Strategic Disclosure and Stock Returns: Theory and Evidence from U.S. Cross-Listing

Shingo Goto, Masahiro Watanabe, Yan Xu

Appendix C Technical Appendix

C.1 Proof of Lemma 1

We can express the joint probability of s, f, and k as

$$h(s,f,k) = h(k)h(s,f|k) = \binom{N}{k} r^k (1-r)^{N-k} \binom{k}{s} \theta^s (1-\theta)^{k-s} \binom{N-k}{f} \theta^f (1-\theta)^{N-k-f}.$$

Considering the relation

$$\frac{h(k|s,f)}{h(k-1|s,f)} = \frac{h(s,f,k)/h(s,f)}{h(s,f,k-1)/h(s,f)},$$

we have

$$h(k|s,f) \propto \frac{1}{(k-s)!(N-k-f)!} r^k (1-r)^{N-k}.$$

Normalizing, we obtain the desired expression. ■

C.2 Proof of Proposition 2

We first derive the necessary moment expressions. Let $h(s) = \binom{N}{s}(r\theta)^s(1-r\theta)^{N-s}$ be the unconditional probability of the manager announcing s successes at date 1. Using Equation

(A6), the expected first-period return under the sanitization strategy is given by

$$\begin{aligned}
E[R_1^a(s)] &= \sum_{s=0}^{N} h(s) R_1^a(s) \\
&= \sum_{s=0}^{N} \binom{N}{s} (r\theta)^s (1-r\theta)^{N-s} \frac{u^s[\pi u + (1-\pi)d]^{N-s}}{[\psi u + (1-\psi)d]^N} \\
&= \sum_{s=0}^{N} \binom{N}{s} (r\theta u)^s [(1-r\theta)\{\pi u + (1-\pi)d\}]^{N-s} \cdot \frac{1}{[\psi u + (1-\psi)d]^N} \\
&= \left[\frac{r\theta \cdot u + (1-r\theta)\{\pi u + (1-\pi)d\}}{\psi u + (1-\psi)d}\right]^N \\
&\equiv [r\theta\gamma_0 + (1-r\theta)\gamma_1]^N,
\end{aligned} \tag{A37}$$

where we have defined $\gamma_0 \equiv \frac{u}{\psi u+(1-\psi)d} > 1$ and $\gamma_1 \equiv \frac{\pi u+(1-\pi)d}{\psi u+(1-\psi)d} < 1$. Similarly, we can calculate

$$\begin{aligned}
E(R_2^a(s)|s) &= \sum_{k=s}^{N} h(k|s) R_2^a(s) \\
&= \sum_{k=s}^{N} \binom{N-s}{k-s} q^{k-s}(1-q)^{N-k} \frac{u^k d^{N-k}}{u^s[\pi u + (1-\pi)d]^{N-s}} \\
&= \sum_{k=s}^{N} \binom{N-s}{k-s} (qu)^{k-s}[(1-q)d]^{N-k} \cdot \frac{1}{[\pi u + (1-\pi)d]^{N-s}} \\
&= \left(\frac{qu + (1-q)d}{\pi u + (1-\pi)d}\right)^{N-s} \equiv \gamma_2^{N-s} > 1,
\end{aligned}$$

where we have defined $\gamma_2 \equiv \frac{qu+(1-q)d}{\pi u+(1-\pi)d} > 1$. Further,

$$\begin{aligned}
E[E(R_2^a(s)|s)] &= \sum_{s=0}^{N} h(s)E(R_2^a(s)|s) \\
&= \sum_{s=0}^{N} \binom{N}{s} (r\theta)^s (1-r\theta)^{N-s} \left(\frac{qu+(1-q)d}{\pi u+(1-\pi)d} \right)^{N-s} \\
&= \left[r\theta + (1-r\theta) \left(\frac{qu+(1-q)d}{\pi u+(1-\pi)d} \right) \right]^N \\
&\equiv [r\theta + (1-r\theta)\gamma_2]^N > 1, \qquad \text{(A38)}
\end{aligned}$$

