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Analysis on Forestry Asset Cash Flow

Song Xiaomei, Pan Huanxue and ChenJing
School of Economics and Management, Beijing Forestry University, 100083, Beijing

Abstract: According to 2011 China forestry basic situation released by national forestry bureau shows: China's forest area reaches 195 million hectares and the forest coverage rate is 20.36%. China's artificial forest area reaches 62 million hectares, ranks No.1 in the world. At the same time, along with development of the forest tenure reform and forestry asset securitization, it's important to understand forestry asset cash flow. Therefore, this article from the perspective of cash flow, has carried on the stationarity test of forestry assets cash flow. Then the author put forward some corresponding policy suggestions at the end of the article.

Key words: Forestry assets, cash flow, stationary test, risk, forest insurance

INTRODUCTION

Forestry assets: Forestry is an important part of the "three rural" work, is also an important part of the economic construction, plays important roles in maintain land security, promote economic development, protect the ecological environment. On the one hand, forestry is a public career. The development of forestry helps maintain the ecological balance and biological diversity. It also makes a great contribution to humanity's ecological construction. On the other hand, forestry is an economic career. Forestry products create the value for society, promote the economic construction and ring huge economic benefits.

Currently, there is no uniform definition on forestry assets. Combined with the implementation details of The Forestry Law of the People's Republic of China, this article defines the forestry assets as follow: forestry assets include the woodland and land crop that can be measured by the currency. Woodland contain forestland, open woodland, immature forest, shrub land, slash land, burned land, nursery land etc. All of their canopy density is more than 0.3. Canopy density(it is based on the ratio of the area of the forest canopy vertical projection and woodland) refers to the extent of the ground forest trees sheltered, which is reflected by the stand density index. A lot of foreign investment funds and trusts have taken forestry assets as earning assets in securities investment portfolio and call them Timberland investment management. Currently, the woodland area in the United States is more than 500 million acres (22% of the total area). The value of them can reach \$460 billion. Besides, the American forestry assets create a value of \$240 billion annually in the global and provide employment opportunities for 1.8 million people.

Literature review: There are no special studies on the cash flow of forest assets, relevant literature mainly focus on two topics: one is on cash flow of others, the other is on forestry assets securitization.

First, study on cash flow of other assets. Chen (2005) and Liu (2004) tried to build a model for enterprise cash flow. Chen and Lu, (2008) discussed how to build enterprise cash flow management system on a prospect of theory. Liu 2004 analyzed the function of financial early warning. Chen (2010) analyzed the cash flow in the industry of real estate.

Second, study on forestry assets securitization. Combining the current situation of forestry financing in terms of application in China of the assets securitisation with the forestry's own characteristic, Liu and Wang (2007) analyzed the feasibility and mode of forestry assets securitization, has offered a new idea for investment and financing of the commercial forest. Na and Xu (2009) discussed the possibility of forestry assets securitization in state-owned forest farms.

ANALYSIS ON FORESTRY ASSET CASH FLOW

The International Accounting Standards Committee (IASC) defines cash flow as follow: Cash flow refers to the inflow and outflow of cash and cash equivalents. This article selected ginkgo as the study sample, the total size of sample is 50 hectares, all observational data are averaged. We select 20 years as a observation period and one-year ginkgo seedlings as starting point (seeds may result in more mistake).

Cash outflow of purchasing seedlings: Cash outflow of the forestry assets is from three main aspects: first, the capital spent on species at the very beginning of

observation period, which refers to one-year ginkgo seedlings. The formula to calculate the amount of seedlings per hectare should purchase is:

$$n = S_t / (S_c * r_1)$$

Where n stands for the number of ginkgo seedlings per hectare, S_t stands for the total area under cultivation, in the model it's one hectare, that of 10000 m², S_c stands for the a single ginkgo crown area (covered area), because ginkgo seedlings in this model are one year, we use a one-year seedling area (0.125 m²) to calculate the amount that we should purchase. r₁ stands for the survival rate of the ginkgo tree, according to the average data of observation, we take r₁ as 90%. So we can know the amount: n = 10000/(0.125*90%) = 88888 and the total cost is 88888*0.5=44444¥.

Cash outflow of drugs and fertilization

Drugs: Generally, ginkgo trees need two kinds drugs: one is for sterilization, the other is for insecticide. A brand called “carbendazim” is used for ginkgo trees to sterilize. One mu ginkgo land need 80 g each time and it cost 5¥ and we should do this three times per year. Therefore, each hectare of ginkgo is required for the “carbendazim” that costs 5*15*3 = 225¥. Besides, another drug “cypermethrin” is used to insecticide. One mu ginkgo tree needs 380ml every year, that also costs 15¥. Therefore, annual expenditure is 15*15 = 225¥.

