\ Wd kbj_c Wj[jWh][j* Cj_i YbW_c [Z ed
eYYWi_ed j^Wj j^_i _dj[h c [Z_Wj[jWh][j_d] _i_d[_Y_[dj* ; u\dWb jWh][j_d]v_i
e\ [h[Z Wi W c eh[[_Y_[dj ijhWj[]o* Ged[jWho feb_Yo i^ekbZ Z_h[Yjbo Yedjheb j^ [
de c_dWb]heii dWj_edWb fheZkYj* ; dWboj_Y [bWXehWj_edi e\ j^_i Z[W m^_Y^ feijkbWj[
W Z_h[Yj Yedjheb e\ de c_dWb AHJ Xo j^ [Wkj^eh_j_[i(_d j^ [i[di[e\ W if[Y_Wb WYj_ed
m^_Y^ Ywd_c c [Z_Wj[bo _n j^_i c W]d_jkZ[(Wh[^WhZbo mehj^ Wdo Z_iYkii_ed* ;
c eh[h[b[1Wdj Wf fheWY^ Wh]k[i j^Wj Wd [Yede c_Y ijhkYjkh[(Z[_d[Z Xo W c eZ[b(
c fb[i W kd_gk[h[bWj_ed X[jm[[d feb_Yo _dijhk c [dji WdZ de c_dWb A>J* He
_dj[h c [Z_Wj[jWh][j_i d[[Z[Z* Id j^ [YedjWho(_j Ywd X[i^emd j^Wj(]_1[d j^ [
c eZ[b(j^ [ki[e\ _dj[h c [Z_Wj[jWh][j_d] _i_d] [d[hWb Wd _d[h_eh fheY[Zkh[* N^_i
Wh]k c [dj Z[f[dZi ^em[1[h YhkY_Wbbo ed j^ [Wiik c fj_ed e\ \kbb WdZ h[b_WXb[
_d\eh c Wj_ed [nfh[ii[Z Xo j^ [c eZ[b* N^_i Wiik c fj_ed ij_bb X[bed]i Wj j^_i ijW][je
H[1[h]H[1[h FwdZ* =edjhebb_d] AHJ ed j^ [XWi_i e\ c_iYedY_l[Z X[b[\i WXekj
j^ [Z[jW_bi e\ j^ [[Yede c oxi h[i fed i [ijhkYjkh[_d1eb1[i ikXijWdj_Wb_h_iai e\ W
Z[ijWX_b_p_d] WYj_l_ij feb_Yo fWjj[hd*

N^ [M[fj[c X[h -54/ feb_Yo ijWj[c [dj %MI G= -54/(f*/& c Wa[i j^ [iW c [fe_dj c eh[YedY_i[bo6

NWh][ji \eh de c_dWb AHJ]hemj^ ^W1[X[[d fhefei[Z Wi Wd Wbj[hdWj_l] je
c ed[jWho jWh][j_i* N^ [_Z[W_i j^Wj j^ [@[Z[hWb L[i[h1[mekbZ WZ_kij j^ []hemj^ e\
c ed[o je WY^_[1[jWh][ji \eh AHJ]hemj^* Q[_dZ de c [h_j_d fhefeiWbi e\ j^_i
a_dZ* N^ [o mekbZ _dYh[Wi [[Yede c_Y _dijWX_b_jo WdZ c Wa[c ed[o]hemj^ [1[d
c eh[kdijWXb[j^Wd kdZ[h Ykhh[dj fheY[Zkh[i*

F_a[m_i[(<hkdd[h %-540& Ye c fWh[i W ufh_Y[hkb[v j^Wj WZ^kiji j^ []hemj^ hWj[e\ j^ [c ed[o
ikf fbo je jWh][j_j^ [fh_Y[b[1 [b m_j^ W ugkWdj_jo hkb[v j^Wj i_c fbo _n[i j^ []hemj^ hWj[e\ c ed[o*
B[YedY[Z[i %<hkdd[h -540(f*-1& j^Wj m^_b[gkWdj_jo hkb[uWle_Zi fej[dj_Wb_h_iai(v_j Wbie
uiWYh_Y[i fej[dj_Wb]W_di e\ f[h\eh c WdY[*v <kj ^ [Wbie [c f^Wi_p[i j^Wj j^ [uh_iai Wh[h[Wb WdZ
j^ [fej[dj_Wb]W_di _d j^ [WXi[dY[e\ WZ[gkWj[ademb[Z][ie c [m^Wj _bbkieho*v

?1[djkWbbo(^em[1[h([1[d j^ [MI G=]W1[kf ed YedijWdj c ed[o]hemj^ hWj[hkb[i* N^ [

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@eh c Wdo o[Whi(m[WZleYWj[Z WdZ Y_j[Z]hemj^ e\ j^ [c ed[jWho XWi[Wi j^ [c eij
h[b_WXb[c [Wikh[e\ @[Z[hWb L[i[h1[WYj_edi* Cd ifh_d] -55,(m[h[Wb_p[Z j^Wj
]hemj^ e\ j^ [XWi[mWi Z_ijehj[Z Xo bWh][_dYh[Wi[i_d Ykhh[dYo je c [[j Z[c WdZi
\eh W h[bWj_1[bo ijWXb[WdZ][d[hWbbo WYY[fjWXb[c ed[o_d ?Wij[hd ?khef[WdZ
FWj_d ; c [h_YW* N^[i[Z_ijehj_edi Yedj.dk[je W\ [Yj j^ [b[1[b e\ j^ [c ed[jWho XWi[
Xkj de bed][h ikXijWdj_Wbbo W\ [Yj _ji Ykhh[dj]hemj^ hWj[* I kh YWbYkbWj_edi i^em
j^Wj j^ [Wddkwb]hemj^ e\ j^ [c ed[jWho XWi[\eh j^ [o[Wh je ZWj[^Wi h[c W_d[Z_d W
hWd][e\ 1 f[hY[dj je 2 f[hY[dj W\j[h Yehh[Yj_d] \eh fWij Z_ijehj_edi* s N^ [@[Z[hWb
L[i[h1[i^ekbZ c W_djW_d]hemj^ e\ j^ [c ed[jWho XWi[m_j^_d j^_i hWd][d[nj o[Wh(
[nYbkZ_d] Y^Wd)[i_d Z[c WdZ \eh O*M* Ykhh[dYo \he c j^ [Me1_l_j h[fkXb_Yi(?Wij[hd
?khef[(FWj_d ; c [h_YW eh [bi[m^h[(m^_Y^ i^ekbZ X[WYYe c c eZWj[Z*

Nme o[Whi bWj[h(; bbWd G[bjp[h % -55/& fh[i[dj[Z W MI G= fei_j_ed fWf[h j^Wj _djheZkY[Z W i_c fb[
\eh c kbW \eh Ye c fkj_d] W jWh][j hWj[e\]hemj^ \eh j^ [c ed[jWho XWi[(WZWfj_1[bo Yehh[Yj_d] \eh Wbb
Y^Wd)[i_d XWi[1[beY_jo(dej `kij j^ei[YWki[Z Xo _dYh[Wi[i_d \eh[_]d ^ebZ_d]i e\ OM Ykhh[dYo(
WdZ WZ`kij_d] \eh Y^Wd)[i_d h[Wb A>J]hemj^ Wi m[bb* ; YYehZ_d] je j^_i d[m hkb[(o[Wh)e1[h)
o[Wh]hemj^ e\ j^ [c ed[jWho XWi[]ji i[j gkwb je . f[hY[dj fbki j^ [j^h[()o[Wh W1[hW][e\ h[Wb
A>J]hemj^ c_dki j^ [j^h[()o[Wh W1[hW][e\ XWi[1[beY_jo]hemj^* N^ [hkb[_i j^ [h[Xo
YedijhkYj[Z je WY^_[1[. f[hY[dj _d\bWj_ed ed W1[hW][(Xkj Wbie i[[ai je WY^_[1[c eZ[ij
ijWX_b_pWj_ed eX`[Yj_1[i* ; YYehZ_d] je G[bjp[h % -543(ff*- .)/&6

N^ [j^h[[o[Wh c e1_d] W1[hW][]_1[i_j_c [je b[Whd m^[j^ [h i^eYai Wh[f[h c Wd[dj
eh jhWdi_jeho* Cj fhe1_Z[i \eh \Wij[h c ed[o]hemj^ h[bWj_1[je ekjfkj_d W YoYb_YWb
h[Y[ii_ed WdZ ibem[h c ed[o]hemj^ h[bWj_1[je ekjfkj_d W YoYb_YWb [nfWdi_ed*
Ged[o]hemj^ WZ`kiji je c W_djW_d[Z Y^Wd)[i_d j^ []hemj^ hWj[e\ ekjfkj eh_d j^ []
]hemj^ hWj[e\ c ed[jWho 1[beY_jo* N^ [hkb[Ze[i dej h[bo ed \eh[YWijj* Odb_a[W
hkb[fh[iYh_X_d] W _n[Z hWj[e\ c ed[o]hemj^ (j^ [fhfeiz hkb[a[[fi j^ [
[nf[Yj[Z fh_Y[b[1[b YedijWdj*

J[hiedd[b Y^Wd)[i Wbie W\ [Yj[Z j^ [dWjkh[WdZ hWd][e\ feb_Yo hkb[i Yedikbj[Z Xo j^ [

MI G=* Cd Hel[c X[h . . . , %MI G= . . . , &(; bbWd G[bjp[h h[j_h[Z Xeja Wi c [c X[h WdZ Y^W_h e\
=e c _jj[[* =^Whb[i Jbei[h WdZ ; ddW MY^mWhjp X[YWc [Ye)Y^W_hi(WdZ <[dd[jj GY=Wbbk c

`e_d[Z Wi W d[m c [c X[h* Hej ikhfh_i_d]bo(ijWhj_d]_d HeI [c X[h . . . (M I G = J e b _ Y o M j W j [c [d j i
X[]Wd h[\[hh_d] je j^[fh[iYh_fj_edi e\ j^[c ed[jWho feb_Yo hkb[fhefei[Z Xo GY=Wbbk c %-543(
-544&*⁵ F_a[G[bjp[hxi(j^[GY=Wbbk c hkb[fheI_Z[i W jWh][j \eh j^[]hemj^ hWj[e\ j^[c ed[jWho
XWi[j^Wj WZ^kiji(WZWfj_l[bo(je fWij Y^Wd)[i _d XWi[l[beY_jo* Mb_] ^jbo Z_\[h[dj \he c G[bjp[hxi(
j^[GY=Wbbk c hkb[fh[iYh_X[i W gkWhj[h]je)gkWhj[h]hemj^ hWj[\eh j^[c ed[jWho XWi[WdZ ki[i W
\ekh)o[Wh Wl[hW][e\ XWi[l[beY_jo je WZ^kij \eh i^_ji _d Ykhh[dYo WdZ h[i[h l[i Z[c WdZ* ; c eh[
ikXijWdj_Wb Z_ij_dYj_ed X[jm[[d j^[jme hkb[i Ye c [i(^em[l[h(j^hek)^ GY=Wbbk c xi _dYbki_ed e\
Wd WZZ_j_edWb \[[ZXWYa j[h c j^hek]^ m^_Y^ j^[fh[iYh_X[Z hWj[e\ XWi[]hemj^ mekbZ_dYh[Wi[eh
Z[Yh[Wi[Wi de c_dWb_dYe c [\bb X[bem eh hei[WXel[W jWh][j b[l[b* GY=Wbbk c xi %-544&
[nf[h_c [dji ki_d] W hWd][e\ i c Wbb)iYWb[c WYhe[Yede c_Y c eZ[bi b[Z ^_c je fh[\[h W hkb[j^Wj
fbWY[Z W c eZ[ij Xkj ij_bb i_]d_YWdj m[_]^j ed j^_i WZZ_j_edWb \[[ZXWYa j[h c (c Wha_d] W \khj^h
Z[fWhjkh[\he c j^[YedijWdj c ed[o]hemj^ hkb[*

<[_dd_d]_d HeI [c X[h . . . (j^[M I G = x i J e b _ Y o M j W j [c [d j i % [*] * (M I G = . . . & W b i e
X[]Wd h[\[hh_d] je j^[i [jj_d]i \eh j^[\[Z[hWb \kdZi hWj[fh[iYh_X[Z Xo j^[N W o b e h % - 5 5 / & h k b [*
N^_i c_] ^j X[h[]WhZ[Z Wi ikhfh_i_d)(]_l[d j^[M I G = x i b e d] i j W d Z _ d] e X [Y j _ e d i j e j ^ [@ [Z [h W b
L[i[h l[xi _dj[h(ij)hWj[jWh][j_d] fheY[Zkh[i* ; i dej[Z WXel[(^em[l[h(GY=Wbbk c xi %-54-(
-542& [Whb_[h h[i[WhY^ ik]] [ij[Z j^Wj j^[fheXb[c m_j^ j^ei[fheY[Zkh[i mWi dej ie c kY^ j^Wj
j^[o ki[Z Wd _dj[h(ij hWj[_dijhk c [dj Xkj j^Wj j^[o \W_b[Z je WZ^kij j^[_dj[h(ij hWj[_dijhk c [dj m_j^
ik_Y_[dj i f[[Z WdZ l_]eh_d h[i fed i [je Y^Wd][i _d_d\bWj_ed t W Yh_j_YWb Z_ij_dYj_ed h[Ye]d_p[Z
bWj[h Xo LWiY^ [%-55.& WdZ_bbki jhWj[Z_d c eh[Z[jW_b Xo =bWh_ZW(AWbq(WdZ A[hjb[h % . . . , &* Cd
\WYj(j^[N W o b e h h k b [[c X e Z _ [i m ^ W j Q e e Z \ e h Z % . . . / (f * 0 , & Y W b b i j ^ [u N W o b e h f h _ d Y _ f b (v j ^ W j _ i (
j ^ [] k _ Z [b _ d [j ^ W j j ^ [_ d j [h [i j h W j [c k i j h _ i [c e h [j ^ W d f h e f e h j _ e d W b b o j e W Y ^ W d] [_ d _ d \ b W j _ e d j e