$$\begin{aligned}
E[R_1^a(s) \cdot E(R_2^a(s)|s)] &= \sum_{s=0}^{N} h(s) \cdot R_1^a(s) E(R_2^a(s)|s) \\
&= \sum_{s=0}^{N} \binom{N}{s} (r\theta)^s (1-r\theta)^{N-s} \frac{u^s[\pi u+(1-\pi)d]^{N-s}}{[\psi u+(1-\psi)d]^N} \left(\frac{qu+(1-q)d}{\pi u+(1-\pi)d} \right)^{N-s} \\
&= \sum_{s=0}^{N} \binom{N}{s} (r\theta)^s (1-r\theta)^{N-s} \frac{u^s[qu+(1-q)d]^{N-s}}{[\psi u+(1-\psi)d]^N} \\
&= \left[\frac{r\theta \cdot u + (1-r\theta)\{qu+(1-q)d\}}{\psi u+(1-\psi)d} \right]^N \\
&\equiv [r\theta\gamma_0 + (1-r\theta)\gamma_1\gamma_2]^N.
\end{aligned}$$

From these moments we can compute the return autocovariance under the sanitization strategy using the Law of Iterated Expectations,

$$\begin{aligned}
&cov(R_1^a(s), R_2^a(s)) \\
&= cov(R_1^a(s), E(R_2^a(s)|s)) \\
&= E[R_1^a(s) \cdot E(R_2^a(s)|s)] - E[R_1^a(s)] \cdot E[E(R_2^a(s)|s)] \\
&= [r\theta\gamma_0 + (1-r\theta)\gamma_1\gamma_2]^N - [\{r\theta\gamma_0 + (1-r\theta)\gamma_1\}\{r\theta + (1-r\theta)\gamma_2\}]^N.
\end{aligned}$$

Comparing the terms inside the square brackets,

$$\begin{aligned}
&r\theta\gamma_0 + (1-r\theta)\gamma_1\gamma_2 - \{r\theta\gamma_0 + (1-r\theta)\gamma_1\}\{r\theta + (1-r\theta)\gamma_2\} \\
&= -r\theta(1-r\theta)(\gamma_2 - 1)(\gamma_0 - \gamma_1) < 0,
\end{aligned} \tag{A39}$$

which implies that $cov(R_1^a(s), R_2^a(s)) < 0$ for all N.

Next, consider full disclosure. Let $h(s,f) = \binom{N}{s}\binom{N-s}{f}(r\theta)^s[(1-r)\theta]^f(1-\theta)^{N-s-f}$ be the unconditional probability of the manager announcing s successes and f failures at date 1. Using this and Equation (A10), we can similarly calculate

$$\begin{aligned}
E[R_1^a(s,f)] &= \sum_{s=0}^{N}\sum_{f=0}^{N-s} h(s,f)\cdot R_1^a(s,f) \\
&= \sum_{s=0}^{N}\sum_{f=0}^{N-s}\binom{N}{s}\binom{N-s}{f}(r\theta)^s[(1-r)\theta]^f(1-\theta)^{N-s-f}\frac{u^s d^f[\psi u + (1-\psi)d]^{N-s-f}}{[\psi u + (1-\psi)d]^N} \\
&= \sum_{s=0}^{N}\binom{N}{s}(r\theta u)^s[(1-r)\theta d + (1-\theta)\{\psi u + (1-\psi)d\}]^{N-s}\cdot\frac{1}{[\psi u + (1-\psi)d]^N} \\
&= \left[\frac{r\theta u + (1-r)\theta d + (1-\theta)\{\psi u + (1-\psi)d\}}{\psi u + (1-\psi)d}\right]^N \\
&= \left[\theta\cdot\frac{ru + (1-r)d}{\psi u + (1-\psi)d} + 1 - \theta\right]^N \\
&\equiv [\theta\gamma_3 + 1 - \theta]^N > 1,
\end{aligned} \tag{A40}$$

where we have defined $\gamma_3 \equiv \frac{ru+(1-r)d}{\psi u+(1-\psi)d} > 1$. Further using Lemma 1 and Equation (A23),