Fertilization: Generally, ginkgo tree use 45S15-15-15 series specifications fertilization. This article use the average price on October 12th, 2012 (2762 ¥/ton) to calculate. The average annual consumption of fertilizers per acre ginkgo tree is 0.1 ton, so the average annual per hectare ginkgo consumption of fertilizer is 2762*0.1 = 276.2¥.

The cash outflow of woodland rent: Currently, woodland rent is 800 ¥/mu, that is 12,000 ¥/hectare per year. Therefore, the key to calculating the rent is to determine the growth rate of the rent. As shown in Figure 1, the figures are the average land price indexes monitored by government between 2000 and 2011. We can see that the growth rate of average land price reaches 7.75% per annum. If we take this growth rate as the standard, we can get the rent per year in the future.

The cash outflow of labor costs and forestry materials

Labor costs: Generally, two people can serve per hectare land of ginkgo and the average wage is 2,000 ¥/month, so the total capital per year is 2000*2*12 = 48,000¥.

Table 1: Average forestry materials price per hectare

| Forestry materials | Unit price | Support-area | Average cost per hectare |
|------------------------------------|------------|--------------|--------------------------|
| Type 17 Tian Lang electric sprayer | 200¥ | 1 hectare | 200¥ |
| High pressure spray machine | 21700¥ | 100 hectare | 217¥ |
| Truck/tractor | 123000¥ | 100 hectare | 1230¥ |
| Other materials | 500¥ | 1 hectare | 500¥ |
| Total | - | - | 2147¥ |

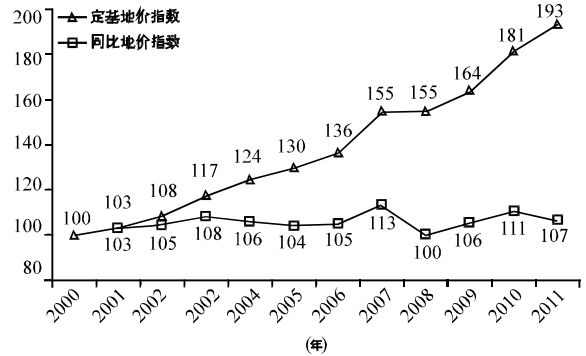


Fig. 1: 2000-2011 the average land price index

Forestry materials: The electric sprayers, high pressure pesticide spraying machines, trucks or tractors, knives, scissors and other materials that per hectare land of ginkgo need is shown in Table 1. This model take 10 years as a depreciation period. All the things shown in Table 2. should purchase again in the 11th year.

THE CASH INFLOW OF FORESTRY ASSET

The cash inflow of natural growth: The cash inflow of forest natural growth is the added value as the ginkgo tree grown. Usually, ginkgo tree growth rate is 1 centimeter (diameter) a year. Early in ginkgo planting, the number of seedlings is 88888, among them 80000 can be survival. However, with the growth of the ginkgo tree, the root cap area will gradually increase, too. That means the number of ginkgo that will gradually one hectare of land can accommodate reduce. Therefore transplant seedlings should conduct regularly. The number of calculated sample gradually reduces. Specific circumstances are shown in Table 2.

Cash inflow of transplant seedlings: As mentioned earlier, due to the actual need, we should regularly transplant seedlings to sparse forests. In this model, the transplant seedlings are converted into cash inflows in accordance with the market price, as shown in Table 3.

The cash inflow of processing added-value: This section focuses on added value due to technology. Take the log

Table 2: Cash inflow of natural growth

| Time | Root cap area (m ²) | Survival no. | Single price(¥) | Total value(¥) | Added-value (¥) |
|------|---------------------------------|--------------|-----------------|----------------|-----------------|
| 1 | 0.125 | 80000 | 0.5 | 40000 | 40000 |
| 2 | 0.5 | 20000 | 5 | 100000 | 60000 |
| 3 | 1 | 10000 | 15 | 150000 | 50000 |
| 4 | 1.5 | 6667 | 25 | 166675 | 16675 |
| 5 | 2 | 5000 | 45 | 225000 | 58325 |
| 6 | 2.4 | 4167 | 65 | 270855 | 45855 |
| 7 | 2.8 | 3571 | 90 | 321390 | 50535 |
| 8 | 3.2 | 3125 | 140 | 437500 | 116110 |
| 9 | 3.6 | 2778 | 170 | 472260 | 34760 |
| 10 | 4 | 2500 | 240 | 600000 | 127740 |
| 11 | 4.4 | 2273 | 270 | 613710 | 13710 |
| 12 | 4.8 | 2083 | 310 | 645730 | 32020 |
| 13 | 5.2 | 1923 | 430 | 826890 | 181160 |
| 14 | 5.6 | 1786 | 600 | 1071600 | 244710 |
| 15 | 6 | 1667 | 850 | 1416950 | 345350 |
| 16 | 6.4 | 1563 | 1000 | 1563000 | 146050 |
| 17 | 6.8 | 1471 | 1300 | 1912300 | 349300 |
| 18 | 7.2 | 1389 | 2300 | 3194700 | 1282400 |
| 19 | 7.6 | 1316 | 3000 | 3948000 | 753300 |
| 20 | 8 | 1250 | 3500 | 4375000 | 427000 |

