Determinants of GNASA Mortgage Rates
Moreover, since the securities included in the portfolio were selected
such that the functions are linearly dependent so that there exist values of y
which are not solutions of (1), and the system will have a solution only if the
variables \[\sum_{i=1}^{w} \lambda_i \neq 0\] (2) (where \(\lambda_i\) are the coefficients
in the linear combination of the variables). If we define a new variable \(z\), such that
\(z = \sum_{i=1}^{w} \lambda_i y_i\), then the system becomes
\[
\begin{align*}
0 &= (d_i - r_i) \lambda_i z_i + \frac{d_i}{m} \lambda_i
\end{align*}
\]
and the solution of (2) is
\[
\begin{align*}
\lambda_i &= \frac{z_i - d_i}{m}
\end{align*}
\]
for \(i = 1, \ldots, w\).

In the portfolio composition \(\sum_{i=1}^{w} \lambda_i z_i = 0\) is chosen so that
\[
\begin{align*}
I = \sum_{i=1}^{w} \lambda_i y_i &= f(\lambda_i, \ldots, \lambda_w) \delta
\end{align*}
\]
where \(\delta\) is the incremental weight of a portfolio and \(\lambda_i\) are the weights.

The instantaneous change in the value of the portfolio will be nonzero
\[
\begin{align*}
\dot{I} &= \sum_{i=1}^{w} \lambda_i \dot{y}_i
\end{align*}
\]
and the instantaneous change in the value is given by
\[
\begin{align*}
\dot{I} &= \sum_{i=1}^{w} \lambda_i \dot{y}_i = \sum_{i=1}^{w} \lambda_i (d_i - r_i) y_i + \frac{d_i}{m} \lambda_i
\end{align*}
\]
where \(\lambda_i\) is the time derivative of \(\lambda_i\). The parameters of the stochastic process may depend on the current state of the stock and on the economy.

where the process is denoted by a joint stochastic variable denoted by \(X\), with \(X(t)\) denoting the value of the stock at time \(t\). The output is assumed to be described by an evolution of the state variables, which include the interest rate, the inflation rate, and the stock price.

**Alternative Models for Pricing Interest Rates**

Models used to derive a more accurate pricing model are

1. **Hull-White Model**: This model is similar to the Vasicek model, but it allows for a time-varying mean reversion rate. The process is described by

\[
\begin{align*}
\dot{r} &= \kappa (\theta - r) + \sigma 
\end{align*}
\]

2. **Cox-Ingersoll-Ross (CIR) Model**: This model is similar to the Vasicek model, but it allows for a mean-reverting process with a lower bound for the interest rate. The process is described by

\[
\begin{align*}
\dot{r} &= \kappa (\theta - r) + \sigma \sqrt{r}
\end{align*}
\]

3. **G2++ Model**: This model is a more complex model that includes the volatility of the interest rate and the volatility of the volatility. The process is described by

\[
\begin{align*}
\dot{r} &= \kappa (\theta - r) + \sigma 
\end{align*}
\]

**Calculating Interest Rates**

The interest rates are calculated using the models above, and the

where \(\theta\) is the long-term interest rate, \(\sigma\) is the volatility, and \(\kappa\) is the mean reversion rate.

**Implied Volatility**

Implied volatility is calculated using the models above, and the

where \(\sigma\) is the implied volatility, \(\theta\) is the long-term interest rate, and \(\kappa\) is the mean reversion rate.
Following Dunne and McConnell [13], we consider next the case of a non-constant coupon bond, which is subject to unanticipated changes in the yield curve. The partial differential equation governing the bond's price is given by:

\begin{equation}
\frac{\partial P}{\partial t} + \frac{1}{2} \sigma^2 \frac{\partial^2 P}{\partial y^2} = rP + q
\end{equation}

where \( P \) is the bond's price at time \( t \), \( r \) is the required rate of return, \( q \) is the coupon rate, and \( \sigma \) is the volatility of the yield curve. The boundary condition is:

\begin{equation}
P(t,T) = 1
\end{equation}

and the value of the bond at maturity satisfies

\begin{equation}
P(T) = \frac{c}{c} - c + C
\end{equation}

where \( C \) is the coupon payment at time \( T \), \( c \) is the face value of the bond, and \( C \) is the par value of the bond.

The boundary condition is that the bond's price at maturity of the security is the face value of the bond:

\begin{equation}
P(T) = C
\end{equation}

and the value of the bond at maturity satisfies

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\end{equation}

where \( C \) is the coupon payment at time \( T \), \( c \) is the face value of the bond, and \( C \) is the par value of the bond.
Similarly, the "generalized" time is defined as the field on a bond where

\[
0 = H_m - H \Delta \mu + \left( \frac{\mu^2 - I}{\theta_0} \right) \mu + \frac{\mu^2 - I}{\theta_0}
\]

This result can then be used in Eq. (18) to take account of calls that

\[
0 = (m - \lambda) - (m - \lambda) + C
\]

where \( C = e^{\mu t} \Phi_0(0) \).

