Benefits of fluctuating exchange rates on the investor's wealth

[1]Obonye Doctor[†] and Edward. M. Lungu[‡]

[†,‡] *Department of Mathematics and Statistical Sciences, Botswana International University of Science and Technology, Palapye, Botswana*

E-mail addresses: doctoro@biust.ac.bw, lungue@biust.ac.bw

DATA

In order to illustrate the effects, MATLAB program was used. The initial conditions are arbitrary selected.

0.1 No Trade Region

```
clear;
mu2=0.2; mu1=0.02; r1=0.09; sigma1=0.25; sigma2=0.5; p=0.5;
rho=3; lambda=1; beta=0.2;
alpha=r1+mu1;
PI=((p-1)*(sigma1^2-beta*sigma1*sigma2)-(mu2-alpha))/((p-1)*(sigma1^2-2*beta*sigma1*sigma2+sigma2^2)) %portfolio
A=-rho/p+PI*(mu2-alpha)+alpha+(p-1)/2*(sigma1^2*(1-PI)^2-2*beta*sigma1*sigma2*PI*(1-PI)+(sigma2^2*PI^2)*PI^2);
xi=0.6
h2=0.5*xi.^2.*(sigma2^2+sigma1^2-2*beta*sigma1*sigma2).*((2*p^2-2*p-1)*(2-xi).*xi-(p^2-p-1));
h1=xi.*((p-1)*(xi.*(1-xi+PI)-PI-0.5*p).*(sigma1^2+sigma2^2-2*beta*sigma1*sigma2)-xi.*(1-xi).*beta*sigma1*sigma2);
h0=p*(A+(p-1)*PI*(xi-PI).*(sigma1^2+sigma2^2-2*beta*sigma1*sigma2));
syms k
J0=symsum(((-1)^k*(xi./2)^(2*k+PI))/(factorial(k)*gamma(1+k+PI)),k,0,Inf);
J1=symsum(((-1)^k*(2*k+PI)*(xi./2).^(2*k+PI-1))/(2*factorial(k)*gamma(1+k+PI)),k,0,Inf);
J2=symsum(((-1)^k*(2*k+PI-1)*(xi./2).^(2*k+PI-2))/(4*factorial(k)*gamma(1+k+PI)),k,0,Inf);
H0=symsum(((-1)^k*(xi./2)^(2*k-PI))/(factorial(k)*gamma(1+k-PI)),k,0,100);
```

[1]We (authors) certify that the general content of the manuscript, in whole or in part, is not submitted, accepted, or published elsewhere, including conference proceedings.

```
H1=symsum(((-1)^k*(2*k-PI)*(xi./2).^(2*k-PI-1))/(2*factorial(k)*gamma(1+k-PI)),k,0,Inf);
H2=symsum(((-1)^k*(2*k-PI-1)*(xi./2).^(2*k-2))/(4*factorial(k)*gamma(1+k-PI)),k,0,Inf);
C3=2; C4=3;
T=2;
t=0:0.1:T;
Q=(h2.*(C3*J2+C4*H2)./(C3*J0+C4*H0)+h1.*(C3*J1+C4*H1)./(C3*J0+C4*H0)+h0)
NU=(C3*J0+C4*H0).*exp(Q*(T-t))
plot(t,NU)
hold on
```

0.2 Sell Region

```
clear;
mu2=0.2; mu1=0.02; r1=0.09; sigma1=0.25; sigma2=0.5; p=0.5;
rho=3; lambda=0.5; beta=0.2;
alpha=r1+mu1;
PI=((p-1)*(sigma1^2-beta*sigma1*sigma2)-(mu2-alpha))/((p-1)*(sigma1^2-2*beta*sigma1*sigma2+sigma2^2)) %portfolio
A=-rho/p+PI*(mu2-alpha)+alpha+(p-1)/2*(sigma1^2*(1-PI)^2-2*beta*sigma1*sigma2*PI*(1-PI)+(sigma2^2*PI^2)*PI^2);
xi2=0.6;
h2=0.5*xi2.^2.*(sigma2^2+sigma1^2-2*beta*sigma1*sigma2).*((2*p^2-2*p-1)*(2-xi2).*xi2-(p^2-p-1));
h1=xi2.*((p-1)*(xi2.*(1-xi2+PI)-PI-0.5*p).*(sigma1^2+sigma2^2-2*beta*sigma1*sigma2)-xi2.*(1-xi2).*beta*sigma1*sigma2);
h0=p*(A+(p-1)*PI*(xi2-PI).*(sigma1^2+sigma2^2-2*beta*sigma1*sigma2));
syms k
J0=symsum(((-1)^k*(xi2./2)^(2*k+PI))/(factorial(k)*gamma(1+k+PI)),k,0,Inf);
J1=symsum(((-1)^k*(2*k+PI)*(xi2./2).^(2*k+PI-1))/(2*factorial(k)*gamma(1+k+PI)),k,0,Inf);
J2=symsum(((-1)^k*(2*k+PI-1)*(xi2./2).^(2*k+PI-2))/(4*factorial(k)*gamma(1+k+PI)),k,0,Inf);
H0=symsum(((-1)^k*(xi2./2)^(2*k-PI))/(factorial(k)*gamma(1+k-PI)),k,0,100);
H1=symsum(((-1)^k*(2*k-PI)*(xi2./2).^(2*k-PI-1))/(2*factorial(k)*gamma(1+k-PI)),k,0,Inf);
H2=symsum(((-1)^k*(2*k-PI-1)*(xi2./2).^(2*k-2))/(4*factorial(k)*gamma(1+k-PI)),k,0,Inf);
C3=2; C4=3;
T=2;
t=0:0.1:T;
xi=0.95;
```

```
Q=(h2.*(C3*J2+C4*H2)./(C3*J0+C4*H0)+h1.*(C3*J1+C4*H1)./(C3*J0+C4*H0)+h0)
NU=(C3*J0+C4*H0).*exp(Q*(T-t))
Nu=NU.*((1-lambda.*xi)/(1-lambda*xi2)).^p
plot(t,Nu)
hold on
```