Table 3: Cash inflow of transplant seedlings

| Time | Survival no. | Transplant | Single price (¥) | Total transplant value (¥) |
|------|--------------|------------|------------------|----------------------------|
| 1 | 80000 | 0 | 0.5 | 0 |
| 2 | 20000 | 60000 | 5 | 300000 |
| 3 | 10000 | 10000 | 15 | 150000 |
| 4 | 6667 | 3333 | 25 | 83325 |
| 5 | 5000 | 1667 | 45 | 75015 |
| 6 | 4167 | 833 | 65 | 54145 |
| 7 | 3571 | 596 | 90 | 53640 |
| 8 | 3125 | 446 | 140 | 62440 |
| 9 | 2778 | 347 | 170 | 58990 |
| 10 | 2500 | 278 | 240 | 66720 |
| 11 | 2273 | 227 | 270 | 61290 |
| 12 | 2083 | 190 | 310 | 58900 |
| 13 | 1923 | 160 | 430 | 68800 |
| 14 | 1786 | 137 | 600 | 82200 |
| 15 | 1667 | 119 | 850 | 101150 |
| 16 | 1563 | 104 | 1000 | 104000 |
| 17 | 1471 | 92 | 1300 | 119600 |
| 18 | 1389 | 82 | 2300 | 188600 |
| 19 | 1316 | 73 | 3000 | 219000 |
| 20 | 1250 | 66 | 3500 | 231000 |

Table 4: Forestry asset value of the different production stages

| | Log sheet | Pulp fiber | 4Cr13 saw board |
|---------------------------|-----------|------------|-----------------|
| Minimum purchase | - | =100 ton | =50 ton |
| Price (¥/ton) | 450 | 5000 | 14200 |
| Breakage rate (estimated) | - | 50% | 50% |
| Actual price after wreck | 450 | 2500 | 3600 |
| Appreciation | - | 455% | 44% |
| Cumulative appreciation | - | 455% | 700% |

sheet as example: the price is 450 ¥/ton at the initial stage. When the hardwood processes into pulp fibers, the market price becomes 5,000 ¥/ton (if the order is less than 100 tons, the market price is higher than the 5,000 ¥/ton). When pulp fibers further processes to the 4Cr13 saw board, its market price has reached 14,200 ¥/ton. When the 4Cr13 saw board processed into

a variety of furniture, its profits will increase significantly. Specific circumstances are shown in Table 4.

STATIONARY TEST OF FORESTRY ASSETS'S CASH FLOW

From now, we can draw the cash flow analysis table according to the previous calculations (Table 5). From the table, the average net cash flow of each stage is more than 4 million Yuan and the average annual cash flow is more than 800,000 Yuan.

And then, we do the stationary tests to cash flow of forestry assets, In this paper, we use the method of ADF proposed by Dickey and Fuller (1979) do the unit root tests. The test equation divided into three categories based on intercept or time trend:

Equation (a):

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \epsilon_t$$

Neither intercept nor time trend

Equation(b):

$$\Delta y_t = \alpha + \gamma y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \epsilon_t$$

Intercept but no time trend

Equation (c):

$$\Delta y_t = \alpha + \delta t + \gamma y_{t-1} + \sum_{i=1}^p \beta_i \Delta y_{t-i} + \epsilon_t$$

Both intercept and time trend

The original assumption of the test is $\gamma = 0$, the alternative one is $\gamma < 0$. If the test statistic is more negative than the critical value the alternative assumption instead of the original one should be accepted and vice versa.

Cash Flow (CF) of forestry assets and its differential ADF test results are shown in Table 2.6. T statistics magnitudes of ADF test are given in three forms in Table 2.6. From the table, we can see the CF sequence is not stable. ΔCF and $\Delta^2 CF$ is the logarithm sequence of CF, the original assumption is accepted at the 5% significance level, that is the logarithmic sequence is not stable, either. Cash flow sequence of forestry assets is not stable or not a single sequence. forestry assets at same cycle stage cannot design financial products or assets packaged.