⁵ M[[(\eh [nW c fb[(M I G = % . . . (f f * -) / & W d Z M I G = % . . . / (f f * .) / & *

fh[i[h1[j^ ijWX_b_jo e\ _d\bWj_ed WhekDZ_ji bed)]hkd jWh] [j* GY=Wbbk c xi % . . , 2& M I G= Jei_j_ed
JWf[h ki[i Xej^ ^_i emd hkb[WdZ NWobehxi je [1WbkWj[\[Z[hWb h[i[h1[feb_Yo kdZ[h =^W_h ; bWd
Ah[[difWd* Q_j^ ijKZ_[i b_a[^_i(j^ M I G= Yedj_dk[Z je Wh]k[\eh j^ ki[\kbd[ii e\ feb_Yo hkb[i
\eh j^ c ed[jWho XWi[([1[d Wi _j h[Ye]d_p[Z j^ 1Wbk[e\ j^ NWobeh hkb[Wi m[bb*

JheXb[c i m_j^ j^ M I G=xi h[b_WdY[ed G- Xej^ Wi Wd _dZ_YWjeh e\ j^ @[Zxi c ed[jWho feb_Yo
ijWdY[WdZ Wi Wd _dj[h c [Z_Wj[jWh][j m_j^_d j^ =e c c_jj[[xi fh[\hh[Z ijhWj[]_Y \hW c [meha Whei[
_d j^ [Whbo -54, i m^ [d _dWdY_Wb _dde1Wj_edi WdZ h[]kbWjeho Y^Wd][i Xbkh[Z j^ Z_ij_dYj_ed
X[jm[[d ded)_dj[h[ij]X[Wh_d] Z[c WdZ Z[fei_ji _d G- WdZ _dj[h[ij]X[Wh_d] iW1_d]i Z[fei_ji _d
G.* N^ [i[fheXb[c i _dj[di_ [Z _d -54/ WdZ -540(m^ [d eXi[h1Wj_edi e\ [njh[c [bo hWf_Z G-
]hemj^ b[Z j^ M I G= je mWhd e\ W h[jkhd je ^_]^[h hWj[i e\ _d\bWj_ed j^Wj(\ehjkdWj[bo[d[1[h
c Wj[h_Wb_p[Z* G [bjp[h % . . , (f*- .2& h[Yekdji

s j^ c ed[jWh_ij c_ijWa[mWi j^ _W_bkh[je \eh[YWij j^ [Z[Yb_d[_d _d\bWj_ed \he c
-, *5 " _d -54- je /*. " _d -54/ WdZ 0*/ " _d -540 s * Ged[o]hemj^ _d -54/ WdZ
-540 W1[hW][Z 5 " *

G_bjed @h_[Zc Wd %-540(f*0, , & c Wa[i j^ iWc [u c ed[jWh_ij c_ijWa[v_d [nfh[ii_d] j^ [i[
YedY[hdi6

N^ [_dYh[Wi[Z hWj[e\ c ed[jWho]hemj^ _d j^ [-54-)5/ X_[dd_k c ik][]iji j^Wj m[
^W1[fWii[Z j^ [jhek]^ _d _d\bWj_ed WdZ j^Wj _d\bWj_ed m_bb X[Z[Y_Z[Zbo ^_]^[h
\he c -54/ je -541 j^Wd _j mWi \he c -54- je -54/*

; i FW_Zb[h % . . , 0(f*4& [c f^Wi_p[i(uj^_i m_Z[bo fkXb_Y_p[Z WdZ [hhed[eki fh[Z_Yj_ed e\ j^
_c c_d[dj h[Wff[WhWdY[e\ ZekXb[Z_]j _d\bWj_ed s Z_Z c kY^ je kdZ[hc_d[j^ [[c f_h_YWb YWi[\eh
XWi_d] c ed[jWho feb_Yo ed Yedjheb e\ j^ c ed[o ikf fbo([1[d W c ed] _dj[h[ij[Z bWo eXi[h1[hi*v

; hekdZ j^_i iWc [j_c [(^em[1[h(<Whd[jj %-54, & Z[c edijhWj[Z ^em [Yede c_Y
W)]h[]Wj_ed WdZ ijWj_ij_YWb _dZ[n dk c X[h j^ [eho YekbZ X[ki[Z je YedijhkYj c eh[WYYkhWj[
c [Wikh[i e\ j^ [c ed[o ikf fbo _d Y_hYk c ijWdY[i t [nWYjbo b_a[j^ei[j^Wj ^W1[fh[1W_b[Z_d j^ [OM
i_dY[j^ [[Whbo -54, i t _d m^_Y^ Yedik c [hi Z[h_l[b_gk_Z_jo i[h1_Y[i \he c W hWd][e\ Wii[ji j^Wj
fWo _dj[h[ij Wj Z_\[h[dj hWj[i WdZ ikXij_jkj[_c f[h[\Yjbo \eh ed[Wdej^[h_d j^ [h fehj\eb_ei*
<Whd[jjxi fh[\[hh[Z u>_1_i_Wv c ed[jWho W)]h[]Wj[i Wii_]d Z_\[h[dj m[_]^ji je j^ [i[Z_\[h[dj
Wii[ji XWi[Z ed j^ [i fh[WZi X[jm[[d j^ [_dj[h[ij hWj[ed Wd _bb_gk_Z uX[dY^ c Whav Wii[j WdZ j^ [
_dj[h[ij hWj[i fW_Z ed j^ [b_gk_Z Wii[ji j^ [c i[bl[i*

@_]kh[. Ye c fWh[i j^ []hemj^ hWj[i e\ j^ [@[Z[hWb L[i[h1[xi e_Y_Wb ui_c fb()ik cv G-
WdZ G. W)]h[]Wj[i je j^ [Yehh[i fedZ_d] >_1_i_W W)]h[]Wj[i*⁶ Geij dejWXbo(j^ [>_1_i_W
W)]h[]Wj[i i_]dWb W c kY^ i^Whf[h c ed[jWho YedjhWYj_ed(dej edbo Zkh_d] -54/0 [f_ieZ[Xkj
j^hek]^ekj j^ [o[Whi e\ j^ [PebYa[h Z_i_d\bWj_ed* <Whd[jj % . , - . (ff*- , .)--& Z_iYkii[i j^_i
[f_ieZ[(YedYbkZ_d] %f*---& j^Wj u@_h[Z c Wdxi [hheh h[ikbj[Z \he c ^_i ki[e\ j^ [@[Zxi e_Y_Wb
i_c fb()ik c c ed[jWho W)]h[]Wj[i(m^_Y^]h[Wjbo Z_ijehj[Z m^Wj ^WZ ^Wff[d[Z je j^ [[Yede c oxi
c ed[jWho i[h1_Y[\bem*v

=^hoijWb WdZ GWY>edWbZ %-550(f*32& Ye_d j^ [j[hc u<Whd[jj Yh_j_gk[v je h[\[h je j^ [
XheWZ[h i[j e\ _dZ_d]i ik]]ij_d] j^Wj ufheXb[c i m_j^ j[iji e\ c ed[o_d j^ [[Yede c o_d h[Y[dj
o[Whi c Wo X[c eh[Zk[je XWZ c [Wikh[c [dj j^ [eho hWj^[h j^Wd je Wd _dijWX_b_jo_d j^ [b_da
X[jm[[d j^ [jhk[c ed[o WdZ j^ [[Yede c o*v <[bed]_W %-552&(B[dZh_Yaied % . , -0&(WdZ <[bed]_W
WdZ Ch[bWdZ % . , -2& fhe1_Z[_bbkijhWj_edi e\ j^_i Yh_j_gk[(Xo i^em_d] j^Wj h[ikbji \he c <[hdWda[

⁶ ; bb ZWjW i[h_[i ki[Z_d j^_i ijkZo Ye c [\he c j^ [@[Z[hWb L[i[h1[<Wda e\ Mj* Fek_ix @L?>
ZWjWXWi[Wj [^jjfi6+\h\[Z*ijbek i\Z*eh\]+](#) ([nY[fj j^ei[\eh j^ [>_1_i_W c ed[jWho W)]h[]Wj[i(m^_Y^
Wh[Z[iYh_X[Z Xo <Whd[jj(F_k(GWjjied(WdZ 1Wd Z[d Heehj % . , - /& WdZ Wh[W1W_bWXb[\he c j^ [
=[dj[h \eh @_dWdY_Wb MjWX_b_jo Wj [^jjfi6+Y\[dj\[h\eh\ dWdY WbijWX_b_jo*eh\]+W c \c VZjWj* f^f*](#)

WdZ <b_dZ[h %-55.&(@h_[Zc Wd WdZ Ekjdd[h %-55.&(WdZ h[bWj[Z ijkZ_[i ik]] [ij_d] _dijWX_bjo_d
ced[o Z[c WdZ WdZ m[Wad[ii_d ej^[h ijWj_ij_Ywb h[bWj_edi^_fi X[jm[[d j^[ced[o ijeYa WdZ
c [Wikh[i e\ W]]h[]Wj[fh_Y[i WdZ_dYec [Wh[\h[gk[djbo h[l[hi[Z m^[d >_l_i_W W]]h[]Wj[i
h[fbWY[i_c fb[ikc i_d j^[_h WdWboi[i*

Geh[h[Y[djbo(j^[ki[\kdb[ii e\ gkWdj_jo)j^[eh[j_Y Wf fheWY^[i je ced[jWho feb_Yo
[lWbkWj_ed Wff[Whi je ^Wl[X[[d YWij_d ijhed] ZekXj Xo j^[[nf[h_dY[Zkh_d] WdZ Wj[h j^[
_dWdY_Wb Yh_i_i WdZ Ah[Wj L[Y[ii_ed e\ . , ,3)5 m^[d(Wi dej[Z WXel[(j^[ced[jWho XWi[
_dYh[Wi[Z Xo W \WYjeh e\ \ekh m_j^ekj] [d[hWj_d] Wdoj^_d] Ybei[je W fhefeh_j_edWb_dYh[Wi[_d
de c_dWb_dYec [eh j^[fh_Y[b[l[b* Bem[l[h(W gk_Ya beea Wj j^[ZWjW je] [j^ [h m_j^ W i c Wbb
W c ekdj e\ h[\b[Yj_ed h[l[Wb j^Wj j^_i YedYbki_ed_i dej Wi _c c [Z_Wj[WdZ eXl_eki Wi c Wdo i[[c je
j^_da*

@_hij(Wi j^[jef fWd[b e\ _]kh[/ i^emi(W ikXijWdj_Wb \hWYj_ed e\ j^_i_dYh[Wi[_d j^[
ced[jWho XWi[eYYkhh[Z Zkh_d] W l[ho dWhhem _dj[h lWb Wj j^[^[_]^j e\ j^[_dWdY_Wb Yh_i_i_d bWj[
. , ,4* ; i [c f^Wi_p[Z Xo QWbj[h WdZ =ekhje_i . , ,5& WdZ Ch[bWdZ . , ,5&(j^[@[Z[hWb L[i[h l[
X[]Wd fWo_d] _dj[h[ij ed XWda h[i[h l[i Zkh_d] j^_i_j_c [(fh[Y_i[bo ie j^Wj j^[^k][_dYh[Wi[_d
h[i[h l[i h[gk_h[Z Xo j^[[nfWdi_ed e\ _ji [c [h][dYo b[dZ_d] fhe]hW c i \ebbem_d] j^[_Wbkh[e\
F[^c Wd <hej^[hi WdZ ; CA mekbZ not fkj \khj^[h ZemdmWhZ fh[iikh[ed j^[\[Z[hWb \kdZi hWj[
WdZ j^[h[Xo WZZ je _d\bWj_edWho fh[iikh[i* N^[Wf fhen_c Wj[ZekXb_d] e\ j^[ced[jWho XWi[_d
. , ,4_i(j^[h[\eh[(X[ij _dj[hfh[j[Z Wi h[\b[Yj_d] h_] ^jmWhZ i^_ji_d Xej^ j^[Z[c WdZ \eh WdZ
ikfbo e\ XWda h[i[h l[i j^Wj b[\j j^[ijWdY[e\ ced[jWho feb_Yo Wf fhen_c Wj[bo kdY^Wd][Z*

Cj h[c W_di jhk[j^Wj j^[ced[jWho XWi[[nfWdZ[Z hWf_Zbo W]W_d Wi j^[@[Z_c fb[c [dj[Z
jme c eh[mWl[i e\ gkWdj_jWj_l[[Wi_d] _d \he c . , ,5 j^hek]^ . , -0* ; bbem_d] \eh j^[ikXi[gk[dj
o[Whi e\ ugkWdj_jWj_l[]_]^j[d_d](v ^em[l[h(j^[XWi[`kij WXekj ZekXb[Z(\he c !-*3 jh_bb_ed_d