$$\begin{aligned}
E(R_2^a(s,f)|s,f) &= \sum_{k=s}^{N-f} h(k|s,f) R_2^a(s,f) \\
&= \sum_{k=s}^{N-f} \binom{N-f-s}{k-s} r^{k-s}(1-r)^{N-f-k} \frac{u^k d^{N-k}}{u^s d^f [\psi u + (1-\psi)d]^{N-s-f}} \\
&= \sum_{k=s}^{N-f} \binom{N-f-s}{k-s} (ru)^{k-s}[(1-r)d]^{N-f-k} \cdot \frac{1}{[\psi u + (1-\psi)d]^{N-s-f}} \\
&= \left(\frac{ru+(1-r)d}{\psi u + (1-\psi)d}\right)^{N-s-f} = \gamma_3^{N-s-f} > 1.
\end{aligned}$$

So,

$$\begin{aligned}
E[E(R_2^a(s,f)|s,f)] &= \sum_{s=0}^{N} \sum_{f=0}^{N-s} h(s,f) \cdot E(R_2^a(s,f)|s,f) \\
&= \sum_{s=0}^{N} \sum_{f=0}^{N-s} \binom{N}{s} \binom{N-s}{f} (r\theta)^s [(1-r)\theta]^f (1-\theta)^{N-s-f} \left(\frac{ru+(1-r)d}{\psi u + (1-\psi)d}\right)^{N-s-f} \\
&= \sum_{s=0}^{N} \binom{N}{s} (r\theta)^s \left[(1-r)\theta + (1-\theta)\left(\frac{ru+(1-r)d}{\psi u + (1-\psi)d}\right)\right]^{N-s} \\
&= \left[r\theta + (1-r)\theta + (1-\theta)\left(\frac{ru+(1-r)d}{\psi u + (1-\psi)d}\right)\right]^{N} \\
&= \left[\theta + (1-\theta)\left(\frac{ru+(1-r)d}{\psi u + (1-\psi)d}\right)\right]^{N} \\
&\equiv [\theta + (1-\theta)\gamma_3]^N > 1, \qquad \text{(A41)}
\end{aligned}$$

$$
\begin{aligned}
&E[R_1^a(s,f)\cdot E(R_2^a(s,f)|s,f)]\\
&=\sum_{s=0}^{N}\sum_{f=0}^{N-s} h(s,f)\cdot R_1^a(s,f)E(R_2^a(s,f)|s,f)\\
&=\sum_{s=0}^{N}\sum_{f=0}^{N-s}\binom{N}{s}\binom{N-s}{f}(r\theta)^s[(1-r)\theta]^f(1-\theta)^{N-s-f}\frac{u^s d^f}{[\psi u+(1-\psi)d]^{s+f}}\cdot\\
&\left(\frac{ru+(1-r)d}{\psi u+(1-\psi)d}\right)^{N-s-f}\\
&=\sum_{s=0}^{N}\sum_{f=0}^{N-s}\binom{N}{s}\binom{N-s}{f}(r\theta u)^s[(1-r)\theta d]^f(1-\theta)^{N-s-f}\frac{[ru+(1-r)d]^{N-s-f}}{[\psi u+(1-\psi)d]^N}\\
&=\sum_{s=0}^{N}\binom{N}{s}(r\theta u)^s[(1-r)\theta d+(1-\theta)\{ru+(1-r)d\}]^{N-s}\cdot\frac{1}{[\psi u+(1-\psi)d]^N}\\
&=\left[\frac{r\theta\cdot u+(1-r)\theta d+(1-\theta)\{ru+(1-r)d\}}{\psi u+(1-\psi)d}\right]^N\\
&=\left[\frac{ru+(1-r)d}{\psi u+(1-\psi)d}\right]^N\equiv\gamma_3^N>1.
\end{aligned}
$$

Again,

$$
\begin{aligned}
cov(R_1^a(s,f),R_2^a(s,f)) &= cov(R_1^a(s,f),E(R_2^a(s,f)|s,f))\\
&= E[R_1^a(s,f)\cdot E(R_2^a(s,f)|s,f)]-E[R_1^a(s,f)]E[E(R_2^a(s,f)|s,f)]\\
&= \gamma_3^N-[\{\theta\gamma_3+1-\theta\}\{\theta+(1-\theta)\gamma_3\}]^N.
\end{aligned}
$$

Comparing the terms in the last line ignoring the exponent,

$$
\gamma_3-\{\theta\gamma_3+1-\theta\}\{\theta+(1-\theta)\gamma_3\}=-\theta(1-\theta)(\gamma_3-1)^2<0, \tag{A42}
$$

which implies that $cov(R_1^a(s,f),R_2^a(s,f))<0$ for all N.

