

Table 1 Firm Factor : Parameters and Their Effects in the General Option Model

Parameter	α	β	γ	k
Condition	$\alpha \geq 1$	$\beta \geq 0$	$\gamma \geq 0$	$k \geq r$
Firm Factor	Property synergy	Construction cost saving	Financing cost	Opportunity cost of firm capital
Source	Agglomeration economy	Co-development	Financial hierarchy/constraint	Free up capital for other project
Threshold	Decrease	Decrease	Increase	Decrease
Investment Timing	Accelerate	Accelerate	Delay	Accelerate
Option Value	Increase	Increase	Decrease	Increase

Table 2: Parameters for Land Development Models

Base Parameter	Market Land (40 years)	Market Land (10 years)	Conversion Land	Auction Land
Property value P	100	100	100	100
Construction Cost I	30	30	30	30
Interest Rate r	0.1	0.1	0.1	0.1
Volatility σ	0.3	0.3	0.3	0.3
Rental Yield δ	0.02	0.02	0.02	0.02
Penalty Coefficient κ	0	0	0.02	0.02
Maturity Period h	40 years	10 years	40 years	10 years
Time to Build τ	2 years	2 years	2 years	2 years
Lattice Step Δt	1 month	1 month	1 month	1 month

Table 3: Option Value of Real Estate Developments

	ML(40)	ML(10)	CL	AL
NPV(Immediate Development)	66.1169	66.1169	0	66.1169
Option Value	73.1128	70.8796	3.8084	69.8874

Notes: The calculations of option value in this table use the parameters in Table 2. ML (40) represents Market Land (40 years); ML (10) represents Market Land (10 years); CL is Conversion Land; and AL is Auction Land. The option value of conversion land is the flexibility to convert farmland into the land with commercial/residential uses. The values in other cases are land values.

Table 4: Option Value with Various Rental Yield and Penalties

Parameter	NPV	ML (10)	AL (Pen=0.01)	AL (Pen=0.02)	AL (Pen=0.03)	AL (Pen=0.1)	AL (Pen=0.2)	AL (Pen=0.3)	AL (Pen=0.4)	AL 2 Years Waiting
RY=0.00	70	86.6061	85.8233	85.0405	84.2579	78.945	75.5025	75.4528	75.4456	75.4398
RY=0.01	68.0199	77.5374	76.8143	76.1027	75.4134	72.0474	71.5644	71.5321	71.5261	71.5203
RY=0.02	66.1169	70.8796	70.3625	69.8874	69.4725	68.068	67.8643	67.8403	67.8344	67.8283
RY=0.03	64.1764	66.162	65.8702	65.6288	65.4369	64.8315	64.7109	64.6899	64.684	64.6774
RY=0.04	62.3116	62.8258	62.7056	62.6096	62.5356	62.3586	62.3143	62.3116	62.3116	62.3116
RY=0.05	60.4837	60.4837	60.4837	60.4837	60.4837	60.4837	60.4837	60.4837	60.4837	60.4837
RY=0.06	58.692	58.692	58.692	58.692	58.692	58.692	58.692	58.692	58.692	58.692
RY=0.07	56.9358	56.9358	56.9358	56.9358	56.9358	56.9358	56.9358	56.9358	56.9358	56.9358
RY=0.08	55.2148	55.2148	55.2148	55.2148	55.2148	55.2148	55.2148	55.2148	55.2148	55.2148
RY=0.09	53.527	53.527	53.527	53.527	53.527	53.527	53.527	53.527	53.527	53.527
RY=0.1	51.8731	51.8731	51.8731	51.8731	51.8731	51.8731	51.8731	51.8731	51.8731	51.8731

Note: NPV is the value from immediate development. Development land bought at auction has at maximum a total of ten years to complete, including two years of construction. *Pen* is the penalty factor if the firm delays the construction more than two years. RY is rental yield. 2 years waiting means that the developer would wait to year and then make development.

Table 5: Early Exercise Boundary for Each Year in Market Land (10 years)

RY	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
0.001	72.3129	75.5749	79.0487	82.7503	86.6968	90.9069	95.4008	1.002
0.01	7.5967	7.9042	8.2307	8.5778	8.9468	9.3393	9.7571	1.0202
0.02	4.0107	4.1528	4.3034	4.463	4.6322	4.8116	5.002	1.0408
0.03	2.8221	2.9083	2.9995	3.0958	3.1975	3.3052	3.419	1.0618
0.04	2.233	2.2907	2.3514	2.4154	2.4829	2.5541	2.6291	1.0833
0.05	1.884	1.9239	1.9659	2.01	2.0564	2.1052	2.1564	1.1052
0.06	1.655	1.6827	1.7117	1.7421	1.774	1.8074	1.8424	1.1275
0.07	1.4948	1.5133	1.5326	1.5528	1.5739	1.596	1.6191	1.1503
0.08	1.3777	1.3889	1.4006	1.4128	1.4255	1.4387	1.4525	1.1735
0.09	1.2894	1.2946	1.3	1.3055	1.3114	1.3174	1.3237	1.1972
0.1	1.2214	1.2214	1.2214	1.2214	1.2214	1.2214	1.2214	1.2214