DWdkWho . , ,5 je !/*/ jh_bb_ed_d DWdkWho . , -5*7 Cd WXiebkj[j[h c i j^_i _dYh[Wi[Wff[Whi bWh] [(Xkj
_j eYYkhh[Z e1[h W f[h_eZ ifWdd_d] Wd [dj_h[Z[YWZ[(bed] [dek]^ \eh j^ [fem[h e\ Ye c fekdZ_d]
je a_Ya _d* Q^[d [nfh[ii[Z Wi Wd Wddkwb_p[Z]hemj^ hWj[(j^ [_dYh[Wi[W c ekdji `kij ib_] ^jbo b[ii
j^Wd 3 f[hY[dj ed W1[hW][e1[h . , ,5)-56 ie c [m^Wj hWf_Z je X[ikh[Xkj(Wi <[bed]_W WdZ Ch[bWdZ
% . , .0& [c f^Wi_p[(dej ekj e\ b_d[m_j^ feijmWh ^_ijeh_YWb [nf[h_dY[WdZ Y[hjW_dbo gk_j[\Wh \he c
^of[h_d\bWj_edWho*

@khj^ [h [1_Z[dY[j^Wj j^ [. , ,4 _dYh[Wi[_d j^ [ikf fbo e\ XWi[c ed[o mWi bWh] [bo
uij[h_b_p[Z(v Wi QWbj[h WdZ =ekhje_i % . , ,5(f* .& fkj _j(Xo W Yehh[i fedZ_d] i^ _j _d j^ [Z[c WdZ \eh
h[i[h1[i Wff[Whi _d j^ [h[c W_d_d] jme fWd[bi e\ _] kh[/ (m^_Y^ h[1[Wb j^Wj d[j^ [h i_c fb]) ik c
deh >_1_i_W G .]hemj^ WYY[b[hWj[Z f[hi_ij[djbo X[jm[[d . , ,4 WdZ . , -5* <o YedjhWij(G .]hemj^
Z_Z ikh[[Zkh_d] j^ [f[h_eZ e\ p[he _dj[h[ij hWj[i WdZ gkWdj_jWj_1[[Wi_d] _d . , , .) -(fh[iW]_d]
j^ [kdmWdj[Z _d\bWj_ed j^Wj \ebem[Z* L[odWhZ % . , . /& [nW c_d[i j^ [i[WdZ i[1[hWb ej^ [h [f_ieZ[i
e\ Y[djhWb XWda XWbWdY[i^ [[j [nfWdi_ed_d j^ [OM(DWfWd(WdZ ; h) [dj_dW WdZ _dZi j^Wj
Yedi_ij[djbo(hWf_Z]hemj^ e\ XWi[c ed[o] [ji \ebem[Z Xo c eh[hWf_Z _d\bWj_ed edbo m^ [d XheWZ
c ed[o]hemj^ WYY[b[hWj[i Wi m[bb*

N^ [i[eXi[h1Wj_edi fe_dj je j^ [d[[Z(_hij(je c [Wikh[j^ [c ed[o ijeYa Wi WYYkhWj[bo Wi
feii_Xb[WdZ(i[YedZ(je Yedjheb \eh ibem) c e1_d] jh[dZi _d c ed[o Z[c WdZ m^ [d beea_d] \eh
gkWdj_jo) j^ [eh[j_Y b_dai X[jm[[d c ed[o]hemj^ WdZ de c_dWb if[dZ_d]* ; i dej[Z WXe1[(j^ [
M I G =]hWZkWbbo h[WY^ [Z j^ [iW c [YedYbki_edi feij]-54, (j^hek)^ Jeeb[xi %-55-(-55.(-550&

⁷ N^ [i[_] kh[i h[\h j e j^ [c ed[jWho XWi[Wi h[fehj[Z Xo j^ [@ [Z[hWb L[i[h1[<eWhZ e\
Ae1[hdehi* N^ [M I G = jof_YWbbo h[\hh[Z je Wd Wbj[hWj_1[c [Wikh[e\ j^ [c ed[jWho XWi[(
WZ^kij[Z \eh Y^Wd] [i _d h[i[h1[h[gk_h[c [dji Xo j^ [Mj* Fek_i @ [Z[hWb L[i[h1[<Wda* <ej^ e\
j^ [i[c [Wikh[i e\ j^ [c ed[jWho XWi[Wh[[nW c_d[Z _d c eh[Z[jW_b X[bem(Xkj i_dY[j^ [Mj* Fek_i
@[Z Z_i Yedj_dk[Z _ji i[h_[i _d . , -5(j^ [hWf^ _d _] kh[/ t hkdd_d] j^hek)^ . , .0 t ki[i j^ [
<eWhZ e\ Ae1[hdehix c [Wikh[_dij[WZ*

meha Z[1[bef_d] j^ [GSG W]]h[]Wj[Wi Wd Wbj[hdWj_1[je j^ [@[Z[hWb L[i[h1[xi G- WdZ G . WdZ
j^hek]^ G [bjp[hxi %-543(-55/& WdZ GY=Wbbk c xi %-543(-544(. , ,2& meha m_j^ c ed[jWho feb_Yo
hkb[i j^Wj WZwfj je i^_ji _d XWi[1[beY_jo* N^ [i[_Z[Wi ^W1[X[[d ki[Z(c eij h[Y[djbo(Xo
<[bed]_W WdZ Ch[bWdZ % . , -1(. , -3(. , . . & WdZ Ch[bWdZ % . , . / (. , . 0b(. , . 0c& je Yed_h c j^ [
Yedj_dk[Z h[b[1WdY[e\ c [Wikh[i e\ c ed[o m_j^_d W ijhWj[]_Y \hW c [meha Z_h[Yj[Z Wj WY^_1_d]
WdZ c_W_djW_d_d] W]h[]Wj[fh_Y[ijWX_b_jo*⁸

N^_i meha [nj[dZi j^ [J)ijWh c eZ[b(m^_Y^ mWi Z[1[bef[Z Xo h[i[WhY^ [hi Wj j^ [@[Z[hWb
L[i[h1[_d j^ [bWj[-54, i Wj j^ [h[gk[ij e\ j^ [d]=^W_h ; bWd Ah[[difWd WdZ fh[i[dj[Z je Wd
WYWZ[c_Y WkZ[_dY[1_W Wd Whj_Yb[_d j^ [*American Economic Review* Xo B Wbb c Wd(Jehj[h(WdZ
M c Wbb %-55-&* ; i [c f^Wi_p[Z Xo Ch[bWdZ % . , . / &(j^ [i[\WYji Wh[dej `kij jh_1_W* N^ [o i[h1[Wi
h[c_dZ[hi j^Wj [c f_h_YWb meha [nfbeh_d] gkWdj_jo)j^ [eh[j_Y b_daW] [i X[jm[[d c ed[jWho
W]]h[]Wj[i WdZ j^ [fh_Y[b[1[b were edY[e\ Wj b[Wij ie c [_dj[h[ij je jef feb_Yo c Wa[hi WdZ j^ [_h
WZ1_iehi Wj j^ [@[Z WdZ je WYWZ[c_Y [Yede c_iji Wi m[bb*

N^ [eh_]_dWb J)ijWh c eZ[b jWa[i Wi _ji ijWhj_d] fe_dj j^ [[gkWj_ed e\ [nY^Wd] [

$$t \ t! \ t \cdot \check{Z}_t'' \quad / \circ$$

m^ [h[t Z[dej[i j^ [c ed[o ijeYa(!_t c ed[jWho 1[beY_jo(\check{Z}_t j^ [W]]h[]Wj[de c_dWb fh_Y[b[1[b(
WdZ " _t h[Wb A>J* I \ Yekhi[(%-& ^ebZi Wi Wd _Z[dj_jo(Xo 1_hjk[e\ j^ [Z[_d_j_ed e\ 1[beY_jo Wi
de c_dWb A>J \check{Z}_t Z_1_Z[Z Xo j^ [c ed[o ijeYa t _t* N^ [J)ijWh c eZ[b]_1[i j^ [[gkWj_ed j[ijWXb[
_c fb_YWj_edi WdZ fh[Z_Yj_1[fem[h(^em[1[h(Xo c Wa_d] Wiik c fj_edi WXekj j^ [X[^W1_eh e\
1[beY_jo WdZ h[Wb A>J* Ne WYYe c fb_i^ j^ _i(B Wbb c Wd(Jehj[h(WdZ M c Wbb h[mh.j[%-& je Z[_d[j^ [
1Wh_WXb[t uJ)ijWhv t j^Wj]_1[i j^ [_h c eZ[b _ji dW c [6

⁸ GkY^ e\ j^ [WdWboi_i j^Wj \ebbemi ZhWmi ed WdZ [nj[dZi j^Wj \he c Ch[bWdZ % . , . 0c&*

$$\check{Z}_t^* \cdot \frac{t! t^*}{t} \quad / \circ$$

Cd % . & (! t* WdZ " t* Z[dej[j^ [udWjkhWb(v u[gk_b_Xh_k c (v eh ujh[dZv b[l[bi je m^_Y^ l[beY_jo WdZ h[Wb
A>J Wh[[nf[Yj[Z je h[jkhd_d j^ [bed] hkd* <ej^ YWd lWho e l[h_j_c [(! t* X[YWki[e\ f[hi_ij[dj
i^_ \j_i _d j^ [Z[c WdZ \eh c ed[o h[bWj_1[je ej^ [h Wi i[ji(_dYbkZ_d] j^ei[h[ikbj_d] \he c _dWdY_Wb
_dde lWj_edi WdZ h[] kbWjeho Y^Wd][i b_a[j^ei[j^Wj W\ \Yj[Z G- l[beY_jo _d j^ [[Whbo -54, i WdZ
G. l[beY_jo _d j^ [[Whbo -55, i(WdZ " t* X[YWki[e\ j[Y^debe]_YWb Y^Wd][i j^Wj] [d[hWj]
\bkYjkWj_edi _d j^ [hWj[e\ bed]) hkd [Yede c_Y] hemj^* N^ [lWh_WXb[\check{Z}_t^* j^ [d ^Wi j^ [_dj[hfh[jWj_ed
Wi j^ [b[l[b je m^_Y^ W]] h[] Wj[fh_Y[i m_bb Yed l[h][(]_1 [d j^ [Ykhh[dj b[l[b e\ j^ [c ed[o ijeYa(
Wi l[beY_jo WdZ h[Wb A>J h[jkhd je j^ [_h emd bed]) hkd b[l[bi*

=edi_ij[dj m_j^ j^ [gkWdj_jo j^ [eho e\ c ed[o(j^ [h[\eh[(j^ [J)ijWh c eZ[b Wbbemi_dYh[Wi[i
_d j^ [c ed[o ikf fbo je X[^[bZ j[c fehWh_bo Wi [nY[ii YWi^ XWbWdY[i(j^ [h[Xo bem[h_d] l[beY_jo(eh
je j[c fehWh_bo ij_c kbWj[i f[dZ_d](j^ [h[Xo_dYh[Wi_d] h[Wb A>J(_d j^ [i^ehj hkd* N^ [c eZ[b
c fb [i(^em[l[h(j^Wj Wi j^ [i[[\ \Yji m[Wh e\ _d j^ [bed] hkd(Wdo Y^Wd][_d j^ [c ed[o ijeYa
m_bb X[c WjY^ [Z Xo W fh ef ehj_ed Wb Y^Wd][_d j^ [W]] h[] Wj[fh_Y[b[l[b*⁹

BWbb c Wd(Jehj[h(WdZ M c Wbb %-55-& j[ij j^ [J)ijWh c eZ[b m_j^ j^ [h[] h[ii_ed [gkWj_ed

$$t_{+t} \cdot \&, ' _1 t_{+t-1}, ' _2 t_{+t-2}, ' _3 t_{+t-3}, ' _4 t_{+t-4}, (/ \$_{t-1}^* - \$_{t-1} O,)_t \quad / \circ$$

m^ [h[+_t \cdot / " " 1 ~ / \check{Z}_t O- ~ / \check{Z}_{t-1} O Z[dej[i j^ [gkWj[hbo _d\bWj_ed hWj[([nfh[ii[Z_d Wddk Wb_p[Z
f[hY[djW][] fe_dj j[h c i(t_{+t} \cdot +_t - +_{t-1} Z[dej[i j^ [Yehh[i fedZ_d] Y^Wd][_d _d\bWj_ed(j^ [
bW]] [Z uf h_Y[] Wfv lWh_WXb[\$_{t-1}^* - \$_{t-1} \cdot \cdot " " 1 ~ / \check{Z}_{t-1} O- ~ / \check{Z}_{t-1} O_i j^ [f[hY[djW][] fe_dj
Z[l_Wj_ed e\ j^ [[gk_b_Xh_k c fh_Y[b[l[b \he c j^ [WYjkWb fh_Y[b[l[b(WdZ j^ [h[] h[ii_ed [hheh)_t _i

⁹ Bk c f^h[o %-545& Z_iYkii[i j^ [J)ijWh c eZ[bxi gkWdj_jo]j^ [eh[j_Y \ekdZWj_edi _d c eh[Z[jW_b*

Wiik c [Z je X[kdYehh[bWj[Z m_j^ _ji emd bW]][Z lWbk[i Wi m[bb Wi m_j^ j^ [ej^ [h h_] ^j)^WdZ)i_Z[
lWh_WXb[i _d %/&*