Finally, we prove that $cov(R_1^a(s),R_2^a(s))<cov(R_1^a(s,f),R_2^a(s,f))$. First, using the Law

of Iterated Expectations, observe that

$$\begin{aligned}
&E[R_1^a(s,f)\cdot E(R_2^a(s,f)|s,f)] \\
&= E\left[\frac{V_1^a(s,f)}{V_0^a}\cdot E\left(\frac{V_2^a}{V_1^a(s,f)}|s,f\right)\right] = \frac{E[V_2^a]}{V_0^a} \\
&= E\left[\frac{V_1^a(s)}{V_0^a}\cdot E\left(\frac{V_2^a}{V_1^a(s)}|s\right)\right] = E[R_1^a(s)\cdot E(R_2^a(s)|s)], \qquad \text{(A43)}
\end{aligned}$$

or equivalently,

$$r\theta\gamma_0 + (1-r\theta)\gamma_1\gamma_2 = \gamma_3,$$

which can also be shown by a direct substitution for γ_0, γ_1, γ_2, and γ_3. Thus,

$$\begin{aligned}
&cov(R_1^a(s),R_2^a(s)) - cov(R_1^a(s,f),R_2^a(s,f)) \\
&= -E[R_1^a(s)]\cdot E[E(R_2^a(s)|s)] + E[R_1^a(s,f)]\cdot E[E(R_2^a(s,f)|s,f)].
\end{aligned}$$

Inspecting Equations (A37), (A38), (A40), and (A41), we see that this expression is negative for all N if it is so for $N=1$. While we could substitute those equations, we proceed with Equations (A39) and (A42) to calculate

$$\begin{aligned}
&cov(R_1^a(s),R_2^a(s)) - cov(R_1^a(s,f),R_2^a(s,f)) \text{ with } N=1 \\
&= \theta(1-\theta)(\gamma_3-1)^2 - r\theta(1-r\theta)(\gamma_2-1)(\gamma_0-\gamma_1) \\
&= \frac{\theta(u-d)^2}{\psi u+(1-\pi)d}\left[\frac{(1-\theta)(r-\psi)^2}{\psi u+(1-\psi)d} - \frac{r(1-r\theta)(q-\pi)(1-\pi)}{\pi u+(1-\pi)d}\right],
\end{aligned}$$

where we have substituted the expressions for γ_0, γ_1, γ_2, and γ_3. Further substituting for the definitions of π, ψ, and q, the square bracket in the last line can be rewritten as

$$\begin{aligned}
&(1-\theta)r^2(1-r)^2(d^{-\alpha}-u^{-\alpha})\times \\
&\left[\frac{d^{-\alpha}-u^{-\alpha}}{[\psi u+(1-\psi)d][ru^{-\alpha}+(1-r)d^{-\alpha}]^2} - \frac{d^{-\alpha}}{[\pi u+(1-\pi)d][(1-\theta)ru^{-\alpha}+(1-r)d^{-\alpha}]^2}\right] < 0,
\end{aligned}$$

after tedious but straightforward algebra. The inequality holds for $\alpha > 0$ because $0 < d^{-\alpha}-u^{-\alpha} < d^{-\alpha}$, $\psi u+(1-\psi)d > \pi u+(1-\pi)d$, and $ru^{-\alpha}+(1-r)d^{-\alpha} > (1-\theta)ru^{-\alpha}+(1-r)d^{-\alpha}$.
■