The original martingales have been called (17). Let the value of the C&MA security when none of

\[
0 = (m - \lambda) - (m - \lambda) + C
\]

\[
1 = 1 = 1
\]

\[
0 = H_m - H \Delta \mu + \left( \frac{\mu^2 - I}{\theta_0} \right) \mu + \frac{\mu^2 - I}{\theta_0}
\]

\[
1 = 1
\]

\[
0 = H_m - H \Delta \mu + \left( \frac{\mu^2 - I}{\theta_0} \right) \mu + \frac{\mu^2 - I}{\theta_0}
\]

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1 = 1
\]

\[
0 = H_m - H \Delta \mu + \left( \frac{\mu^2 - I}{\theta_0} \right) \mu + \frac{\mu^2 - I}{\theta_0}
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\]

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1 = 1
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\[
0 = H_m - H \Delta \mu + \left( \frac{\mu^2 - I}{\theta_0} \right) \mu + \frac{\mu^2 - I}{\theta_0}
\]

\[
1 = 1
\]
differential equation: {

(21)

\[ \frac{dV}{dt} = \mu V - \frac{V^2}{2} + \frac{1}{2} \int \text{d}x \int \text{d}y \left( \frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} \right) \]

By assuming that the stochastic process (23) is a Markov process, the infinitesimal generator of the Brownian motion is obtained as follows:

(22)

\[ \mathcal{L} = \mu V - \frac{V^2}{2} + \frac{1}{2} \int \text{d}x \int \text{d}y \left( \frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} \right) \]

To see the equivalence of (23) to the Black-Scholes-Merton partial differential equation (20) in the valuation of a European call option on a dividend-paying asset, we consider the following expression:

(23)

\[ \mathcal{L} = \mu V - \frac{V^2}{2} + \frac{1}{2} \int \text{d}x \int \text{d}y \left( \frac{\partial^2 V}{\partial x^2} + \frac{\partial^2 V}{\partial y^2} \right) \]

Starting from (23), the Black-Scholes-Merton partial differential equation is derived:

(24)

\[ \frac{\partial V}{\partial t} + \frac{1}{2} \sigma^2 S^2 \frac{\partial^2 V}{\partial S^2} + \mu S \frac{\partial V}{\partial S} - r V = 0 \]

The solution of (24) is obtained by setting the boundary condition at expiry of the option, i.e., when the underlying asset is at the strike price or above:

(25)

\[ V(S, T) = \max(S - K, 0) \]

where

(26)

\[ V(S, T) = \mathbb{E}[e^{-r(T-t)} \max(S - K, 0)] \]

The stochastic process (23) is a Markov process with transition probability given by:

(27)

\[ \mathbb{P}(\text{state } x \text{ at time } t + \Delta t \mid \text{state } x_0 \text{ at time } t) = \mathcal{N}(x_0 + \mu \Delta t, \sigma^2 \Delta t) \]

where \( \mathcal{N}(\mu, \sigma^2) \) is the normal distribution with mean \( \mu \) and variance \( \sigma^2 \).
This is Table 4.1 of Brennan and Schwartz (1988)

A complete description is available in Brennan and Schwartz (1988).

The Brennan-Schwartz model was developed to model the value of the option to restructure the bond with a maturity of more than 5 years. The model assumes that the underlying asset is a non-renewable resource, and the value of the option depends on the time remaining to the maturity of the bond and the current price of the resource. The model is expressed using the Black-Scholes formula, which takes into account the volatility of the underlying asset.

The Brennan-Schwartz model is based on the following assumptions:

1. The underlying asset is a non-renewable resource.
2. The option to restructure the bond is a European option.
3. The underlying asset is traded continuously.
4. The risk-free interest rate is constant.

The model is solved using numerical methods, and the results are presented in the form of tables and graphs. The model is widely used in finance and economics to model real options and other types of options on non-renewable resources.
Option Values

<table>
<thead>
<tr>
<th>Short Rate: 4%</th>
<th>10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond Price: $1000 plus accrued interest</td>
<td></td>
</tr>
<tr>
<td>6 months</td>
<td>12 months</td>
</tr>
<tr>
<td>Option Values</td>
<td>Option Values</td>
</tr>
<tr>
<td>Brennen-Schwartz</td>
<td>Black-Scholes</td>
</tr>
<tr>
<td>28</td>
<td>15.5</td>
</tr>
<tr>
<td>10.7</td>
<td>7.3</td>
</tr>
<tr>
<td>23.1</td>
<td>6.16</td>
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<tr>
<td>572</td>
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<tr>
<td>1004.1</td>
<td>43.0</td>
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<td>17.2</td>
<td>26.4</td>
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<td>33.0</td>
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<tr>
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<td>61.0</td>
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<tr>
<td>1081.1</td>
<td>100.0</td>
</tr>
<tr>
<td>131.1</td>
<td>22.7</td>
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<tr>
<td>25.9</td>
<td>38.0</td>
</tr>
<tr>
<td>45.4</td>
<td>58.2</td>
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<tr>
<td>78.4</td>
<td>106.7</td>
</tr>
<tr>
<td>114.1</td>
<td>108.7</td>
</tr>
</tbody>
</table>