0.3 Buy Region

```
clear;
mu2=0.2; mu1=0.02; r1=0.09; sigma1=0.25; sigma2=0.5; p=0.5;
rho=3; lambda=0.5; beta=0.2;
alpha=r1+mu1;
PI=((p-1)*(sigma1^2-beta*sigma1*sigma2)-(mu2-alpha))/((p-1)*(sigma1^2-2*beta*sigma1*sigma2+sigma2^2)) %portfolio
A=-rho/p+PI*(mu2-alpha)+alpha+(p-1)/2*(sigma1^2*(1-PI)^2-2*beta*sigma1*sigma2*PI*(1-PI)+(sigma2^2*PI^2)*PI^2);
xi1=0.4;
h2=0.5*xi1.^2.*(sigma2^2+sigma1^2-2*beta*sigma1*sigma2).*((2*p^2-2*p-1)*(2-xi1).*xi1-(p^2-p-1));
h1=xi1.*((p-1)*(xi1.*(1-xi1+PI)-PI-0.5*p).*(sigma1^2+sigma2^2-2*beta*sigma1*sigma2)-xi1.*(1-xi1).*beta*sigma1*sigma2);
h0=p*(A+(p-1)*PI*(xi1-PI).*(sigma1^2+sigma2^2-2*beta*sigma1*sigma2));
syms k
J0=symsum(((-1)^k*(xi1./2)^(2*k+PI))/(factorial(k)*gamma(1+k+PI)),k,0,Inf);
J1=symsum(((-1)^k*(2*k+PI)*(xi1./2).^(2*k+PI-1))/(2*factorial(k)*gamma(1+k+PI)),k,0,Inf);
J2=symsum(((-1)^k*(2*k+PI-1)*(xi1./2).^(2*k+PI-2))/(4*factorial(k)*gamma(1+k+PI)),k,0,Inf);
H0=symsum(((-1)^k*(xi1./2)^(2*k-PI))/(factorial(k)*gamma(1+k-PI)),k,0,100);
H1=symsum(((-1)^k*(2*k-PI)*(xi1./2).^(2*k-PI-1))/(2*factorial(k)*gamma(1+k-PI)),k,0,Inf);
H2=symsum(((-1)^k*(2*k-PI-1)*(xi1./2).^(2*k-2))/(4*factorial(k)*gamma(1+k-PI)),k,0,Inf);
C3=2; C4=3;
T=2;
t=0:0.1:T;
xi=0.25;
Q=(h2.*(C3*J2+C4*H2)./(C3*J0+C4*H0)+h1.*(C3*J1+C4*H1)./(C3*J0+C4*H0)+h0)
NU=(C3*J0+C4*H0).*exp(Q*(T-t));
Nu=NU.*((1+lambda.*xi)/(1+lambda*xi1)).^p
plot(t,Nu)
```

0.4 Modified Merton Value Function

```
clear;
mu2=0.2; mu1=0.02; r1=0.09; sigma1=0.25; sigma2=0.5; p=0.5;
rho=3; lambda=0.5; beta=0.2;
alpha=r1+mu1;
PI=((p-1)*(sigma1^2-beta*sigma1*sigma2)-(mu2-alpha))/((p-1)*(sigma1^2-2*beta*sigma1*sigma2+sigma2^2)) %portfolio
A=-rho/p+PI*(mu2-alpha)+alpha+(p-1)/2*(sigma1^2*(1-PI)^2-2*beta*sigma1*sigma2*PI*(1-PI)+(sigma2^2*PI^2)*PI^2);
w=0.7;
T=1;
t=0:0.1:T;
v=w^p/p*exp(p*A*(T-t));
plot(t,v)
```