C.3 A Multi-period Extension

This subsection extends the two-period model in the main text to an overlapping-generations (OLG) economy. Within each generation t there are three dates, $\tau = 0$, 1, and 2, denoted by (t, τ). These three dates correspond to those in the two-period model. At date $(t, 0)$, generation t of investors and a firm manager are born. The investors are endowed with a certain amount of the consumption good. The firm is a going concern and has undertaken N_{t-1} projects by the end of generation $t-1$, of which k_{t-1} are successes. In each generation t, a fixed number N of new projects are introduced, so that N_{t-1} is deterministic and equals $N(t-1)$ up to some constant. Upon birth, the generation t investors trade the firm's stock with generation $t-1$. At date $(t, 1)$, the firm's manager makes a disclosure, (s_t, f_t), where s_t and f_t represent the number of disclosed successes and failures, respectively, out of the N newly introduced projects. At date $(t, 2)$, which is equivalent with date $(t+1, 0)$, the stock pays a random dividend

$$D_{t+1} = u^{k_t} d^{N_t - k_t}$$

when $\Delta k_t = k_t - k_{t-1}$ out of the N projects succeed. After receiving the dividend, the generation t investors sell their security holdings to generation $t+1$, consume, and die. The economy is now operated by generation $t+1$, and this cycle repeats indefinitely. The gross interest rate per period is $R > 1$. Other assumptions are kept unchanged from the two-period model.

Following the standard solution technique, we look only for a price function that is stationary and linear in the dividend. Conjecture a price function at date $(t, 0)$ of the form

$$P^a_{t,0} = gD_t, \tag{A44}$$

where g is a constant. It is straightforward to confirm that a slightly more general conjecture, $P^a_{t,0} = gD_t + e$, changes nothing in the analysis to follow because the constant e must be zero for the conjecture to be sustainable. The primary difference from the two-period model is that investors' future wealth now contains the selling price of the stock,

$$W_{t,2} = D_{t+1} + P^a_{t+1,0} = (g+1)u^{\Delta k_t} d^{N - \Delta k_t} D_t. \tag{A45}$$

The assumption of a complete market again implies the existence of state prices,

$$\begin{aligned}\varphi_{t,0}(\Delta k_t) &= \frac{h(\Delta k_t|\mathcal{F}_{t,0})U'(W_{t,2})}{R^2\sum_{\Delta k_t=0}^{N} h(\Delta k_t|\mathcal{F}_{t,0})U'(W_{t,2})} \\ &= \frac{h(\Delta k_t|\mathcal{F}_{t,0})U'(u^{\Delta k_t}d^{N-\Delta k_t})}{R^2\sum_{\Delta k_t=0}^{N} h(\Delta k_t|\mathcal{F}_{t,0})U'(u^{\Delta k_t}d^{N-\Delta k_t})},\end{aligned} \tag{A46}$$

where $h(\Delta k_t|\mathcal{F}_{t,0})$ denotes the probability of Δk_t successes out of the N newly-introduced projects conditional on the information set $\mathcal{F}_{t,0} = \{k_{t-1}\}$ at date $(t,0)$. Notice that the term $(g+1)D_t$ in the future wealth (A45) is constant up to $\mathcal{F}_{t,0}$ and cancels out in the numerator and the denominator of Equation (A46). Since the state prices are similar to those in the two-period model (see Equation (2)), so is the pricing. The only difference is to take care of the discounting factor $1/R^2$ appearing in Equation (A46), which has resulted from the interest-rate condition $\sum_{\Delta k_t=0}^{N}\varphi_{t,0}(\Delta k_t) = 1/R^2$. Apply the state prices to the future wealth (A45) to obtain the stock price

$$P_{t,0}^a = E_{t,0}[\varphi_{t,0}(\Delta k_t)\cdot(g+1)u^{\Delta k_t}d^{N-\Delta k_t}D_t] = (g+1)\frac{[\psi u+(1-\psi)d]^N}{R^2}D_t.$$