Table 6: The Ratio for the Worst Scenario in Market Land (10 years)

Year	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Min Boundary	2.4694	1.8294	1.3552	1.004	0.7438	0.551	0.4082	0.3024

Table 7: Early Exercise Thresholds for Auction Land with Various Rental Yields and Penalties

Pen=0.02	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
RY=0.001	72.3129	75.5749	83.0667	92.7903	106.7669	131.0271	195.6511	1.002
RY=0.01	7.5967	7.9042	8.6491	9.6185	11.018	13.4611	20.0102	1.0202
RY=0.02	4.0107	4.1528	4.5222	5.0045	5.7046	6.9352	10.2583	1.0408
RY=0.03	2.8221	2.9083	3.1519	3.4714	3.9378	4.7639	7.0118	1.0618
RY=0.04	2.233	2.2907	2.4709	2.7085	3.0577	3.6813	5.3918	1.0833
Pen=0.2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
RY=0.001	72.3129	75.5749	119.2291	183.151	287.398	492.1087	1097.9039	1.002
RY=0.01	7.5967	7.9042	12.4144	18.9852	29.6584	50.5568	112.2882	1.0202
RY=0.02	4.0107	4.1528	6.4909	9.878	15.3557	26.047	57.5647	1.0408
RY=0.03	2.8221	2.9083	4.5241	6.8518	10.5998	17.892	39.3471	1.0618
RY=0.04	2.233	2.2907	3.5466	5.3461	8.2308	13.826	30.2565	1.0833
Pen=0.4	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
RY=0.001	72.3129	75.5749	159.4094	283.5517	488.0991	893.3104	2100.407	1.002
RY=0.01	7.5967	7.9042	16.5981	29.3926	50.37	91.7743	214.8193	1.0202
RY=0.02	4.0107	4.1528	8.6783	15.293	26.0792	47.2823	110.1274	1.0408
RY=0.03	2.8221	2.9083	6.0487	10.6079	18.002	32.4788	75.2753	1.0618
RY=0.04	2.233	2.2907	4.7419	8.2767	13.9788	25.098	57.884	1.0833

Table 8: Option Values for Land Development incorporating Firm Factors

	$\alpha=1$	$\alpha=1.01$	$\alpha=1.02$	$\alpha=1.05$	$\alpha=1.1$	$\alpha=1.15$
ML(40 years)	73.1128	73.9550	74.7974	77.3401	81.6072	85.8974
ML(10 years)	70.8796	71.7535	72.6281	75.2591	79.6696	84.0994
AL	69.8874	70.7717	71.6569	74.3242	78.7788	83.2559
	$\beta=0$	$\beta=0.01$	$\beta=0.02$	$\beta=0.05$	$\beta=0.1$	$\beta=0.15$
ML(40 years)	73.1128	73.2239	73.3352	73.6864	74.3000	74.9583
ML(10 years)	70.8796	71.0447	71.2105	71.7165	72.5864	73.4858
AL	69.8874	70.0728	70.2592	70.8304	71.7934	72.7883
	$\gamma=0$	$\gamma=0.01$	$\gamma=0.02$	$\gamma=0.05$	$\gamma=0.1$	$\gamma=0.15$
ML(40 years)	73.1128	73.0016	72.8905	72.5573	72.0502	71.5489
ML(10 years)	70.8796	70.7153	70.5514	70.0624	69.2643	68.4850
AL	69.8874	69.7115	69.5384	69.0248	68.1946	67.3797
	$k=0.1$	$k=0.15$	$k=0.20$	$k=0.25$	$k=0.30$	$k=0.40$
ML(40 years)	73.1128	73.4179	73.7244	74.0322	74.3413	74.9634
ML(10 years)	70.8796	71.1603	71.4543	71.7513	72.0504	72.6524
AL	69.8874	70.1685	70.4593	70.7526	71.0475	71.6417

Note: when calculating option values in the table, only one of the four factors generate impacts each time. For example, if the option value with varying property synergy is calculated, the other three factors are set as $\beta=0$, $\gamma=0$ and $k=0.1$ for the other two factors. The parameters for land development are in Table 2: $P=100$, $l=30$, $r=0.01$, $\sigma=0.3$ and $\delta=0.02$. ML (40 years) is market land with 40 years lease period; ML (10 years) is market land with 10 years; and AL is auction land. The value in first column is the option value without firm factors.

