
(ANNs & ARIMA)

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(// // //)

(ANNs)

(ARIMA)

(PNNs)

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(PNNs)

(ARIMA)

(ANNs)

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$$y_t = \theta_0 + \phi_1 y_{t-1} + \dots + \phi_p y_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \dots - \theta_q \varepsilon_{t-q} \quad ()$$

ε_t, y_t

$\phi_i (i=1,2,\dots, p) \quad t$

q, p

$\theta_j (j=1,2,\dots, q)$

ε_t

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σ^2

$q=0$

p

()

:

q

$p=0$

(ANNs)

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(y_t)

:

$(y_{t-1}, \dots, y_{t-p})$

$$y_t = \alpha_t + \sum_{j=1}^q \alpha_j g(B\alpha_j + \sum_{i=1}^p B_i y_{t-i}) + \varepsilon_t \quad ()$$

(ARIMA)

$$e_t = y_t - \hat{L}_t \quad (1)$$

$$g(x) = \frac{1}{1 + \exp(-x)} \quad (2)$$

$$e_t = f(e_{t-1}, \dots, e_{t-n}) + \varepsilon_t \quad (3)$$

$$y_t = f(y_{t-1}, \dots, y_{t-p}, w) + \varepsilon_t \quad (4)$$

N_t (ANNs & ARIMA)

$$\hat{y}_t = \hat{L}_t + \hat{N}_t \quad (5)$$

(PNN)

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$$y_t = N_t + L_t \quad (6)$$

N_t L_t

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$$Max_i \{h_i l_i f_i(X)\} \quad ()$$

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$$f_i(X) = \frac{1}{(2\pi)^{\frac{k}{2}} \sigma^k} \cdot \frac{1}{n_i} \sum_{j=1}^{n_i} \exp \left[-\frac{(X - Y_{i,j})^2 \cdot (X - Y_{i,j})}{2\sigma^2} \right] \quad ()$$

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n_i ()

j $Y_{i,j}$ i

σ i

n

(X)

()

$$X \in C_r \quad \text{if} \quad h_r l_r f_r(X) \geq h_s l_s f_s(X) \quad ()$$

for $\forall s, s \neq r \quad 1 \leq r \leq q$

X

l_i

X

h_i i

i

$f_i(X)$ i

X

)

(

$$\sigma \quad ()$$

σ

y

$$\sigma \quad (MSE)$$

σ

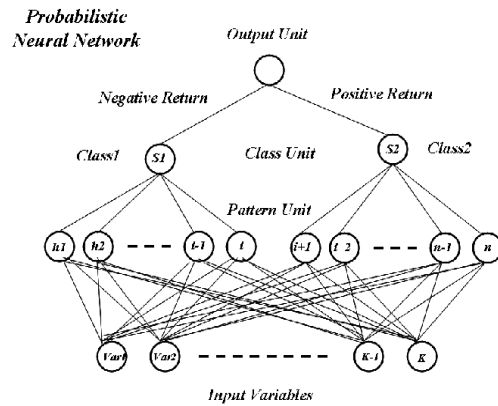
σ

$$[]$$

(ANNs/ARIM & PNNs)

$$\exp(-(W_i - X)^T (W_i - X) / 2\sigma^2) \quad ()$$

$$[]$$



$\{Z_t\}$

$$\hat{I}_t = \varphi_1 W_{t-1} + \varphi_2 W_{t-2} + \dots + \varphi_p W_{t-p} - \theta_{p+1} a_{t-1} - \theta_{p+2} a_{t-2} - \dots - \theta_{p+q} a_{t-q} \quad ()$$

$$\varphi_1, \varphi_2, \dots, \varphi_p \quad \theta_1, \theta_2, \dots, \theta_q \quad (\sigma)$$

$$W_t = (1-B)^d (Z_t - \mu)$$

:

