JOURNAL OF ECONOMIC DEVELOPMENT
Volume 26, Number 2, December 2001

Asymmetric Information and Fragility in the South African Low-Income Housing Market

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This paper focuses on the financing gap in the South African low-income housing market. A model is presented to analyze the effect of asymmetric information on the loan market notably lenders' need to separate low from high-risk African borrowers. In equilibrium the separation contract is shown to reduce total loans and the size of loans. In addition, it results in greater sensitivity among lenders to factors that might reduce the valuation of collateral (the house) such as poor quality construction, inferior infrastructure, crime and corruption. This puts upward pressure on the already high cost of loans, which in turn drives out the remaining low risk borrowers. The paper concludes with policy recommendations to close financing gaps under asymmetric information.

I. Introduction

This paper models the impact of asymmetric information on the South African financial market. Its purpose is to see how asymmetric information affects the willingness of lenders to issue loans and the willingness of borrowers to take out loans. The idea is that financing gaps can be found in certain credit markets, notably markets that could potentially channel funds to poor people in developing economies. In South Africa the largest such gap surely is to be found in the low-income mortgage market. At present the financing gap is estimated to be $8.5 billion (R60 billion), which is required to provide homes to the approximately 2 million homeless Africans.[1] This paper demonstrates how the presence of information asymmetries can cause fragility in the loan market, which in turn can impede the flow of credit to low income households.

The model presented here demonstrates an adverse selection effect in the tradition of Akerlof (1970), and follows the more recent models applied to financial markets of Stigliz and Weiss (1981) and Bester (1985). George Akerloff in his 1970 article on the "Lemons" market shows, using the example of the used car market, how asymmetric information can result in market failure. In the market information is asymmetric because the car dealer knows the quality of each car whereas the buyer does not. As a result the buyer, in order to reduce the likelihood of paying too much for a lemon, will view all cars on the lot as average

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1. This figure is based on the estimated cost of a minimally decent house of R30,000.00. At $1/R7 this is $4,285.00. The estimate of the backlog in housing in South Africa is between 2 to 3 million units.

quality and will only be willing to pay for any car on the lot the price of the average car. Given this offer the dealer will take all the above average cars off the lot, reducing the average quality of cars and starting the cycle over again. This adverse selection effect can cause the market to break down completely. The model here follows Akerloff in suggesting that asymmetric information can lead to adverse selection effects.

More recent work by Stiglitz and Weiss (1981) extends Akerloff's analysis and demonstrates how adverse selection can take the form of credit rationing in a financial market. Stiglitz and Weiss assume that bad or high risk borrowers have a low degree of risk aversion relative to good or low risk borrowers hence as the proportion of bad to good borrowers increases the *average* degree of risk aversion will decline. The fall in the average degree of risk aversion can lead to credit rationing. Credit rationing occurs if the interest rate reaches or exceeds a critical level at which the probability of default, associated with borrowers of higher risk on account that they are willing to pay higher interest rates, is such that expected returns to the bank decline. To prevent a decline in expected returns the bank will ration credit above a critical interest rate.

Bester (1985) counters this credit rationing story by arguing that under conditions of asymmetric information, a lender can screen out high risk borrowers by inserting collateral as part of the loan contract, thereby eliminating the credit rationing problem altogether. He demonstrates this by taking the case of a firm that requires a fixed amount of money for an investment, *I*, and that has an initial endowment of wealth, *W*, where, $W < I$. The firm finances the investment by taking out a loan equal in size to the difference between wealth and investment, $I - W$. Given loan size the bank specifies a loan contract, comprised of *r*, the interest rate, and *C*, the collateral. According to Bester a high risk borrower (who has a high probability of default) when offered the loan package would only accept offers with a high interest rate and low collateral.[2] Credit rationing in the Stiglitz and Weiss case would not occur because if a high risk borrower does not get the loan contract she prefers she can always apply for a loan contract chosen by less risky borrowers. Bester than goes on to demonstrate that in equilibrium not all borrows will receive the same contract because under competition "…there exists another credit offer that is profitable because it attracts only the good risks from the pooling contract." That is, another lender can offer a contract with high collateral that high risk borrowers will not accept.

