



**International Business and Management**  
Vol. 6, No. 1, 2013, pp. 51-54  
DOI:10.3968/j.ibm.1923842820130601.1115

ISSN 1923-841X [Print]  
ISSN 1923-8428 [Online]  
www.cscanada.net  
www.cscanada.org

## Wealth Optimization Models with Stochastic Volatility and Continuous Dividends

YANG Yunfeng<sup>[a]\*</sup>; JIN Hao<sup>[a]</sup>

<sup>[a]</sup>School of Science XI'AN University of Science and Technology, XI'AN, 710054, China.

\*Corresponding author.

**Supported by** NSFC(71103143), SSTF(2009KRM99), NSFS (2011JQ1016), NPFC(20110491672, 2012T50809), SSFE(12JK0858), XUST(201240).

Received 1 January 2013; accepted 14 February 2013

### Abstract

This paper study the problem of wealth optimization. It is established that the behavior model of the stock pricing process is jump-diffusion driven by a count process and stochastic volatility. Supposing that risk assets pay continuous dividend regarded as the function of time. It is proved that the existence of an optimal portfolio and unique equivalent martingale measure by stochastic analysis methods. The unique equivalent martingale measure, the optimal wealth process, the value function and the optimal portfolio are deduced.

**Key words:** Jump-Diffusion process; Stochastic volatility; Dividends; Incomplete financial market; Wealth optimization

YANG Yunfeng, JIN Hao (2013). Wealth Optimization Models with Stochastic Volatility and Continuous Dividends. *International Business and Management*, 6(1), 51-54. Available from: <http://www.cscanada.net/index.php/ibm/article/view/j.ibm.1923842820130601.1115> DOI: <http://dx.doi.org/10.3968/j.ibm.1923842820130601.1115>

### INTRODUCTION

The wealth optimization problem and the portfolio selection theory are always the kernel problems on financial mathematics. The domestic and foreign scholars have done a great deal of researches on the wealth optimization problem and obtained many results which is instructive to financial practice. When markets

are complete, the existence of optimal strategies can be found Merton (1), Jeanblanc and Pontier (2), Follmer and Leukert (3), Pham (4), Nakano (5) discussed continuous and jump-diffusion modes.

In this paper, We define the wealth optimization problem:

$$V(t, x, y) = \sup_{\pi \in A} E[U(X^{x, \pi}(T)) | X^{x, \pi}(t) = x, Y(t) = y]$$

where  $X^{x, \pi}(t)$  is the wealth process and  $A$  is the set of a dismissible portfolios. When the wealth is equal to  $x$  at the time  $t$ . we consider an economic agent whose behavior facing the risk is determined by a utility function  $U(\cdot)$ . Utility function is non decreasing, strictly concave, obviously  $U(\cdot)$  admits an inverse  $I(\cdot)$ . He invests his wealth in the two assets and wants to maximize the expected utility of wealth at time  $T$ . Our work extends those studies and analyses the wealth optimization problem when markets is incomplete and driven by discontinuous prices. We consider that price of underlying asset price obeys jump-diffusion process, jump process generalized conforms to the actual situation of stock price movement. This paper discusses jump-diffusion asset price model being driven by a count process that more general than Poisson process. Supposing that risk assets pay continuous dividend regarded as the function of time. It is proved that the existence of an optimal portfolio and unique equivalent martingale measure by stochastic analysis methods. The unique equivalent martingale measure, the optimal wealth process, the value function and the optimal portfolio are deduced.

### 1. ASSUMPTIONS AND MODEL

Let  $(\Omega, F, P, (F_t)_{0 \leq t \leq T})$  be a probability space. The market is built with a bond  $B(t)$  and a risky asset  $S(t)$ . We suppose that  $B(t)$  and  $S(t)$  satisfy differential equation

$$dB(t) = B(t)r(t)dt, \quad B(0) = 1 \quad (1)$$

$$dS(t) = S(t)((\alpha(S(t)) - \beta(S(t)))dt + \sigma(S(t))dW_1(t) + \gamma(S(t))dM(t)) \quad (2)$$

$$dY(t) = b(Y(t))dt + a(Y(t))(\rho dW_1(t) + \sqrt{1-\rho^2}dW_2(t)) \quad (3)$$

where  $r$  is free interest rate  $\lambda(t)$  volatility  $\sigma(Y(t))$  continuous dividends  $\lambda(Y(t))$  Standard Wiener process  $\{W_1(t), 0 \leq t \leq T\}$  and  $\{W_2(t), 0 \leq t \leq T\}$  are independent