Compare with the original price conjecture to determine the coefficient, $g = \frac{[\psi u+(1-\psi)d]^N}{R^2-[\psi u+(1-\psi)d]^N}$. To ensure a positive stock price, we additionally assume that

$$R^2 > [\psi u + (1-\psi)d]^N. \tag{A47}$$

Once the price coefficient is determined, the problem at date $(t,1)$ can be solved similarly to the date 1 problem in the two-period model except again that the final wealth (A45) for generation t contains the proceeds from selling the stock to the new generation. The following theorem summarizes the result, with a complete mathematical proof available in Section C.3.2:

Theorem 2. *(Firm value in an OLG model) (i) The firm value at date* $(t,0)$ *is given by*

$$V_{t,0}^a = \frac{u^{k_{t-1}}d^{N_{t-1}-k_{t-1}}}{R^2-[\psi u+(1-\psi)d]^N}[\psi u+(1-\psi)d]^N.$$

(ii) (Sanitization strategy) The firm value at date $(t,1)$ *when the manager reports* s_t

successes and zero failures is given by

$$V^a_{t,1}(s_t) = \frac{u^{k_{t-1}} d^{N_{t-1}-k_{t-1}}}{R^2 - [\psi u + (1-\psi)d]^N} R u^{s_t} [\pi u + (1-\pi)d]^{N-s_t}.$$

(iii) (Full disclosure) The firm value at date $(t,1)$ *when the manager discloses both the observed number of successes,* s_t*, and failures,* f_t*, is given by*

$$V^a_{t,1}(s_t, f_t) = \frac{u^{k_{t-1}} d^{N_{t-1}-k_{t-1}}}{R^2 - [\psi u + (1-\psi)d]^N} R u^{s_t} d^{f_t} [\psi u + (1-\psi)d]^{N-s_t-f_t}.$$

C.3.1 ***News covariance and return reversal in the OLG model.*** From the result in the preceding section, we can calculate the first- and second-period returns under the sanitization strategy as

$$R^a_{t,1}(s_t) = \frac{V^a_{t,1}(s_t)}{V^a_{t,0}} = R \cdot R^a_1(s_t), \tag{A48}$$

$$R^a_{t,2}(s_t) = \frac{V^a_{t+1,0}}{V^a_{t,1}(s_t)} = \frac{[\psi u + (1-\psi)d]^N}{R} R^a_2(s_t), \tag{A49}$$

respectively, where $R^a_1(s_t)$ and $R^a_2(s_t)$ denote the returns (A6) and (A18) from the two-period model with s and k replaced by s_t and Δk_t, respectively. Similarly, the first- and second-period returns under full disclosure are

$$R^a_{t,1}(s_t, f_t) = \frac{V^a_{t,1}(s_t, f_t)}{V^a_{t,0}} = R \cdot R^a_1(s_t, f_t), \tag{A50}$$

$$R^a_{t,2}(s_t, f_t) = \frac{V^a_{t+1,0}}{V^a_{t,1}(s_t, f_t)} = \frac{[\psi u + (1-\psi)d]^N}{R} R^a_2(s_t, f_t), \tag{A51}$$

respectively, where $R^a_1(s_t, f_t)$ and $R^a_2(s_t, f_t)$ denote the returns (A10) and (A23) from the two-period model with s, f, and k replaced by s_t, f_t, and Δk_t, respectively. These expressions say that returns are proportional to their two-period counterpart with a fixed positive proportionality constant. Therefore, the two propositions continue to hold in the corresponding period within a generation. It remains to examine the moments at the turn of the generation. The above expressions imply that the only news in the second period is the news about realized successes, Δk_t, which is cash-flow news according to a definition similar to the first period, $N_{cf} \equiv \ln R_2 - E_0 [\ln R_2]$. Thus, the expected-return news in the second-period is constant up to the information set at date $(t, 1)$ and therefore the news covariance is zero under both disclosure policies. Furthermore, two successive returns over two generations are uncorrelated because project outcomes and hence disclosures are independent. We remark these results in the following two propositions, with complete mathematical proofs available in Section C.3.2.