The model here basically combines Akerloff's adverse selection story with Stiglitz and Weiss and Bester. It demonstrates that under asymmetric information collateral will eliminate the Stiglitz and Weiss credit rationing problem but Akerloff's adverse selection effect will still prevail because collateral, as used by Bester, is a much less effective a screening device. The reason is that, unlike Bester, borrowers are able to choose the loan size after choosing the offer of a loan contract comprised of an interest rate and collateral. Here the amount of collateral paid by the borrower is specified by the lender in the form of a downpayment rate, which permits high risk borrowers to reduce the collateral by reducing loan size. For this reason banks must offer all borrowers a very high rate of downpayment,

2. High risk borrowers are averse to high collateral yet not averse to high interest rates because in the likely event of default they will lose the collateral yet not pay the interest.

high enough so that high risk borrowers cannot compensate by reducing loan size. It is this very high rate of downpayment that creates a type of fragility similer to Akerloff's adverse selection, whereby some low risk borrowers get squeezed out with the very high downpayment rates. This type of fragility leads not only to fewer loans but also a reduction in loan size.

The experience of lending to low income African's in the South African township of Alexandra will be used to demonstrate how this type of fragility can cause the loan market to collapse altogether. Lender's need to screen out high risk borrowers with variable loan size, can have particularly dire consequences for South African communities where the demand for houses is greatest, and where crime, corruption and degradation are rampant. It will be shown how this type of fragility can exacerbate the effect of rising interest rates in South Africa on lending to low income households.

The policy implication of the model is straightforward: collateral valuation on the part of lenders is especially important in the presence of asymmetric information. This is especially important in the situation like South Africa where the government places the burden of closing financing gaps on private sector lenders. The argument will be made that in order for a sufficient lending to take place, communities must be upgraded and crime reduced. The case of mortgage lending in the South African township of Alexandra during the last years of apartheid, will be given to demonstrate how asymmetric information could heighten lender's sensitivity to poor quality construction, corruption and crime causing a break down in the housing loan market altogether.

This paper will proceed as follows. First, a model of the low-income housing market will be presented and the equilibrium loan contract derived under symmetric information. Second, the assumption of complete information will be dropped and the new equilibrium loan contract derived. It will be demonstrated that under asymmetric information fewer loans are given and loans that are taken out are smaller in size. Third, a case will be made for the existence of asymmetric information in the low-income mortgage market in South Africa. A case study of the mortgage lending in the South African township, Alexandra, will be presented to demonstrate how increased fragility, due to asymmetric information, could exacerbate the problem of lending in communities characterized with high crime and corruption and rising interest rates. The presence of fragility combined with crime and corruption and rising interest rates could lead to a swift and severe collapse of the loan market.

II. The Model

The model here demonstrates how asymmetric information can lead to fragility of the loan market. Unlike Bester, where credit rationing is reduced entirely because lenders can offer a range of contracts where high and low risk borrowers self-select themselves and the bank does not lose money, the self-selection mechanism does not work as efficiently. For this reason a type of adverse selection does prevail. Unlike Akerloff, however, the market will not necessarily break down but instead will become increasingly fragile. Increased fragility of the market, in turn can be seen to exacerbate the negative effects of declining

collateral valuation due to external factors like rising crime, corruption and poverty (that often characterize communities in developing countries) and rising deposit rates.

The behavior of two types of borrowers is modeled here, low risk and high risk. Each borrower faces a good state and a bad state. A good state occurs when the borrower does not default on the loan and a bad state occurs when the borrower defaults on the loan. The probability of a good state happening, $p^i (i = L, H)$, is greater for the low risk borrower than for the high-risk borrower, and $p^L > p^H$. The probability of a bad state, $(1 - p^i)$, is greater for a high-risk borrower than for the low risk borrower, and $(1 - p^L) < (1 - p^H)$. Probabilities are exogenous and there is no moral hazard.