Table 9: Investment Thresholds incorporating Firm Factors**Panel A: Investment Thresholds for Market Land (10 years)**

ML(10 years)	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Base Case	4.0107	4.1528	4.3034	4.463	4.6322	4.8116	5.002	1.0408
$\alpha=1.01$	3.9709	4.1117	4.2608	4.4188	4.5864	4.764	4.9525	1.0305
$\alpha=1.02$	3.932	4.0714	4.2191	4.3755	4.5414	4.7173	4.9039	1.0204
$\alpha=1.05$	3.8197	3.9551	4.0985	4.2505	4.4116	4.5825	4.7638	0.9912
$\alpha=1.1$	3.6461	3.7753	3.9122	4.0573	4.2111	4.3742	4.5473	0.9462
$\alpha=1.15$	3.4875	3.6112	3.7421	3.8809	4.028	4.184	4.3496	0.9051
$\beta=0.01$	3.9706	4.1113	4.2604	4.4184	4.5859	4.7635	4.952	1.0304
$\beta=0.02$	3.9304	4.0698	4.2174	4.3738	4.5396	4.7154	4.902	1.02
$\beta=0.05$	3.8101	3.9452	4.0883	4.2399	4.4006	4.5711	4.7519	0.9888
$\beta=0.1$	3.6096	3.7376	3.8731	4.0167	4.169	4.3305	4.5018	0.9367
$\beta=0.15$	3.4091	3.5299	3.6579	3.7936	3.9374	4.0899	4.2517	0.8847
$\gamma=0.01$	4.0508	4.1944	4.3465	4.5077	4.6785	4.8598	5.052	1.0512
$\gamma=0.02$	4.0909	4.2359	4.3895	4.5523	4.7249	4.9079	5.102	1.0616
$\gamma=0.05$	4.2112	4.3605	4.5186	4.6862	4.8638	5.0522	5.2521	1.0929
$\gamma=0.1$	4.4117	4.5681	4.7338	4.9093	5.0954	5.2928	5.5022	1.1449
$\gamma=0.15$	4.6123	4.7758	4.949	5.1325	5.327	5.5334	5.7523	1.1969
$k=0.15$	3.1736	3.182	3.1611	3.0939	2.9507	2.6749	2.1444	1.0408
$k=0.20$	2.6861	2.6532	2.5906	2.4861	2.3207	2.0649	1.6684	1.0408
$k=0.25$	2.3674	2.3209	2.2489	2.143	1.9912	1.7762	1.4726	1.0408
$k=0.30$	2.1429	2.0929	2.0216	1.9229	1.7887	1.6082	1.366	1.0408
$k=0.40$	1.8483	1.801	1.7385	1.6574	1.5533	1.4208	1.253	1.0408

Note: similar to Table 8, this table only shows the effect of one factor each time. The Base Case is the case without firm factors. The parameters for land development are: $P=100$, $l=30$, $r=0.01$, $\sigma=0.3$ and $\delta=0.02$.

Panel B: Investment Thresholds for Auction Land

AL	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Base Case	4.0107	4.1528	4.5222	5.0045	5.7046	6.9352	10.2583	1.0408
$\alpha=1.01$	3.9709	4.1117	4.4774	4.955	5.6481	6.8665	10.1567	1.0305
$\alpha=1.02$	3.932	4.0714	4.4335	4.9064	5.5927	6.7992	10.0571	1.0204
$\alpha=1.05$	3.8197	3.9551	4.3068	4.7662	5.4329	6.6049	9.7698	0.9912
$\alpha=1.1$	3.6461	3.7753	4.1111	4.5496	5.186	6.3047	9.3257	0.9462
$\alpha=1.15$	3.4875	3.6112	3.9323	4.3518	4.9605	6.0306	8.9202	0.9051
$\beta=0.01$	3.9706	4.1113	4.477	4.9545	5.6475	6.8658	10.1557	1.0304
$\beta=0.02$	3.9304	4.0698	4.4317	4.9044	5.5905	6.7965	10.0531	1.02
$\beta=0.05$	3.8101	3.9452	4.2961	4.7543	5.4193	6.5884	9.7454	0.9888
$\beta=0.1$	3.6096	3.7376	4.07	4.5041	5.1341	6.2417	9.2324	0.9367
$\beta=0.15$	3.4091	3.5299	3.8439	4.2539	4.8489	5.8949	8.7195	0.8847
$\gamma=0.01$	4.0508	4.1944	4.5674	5.0546	5.7616	7.0045	10.3609	1.0512
$\gamma=0.02$	4.0909	4.2359	4.6126	5.1046	5.8187	7.0739	10.4634	1.0616
$\gamma=0.05$	4.2112	4.3605	4.7483	5.2548	5.9898	7.2819	10.7712	1.0929
$\gamma=0.1$	4.4117	4.5681	4.9744	5.505	6.275	7.6287	11.2841	1.1449
$\gamma=0.15$	4.6123	4.7758	5.2005	5.7552	6.5602	7.9754	11.797	1.1969
$k=0.15$	3.1736	3.182	3.3032	3.4188	3.521	3.5952	3.6089	1.0408
$k=0.20$	2.6861	2.6532	2.6945	2.7147	2.7029	2.6416	2.5013	1.0408
$k=0.25$	2.3674	2.3209	2.3299	2.3174	2.2749	2.1904	2.0457	1.0408
$k=0.30$	2.1429	2.0929	2.0873	2.0625	2.0121	1.9276	1.7975	1.0408
$k=0.40$	1.8483	1.801	1.7853	1.7549	1.7063	1.6348	1.5346	1.0408

Note: The parameters for land development are: $P=100$, $l=30$, $r=0.01$, $\sigma=0.3$, $\delta=0.02$ and $Pen=0.02$. Similar to the results Table 5 and Table 7, the investment thresholds are higher for Auction Land than Market Land after Year 2.