$$\begin{array}{ccc}
 t & \begin{matrix} p \\ (Z_{t-1}, Z_{t-2}, \dots, Z_{t-p}) \end{matrix} & \begin{matrix} \\ (\hat{N}_t = f(e_{t-1}, \dots, e_{t-n})) \end{matrix} \\
 t & \begin{matrix} q \\ (a_{t-1}, a_{t-2}, \dots, a_{t-q}) \end{matrix} & \begin{matrix} \\ \\ \end{matrix} \\
 t & \begin{matrix} (\hat{L}_t, \hat{N}_t) \end{matrix} & \begin{matrix} \text{Fit}(\text{Com})_t \\ \\ \end{matrix} \\
 & \begin{matrix} \text{Fit}(\text{Com})_t \\ \\ \end{matrix} & \begin{matrix} \\ \\ \end{matrix}
 \end{array}
 \quad ()$$

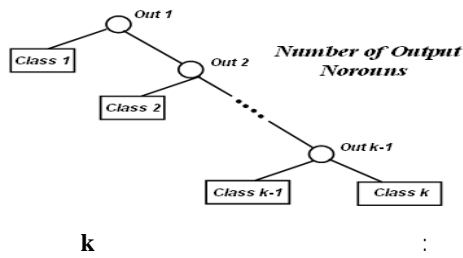
$$\begin{matrix}
 (\hat{L}_{t-1}, \hat{L}_{t-2}, \dots, \hat{L}_{t-m}, \hat{N}_{t-1}, \hat{N}_{t-2}, \dots, \hat{N}_{t-m}) & t \\
 p, q & m
 \end{matrix}$$

(target=0)

$$\begin{matrix}
 k \\
 () \quad [] \quad k-1
 \end{matrix}$$

(target=-1)

$$\begin{matrix}
 () \\
 (target=+1)
 \end{matrix}$$



$$\text{tar} = \begin{cases} -1 & \text{if } \text{fit}(\text{Com})_t > y_t + \text{pitch} \\ 0 & \text{if } y_t - \text{pitch} \leq \text{fit}(\text{Com})_t \leq y_t + \text{pitch} \\ +1 & \text{if } \text{fit}(\text{Com})_t < y_t - \text{pitch} \end{cases} \quad ()$$

$$\text{Fit}_{\text{new}} = \text{Fit}_{\text{old}} + \text{trend} \cdot \text{pitch} \quad ()$$

$$\begin{matrix}
 \text{Fit}_{\text{new}}, \text{Fit}_{\text{old}} \\
 \text{trend} \in \{-1, 0, +1\} \\
 \text{pitch}
 \end{matrix}$$

$$MAE_p = MAE_c + \frac{1}{n} \left[\sum_{t=1}^n D(\text{target}, \text{trend}) \cdot \text{target} \cdot \text{pitch} \right] \quad ()$$

MAE_p, MAE_c

()

$D(\text{target}, \text{trend})$

$$D(\text{target}, \text{trend}) = \begin{cases} +1 & \text{if } \text{target} = \text{trend}, \\ -1 & \text{if } \text{target} \neq \text{trend}, \end{cases} \quad ()$$