Cd %/&(W fei_j_l [WdZ ijWj_ij_YWbbo i_]d_YWdj [ij_c Wj[e\ j^ [Ye[_Y_[dj (Yed_h c i j^ [
c eZ[bxi gkWdj_je)^j^ [eh[j_Y _c fb_YWj_ed j^Wj _d\bWj_ed m_bb WYY[b[hWj[m^ [d j^ [fh_Y[] Wf _i
fei_j_l [(Wi Ž_t h_i [i je c [[j Ž_t^* F_a [m_i [(_d\bWj_ed m_bb Z[Y[b[hWj[m^ [d j^ [fh_Y[] Wf _i
d[]Wj_l [* N^ [fWij Y^Wd] [i _d _d\bWj_ed _dYbkZ[Z ed j^ [h_] ^j)^WdZ)i_Z[e\ %/& Wbbem j^ [
Yedl[h] [dY[e\ Ž_t je Ž_t^* je jWa[fbWY[i c eej^bo WdZ m_j^ W bed] [h bW] * ; fei_j_l [WdZ ijWj_ij_YWbbo
i_]d_YWdj [ij_c Wj[e\ ((j^ [h[\eh[(_c fb_[i j^Wj j^ [J)ijWh fh_Y[] Wf _i W ki [\kb _dZ_YWjeh e\ j^ [
[\[Yji j^Wj fWij c ed[o]hemj^ m_bb ^Wl [ed \kjkh[_d\bWj_ed*

<[bed]_W WdZ Ch[bWdZ % . , -1(. , -3& c eZ_o j^ [J)ijWh c eZ[b je Wf fbo je de c_dWb A>J
]hemj^ _dij[WZ e\ _d\bWj_ed WdZ je WYYekdj \eh j^ [bWh] [h c e l [c [dji _d c ed[jWho l[beY_jo i[[d _d
j^ [OM i_dY[-54, * N^ [c eZ_YWj_ed ijWhji Xo h[mh_j_d] j^ [[gkWj_ed e\ [nY^Wd] [%- & Wi

$$t_t! t \cdot \dot{Z}_t \quad //O$$

h[fbWY_d] j^ [W]h[]Wj[fh_Y[b[l[b e\ h[Wb A>J ed j^ [h_] ^j)^WdZ)i_Z[Xo j^ [_h fheZkYj(de c_dWb
A>J6 Ž_t \cdot \dot{Z}_t^* H[nj(j^ [lWh_WXb[uK)ijWhv] [ji Z[_d[Z WdWbe] ekibo je J)ijWh Wi

$$\dot{Z}_t^* \cdot t_t! t^{**} \quad /fIO$$

Cd %1& Wi _d % .& (! t^* h[fh[i [dji j^ [[gk_b_Xh_k c b[l[b e\ l[beY_jo^* N^ [h[\eh[(Ž_t^* _i j^ [[gk_b_Xh_k c
b[l[b e\ de c_dWb A>J _c fb_[Z Xo j^ [Ykhh[dj b[l[b e\ j^ [c ed[o ijeYa(je m^ _Y^ de c_dWb A>J
i^ekbZ Yedl[h] [Wi l[beY_jo h[jkhdi je _ji emd bed])hkd b[l[b*

=e c fWh_d] % .& WdZ %1& h[l[Wbi ed[a[o WZlWdjW] [e\ de c_dWb A>J]hemj^ e l[h _d\bWj_ed
jWh] [j_d] m^ [d _c fb[c [dj[Z m_j^ h[\[h[dY[je j^ [J)ijWh c eZ[b6 de c_dWb A>J jWh] [j_d] Ze[i dej

h[gk_h] Wd [ij_c Wj] e\ j^ [dWjkhWb hWj] e\ ekjfkj "t**10 I d j^ [ej^ [h ^WdZ(%1& ij_bb h[gk_h] i Wd
[ij_c Wj] e\ I [beY_joxi jh[dZ I Wbk[! t** B Wbb c Wd(Jehj[h(WdZ M c Wbb % -55-& i[b[Yj[Z G . Wi j^ [_h
c [Wikh[e\ c ed[o WdZ jeea ! t* je X[W YedijWdj(i_dY[G . I [beY_jo \bkYjkWj[Z WhekDZ W YedijWdj
bed)hkD I Wbk[_d gkWhj[hbo ZWjW \he c -511 j^hek]^ -544* N^_i c eZ[bb_d] Y^e_Y[(j^ek]^ gk_j[
YedI[d_[dj Wj j^ [j_c [(fheI_Z[kd\ehjkdWj[m^ [d _d j^ [[Whbo -55, i(j^ [_dWdY_Wb _ddeI Wj_edi
Z_iYkii[Z Xo >kYW % . . . , &(<WY^c [_h WdZ MmWdied % . . . , 1&(WdZ =Whbied(Be\ \ c Wd(E[[d(WdZ
LWiY^ [% . . . , 1& YWki[Z G . I [beY_jo je c eI[i^Whfbo ^_]^[h* ; i Z_iYkii[Z \khj^ [h Xo I hf^Wd_Z[i
WdZ Jehj[h % . . . , &(j^_i i^_j _d I [beY_jo j^h[m j^ [eh_]_dWb J)ijWh c eZ[bxi \eh[YWiji e\ \ jhWYa
Wb c eij_c c [Z Wj[bo W\j[h j^ [fkXb_YWj_ed e\ j^ [B Wbb c Wd)Jehj[h)M c Wbb Whj_Yb[*

<[bed]_W WdZ Ch[bWdZ % . . . -1(. . . -3& i^em(^em[1[h(j^Wj c eI[c [dji _d [gk_h_Xh_k c
I [beY_jo YWd X[jhWYa[Z Ybei[bo Xo [ij_c Wj[i fheI_Z[Z Xo W ed)i_Z[Z I [hi_ed e\ j^ [BeZh_Ya)
Jh[iYejj % -553& j_c ()i[h_[i _bj[h Z[iYh_X[Z Xo MjeYa WdZ QWjied % -555&* ?ii[dj_Wbbo(j^_i I [hi_ed
e\ j^ [BJ _bj[h ki[i W bed] c eI_d] W1[hW][e\ fWij I Wbk[i e\ I [beY_jo _ji[b\ je Ye c fkj[W j_c ()
IWho_d] [ij_c Wj] e\ ! t* i_c_bWh je j^ei[ki[Z_d G [bjp[hxi % -543(-55/& WdZ GY=Wbbk c xi % -543(
-554(. . . , 2& hkb[i \eh WZ^kij_d] W jWh] [j \eh c ed[jWho XWi[]hemj^ \eh I [beY_jo i^_ji*
C c fehjWdjbo(j^ [ed)i_Z[Z _bj[hxi ki[e\ fWij ZWjW Wbed[c [Wdi j^Wj j^ [c eZ[bxi [ij_c Wj[i e\ ! t*
WdZ ž_t* YWd X[kfZWj[Z m_j^ _d\eh c Wj_ed W I W_bWXb[je feb_Yo c Wa[hi _d h[Wb j_c [*

@_]kh[O fbeji j^ [I [beY_j_[i e\ Xeja i_c fb)ik c WdZ >_I_i_W G . (Wi m[bb Wi jme c [Wikh[i
e\ j^ [c ed[jWho XWi[*11 N^ [_hij c [Wikh[t j^ [Mj* Fek_i WZ^kij[Z c ed[jWho XWi[t _i j^ [ed[

¹⁰ @eh W XheWZ[h Z_iYkii_ed e\ j^ [fheXb[c i c ed[jWho feb_Yo c Wa[hi \WY[m^ [d [ij_c Wj_d] j^ [dWjkhWb hWj] e\ ekjfkj(i[[I hf^Wd_Z[i % . . . , -& WdZ I hf^Wd_Z[i WdZ I Wd HehZ[d % . . . , &*

¹¹ Q^ [d Ye c fWh_d] j^ [\ekh fWd[bi e\ _]kh[O(_j _i _c fehjWdj je dej[j^Wj m^_b[i_c fb)ik c G . WdZ Xeja c [Wikh[i e\ j^ [c ed[jWho XWi[Wh[[nfh[ii[Z_d kdji e\ ZebbWhi(>_I_i_W G . _i Wd_dZ[n dk c X[h(deh c Wb_p[Z je [gkwb - , , _d j^ [XWi[o[Wh e\ -523* N^ki(kdb_a[j^ [dk c [h_YWb I Wbk[i e\ XWi[WdZ i_c fb)ik c G . I [beY_jo(m^_Y^ c [Wikh[j^ [ZebbWh I Wbk[e\ de c_dWb A>J h[bWj_1[je j^ [

fh[\[hh[Z Xo G [bjp[h %-55/& WdZ GY=Wbbk c % . . , 2&* ; i_ji dW c [ik]] [iji(j^_i c [Wikh[mWi
YedijhkYj[Z Wj j^@ [Z[hWb L[i[h1[<Wda e\ Mj* Fek_i WdZ WZ^kiji \eh Y^Wd][i_d h[i[h1[
h[gk_h[c [dji Wi m[bb Wi \eh j^ h[jW_b Z[fei_j im[[f fhe]hW c i ki[Z Xo XWdai ijWhj_d] _d j^ [c_Z)
-55, i je c_d_c_p[j^[_h h[gk_h[Z h[i[h1[i*¹² Od\ehjkdWj[bo(j^ Mj* Fek_i @ [Z Z_i Yedj_dk[Z j^_i
i[h_[i_d j^ \ekhj^ gkWhj[h e\ . , -5* B[dY[(_)kh[0 Wbie fbeji j^ 1[beY_jo e\ j^ c ed[jWho XWi[
Wi Ye c fkj[Z Xo j^ @ [Z[hWb L[i[h1[<eWhZ e1[h j^ f[h_eZ i_dY[. . , 5* Odb_a[j^ Mj* Fek_i
c [Wikh[(j^ <eWhZxi XWi i[h_[i _i dej WZ^kij[Z \eh Y^Wd][i_d h[i[h1[h[gk_h[c [dji(deh _i_j
i[WiedWbbo WZ^kij[Z* N^ []hWf^ _d _)kh[0 h[1[Wbi(^em[1[h(j^Wj XWi 1[beY_jo Ye c fkj[Z m_j^
j^ <eWhZxi c [Wikh[i_dY[. . , 5 Ze[i dej Wff[Wh je YedjW_d_c fehjWdj i[WiedWb \bkYjkWj_edi*

?WY^ fWd[b e\ _)kh[0 Ye c fWh[i 1[beY_jo ! _t je j^ Yehh[i fedZ_d] [ij_c Wj[e\ ! _t * eXjW_d[Z
\he c j^ ed[i_Z[Z BJ _bj[h*¹³ Cd [1[ho YWi[t _dYbkZ_d](_c fh[ii_l[bo(\eh j^ Mj* Fek_i XWi[
i[h_[i(m^_Y^ i^emi W c Wii_1[Z[Yb_d[_d 1[beY_jo_d . . , 4 t c e1[c [dji _d ! _t * WZWfj gk_Yabo je
Y^Wd][i_d 1[beY_jo _ji[b(\ hW_i_d) ^ef[i j^Wj(W\j[h WYYekdj_d] \eh c e1[c [dji _d jh[dZ 1[beY_jo(
j^ [J)ijWh c eZ[b m_bb h[c W_d W ki[\kb]k_Z[([j^[_h_d ki_d] W XheWZ c ed[jWho W]h[]Wj[_ba[G .
Wi Wd_dj[h c [Z_Wj[jWh][j je WY^_1[W Z[i_h[Z fWj^ \eh de c_dWb A>J Wi ik]] [ij[Z Xo <hkdd[h
%-54.& eh_d ki_d] j^ c ed[jWho XWi[je Z_h[Yjbo jWh][j de c_dWb A>J Wi ik]] [ij[Z Xo GY=Wbbk c
%-543(-544(. . , 2&*

ZebbWh lWbk[e\ j^ c ed[o ijeYa(j^ dk c [h_YWb lWbk[i e\ >_1_i_W G . 1[beY_jo ^Wi de if[Y_Wb
c [Wd_d]* C dij[WZ(j^ f[hY[djW][Y^Wd][i_d >_1_i_W G . 1[beY_jo i^ekbZ X[Ye c fWh[Z je j^ei[_d
i_c fb)ik c WdZ XWi[1[beY_jo Wbb c [Wikh[j^]hemj^ hWj[i e\ de c_dWb A>J h[bWj_1[je j^
Yehh[i fedZ_d] c [Wikh[e\ j^ c ed[o ijeYa*

¹² N^ [Mj* Fek_i WZ^kij[Z XWi[i[h_[i _i Z[iYh_X[Z Xo ; dZ[hied WdZ LWiY^ [m_j^ Fe[i[b % . . , /&*
>[fei_j im[[f fhe]hW c i Wh[Z_iYki[Z Xo ; dZ[hied WdZ LWiY^ [% . . , -&*

¹³ ; ffb_o_d] j^ _bj[h h[gk_h[i Y^eei_d] W lWbk[\eh j^ fWhW c [j[h * j^Wj]e1[hdi j^ h[bWj_1[
lebWj_b_j_[i e\ j^ YoYb_YWb WdZ jh[dZ Ye c fed[dji^7 j^ [i[jj_d] * . . fl'' ki[Z ^[h[_i j^ ed[
h[Ye c c [dZ[Z \eh gkWhj[hbo ZWjW Xo BeZh_Ya WdZ Jh[iYejj %-553&*