$M(t) = N(t) - \int_0^t \lambda(s)ds, T \geq t \geq 0$  is the compensated martingale of non explosive counting process  $\{N(t), 0 \leq t \leq T\}$  with intensity parameter  $\lambda(t)$

**Lemma 1** For all  $P^*$  in  $\mathcal{P}$  there exist predictable processes  $\alpha_1(t), \alpha_2(t), \alpha_3(t)$  satisfy

$$\begin{aligned} \alpha(Y(t)) &= \alpha_1(t) + \alpha_2(t) + \alpha_3(t) \\ \alpha(Y(t)) + a(Y(t))\rho &= \alpha_1(t) + a(Y(t))\sqrt{1-\rho^2} \alpha_2(t) \end{aligned} \quad (5)$$

**Proof** Since  $P^*$  in  $\mathcal{P}$  then  $\frac{dP^*}{dP} \Big|_{\mathcal{F}_t} = L(t)$  is the martingale applying martingale representation theorem there exists  $\alpha_1(t), \alpha_2(t), \alpha_3(t)$  such that

$$\begin{aligned} dL(t) &= \alpha_1(t)dW_1(t) + \alpha_2(t)dW_2(t) + \alpha_3(t)dN(t) \\ \text{that is } \alpha(t) &= \alpha_1(t) + \alpha_2(t) + \alpha_3(t) \\ &= \exp\left\{\int_0^t \alpha_1(s)dW_1(s) - \frac{1}{2}\int_0^t \alpha_2^2(s)ds + \int_0^t \alpha_3(s)dN(s) - \frac{1}{2}\int_0^t \alpha_3^2(s)ds\right\} \exp\left\{\int_0^t \ln(1 + \alpha_3(s))dN(s) - \int_0^t \lambda(s)\alpha_3(s)ds\right\} \end{aligned}$$

applying Girsanov theorem  $W_1^*(t) = W_1(t) - \int_0^t \alpha_1(s)ds$

$W_2^*(t) = W_2(t) - \int_0^t \alpha_2(s)ds$  are standard Wiener process under the martingale measure  $\mathbb{P}^*$   $M^*(t) = N(t) - \int_0^t \lambda(s)(1 + \alpha_3(s))ds$  is martingale So

$\tilde{S}(t) = \frac{S(t)}{B(t)}$  and  $Y(t)$  satisfy

$$\begin{aligned} d\tilde{S}(t) &= \tilde{S}(t-)(\mu(Y(t)) - \tau(Y(t)) - r(t))dt + \\ &\sigma(Y(t))dW_1^*(t) + \sigma(Y(t))\theta_1(t)dt + \varphi(Y(t))dM^*(t) + \\ &\varphi(Y(t))\lambda(t)\theta_3(t)dt = \tilde{S}(t-)(\mu(Y(t)) - \tau(Y(t)) - r(t) + \\ &\sigma(Y(t))\theta_1(t) + \lambda(t)\varphi(Y(t))\theta_3(t))dt + \sigma(Y(t))dW_1^*(t) + \\ &\varphi(Y(t))dM^*(t) \quad dY(t) = b(Y(t))dt + a(Y(t))\rho dW_1^*(t) + \\ &a(Y(t))\rho\theta_1(t)dt \\ &+ a(Y(t))\sqrt{1-\rho^2}dW_2^*(t) + a(Y(t))\sqrt{1-\rho^2}\theta_2(t)dt \\ &= (b(Y(t)) + a(Y(t))\rho\theta_1(t) + a(Y(t))\sqrt{1-\rho^2}\theta_2(t))dt \\ &+ a(Y(t))\rho dW_1^*(t) + a(Y(t))\sqrt{1-\rho^2}dW_2^*(t) \end{aligned}$$

$$\pi^*(t) = \frac{r(t) - \mu(y) + \tau(y) - \lambda(t)\varphi(y)\theta_3(t)}{\sigma^2(y)} \frac{V'_x(t, x, y)}{V''_{xx}(t, x, y)} - \frac{\rho a(y)}{\sigma(y)} \frac{V''_{xy}(t, x, y)}{V''_{xx}(t, x, y)}$$