$$\alpha = \sum_{t=1}^n D(\text{target}, \text{trend}) \cdot |\text{target}|$$

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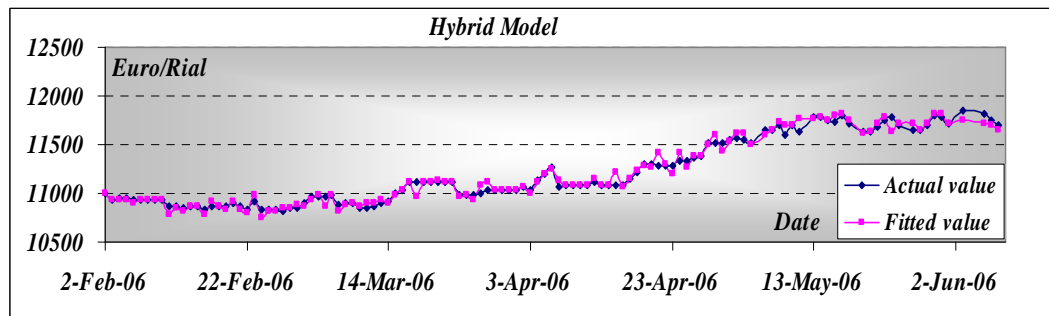
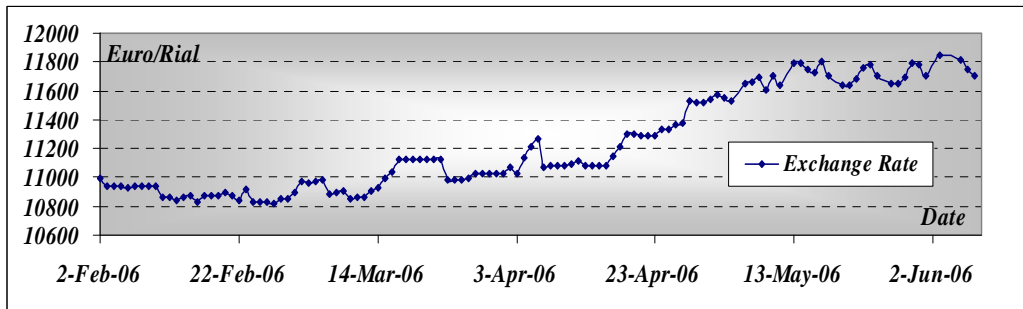
2 Feb 2006

8 Jun 2006

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(α)

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pitch =

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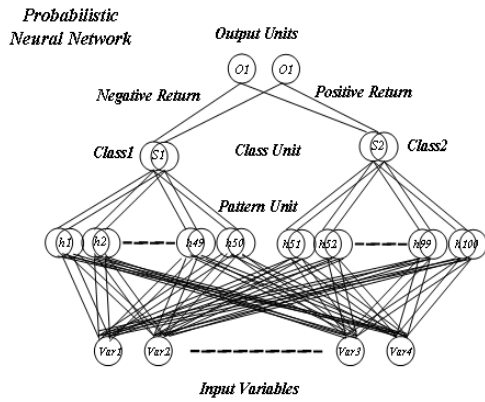
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Eviews

MATLAB7

(MSE)

(MAE)



$$MSE = \frac{1}{N} \sum_{i=1}^N (e_i)^2$$

$$MAE = \frac{1}{N} \sum_{i=1}^N |e_i|$$

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ARIMA(2,1,0)

$N^{(3-3-1)}$

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($\delta = 0.47$)

MATLAB7

%

$\alpha =$

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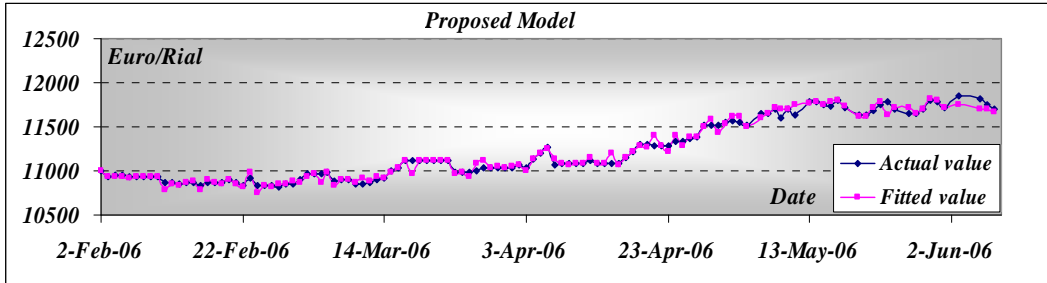
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MSE	AIC	BIC	HQC	MAE	MSE	SSE	RMSE	ME	MAPE	MAE
	/	/	/	/			/	/	/	/



MSE	AIC	BIC	HQC	MAE	MSE	SSE	RMSE	ME	MAPE	MAE
	+			+			-			+
	+			+						

MSE	AIC	BIC	HQC	MAE	MSE	SSE	RMSE	ME	MAPE	MAE
	/	/	/	/			/	/	/	/

MSE	SSE	RMSE	ME	MAPE	MAE					
		/	/	/	/					
		/	/	/	/					
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