Ne j[ij j^i ^ofej^i_i(j^ eh_]_dWb J)ijWh h[]h[ii_ed %/& YWd X[h[fbWY[Z Xo
 1#t . & , ' 1t#t-1 , ' 2t#t-2 , ' 3t#t-3 , ' 4t#t-4 , (/%*_{t-1} - %_{t-1}O,)t' /fIO
 m^h[#t . / " " 1 ~ /z_t O- ~ /z_{t-1} QZ[dej[i j^ [gkWhj[hbo]hemj^ hWj[e\ de c_dWb A>J(
 [nfh[ii[Z_d Wddkwb_p[Z f[hY[djW[])]fe_dj j[h c i (t#t . #t - #t-1 Z[dej[i j^ [Yehh[i fedZ_d]
 Y^Wd][_d de c_dWb A>J]hemj^(WdZ j^ [bW]][Z ude c_dWb A>J]Wfv %*_{t-1} - %_{t-1} .
 . " " 1 ~ /z_{t-1} O- ~ /z_{t-1} Q_i Ye c fkj[Z Wi j^ [f[hY[djW[])]fe_dj Z[l_Wj_ed X[jm[[d j^ [
 [gk_b_Xh_kc WdZ WYjkwb b[l[bi e\ de c_dWb A>J* Dkij Wi X[\eh[(W fei_j_l[WdZ ijWj_ij_YWbbo
 i_]d_YWdj [ij_c Wj[e\ j^ [Ye[_Y_[dj (\he c %2& _c fb_[i j^Wj j^ [@ [Z YekbZ ki[_ji _d\bk[dY[e l[h
 G . eh _ji Z_h[Yj Yedjheb e\ j^ [ced[jWho XWi[je ikYY[ii\kbb ijWX_b_p[de c_dWb _dYe c [WdZ
 if[dZ_d]* Cd fWhj_YkbWh(j^ [@ [Z YekbZ ij_c kbWj[G .]hemj^ eh Z_h[Yjbo _dYh[Wi[j^ []hemj^ hWj[
 e\ j^ [ced[jWho XWi[je _dYh[Wi[ž_t* l_W %1 & WdZ j^ [h[Xo fkj kfmWhZ fh[iikh[ed de c_dWb A>J
]hemj^ j^hek]^ %2&* F_a[m_i[(_j YekbZ WYj je ibem j^ [hWj[e\ G . eh ced[jWho XWi[]hemj^(
 h[ZkY_d] ž_t* WdZ fkj_d] ZemdmWhZ fh[iikh[ed de c_dWb A>J]hemj^*

NWXb[- Z_i fbWoi h[ikbji m^ [d %2& _i [ij_c Wj[Z m_j^ gkWhj[hbo ZWjW ed i_c fb()ikc WdZ
 >_l_i_W G.* N^ [bed][ij iW c fb[f[h_eZ ijWhji _d -5236-(Wi Z[j[h c_d[Z Xo j^ [WlW_bWX_b_jo e\ ZWjW
 ed >_l_i_W G.(WdZ [dZi_d . , .06-* @he c j^Wj bed] iW c fb[(Xej^ [ij_c Wj[i e\ j^ [a[o fWhW c [j[h
 (Wh[bWh][(WiieY_Wj_d] W ed)f[hY[djW[])]fe_dj de c_dWb A>J]Wf m_j^ Wd WYY[b[hWj_ed e\ de c_dWb
 A>J]hemj^(ed[gkWhj[h bWj[h(e\ c eh[j^Wd ^Wb\ W f[hY[djW][fe_dj* N^ [i [[ij_c Wj[i Wh[Xej^
 ^_] ^bo i_]d_YWdj Wi m[bb6 p lWbk[i b[ii j^Wd , * , - h[_Yj j^ [dkbb ^ofej^i_i j^Wj j^ [Ye[_Y_[dj
 [gkWbi p[he m_j^ Wd [njh[c [bo ^_] ^ Z[]h[[e\ Yed_Z[dY[*

M_dY[(Wi dej[Z WXel[(j^ [fh[Z_Yj_l[fem[h e\ XheWZ ced[o]hemj^ _i m_Z[bo X[b_l[Z je
 ^Wl[m[Wa[d[Z Wj[h -54, (jWXb[- Wbie h[fehji [ij_c Wj[i e\ %2& \he c ikXiW c fb[i e\ ZWjW X[\eh[
 WdZ Wj[h -54,* CdZ[[Z([ij_c Wj[i e\ (Ze Z[Yb_d[\he c WhekdZ , *5, X[\eh[-54, je WXekj , *2,

Wj[h* <kj [l[d j^ feij)-54, [ij_c Wj[i WiieY_Wj[j^ bW]][Z de c_dWb A>J]Wf m_j^ W i_pWXb[
WYY[b[hWj_ed_d de c_dWb A>J]hemj^* ; dZ [ij_c Wj[i \he c Xe j^ ikXiW c fb[i h[c_W_d ^_] ^bo
i_]d_YWdj*

@_dWbbo(jWXb[- pee c i_d ed jme h[Y[dj f[h_eZi6 j^ _hij ijWhj_d] _d -54, WdZ hkdd_d]
j^hek]^ . . ,3 WdZ j^ i [YedZ Ye l[h_d] j^ f[h_eZ i_dY[. . ,4(m^ [d j^ [@ [Z[hWb L[i[h l[xi jWh] [j
\eh j^ [\[Z[hWb \kdZi hWj[^Wi X[[d h[f[Wj[Zbo YedijhW_d[Z Xo j^ p[he bem[h_dj[h ij hWj[XekdZ*
N^ [[ij_c Wj[i e\ (e\ WYheii j^ [i jme ikXiW c fb[i i^em j^Wj j^ [\[Yji e\ XheWZ c ed[o]hemj^
ed de c_dWb A>J ^Wl[WYjkWbbo X[Ye c [stronger i_dY[. . ,4* ; dZ m^_b[j^ <Whd[jj Yh_j_gk[
\Wleh_d] j^ [ki[e >_l_i_W e l[h_i_c fb()ik c c ed[jWho W]]h[] Wj[i ^Wi e\j[d X[[d \ekdZ je X[
_c fehjWdj(ded[e\ j^ [h[ikbji ^[h[Wff[Whi i[di_j_l[je j^ Y^e_Y[X[jm[[d i_c fb()ik c WdZ
>_l_i_W G.*

NWXb[. \eYki[i ed [ij_c Wj[i e %2& ki_d] j^ jme c [Wikh[i e\ j^ c ed[jWho XWi[* ; i
dej[Z WXel[(XWi[l[beY_jo c e l[Z i^Whfbo bem[h_d . . ,4(m^ [d j^ [@ [Z X[] Wd fWo_d] _dj[h ij ed
XWda h[i[h l[i* Hej ikhfh_i_d]bo(j^ [h[\eh[(j^ fWhW c [j[h lWbk[(. "" / Wff[Whi i c Wbb m^ [d
[ij_c Wj[Z m_j^ gkWhj[hbo ZWjW ed j^ [Mj* Fek_i c ed[jWho XWi[hkdd_d] \he c -5236- j^hek]^
. . , -56/*¹⁴ <kj [l[d_d j^_i YWi[(j^ p lWbk[\eh j[ij_d] j^ dkbb ^ofej^[i_i j^Wj j^_i a[o
Ye[_Y_[dj [gkWi p[he \Wbbi X[bem ,*-, (h^ [Yj_d] j^Wj ^ofej^[i_i m_j^ 5, f[hY[dj Yed_Z[dY[*

Mjhed][h h[ikbji h()][c [h][m^ [d %2& _i [ij_c Wj[Z m_j^ ZWjW e l[h i[fWhWj[ikXiW c fb[i(
ki_d] j^ [Mj* Fek_i XWi[c [Wikh[\eh f[h_eZi hkdd_d] \he c -5236- j^hek]^ -53560 WdZ \he c
-54,6- j^hek]^ . . ,360 WdZ ki_d] j^ [@ [Z[hWb L[i[h l[<eWhXi c [Wikh[\eh W f[h_eZ hkdd_d] \he c
. . ,56- j^hek]^ . . ,/60 t j^ [h[Xo Wbbem_d] \eh W ed)o[Wh jhWdi_j_ed f[h_eZ Zkh_d] m^_Y^ XWdai

¹⁴ ; i Wbie dej[Z WXel[(j^ [Mj* Fek_i @ [Z Z_i Yedj_dk[Z_ji i[h[i \eh j^ WZ^kij[Z c ed[jWho XWi[(
ie j^Wj iW c fb[i e\ ZWjW ki_d] j^_i i[h[i c kij [dZ de bWj[h j^Wd . . , -56/*

WZ^kij[Z j^[_h Z[c WdZ \eh h[i[h1[i _d h[i fed i[je j^[@[Zxi Z[Y_i ed je fWo _dj[h[ij ed h[i[h1[i*
I dY[c eh[(j^[_ij_c Wj[Z 1Wbk[e\ (\Wbbi W\j[h -54,(Xkj h[c W_di i_pWXb[_d Xej^ h[Y[dj f[h_eZi(
WiieY_Wj_d] W ed)f[hY[djW][)fe_dj_dYh[Wi[_d j^[_de c_dWb A>J]Wf m_j^ W gkWhj[h f[hY[djW][)
fe_dj WYY[b[hWj_ed_d de c_dWb A>J]hemj^ ed[gkWhj[h bWj[h* ;dZ_d [WY^ e\ j^[_j^h[[
ikXiW c fb[i(j^[_ij_c Wj[e\ (h[jW_di W ^_] ^ Z[h[[e\ ijWj_ij_YWb i_]d_YWdY[*

N^[i[h[ikbji Yed_h c j^Wj(m^_b[W YedijWdj c ed[o]hemj^ hWj[hkb[b_a[j^Wj fh[iYh_X[Z
Xo j^[MI G= \he c j^[_Wbb_ij o[Whi e_ji [n_ij[dY[_i de bed][h Z[i_hWXb[(W c eZ_ [Z hkb[b_a[
G[bjphxi %-543(-55/& eh GY=Wbbk c xi %-543(. , ,2& YWd ij_bb i[h1[Wi W ki[\kb Wbj[hWj_1[
je NWobehxi %-55/&(Wi W X[dY^c Wha j^Wj ki[i _d\eh c Wj_ed_d c [Wikh[i e\ j^[_c ed[o ijeYa je
[1WbkWj[j^[_ijWdY[t d[kjhWb(e1[hbo WYYe c ceZWj_1[(eh e1[hbo h[ijh_Yj_1[t e\ j^[_@[Z[hWb
L[i[h1[xi c ed[jWho feb_Y_[i*

; _dWb YWi[ijkZo ^_] ^b_] ^ji j^[_Yedj_dk[Z ki[\kbd[ii e\ j^[_MI G=xi fh[\[hh[Z Wf fheWY^ je
c ed[jWho feb_Yo WdWboi_i WdZ [1WbkWj_ed ki_d] j^[_c ed[jWho XWi[WdZ j^[_XheWZ[h c ed[jWho
W])h[]Wj[i* N^[jef b[\j]^WdZ fWd[b e\ _]kh[1 fbeji o[Wh)e1[h]o[Wh]hemj^_d de c_dWb A>J
i_dY[. . ,5* N^[]hWf^ i^emi j^[_[nj[dZ[Z f[h_eZ e\ c eZ[hWj[WdZ ijWXb[de c_dWb A>J]hemj^
[nj[dZ_d] \he c . , -- j^hek]^ . , -5(j^[_i^Whf Z[Yb_d[_d de c_dWb i f[dZ_d] Zkh_d] j^[_ . . . ,
[Yede c_Y Ybeikh[i(WdZ j^[_ [1[d c eh[ZhW c Wj_Y WYY[b[hWj_ed_d de c_dWb A>J]hemj^ h[\b[Yj_d]
j^[_kdmWdj[Z h_i[_d_d\bWj_ed i_dY[. . . -*

Geij h[Y[djbo(de c_dWb A>J]hemj^ ^Wi X[[d jh[dZ_d] ZemdmWhZ* <kj m_bb j^_i jh[dZ
Yedj_dk[9 Ne ^[bf Wdim[h j^_i gk[ij_ed(j^[_h[c W_d_d] fWd[bi e\ _]kh[1 fbej j^[_j^h[[c [Wikh[i
e\ j^[_de c_dWb A>J]Wf ki[Z(WXe1[(_d [ij_c Wj_d] %2& e1[h f[h_eZi hkdd_d] j^hek]^ j^[_ fh[i[dj6

XWi[Z ed i_c fb()ik c WdZ >_1_i_W G . WdZ j^ [<eWhZxi c [Wikh[e\ j^ [c ed[jWho XWi[* H[]Wj_1[
lWbk[i \eh Wbb j^h[[c [Wikh[i i^em ^em c ed[jWho feb_Yo fkj ZemdmWhZ fh[iikh[ed de c_dWb
A>J]hemj^ \he c ., -- j^hek]^ ., -5* N^Wj j^ [\[Z[hWb \kdZi hWj[jWh][j h[c W_d[Z_d W hWd][d[Wh
p[he \eh c kY^ e\ j^_i f[h_eZ i^ekbZ Xh_d] XWYa je c_dZ j^ [M I G=xi mWhd_d] j^Wj _dj[h[ij hWj[i
YwD X[c_ib[WZ_d] _dZ_YWjehi e\ j^ [c ed[jWho feb_Yo ijWdY[* Mjhed]bo fei_j_1[c [Wikh[i \eh Wbb
j^h[[c ed[o]XWi[Z]Wf c [Wikh[i i^em(jee(^em [nY[ii c ed[o]hemj^ fh[f[bb[Z de c_dWb A>J
]hemj^ WdZ _d\bWj_ed ^_)^ [h_d . . . , WdZ . . . - t Z odW c_Yi h[c_d_iY[dj e\ M I G= Z[iYh_fj_edi e\
c ed[jWho feb_Yo Zkh_d] j^ [-53, i(m^_Y^ [c f^Wi_p[Z ^em(Xo ^ebZ_d] _dj[h[ij hWj[i jee bem \eh
jee bed] Zkh_d] j^ [[Whbo ijW][i e\ [Yede c_Y h[Ye l[ho(j^ [@ [Z] [d[hWj[Z fheYoYb_YWb \bkYjkWj_edi
_d c ed[o]hemj^ WdZ \k[b[Z _d\bWj_edxi h_i[*