Since  $\tilde{S}(t)$  and  $Y(t)$  are martingale then

$$\begin{aligned} \alpha(Y(t)) &= \alpha_1(t) + \alpha_2(t) + \alpha_3(t) \\ b(Y(t)) + a(Y(t))\rho\theta_1(t) + a(Y(t))\sqrt{1-\rho^2}\theta_2(t) &= 0 \end{aligned}$$

We define the investor wealth process in a self-financing way the investor wealth process  $X^{x,\pi}(\cdot)$  satisfy

$$X^{x,\pi}(s) = m_1(s)B(s) + m_2(s)S(s) \quad 0 \leq t \leq s \leq T$$

Let  $m_2(\cdot)$  and  $m_1(\cdot)$  then  $X^{x,\pi}(\cdot)$  satisfy

$$dX^{x,\pi}(t) = r(t)X^{x,\pi}(t)dt + \alpha(Y(t))\sigma(Y(t))dW_1(t) + \alpha(Y(t))\sqrt{1-\rho^2}\theta_2(t)dW_2(t) + \alpha(Y(t))\lambda(t)dN(t)$$

and  $\tilde{X}^{x,\pi}(s) = \frac{X^{x,\pi}(s)B(s)}{B(s)}$  satisfy

$$\begin{aligned} d\tilde{X}^{x,\pi}(s) &= \tilde{\pi}(s)(\mu(Y(s)) - \tau(Y(t)) - r(s))ds \\ &+ \tilde{\pi}(s)\sigma(Y(s))dW_1(s) + \tilde{\pi}(s)\varphi(Y(s))dM(s) \\ &= \tilde{\pi}(s)(\mu(Y(s)) - \tau(Y(t)) - r(s) + \sigma(Y(s))\theta_1(s) + \\ &\lambda(s)\varphi(Y(s))\theta_3(s))ds + \tilde{\pi}(s)\sigma(Y(s))dW_1^*(s) + \\ &\tilde{\pi}(s)\varphi(Y(s))dM^*(s) \end{aligned}$$

by Lemma 1, we have

$$d\tilde{X}^{x,\pi}(s) = \tilde{\pi}(s)\sigma(Y(s))dW_1^*(s) + \tilde{\pi}(s)\varphi(Y(s))dM^*(s) \quad (\square)$$

so  $\tilde{X}^{x,\pi}(s)$   $0 \leq t \leq s \leq T$  is a martingale

**Lemma 2** function

$$F(z) = z + \lambda\varphi - \frac{\lambda\varphi}{V'_x} V'_x(t, x + \frac{\varphi}{\sigma^2}(r - \mu + \tau - \rho\sigma a \frac{V''_{xy}}{V'_x} - z) \frac{V'_x}{V''_{xx}}, y)$$

exists unique zero point  $z_0 \in \mathbb{R}$

and

$$\theta_3 = \frac{1}{V'_x} V'_x(t, x + \frac{\varphi}{\sigma^2}(r - \mu + \tau - \rho\sigma a \frac{V''_{xy}}{V'_x} - z) \frac{V'_x}{V''_{xx}}, y) - 1$$

we have  $\alpha(\cdot)$  exists unique zero point  $z_0$  so exists unique zero point  $z_0$  such that

$$\theta_3 = \frac{1}{V'_x} V'_x(t, x + \frac{\varphi}{\sigma^2}(r - \mu + \tau - \rho\sigma a \frac{V''_{xy}}{V'_x} - \lambda\varphi\theta_3) \frac{V'_x}{V''_{xx}}, y) - 1 \quad (\square)$$

together with (5) and (6) we can define a unique equivalent martingale measure  $\mathbb{P}^*$

## 2. MAIN RESULTS

**Proposition 1** We assume that utility function satisfies a polynomial growth condition then the optimal strategy  $\pi^*$  is given by

**Proof.** The associated H-J-B equation takes the following form

$$V'_t + \sup_{\pi} \{ [xr + \pi(\mu(y) - \tau(y) - \lambda\phi(y) - r)]V'_x + \pi\rho\sigma(y)a(y)V''_{xy} + \frac{1}{2}\pi^2\sigma^2(y)V''_{xx} + \frac{1}{2}a^2(y)V''_{yy} + b(y)V'_y + \lambda[V(t, x + \pi\phi(y), y) - V] \} = 0$$

$$V(T, x, y) = U(x)$$

□ e have

$$(\mu(y) - \tau(y) - \lambda\phi(y) - r)V'_x + \pi^*\sigma^2(y)V''_{xx} + \rho\sigma(y)a(y)V''_{xy} + \lambda\phi(y)V'_x(t, x + \pi^*\phi(y), y) = 0$$