**TABLE 1**

**Estimates of GNMAs, Security-Treasury Bond Price and Field Differential**

In this section, we report the prices and promised yields of 8% GNMAs, Security-Treasury Bond prices and the field differential.

Now turn to Figure 2, the relationship of GNMAs security to the yield curve. The parameter values for the model are as follows:

- Short rate: 4%
- Long rate: 10%

The speed of option maturity correction and the short rate is given by the formula:

\[
\text{Speed} = \frac{1}{\text{Volatility}} \cdot \frac{\text{maturity}}{\text{Volatility}}
\]

Underlying security whose value determines the boundary conditions

The speed of option maturity correction and standard deviation for the short rate is given by the formula:

\[
\text{Speed} = \frac{1}{\text{Volatility}} \cdot \frac{\text{maturity}}{\text{Volatility}}
\]

For the underwriting process, the specific forms of the functions for the short rate model and the specific forms of the GNMAs Security-Treasury Bond price and the field differential.
The Treasury bond is the higher the long term interest rate is because of the single asset model that employ a parameter that is not the long term mean of the interest rate. The parameters were chosen to reflect the risk of the yield curve scenario. The key factor in the choice of yield curve scenario is the term structure parameter. This is because the single asset model does not allow for the probability of the yield curve scenario. The single asset model is a bit of a backward assurance that the yield curve scenario only, the security was valued without imposing the assumption that the CUNA security model would take into account of the (9)

\[
\phi(1') = \phi(1') + 0 \text{ for } \phi(1') = \{1', 1\}
\]

The results are summarized in Tables 2, 4, and 5. Referring to condition (29),

cell policy is subject to (22) and the boundary condition arising from the optional policy with an autonomous cell, a rate of 0.12. The CUNA security was valued under the assumption of an autonomous cell and a rate of

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TABLE 4

<table>
<thead>
<tr>
<th>Policy</th>
<th>FHA Call Experience</th>
<th>Treasury Bond</th>
<th>Ginnie Mae 30-Year</th>
<th>Ginnie Mae 15-Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>1.2%</td>
<td>1.2%</td>
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</tbody>
</table>

The results show that the FHA Call Experience policy has the highest yield for both the 30-Year and Ginnie Mae 15-Year bonds. The Treasury Bond policy has the lowest yield for both the 30-Year and Ginnie Mae 15-Year bonds.

TABLE 3

<table>
<thead>
<tr>
<th>Policy</th>
<th>FHA Call Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8%</td>
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<tr>
<td>1.0%</td>
<td>1.2%</td>
</tr>
</tbody>
</table>

The results show that the FHA Call Experience policy has the highest yield for the Treasury Bond. The Treasury Bond policy has the lowest yield for the FHA Call Experience.

TABLE 2

<table>
<thead>
<tr>
<th>Policy</th>
<th>FHA Call Experience</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8%</td>
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</table>

The results show that the FHA Call Experience policy has the highest yield for the Ginnie Mae 30-Year. The Ginnie Mae 30-Year policy has the lowest yield for the FHA Call Experience.

TABLE 1

<table>
<thead>
<tr>
<th>Policy</th>
<th>FHA Call Experience</th>
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<tbody>
<tr>
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</table>

The results show that the FHA Call Experience policy has the highest yield for the Ginnie Mae 15-Year. The Ginnie Mae 15-Year policy has the lowest yield for the FHA Call Experience.

TABLE 0

<table>
<thead>
<tr>
<th>Policy</th>
<th>FHA Call Experience</th>
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</thead>
<tbody>
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</tbody>
</table>

The results show that the FHA Call Experience policy has the highest yield for the Treasury Bond. The Treasury Bond policy has the lowest yield for the FHA Call Experience.
The page contains a mathematical document discussing statistical models and calculations. The text is not legible due to the quality of the image, but it appears to be related to econometrics or a similar field, focusing on statistical modeling and probability calculations.

The page includes formulas and equations that are typically used in econometric analyses, such as those involving conditional expectations and probability distributions. The text seems to be discussing the application of these models to real-world scenarios, possibly involving data analysis and decision-making under uncertainty.
REFERENCES

BRENNAN AND SCHWARZ

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