Geij h[Y[djbo(^em[l[h(Wbb j^h[[]Wf c [Wikh[i ^Wl[c el[Z XWYa _dje d[]Wj_1[j[hh_jeho*
N^ [i[h[WZ_d]i Yed\h_c j^Wj j^Wj j^ [_dj[h[ij hWj[_dYh[Wi[i _c fb[c [dj[Z Xo j^ [@ I G= _d . . .
WdZ . . . / have meha[Z(Wi _dj[dZ[Z(je]h[Wjbo h[ZkY[_d\bWj_edWho fh[iikh[i* L[Y[dj fWjj[hdi _d
c ed[o]hemj^ ^ [bf Wiikh[ki j^Wj @ [Z[hWb L[i[h1[feb_Yo _i dem Yedi_ij[dj m_j^ W h[jkhd e\
de c_dWb _dYe c []hemj^ WdZ _d\bWj_ed je c eh[deh c Wb b[l[bi* Cd Ze_d] ie(j^ [o Wbie Yed\h_c j^ [\
Yedj_dk[Z h[b[lWdY[e\ j^ [M I G=xi Wh]k c [dji \eh W c ed[o]XWi[Z ef[hWj_edWb ijhWj[]o*

; dZ[hied(L_Y^WhZ A* WdZ LeX[hj B* LWiY^[* uL[jW_b Mm[[f Jhe]hWc i WdZ <Wda L[i[h1[i(-550)

-555*v @ [Z[hWb L[i[h1[<Wda e\ Mj* Fek_i Review 4/ %DWdkWho+@[XhkWho . . . , -&6 1-)3.*

; dZ[hied(L_Y^WhZ A* WdZ LeX[hj B* LWiY^ [m_j^ D[\h[o Fe[i[b* u ; L[YedijhkYj_ed e\ j^ [

@ [Z[hWb L[i[h1[<Wda e\ Mj* Fek_i ; Z`kij[Z Ged[jWho <Wi[WdZ L[i[h1[i*v @ [Z[hWb

L[i[h1[<Wda e\ Mj* Fek_i Review 41 %M[fj[c X[h+ I YjeX[h . . . , /&6 /5)25*

<WY^ c [_[h(FwDY[D* WdZ Heh c Wd L* MmWdied* uJh[Z_Yj_d] Cd\bWj_ed6 >e[i j^ [KkWdj_jo N^[eho
B[bf9v *Economic Inquiry* 0/ %Dkbo . . , 1&6 13,)141*

<Whd[jj(Q_bb_Wc ; * u?Yede c_Y Ged[jWho ;]h[]Wj[i6 ; d ; ffb_YWj_ed e\ CdZ[n Hk c X[h WdZ
;]h[]Wj_ed N^[eho*v *Journal of Econometrics* -0 %M[fj[c X[h -54, &6 --)04*

<Whd[jj(Q_bb_Wc ; * *Getting It Wrong; How Faulty Monetary Statistics Undermine the Fed, the
Financial System, and the Economy** =Wc Xh_Z][6 GCN Jh[ii(. , - . *

<Whd[jj(Q_bb_Wc ; * (D_W F_k(LoWd M* GWjjied(WdZ D[\ 1Wd Z[d Heehj* uN^[H[m =@M >_1_i_W
Ged[jWho ;]h[]Wj[i6 >[i_]d(=edijkYj_ed(WdZ >WjW MekhY[i*v *Open Economies
Review* .0 %@[XhkWho . , - /&6 - , -) .0

<[bed]_W(G_Y^W[b N* uG[Wikh[c [dj GWjj[hi6 L[Y[dj L[ikbji \he c Ged[jWho ?Yede c_Yi
L[[nWc_d[Z*v *Journal of Political Economy* - , 0 % I YjeX[h -552&6 - , 21)- , 4/*

<[bed]_W(G_Y^W[b N* WdZ J[j[h H* Ch[bWdZ* u ; w Qeha_d]v Mebkj_ed je j^ [Kk[ij_ed e\ He c_dWb
A>J NWh][j_d]*v *Macroeconomic Dynamics* -5 % ; fh_b . , - 1&6 1, 4)1/0*

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L[1_i_j[Z*v *Journal of Money, Credit, and Banking* 04 %M[fj[c X[h . , -2&6 - . . /)- .22*

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Ged[jWho Jeb_Yo Lkb[i <Wi[Z ed Ged[o*v *Journal of Macroeconomics* 10 %>[Y[c X[h
. , -3&6 0.)14*

<[bed]_W(G_Y^W[b N* WdZ J[j[h H* Ch[bWdZ* u ; =bWii_YWb P_[m e\ j^ [<ki_d[ii =oYb[*v *Journal of
Money, Credit, and Banking* 1/ %GWhY^); fh_b . , - &6 //)/22*

<[bed]_W(G_Y^W[b N* WdZ J[j[h H* Ch[bWdZ* uMjh[d]j^ [d_d] j^ [M[YedZ J_bbWh6 ; Ah[Wj[h Leb[\eh
Ged[o_d]j^ [?=<si MjhWj[]o*v *Applied Economics* 10 % . . . (Ciik[-&6 55)-0*

<[bed]_W(G_Y^W[b N* WdZ J[j[h H* Ch[bWdZ* uN^[NhWdi c_ii_ed e\ Ged[jWho Jeb_Yo M^eYai

N^hek]^ j^[GWha[ji \eh L[i[h1[i WdZ Ged[o^v *Journal of Macroeconomics* 4, %Dkd[

.,.0&6 ;hj_Yb[-, /15,*

<[hdWda[(<[d M* WdZ ; bWd M* <b_dZ[h* uN^[@[Z[hWb @kdZi LWj[WdZ j^[=^Wdd[bi e\ Ged[jWho

NhWdi c_ii_ed^v *American Economic Review* 4. %M[fj[c X[h -55.&6 5, -)5. -*

<[hdWda[<[d M*(N^e c Wi FWkXWY^(@h[Z[h_Y M* G_i^a_d(WdZ ; ZWc M* Jei[d* *Inflation*

*Targeting: Lessons from the International Experience** Jh_dY[jed6 Jh_dY[jed Od_l[hi_jo

Jh[ii(-555*

<bWdY^WhZ(I b_l_[h WdZ DehZ_ AWbq* uL[Wb QW][L_]Z_j_[i WdZ j^[H[m E[od[i_Wd GeZ[b*v

Journal of Money, Credit, and Banking /5 %@[XhkWho . , ,3(Mkfb[c [dj&6 /1)21*

<eWhZ e\ AeI[hdehi e\ j^[@[Z[hWb L[i[h1[Moij[c* *Monetary Policy Report** QWi^_d]jed(>=(-

GWhY^ . , .0*

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*on Track** MjWd\ehZ6 Beel[h Cdi_jkj_ed Jh[ii(. , .0*

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Review 13 %Dkd[-531&6 .)4*

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-, 1 %-53, &6 -)/,*

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<hkdd[h(EWhb(u ; ii[ii c [dj e\ Ged[jWho Jeb_Yo*v MI G= Jei_j_ed JWf[h(2 M[fj[c X[h -530b*

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-531a*

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M[fj[cX[h -531b*

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JkhikWdj je j^[@kbb ? c fbeo c [dj WdZ <WbWdY[Z Ahemj^ ; Yj e\ -534* QWi^_d]jed(>=6
OM Beki[e\ L[fh[i[djWj_1[i(=e c c_jj[[ed <Wda_d)(@_dWdY[WdZ OhXWd ; \W_hi(. .
@[XhkWho -535a*

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-535b*

<hkdd[h(EWhb* uJeb_Yo c Wa_d)(; YYekdjWX_b_jo(WdZ j^[MeY_Wb L[i fed_i_X_b_jo e\ j^[@[Z*v MI G=
Jei_j_ed JWf[h(-1)-2 GWhY^ -54-*

<hkdd[h(EWhb* uN^[Pe_Y[i e\ w@W_bkh[x WdZ j^[@W_bkh[e\ Ged[jWho Jeb_Yo)G Wa_d]*v MI G=
Jei_j_ed JWf[h(- .)- / M[fj[cX[h -54.*

<hkdd[h(EWhb* uGed[jWho Jeb_Yo Wi W LWdZe c QWba N^hek]^ B_ijeho*v MI G= Jei_j_ed JWf[h(2)
3 GWhY^ -54/*

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>[\bWj_ed*xv MI G= Jei_j_ed JWf[h(/ , M[fj[cX[h t - IYjeX[h(-540*

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u@_iYwb WdZ Ged[jWho Jeb_Y_[i_d GeZ[hWj[Cd\bWj_ed6 =Wi[MjkZ_[i e\ N^h[[=ekdjh_[i*v
Journal of Money, Credit, and Banking 1 %@[XhkWho -53/(JWhj .&6 / - /)/1/*

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//0)/04*

<hkdd[h(EWhb WdZ ; bbWd G [bjp[h* uN^[J^_bb_fi =khI[*v *Carnegie-Rochester Conference Series on Public Policy* - 532&6 -)-4*

<khdi(; hj^kh @* uGed[o Mkffbo_d j^[=edZkYj e\ Ged[jWho Jeb_Yo**Federal Reserve Bulletin* 15 %He1[c X[h -53/&6 35-)354*

=Whbied(De^d <*(>[dd_i F* Be\\ c Wd(<[d^W c_d >* E[[d(WdZ LeX[hj B* LWiY^[* uL[ikbji e\ W MjkZo e\ j^[MjWX_b_jo e\ =e_dj[]hWj_d] L[bWj_edi =e c fh_i[Z e\ <heWZ Ged[jWho ;]h[]Wj[i**Journal of Monetary Economics* 02 % I YjeX[h . . . , &6 /01)/4/*

=^hoijWb(E* ; b[Y WdZ LedWbZ GWY>edWbZ* u? c f_h_YWb ?1_Z[dY[ed j^[L[Y[dj <[^W1_eh WdZ Oi[\kdb[ii e\ M_c fb()Mkc WdZ Q[_]^j[Z G [Wikh[i e\ j^[Ged[o MjeYa**@ [Z[hWb L[i[h1[<Wda e\ Mj* Fek_i Review* 32 %GWhY^+ ; fh_b -550&6 3/)- ,5*

=bWh_ZW(L_Y^WhZ(DehZ_ AWbq(WdZ GWha A[hjb[h* uGed[jWho Jeb_Yo Lkb[i WdZ GWYhe[Yede c_Y MjWX_b_jo6 ?1_Z[dY[WdZ Me c [N^[eho**Quarterly Journal of Economics* --1 %@[XhkWho . . . , &6 -03)-4,*

=eea(N_c ej^o* u>[j[hc_dWdji e\ j^[@ [Z[hWb @kdZi LWj[6 -535)-54.*v @ [Z[hWb L[i[h1[<Wda e\ L_Y^ c edZ *Economic Review* 31 %DWdkWho+@[XhkWho -545&6 /)-5*

>kYW(De^d P* u@d_WdY_Wb N[Y^debe]o M^eYai WdZ j^[=Wi[e\ j^[G_ii_d] G.**Journal of Money, Credit, and Banking* / . %@[XhkWho . . . , &6 4 . .)4/5*

@ [Z[hWb I f[d GWha[j =e c c _jj[[(uMjWj[c [dj ed Fed][h)Lkd AeWbi WdZ Ged[jWho Jeb_Yo MjhWj[]o*v .0 DWdkWho . . . - .*

@h_[Zc Wd(<[d^W c_d G* WdZ E[dd[j^ H* Ekjkd[h* uGed[o CdYe c [(Jh_Y[i(WdZ Cdj[h[ij LWj[i**American Economic Review* 4 . %Dkd[-55 . &6 03 .)05 . *

@h_[Zc Wd(G_hjed* *A Program for Monetary Stability** H[m Reha6 @ehZ^W c Od_1[hi_jo Jh[ii(-52,*

@h_[Z c Wd(G_bjed* uN^[Ged[jWho MjkZ_[i e\ j^[HWj_edWb <kh[Wk*v Cd *The National Bureau Enters Its Forty-fifth Year** H[m Reha6 HWj_edWb <kh[Wk e\ ?Yede c_Y L[i[WhY^(-520(ff*3).1*

@h_[Z c Wd(G_bjed* uCd\bWj_ed6 =Wki[i WdZ =edi[gk[dY[i*v Cd *Dollars and Deficits: Living with America's Economic Problems** ?d]b[meeZ =b_\i6 Jh[dj_Y()]Bwbb(-524(ff*. -)3-*