□ et  $r - \mu - \rho\sigma a \frac{V''_{xy}}{V'_x} - \pi^*\sigma^2 \frac{V''_{xx}}{V'_x} = z$ , this equation equivalently

$$z + \lambda\phi - \frac{\lambda\phi}{V'_x}V'_x(t, x + \frac{\phi}{\sigma^2}(r - \mu + \tau - \rho\sigma a \frac{V''_{xy}}{V'_x} - z) \frac{V'_x}{V''_{xx}}, y) = 0$$

Thus, we prove that

$$\pi^*(t) = \frac{r(t) - \mu(y) + \tau(y) - \lambda(t)\phi(y)\theta_3(t)}{\sigma^2(y)} \frac{V'_x(t, x, y)}{V''_{xx}(t, x, y)}$$

$$- \frac{\rho a(y)}{\sigma(y)} \frac{V''_{xy}(t, x, y)}{V''_{xx}(t, x, y)}$$

$$\square \text{et } Z^{(t,z)}(s) =$$

$$z \exp\left\{-\int_t^s r(u)du\right\} \frac{\varepsilon(\theta_1 W_1)_s \varepsilon(\theta_2 W_2)_s \varepsilon[(1 + \theta_3)M]_s}{\varepsilon(\theta_1 W_1)_t \varepsilon(\theta_2 W_2)_t \varepsilon[(1 + \theta_3)M]_t}$$

$0 \leq t \leq s \leq T$ , □ obviously

$$Z^{(t,z)}(s) = zZ^{(t,1)}(s) = z \frac{B(t)L(s)}{B(s)L(t)}$$

is a  $P$  martingale.

□ et  $X(t, z, y) = \square^* \left[ \square \int_t^T r(u)du \square(Z^{(t,z)}(T)) \right]$ , we have

$$X(t, z, y) = \square^* \left\{ \square^* \left[ \square \int_t^T r(u)du \square(Z^{(t,z)}(T)) \right] \middle| \mathcal{F}_t \right\}$$

$$= \square \left\{ \frac{L(T)}{L(t)} \square \left[ \square \int_t^T r(u)du L(T) \square(Z^{(t,z)}(T)) \right] \middle| \mathcal{F}_t \right\}$$

$$= \frac{1}{z} \square \{ L(T) \square [Z^{(t,z)}(T) \square(Z^{(t,z)}(T))] \middle| \mathcal{F}_t \}$$

$$= \frac{1}{z} \square [Z^{(t,z)}(T) \square(Z^{(t,z)}(T))] \middle| \mathcal{F}_t$$

**Proposition 2** The optimal wealth process  $\square^{x,\pi^*}(s)$  satisfies

$$\square^{x,\pi^*}(s) = \frac{1}{Z^{(t,1)}(s)} \square \left[ \square(X^{-1}(t, x, y)Z^{(t,1)}(T))Z^{(t,1)}(T) \right]$$

$$\middle| \mathcal{F}_s \right] (0 \leq t \leq s \leq T).$$

**Proof** Since  $\frac{\square^{x,\pi^*}(s)B(t)}{B(s)} (0 \leq t \leq s \leq T)$  is a  $P$  martingale, applying Bayes's rule,

$$x = \square^* \left[ \frac{\square^{x,\pi^*}(T)B(T)}{B(T)} \middle| \mathcal{F}_t \right] \square \left[ \frac{L(T)}{L(t)} \middle| \mathcal{F}_t \right]$$

$$= \square \left[ \left[ \frac{\square^{x,\pi^*}(T)B(T)}{B(T)} \right] \frac{L(T)}{L(t)} \middle| \mathcal{F}_t \right]$$

$$= \square \left[ \square^{x,\pi^*}(T)Z^{(t,1)}(T) \middle| \mathcal{F}_t \right]$$