Proposition 3. *(News covariance in the OLG model) Cash-flow news and expected-return news at any date (t, τ) are (i) non-positively correlated under the sanitization strategy: $Cov(N_{cf}, N_{er}) \leq 0$; and (ii) non-negatively correlated under full disclosure: $Cov(N_{cf}, N_{er}) \geq 0$.*

Proposition 4. *(Return reversal in the OLG model) The stock return exhibits a non-positive autocovariance. Moreover, the autocovariance under the sanitization strategy is smaller than or equal to the autocovariance under full disclosure: $cov(R^a_{t,\tau}(s_t), R^a_{t,\tau+1}(s_t)) \leq cov(R^a_{t,\tau}(s_t, f_t), R^a_{t,\tau+1}(s_t, f_t)) \leq 0$ for $\tau = 0, 1$, where $R^a_{t,0}(\cdot)$ is equivalent with $R^a_{t-1,2}(\cdot)$.*

C.3.2 *Proofs*

Proof of Theorem 2. (i) The firm value at date $(t, 0)$ in the OLG model is obtained immediately by substituting

$$g = \frac{[\psi u + (1-\psi)d]^N}{R^2 - [\psi u + (1-\psi)d]^N} \tag{A52}$$

back into Equation (A44) and noting that there is one share outstanding by assumption, which implies that $V^a_{t,0} = P^a_{t,0}$.

(ii) **Sanitization strategy**. Substitute Equation (A52) into Equation (A45) to get

$$W_{t,2} = \frac{R^2}{R^2 - [\psi u + (1-\psi)d]^N} u^{\Delta k_t} d^{N-\Delta k_t} D_t.$$

State prices under the sanitization strategy are given by Equation (A46) with the conditioning information set $\mathcal{F}_{t,0} = \{k_{t-1}\}$ replaced by $\mathcal{F}_{t,1} = \{k_{t-1}, s_t\}$ and the discounting reduced to $\frac{1}{R}$. Suppressing the common element in the information sets k_{t-1},

$$\varphi_{t,1}(\Delta k_t|s_t) = \frac{h(\Delta k_t|s_t)U'(u^{\Delta k_t}d^{N-\Delta k_t})}{R\sum_{\Delta k_t=s_t}^{N} h(\Delta k_t|s_t)U'(u^{\Delta k_t}d^{N-\Delta k_t})},$$
$$h(\Delta k_t|s_t) \equiv \binom{N-s_t}{\Delta k_t - s_t} q^{\Delta k_t - s_t}(1-q)^{N-\Delta k_t},$$

which is similar to Shin's (2003) Lemma 1. Therefore, the first-period price under the sanitization strategy is

$$P^a_{t,1}(s_t) = \frac{R^2}{R^2 - [\psi u + (1-\psi)d]^N} E_{t,1}[\varphi_{t,1}(\Delta k_t|s_t)u^{\Delta k_t}d^{N-\Delta k_t}|s_t]D_t$$
$$= \frac{Ru^{s_t}[\pi u + (1-\pi)d]^{N-s_t}}{R^2 - [\psi u + (1-\psi)d]^N} D_t = V^a_{t,1}(s_t).$$

(iii) **Full disclosure**. Similarly, replacing the conditioning information set $\mathcal{F}_{t,0} = \{k_{t-1}\}$ in Equation (A46) with $\mathcal{F}_{t,1} = \{k_{t-1}, s_t, f_t\}$ and reducing the discounting by one period, state prices under full disclosure are

$$\varphi_{t,1}(\Delta k_t|s_t, f_t) = \frac{h(\Delta k_t|s_t, f_t)U'(u^{\Delta k_t}d^{N-\Delta k_t})}{R\sum_{\Delta k_t=s_t}^{N_t-f_t} h(\Delta k_t|s_t, f_t)U'(u^{\Delta k_t}d^{N-\Delta k_t})},$$
$$h(\Delta k_t|s_t, f_t) \equiv \binom{N-f_t-s_t}{\Delta k_t - s_t} r^{\Delta k_t - s_t}(1-r)^{N-f_t-\Delta k_t},$$

which is similar to Lemma 1. Therefore the first-period price under full disclosure is

$$P^a_{t,1}(s_t, f_t) = \frac{R^2}{R^2 - [\psi u + (1-\psi)d]^N} E_{t,1}[\varphi_{t,1}(\Delta k_t|s_t, f_t)u^{\Delta k_t}d^{N-\Delta k_t}|s_t, f_t]D_t$$
$$= \frac{Ru^{s_t}d^{f_t}[\psi u + (1-\psi)d]^{N-s_t-f_t}}{R^2 - [\psi u + (1-\psi)d]^N} D_t = V^a_{t,1}(s_t, f_t). \blacksquare$$