Table 5: Table of analysis on forestry assets' cash flow unit:¥

| Time | Cash inflow(+) | | | Cash outflow(-) | | | | | | Total |
|------|----------------|------------|-----------|-----------------|-------|----------|-------|-----------|-------------|-------|
| | Growth | Transplant | Add-value | Seedlings | Drugs | Rent | Labor | Materials | | |
| 1 | 40000 | 0 | 0 | 44444 | 501.2 | 12000 | 48000 | 2147 | -67092.20 | |
| 2 | 60000 | 300000 | 0 | 0 | 501.2 | 12930 | 48000 | 0 | 298568.80 | |
| 3 | 50000 | 150000 | 0 | 0 | 501.2 | 13932.08 | 48000 | 0 | 137566.72 | |
| 4 | 16675 | 83325 | 0 | 0 | 501.2 | 15011.81 | 48000 | 0 | 36486.99 | |
| 5 | 58325 | 75015 | 0 | 0 | 501.2 | 16175.23 | 48000 | 0 | 68663.57 | |
| 6 | 45855 | 54145 | 0 | 0 | 501.2 | 17428.81 | 48000 | 0 | 34069.99 | |
| 7 | 50535 | 53640 | 0 | 0 | 501.2 | 18779.54 | 48000 | 0 | 36894.26 | |
| 8 | 116110 | 62440 | 0 | 0 | 501.2 | 20234.95 | 48000 | 0 | 109813.85 | |
| 9 | 34760 | 58990 | 0 | 0 | 501.2 | 21803.16 | 48000 | 0 | 23445.64 | |
| 10 | 127740 | 66720 | 0 | 0 | 501.2 | 23492.91 | 48000 | 0 | 122465.89 | |
| 11 | 13710 | 61290 | 0 | 0 | 501.2 | 25313.61 | 48000 | 2147 | -961.81 | |
| 12 | 32020 | 58900 | 0 | 0 | 501.2 | 27275.41 | 48000 | 0 | 15143.39 | |
| 13 | 181160 | 68800 | 0 | 0 | 501.2 | 29389.26 | 48000 | 0 | 172069.54 | |
| 14 | 244710 | 82200 | 0 | 0 | 501.2 | 31666.92 | 48000 | 0 | 246741.88 | |
| 15 | 345350 | 101150 | 0 | 0 | 501.2 | 34121.11 | 48000 | 0 | 363877.69 | |
| 16 | 146050 | 104000 | 0 | 0 | 501.2 | 36765.50 | 48000 | 0 | 164783.30 | |
| 17 | 349300 | 119600 | 0 | 0 | 501.2 | 39614.82 | 48000 | 0 | 380783.98 | |
| 18 | 1282400 | 188600 | 0 | 0 | 501.2 | 42684.97 | 48000 | 0 | 1379813.83 | |
| 19 | 753300 | 219000 | 0 | 0 | 501.2 | 45993.06 | 48000 | 0 | 877805.74 | |
| 20 | 427000 | 231000 | 11676000 | 0 | 501.2 | 49557.52 | 48000 | 0 | 12235941.28 | |

SUGGESTIONS

First, carry out the forest understory economy vigorously, increase cash inflows. The forest understory economic is an economic model using the existing understory land resources and forest under the shade of the environment. In the model, we can plant understory plantings and other economic crops among ginkgo trees in order to reduce average fixed cost of the initial investment. It also increase woodland revenue and realize the goal of increasing cash inflow of forestry enterprise. Second, finance in multi-channel, ensure the funding chain. As the main economic bodies, foresters and forestry enterprises need cash flow to maintain the operation. However, financing channels for foresters and forestry enterprises are far from perfect. Order to broaden the financing channels of foresters and forestry enterprises, we can construct various forestry support fund, continue to promote the forestry asset securitization and forestry financial products innovation. encourage institutional and individual investors put their capital on the state-sponsored or high-level assessment projects.

Third, enhance efforts of forest insurance policy to eliminate unnecessary cash outflow. Forestry is the carrier of forestry capital market, due to its poor anti-risk ability, the country should transfer risks to the financial markets. One of the most effective methods is to carry out the policy forest insurance. Thought the commercial insurance market is more efficient way, due to the shortcomings of the forest itself, insurance company cannot develop this business. Even the most developed

forest insurance in the United States, Japan and the Nordic, their government subsidy relevant departments. Besides, their governments also carry out all kinds of preferential treatment. Since our country developed the policy forest insurance pilot, the situation is much better than before. But there are still dual cold situations of supply and demand. Therefore, the government should also popularize knowledge of forestry and insurance to foresters, eliminate fluke psychological risk, use scientific theory to help the foresters build the anti-risk measures to improve the system, in order to increase forest insurance coverage.

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