and

$$x = X(t, X^{-1}(t, x, y), y) = \square [Z^{(t,1)}(T) \square(X^{-1}(t, x, y)Z^{(t,1)}(T))] \middle| \mathcal{F}_t$$

we have

$$\square^{x,\pi^*}(T) = \square(X^{-1}(t, x, y)Z^{(t,1)}(T))$$

so

$$\frac{\square^{x,\pi^*}(s)B(t)}{B(s)} = \square^* \left[ \frac{\square^{x,\pi^*}(T)B(t)}{B(T)} \middle| \mathcal{F}_s \right]$$

$$= \square \left[ \frac{\square^{x,\pi^*}(T)B(t)L(T)}{B(T)L(t)} \middle| \mathcal{F}_s \right] / \square \left[ \frac{L(T)}{L(t)} \middle| \mathcal{F}_s \right]$$

$$= \frac{L(t)}{L(s)} \square \left[ \frac{\square^{x,\pi^*}(T)B(t)L(T)}{B(T)L(t)} \middle| \mathcal{F}_s \right]$$

$$= \frac{L(t)}{L(s)} \square \left[ \frac{\square(X^{-1}(t, x, y)Z^{(t,1)}(T))B(t)L(T)}{B(T)L(t)} \middle| \mathcal{F}_s \right]$$

then

$$\square^{x,\pi^*}(s) = \frac{1}{Z^{(t,1)}(s)} \square \left[ \square(X^{-1}(t, x, y)Z^{(t,1)}(T))Z^{(t,1)}(T) \middle| \mathcal{F}_s \right]$$

**Proposition 3** □ et

□  $(t, z, y) = \square [U(\square(zZ^{(t,1)}(T)))]$ , the value function and the optimal portfolio are given □ y

$$V(t, x, y) = \square(t, X^{-1}(t, x, y), y)$$

$$\pi^*(s) = \frac{r - \mu + \tau - \lambda\phi\theta_3}{\sigma^2} \frac{X^{-1}(s, \square^{x,\pi^*}(s), \square(s))}{X^{-1}'(s, \square^{x,\pi^*}(s), \square(s))}$$

$$- \frac{\rho a}{\sigma} \frac{X^{-1}'(s, \square^{x,\pi^*}(s), \square(s))}{X^{-1}'(s, \square^{x,\pi^*}(s), \square(s))}$$

**Proof.** □ or  $0 < \xi < z$ ,

$$zX(t, z, y) - \xi X(t, \xi, y) - \int_{\xi}^z X(t, u, y)du$$

$$= \square [Z^{(t,z)}(T) \square(Z^{(t,z)}(T)) - Z^{(t,\xi)}(T) \square(Z^{(t,\xi)}(T))] -$$

$$\int_{\xi}^z \frac{1}{u} Z^{(t,u)}(T) \square(Z^{(t,u)}(T))du$$

$$= \square [Z^{(t,z)}(T) \square(Z^{(t,z)}(T)) - Z^{(t,\xi)}(T) \square(Z^{(t,\xi)}(T))] -$$

$$\int_{\xi Z^{(t,1)}(T)}^{z Z^{(t,1)}(T)} I(v)dv$$

$$= E[U(I(zZ^{(t,1)}(T))) - U(I(\xi Z^{(t,1)}(T)))]$$

$$= G(t, z, y) - G(t, \xi, y)$$

then we easily see that  $G'_z(t, z, y) = zX'_z(t, z, y)$

$$V(t, x, y) = \sup_{\pi \in A} E[U(X^{x,\pi}(T)) | X^{x,\pi}(t) = x, Y(t) = y]$$

$$= E[U(X^{x,\pi^*}(T)) | X^{x,\pi^*}(t) = x, Y(t) = y]$$

$$= E[U(I(X^{-1}(t, x, y)Z^{(t,1)}(T)))]$$

$$= G(t, X^{-1}(t, x, y), y)$$

thus

$$V'_x(t, x, y) = G'_z(t, X^{-1}(t, x, y), y)X'_x^{-1}(t, x, y) = X^{-1}(t, x, y)$$

$$V''_{xx}(t, x, y) = X^{-1}'_x(t, x, y) \quad V''_{yy}(t, x, y) = X^{-1}'_y(t, x, y)$$

applying Proposition 1 we have

$$\pi^*(s) = \frac{r - \mu + \tau - \lambda\phi\theta_3}{\sigma^2} \frac{X^{-1}(s, X^{x,\pi^*}(s), Y(s))}{X^{-1}'_x(s, X^{x,\pi^*}(s), Y(s))}$$

$$\frac{\rho a}{\sigma} \frac{X^{-1}'_y(s, X^{x,\pi^*}(s), Y(s))}{X^{-1}'_x(s, X^{x,\pi^*}(s), Y(s))}$$