@h_[Z c Wd(G_bjed* uF[iiedi \he c j^[-535)4. Ged[jWho Jeb_Yo ?nf[h_c [dj*v *American Economic Review* 30 %Gwo -540&6 /53)0, ,*

@h_[Z c Wd(G_bjed WdZ ; ddW DWYeXied MY^mWhjp* *A Monetary History of the United States, 1867-1960** Jh_dY[jed6 Jh_dY[jed Od_1[hi_jo Jh[ii(-52/*

Awbq(DehZ_* *Monetary Policy, Inflation, and the Business Cycle*. .dZ ?Z* Jh_dY[jed6 Jh_dY[jed Od_1[hi_jo Jh[ii(., -1*

A_bX[hj(L* ; bjed* u ; =Wi[MjkZo_d Ged[jWho =edjheb6 -54,)4.*v @[Z[hWb L[i[h1[<Wda e\ Mj* Fek_i *Review* 32 %M[fj[cX[h+ IYjeX[h -550&6 /1)14*

AebZ[d(Me c W* u=h_j_Yi Oh][j^[@[Z je BebZ >emd LWj[i*v *New York Times* -0 Dkbo -531(ff*/3(/5*

AeeZ\h_[dZ(GWh1_d* u ; Jh[iYh_fj_ed \eh Ged[jWho Jeb_Yo -54-*v @[Z[hWb L[i[h1[<Wda e\ L_Y^ c edZ *Economic Review* 23 %He1[cX[h+>[Y[cX[h -54- &6 --)-4*

AeeZ\h_[dZ(GWh1_d WdZ LeX[hj A* E_d]* uN^[H[m H[eYbWii_YWb Modj^[i_i WdZ j^[Leb[e\ Ged[jWho Jeb_Yo*v Cd <[d M* <[hdWda[WdZ Dkb_e Lej[cX[h](?Zi* *NBER Macroeconomics Annual 1997** =W c Xh_Z][6 GCN Jh[ii(-553(ff*. /-).4/*

Ah[[di fWd(; bWd* N[ij_c edo X[\eh[j^[MkXYe c_c_jj[[ed ?Yede c_Y Ahemj^ WdZ =h[Z_j @ehc Wj_ed e\ j^[=e c_c_jj[[ed <Wda_d)(@_dWdY[WdZ OhXWd ; \\W_hi(O*M* Beki[e\ L[fh[i[djWj_1[i(., Dkbo -55/*

BWbb c Wd(D[\h[o D*(L_Y^WhZ >* J ehj[h(WdZ >W1_Z B* M c Wbb* uCi j^[Jh_Y[F[1[b N_[Z je j^[G .

Ged[jWho ;]h[]Wj[_d j^[Fed] Lkd9v *American Economic Review* 4- %M[fj[c X[h
-55-&6 40-)414*

B[dZh_Yaied(Dei^kW L* uL[ZkdZWdYo eh G_i c [Wikh[c [dj9 ; L[WffhW_iWb e\ Ged[o*v

Macroeconomic Dynamics -4 % IYjeX[h . , -0&6 -0/3)-021*

B[jp[b(LeX[hj F* uGWa_d] Ged[jWh_ij Jh_dY_fb[i L[b[1Wdj ;]W_d j^hek]^ W L[]nfei_j_ed e\ j^[

KkWdj_jo N^[eho*v GWdkiYh_fj(.5 ; fh_b . , .0*

BeZh_Ya(LeX[hj D* WdZ ?ZmWhZ =* Jh[iYejj* uJeijmWh O*M* <ki_d[ii =oYb[i6 ; d ? c f_h_YWb

Cd1[ij_]Wj_ed*v *Journal of Money, Credit, and Banking* .5 %@[XhkWho -553&6 -)-2*

Bk c f^h[α(N^e c Wi G* uJh[Ykhihi e\ j^[J)ijWh GeZ[b*v @ [Z[hWb L[i[h1 [<Wda e\ L_Y^c edZ

Economic Review 31 %Dkbo+ ; k]kij -545&6 /)5*

Ch[bWdZ(J[j[h H* uN^ [Leb[e\ =ekdj[hYoYb_YWb Ged[jWho Jeb_Yo*v *Journal of Political Economy*

- ,0 % ; k]kij -552&6 3,0)3. /*

Ch[bWdZ(J[j[h H* uGed[oxi Leb[_d j^ [Ged[jWho <ki_d[ii =oYb[*v *Journal of Money, Credit, and*

Banking /2 %> [Y[c X[h . , ,0&6 525)54/*

Ch[bWdZ(J[j[h H* uCdj[h[ij ed L[i[h1[i6 B_ijeho WdZ LWj_edWb[(=e c fb_YWj_edi WdZ L_iai*v *Cato*

Journal /5 %Mfh_d]+Mk c c [h . , -5&6 / .3) //3*

Ch[bWdZ(J[j[h H* uOM Ged[jWho Jeb_Yo(. . . .) /6 Jkjj_d] j^ [KkWdj_jo N^ [eho je j^ [N[ij*v

Journal of Applied Corporate Finance /1 %Mk c c [h . , . /&7 0.)04*

Ch[bWdZ(J[j[h H* uN^ [>[1ebkj_ed e\ @ [Z[hWb L[i[h1 [Ged[jWho Jeb_Yo MjhWj[]α(. , - .) .0*v

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MjWj[i6 G[Wikh[c [dj Ciik[i WdZ L[Y[dj L[ikbji*v GwdkiYh_fj* =^[ijdkj B_bb6 <eijed

=ebb[][(> [fWhj c [dj e\ ?Yede c_Yi(Gwo . . .0b*

Ch[bWdZ(J[j[h H* uNWh][j_d] He c_dWb A>J N^hek]^ Ged[jWho =edjheb*v Jeb_Yo <h[* ; hb_d]jed(

P ; 6 G[hYWjki = [dj[h Wj A[eh][Gwied Od_1[hi_jo(@ehj^Ye c_d] . . .0c*

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JWf[h(/)0 @[XhkWho -54, a*

De^Wdd[i(DW c [i G* WdZ LeX[hj B* LWiY^[* uN^ [=edijhkYj_ed WdZ @eh[YWij_d] e\ Ged[o

Gkbj_fb_[hi \eh j^ [H[m Ged[jWho ;]h[]Wj[i*v MI G= Jei_j_ed JWf[h(. -) . . M[fj[cX[h

-54, b*

EoZbWdZ(@_dd ?* WdZ ?ZmWhZ =* Jh[iYejj* uN_c [je <k_bZ WdZ ;]h[]Wj[@bkYjkWj_edi*v

Econometrica 1, %He1[cX[h -54.&6 -/01)-/3, *

FW_Zb[h(>W1_Z ?* Q* *The Demand for Money: Theories, Evidence, and Problems** Oj^ ?Z* H[m

Reha6 BWhf[h=ebb_di =ebb[] [JkXb_i^ [hi(-55/*

FW_Zb[h(>W1_Z* uFkYWi % -53.&6 ; J[hiedWb P_[m \he c j^ [Qhed] i_Z[e\ j^ [MkXi[gk[dj @_jo

R[Whi*v *European Journal of the History of Economic Thought* %@ehj^Ye c_d] . . .0&*

F[[f[h(?h_Y G* WdZ D[dd_\[h ?* LekI^* uJkjj_d] wGx <WYa_d Ged[jWho Jeb_Yo*v *Journal of*

Money, Credit, and Banking /1 %> [Y[cX[h . . . / (JWhj .&6 - . -3) - .12*

F[lo(G_Ya[o >* uN^ [@ [Z6 <WZ @eh[YWiji WdZ G_i]k_Z[Z Ged[jWho Jeb_Yo*v Cd G_Y^W[b >*

<ehZe(De^d B* =eY^hWd[(WdZ De^d <* NWobeh(?Zi* *Getting Monetary Policy Back on*

*Track** MjWd\ehZ6 Beel[h Cdi_jkj_ed Jh[ii(. . .0(ff*.2-).5, *

Fed](De^d <* Dh* WdZ =^Whb[i C* Jbeii[h* uL[Wb <ki_d[ii =oYb[i*v *Journal of Political Economy*

5- %@[XhkWho -54/&6 /5)25*

FkYWi(LeX[hj ?*(Dh* u?Yede c [jh_Y Jeb_Yo ?1WbkWj_ed6 ; =h_j_gk[*v *Carnegie-Rochester
Conference Series on Public Policy* - 532&6 -5)02*

GWo[h(N^e c Wi* uN^[MjhkYjkh[e\ Ged[jWh_i c %C&*v Cd N^e c Wi GWo[h(?Z* *The Structure of
Monetarism** H[m Reha6 Q*Q* Hehj ed # =e c fWdo(-534(ff*-). 1*

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?nf[YjWj_edi*v *Journal of Monetary Economics* 4 %-54-(Ciik[/&6 / -5)/ .5*

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>[j[h c_dWYo(WdZ j^ [L[Wb <_bbi >eYjh_d[*v *Journal of Monetary Economics* -3 %DWdkWho
-542&6 -/1)-2,*

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?nW c fb[*v @ [Z[hWb L[i[h1[<Wda e\ L_Y^ c edZ *Economic Review* 3/ %M[fj[c X[h+ I YjeX[h
-543&6 - ,)-4*

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Table 1

Estimated P-star Forecasting Equations for Nominal GDP Using Broad Money

Dependent Variable: Changes in Nominal GDP Growth Δg_t

Q
1967:1 – 2024:1

Simple-Sum M2

Divisia M2

estimate

Table 1 (Continued)**Estimated P-star Forecasting Equations for Nominal GDP Using Broad Money**Dependent Variable: Changes in Nominal GDP Growth Δg_t

1980:1 – 2007:4

	Simple-Sum M2			Divisia M2		
	estimate	stat	value	estimate	stat	value
constant	-0.05	-0.20	0.84	-0.19	-0.81	0.42
Δg_{t-1}	-0.51	-5.81	0.00	-0.52	-5.94	0.00
Δg_{t-2}	-0.06	-0.61	0.55	-0.08	-0.83	0.41
Δg_{t-3}	0.03	0.38	0.71	0.01	0.16	0.88
Δg_{t-4}	-0.03	-0.38	0.70	-0.03	-0.40	0.69
$q_{t-1}^* - q_{t-1}$	0.34	2.89	0.00	0.27	2.87	0.01

2008:1 – 2024:1

	Simple-Sum M2			Divisia M2		
	estimate	stat	value	estimate	stat	value
constant	1.20	1.28	0.21	1.25	1.32	0.19
Δg_{t-1}	-0.94	-7.99	0.00	-0.95	-8.01	0.00
Δg_{t-2}	-0.69	-4.45	0.00	-0.70	-4.51	0.00
Δg_{t-3}	-0.44	-2.84	0.01	-0.45	-2.90	0.01
Δg_{t-4}	-0.24	-2.09	0.04	-0.25	-2.14	0.04
$q_{t-1}^* - q_{t-1}$	0.74	3.77	0.00	0.69	3.69	0.00

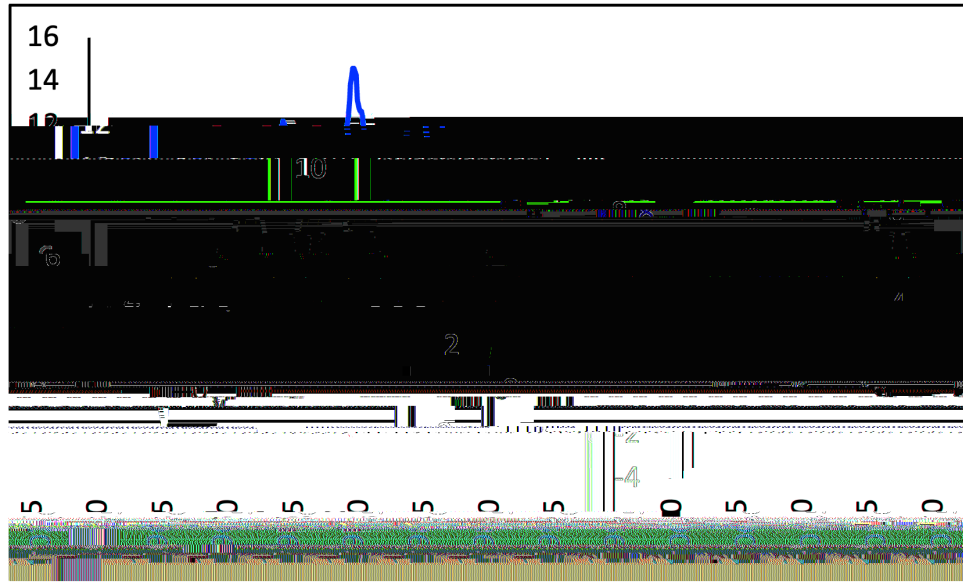
Table 2**Estimated P-star Forecasting Equations for Nominal GDP Using Base Money**Dependent Variable: Changes in Nominal GDP Growth Δg_t

	St. Louis Adjusted Base 1967:1 – 2019:3			St. Louis Adjusted Base 1967:1 – 1979:4		
	estimate	stat	value	estimate	stat	value
constant	0.00	0.00	1.00	0.45	0.74	0.46
Δg_{t-1}	-0.62	-8.89	0.00	-0.81	-5.36	0.00
Δg_{t-2}	-0.38	-4.78	0.00	-0.57	-3.14	0.00
Δg_{t-3}	-0.28	-3.57	0.00	-0.47	-2.64	0.01
Δg_{t-4}	-0.07	-1.04	0.30	-0.13	-0.90	0.37
$q_{t-1}^* - q_{t-1}$	0.04	1.77	0.08	1.29	2.28	0.03