Proof of Proposition 3. From Equations (A48) and (A50), the first-period cash-flow news and expected-return news in the OLG model are clearly identical to those in the two-period model up to a constant. So, the proposition about the news covariance holds for the first period.

For the second period, first consider the decomposition under the sanitization strategy.

Substituting $R_2^a(s)$ in Equation (A18) into Equation (A49) and taking logarithm, we have

$$\begin{aligned}
\ln R_{t,2}^a(s_t) &= \Delta k_t \ln \frac{u}{d} - s_t \ln \frac{u}{\pi u + (1-\pi)d} + const.,\\
\ln \widetilde{R}_{t,2}^a &\equiv \ln R_{t,2}^a(s_t) - E_{t,1}[\ln R_{t,2}^a(s_t)|s_t]\\
&= \Delta k_t \ln \frac{u}{d} + const.,\\
N_{cf} &= \ln \widetilde{R}_{t,2}^a|_{\pi\to q} = \Delta k_t \ln \frac{u}{d} + const.,\\
N_{er} &= N_{cf} - \ln \widetilde{R}_{t,2}^a = const.,
\end{aligned}$$

where *const.* denotes a constant up to the information set at date $(t,1)$, which can include s_t. Because N_{er} is constant up to that information set, clearly,

$$Cov(N_{cf}, N_{er}) = Cov(E[N_{cf}|s_t], const.) = 0.$$

Similarly, substituting $R_2^a(s,f)$ in Equation (A23) into Equation (A51), the decomposition under full disclosure is

$$\begin{aligned}
\ln R_{t,2}^a(s_t,f_t) &= \Delta k_t \ln \frac{u}{d} + s_t \ln \frac{\psi u + (1-\psi)d}{u} + f_t \ln \frac{\psi u + (1-\psi)d}{d} + const.,\\
\ln \widetilde{R}_{t,2}^a &\equiv \ln R_{t,2}^a(s_t,f_t) - E_{t,1}[\ln R_{t,2}^a(s_t,f_t)|s_t,f_t]\\
&= \Delta k_t \ln \frac{u}{d} + const.,\\
N_{cf} &= \ln \widetilde{R}_{t,2}^a|_{\psi\to r} = \Delta k_t \ln \frac{u}{d} + const.,\\
N_{er} &= N_{cf} - \ln \widetilde{R}_{t,2}^a = const.,
\end{aligned}$$

where, again, *const.* denotes a constant up to the information set at date $(t,1)$, which can include s_t and f_t. Then,

$$Cov(N_{cf}, N_{er}) = Cov(E[N_{cf}|s_t,f_t], const.) = 0. \blacksquare$$

Proof of Proposition 4. From Equations (A48)-(A51), the returns in the OLG model are proportional to their two-period counterpart with fixed positive proportionality constants. So, the proposition about return reversal holds for two successive returns within a generation.

Return autocovariance between two successive returns over two generations is zero under both disclosure policies because project outcomes and hence disclosures are independent. Formally, compute

$$Cov(R^a_{t,2}(s_t), E_{t+1,0}[R^a_{t+1,1}(s_{t+1})]) = 0,$$
$$Cov(R^a_{t,2}(s_t, f_t), E_{t+1,0}[R^a_{t+1,1}(s_{t+1}, f_{t+1})]) = 0.$$

This is so because both $E_{t+1,0}[R^a_{t+1,1}(s_{t+1})]$ and $E_{t+1,0}[R^a_{t+1,1}(s_{t+1}, f_{t+1})]$ are clearly deterministic numbers [substitute Equations (A6) and (A10) into Equations (A48) and (A50) at time $t + 1$, and consider their expected values on date $(t + 1, 0)$]. ■