**Proposition 4** Assume that  $U(x) = \ln x$ ,  $0 < x < \infty$

then

$$\theta_3(s) = \frac{\phi(r - \mu + \tau - \lambda\phi\theta_3)}{\sigma^2 - \phi(r - \mu + \tau - \lambda\phi\theta_3)}$$

$$X^{x,\pi^*}(s) = \frac{x}{Z^{(t,1)}(s)} \quad V(t, x, y) = \ln x - E[\ln Z^{(t,1)}(T) | \mathcal{F}_t]$$

$$\pi^*(s) = \frac{\mu - r - \tau + \lambda\phi\theta_3}{\sigma^2} X^{x,\pi^*}(s)$$

Assume that  $U(x) = \frac{x^\alpha}{\alpha}$ ,  $0 < x < \infty$ ,  $0 < \alpha < 1$  then

for  $s(0 \leq t \leq s \leq T)$   $\theta_3(s)$  and  $\theta_3(s)$  satisfy

$$(\alpha - 1)\sigma^2(1 + \theta_3)^{\frac{1}{\alpha-1}} = (\alpha - 1)\sigma^2 + \phi(r - \mu + \tau -$$

$$\rho\sigma a(1 - \alpha) \frac{X'_y(s, 1, Y(s))}{X(s, 1, Y(s))} - \lambda\phi\theta_3)$$

the optimal wealth, the value function and the optimal portfolio are given by

$$X^{x,\pi^*}(s) = x \frac{Z^{(t,1)}(s)^{\frac{1}{\alpha-1}}}{Z^{(t,1)}(t)^{\frac{1}{\alpha-1}}} \exp\left\{\int_t^s \frac{-\phi}{2(\alpha-1)^2} [\theta_1^2 + \theta_2^2] -$$

$$\lambda[(1 + \theta_3)^{\frac{\alpha}{\alpha-1}} - \frac{\alpha}{\alpha-1} \theta_3 - 1]d\tau\right\}$$

$$V(t, x, y) = \frac{x^\alpha}{\alpha} X^{1-\alpha}(t, 1, y)$$

$$\pi^*(s) = \frac{r - \mu + \tau - \lambda\phi\theta_3}{\sigma^2} \frac{X^{x,\pi^*}(s)}{\alpha - 1} +$$

$$\frac{\rho a}{\sigma} X^{x,\pi^*}(s) \frac{X'_y(s, 1, Y(s))}{X(s, 1, Y(s))}$$

where

$$X(t, 1, y) = \exp\left\{\int_t^T \frac{-\phi}{\alpha-1} + \frac{\phi}{2(\alpha-1)^2} [\theta_1^2 + \theta_2^2] +$$

$$\lambda[(1 + \theta_3)^{\frac{\alpha}{\alpha-1}} - \frac{\alpha}{\alpha-1} \theta_3 - 1]d\tau\right\}$$

## REFERENCES

Chollmer & Eufert Efficient Hedging Cost Versus Shortfall Risk *Finance and Stochastics*, 4(4) 401-414

Chan, Lancaster & Montier Market Optimal Portfolio for a Small Investor in a Market Model with Discontinuous Prices *Applied Mathematical Optimization*, 22(4) 381-394

Marc Oliver Rieger Optimal Financial Investments for Monotone Concave Utility Functions *Economics Letters*, 114(4) 401-404

Merton Risk-Neutral Optimum Consumption and Portfolio Rules in a Continuous Time Model *Journal of Economic Theory*, 3(4) 401-414

Ham & Dynami Hedging in Discrete Time Under Cone Constraints *SIAM J. Control Optim.*, 38(5) 501-514

Wang & Forsyth Maximal Use of Central Differencing for Hamiltonian Problems in Finance *SIAM Journal on Numerical Analysis*, 46(5) 501-514

Umiharu, Tanaka & Minimization of Shortfall Risk in a Jump Diffusion Model *Statistics & Probability Letters*, 67(5) 501-514