	St. Louis Adjusted Base 1980:1 – 2007:4			Board of Governors Base 2009:1 – 2024:1		
	estimate	stat	value	estimate	stat	value
constant	-0.07	-0.29	0.77	0.75	0.75	0.46
Δg_{t-1}	-0.51	-5.81	0.00	-0.99	-7.97	0.00
Δg_{t-2}	-0.09	-0.86	0.39	-0.79	-4.75	0.00
Δg_{t-3}	0.00	0.02	0.99	-0.53	-3.19	0.00
Δg_{t-4}	-0.04	-0.56	0.57	-0.29	-2.36	0.02
$q_{t-1}^* - q_{t-1}$	0.26	2.47	0.02	0.27	3.27	0.00

Figure 1

Consumer Price Inflation

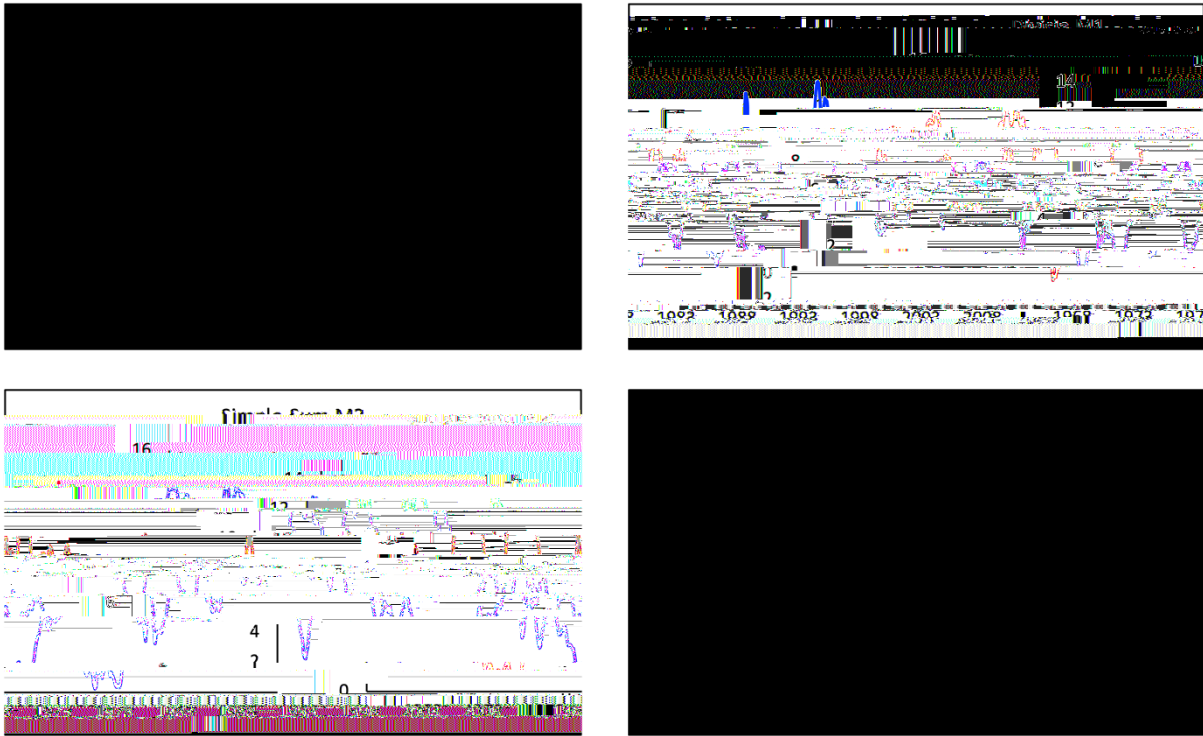


Note: The graph shows year-over-year percentage changes in the consumer price index for all urban consumers.

Source: Federal Reserve Bank of St. Louis Economic Database (FRED).

Figure 2

Simple-Sum versus Divisia Money Growth

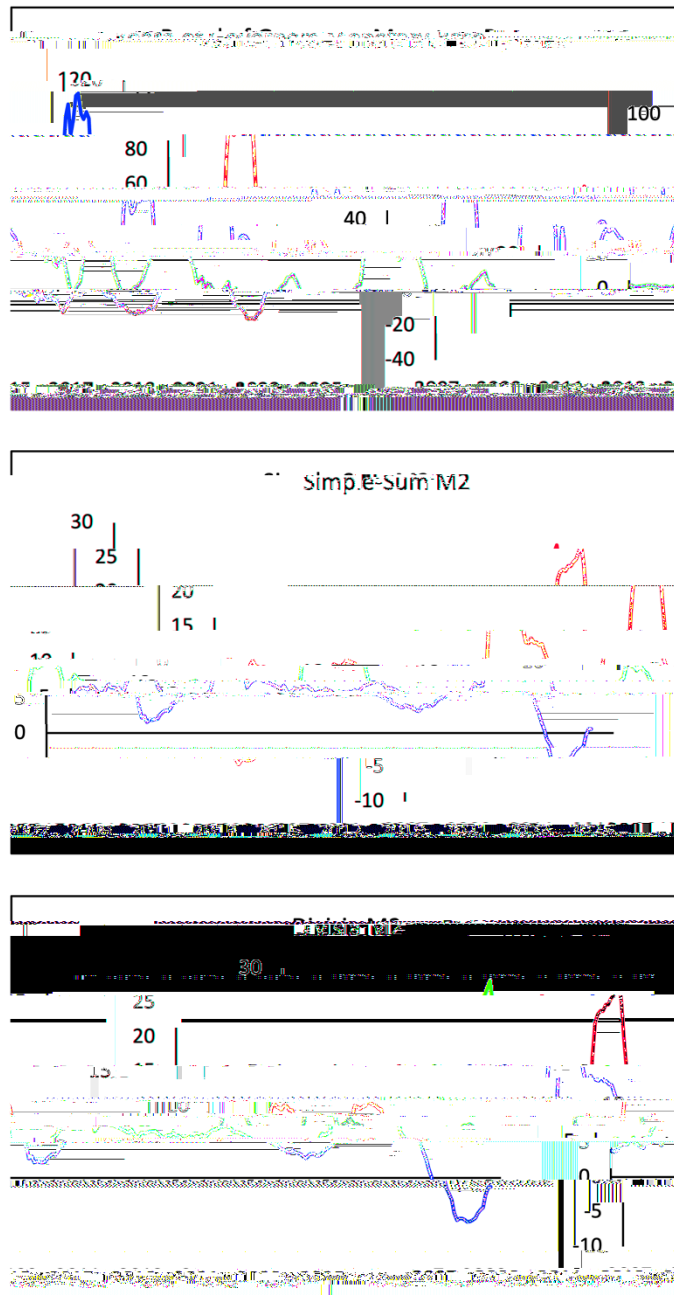


Note: Each panel shows year-over-year percentage changes in the indicated monetary aggregate.

Sources: FRED, Center for Financial Stability (CFS).

Figure 3

Monetary Base and M2 Growth

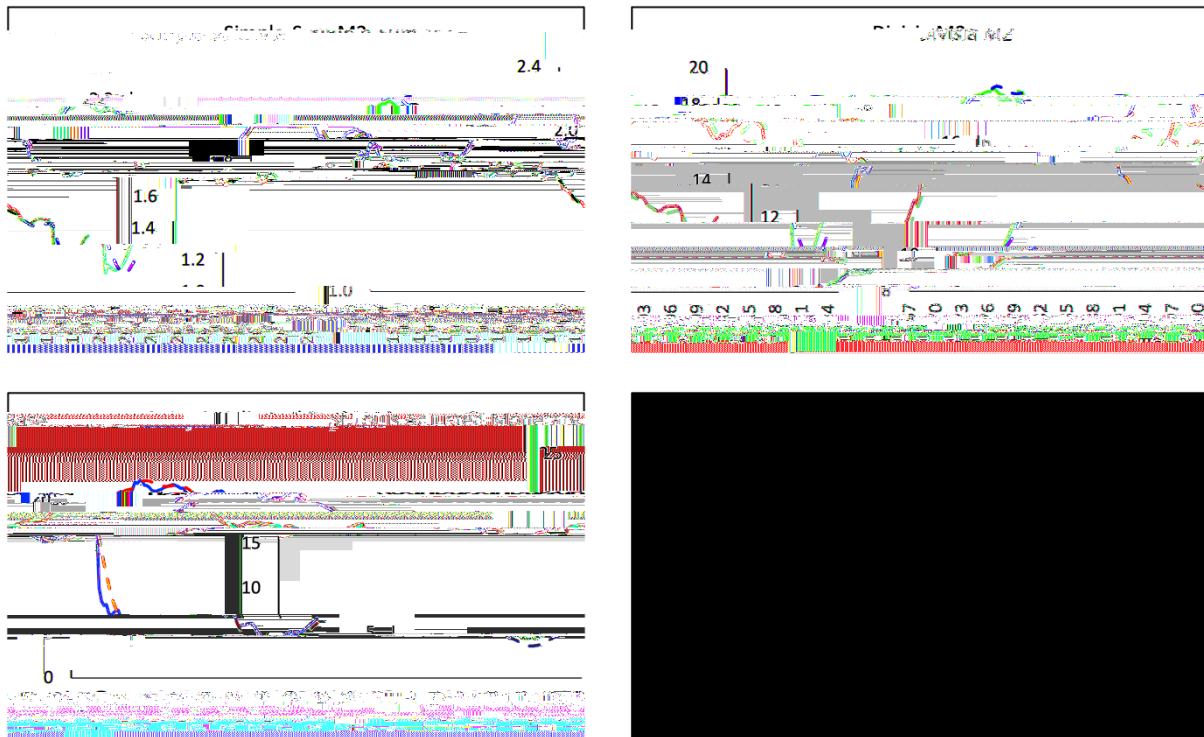


Note: Each panel shows year-over-year percentage changes in the indicated monetary aggregate.

Sources: FRED, CFS.

Figure 4

Velocities of Broad and Base Money

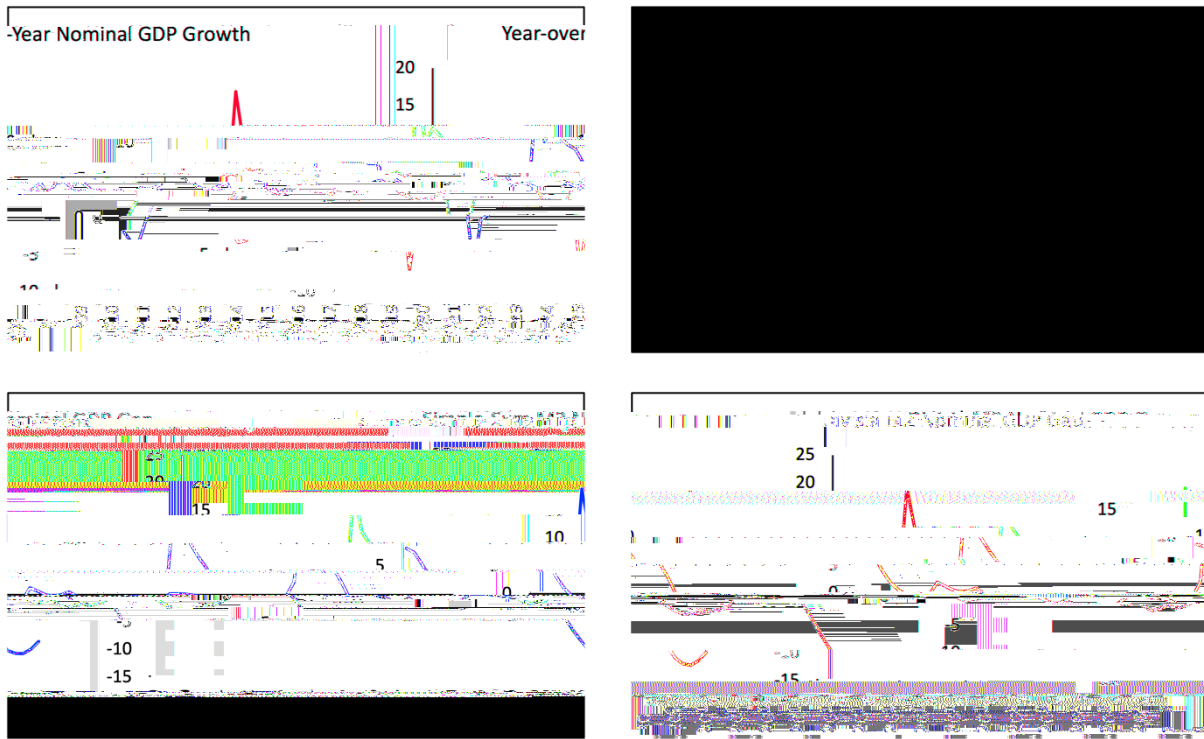


Note: Each panel shows the velocity of the indicated monetary aggregate (solid blue line) together with its equilibrium value, estimated using the one-sided Hodrick-Prescott filter.

Sources: FRED, CFS, author's calculations.

Figure 5

Nominal GDP Growth and Money-Based Nominal GDP Gaps



Note: The top left-hand panel shows year-over-year percentage changes in nominal GDP. The remaining three panels show the nominal GDP gap, in percentage points, computed using the indicated monetary aggregate.

Sources: FRED, CFS, author's calculations.