Each borrower faces an expected utility function:

$$U^i = p^i (R + V(H) - (1 + r)L - F(D)) - (1 - p^i)F(D),$$

where R is income from employment and H is house size in money terms. H is the collateral and will be repossessed by the lender in the case of default. $H = D + L$, where L = loan size and D is that portion of the house the borrower actually owns.

$V(H)$ is the utility the borrower expects to get from the house and $F(D)$ is the disutility of having to make the down payment, D. In a good state the borrower will receive satisfaction from the income and from the house, and will lose satisfaction from paying back the loan plus principle, and from making a downpayment. In a bad state the borrower will default and the bank will repossess the house. Although the borrower no longer suffers from having to pay back the loan, she loses that portion of the house that she owns, the downpayment. As in Bester, the point that a borrower will lose the downpayment or collateral should she default, is necessary to insure a separation equilibrium.

The first and second derivatives of $V(H)$ and $F(D)$ are the following:

$$V(H)' > 0,\ V(H)'' < 0,\ F(D)' > 0,\ F(D)'' > 0$$

The utility from owning a house, $V(H)$, increases but at a diminishing rate as house size increases. The disutility from having to make a downpayment, $F(D)$, increases but at an increasing rate as the size of the downpayment arises.[3] This is an important result because it means that the borrower will actually participate in the loan market as opposed to paying for the entire house with a downpayment.

3. This is a reasonable because having to make a down payment is likely to entail a substantial inconvenience especially among poor households. For instance, poor households are less likely to have sufficient savings (or any savings at all) or friends and relatives with extra savings they could borrow. Accumulating the down payment might entail having to borrow funds from a moneylender in the informal sector who charges usurious interest rates. Or it might mean the borrower works longer hours to accumulate sufficient funds to cover the down payment.

Finally, each borrower has identical income, *R*, and functions, $V(H)$, $F(D)$. The only difference is the exogenous probability, p^i. This is important because it means qualitative differences between borrowers other than p^i, have no effect on lending.

The lender operates in a perfectly competitive market. This forces the lender to offer the best contract and eliminates the possibility of making a profit. There are no externalities or discrimination and loans earn a market rate of return. The lender's expected profit function is the following:

$$E(\boldsymbol{p})^i = p^i(1+r)L + (1-p^i)kH - (1+\boldsymbol{q})L = 0,$$

where *k* is the lender's valuation of the collateral, *H*. This includes any transaction or liquidation cost that might be incurred when the lender repossesses the house and $0 < k < 1$. $(1+r)L$ is the interest and principle that the lender receives from the borrower and $(1+\boldsymbol{q})L$ is the bank's marginal cost of funds.

If we take the profit equation and replace H with $D+L$ and divide through by L, we can rewrite the profit equation as:

$$E(\boldsymbol{p}) = p^i(1+r) + (1-p^i)k(1+\boldsymbol{a}) - (1+\boldsymbol{q}) = 0,$$

where $\boldsymbol{a}$ is the rate of downpayment and $\boldsymbol{a} = \frac{D}{L}$. The rate of downpayment, $\boldsymbol{a}$, is specified by the lender who determines the downpayment as a proportion of loan size. The lender will offer a set of contracts comprised of an interest rate and downpayment rate combination, $C = (1+r^i, \boldsymbol{a}^i)$, and the borrower will choose the contract that maximizes utility after maximizing over loan size.[4] By specifying the downpayment as a proportion of loan size, unlike in Bester where loan size is fixed, the borrower can increase or decrease the size of the downpayment by changing the size of the loan. In this manner, a high risk borrower can reduce the size of the downpayment by choosing a smaller loan size. For this reason, collateral in the form of a downpayment is less effective a separation device because high risk borrowers can reduce loan size to reduce the required downpayment. Below it will be shown that by offering a rate of downpayment as opposed to a fixed collateral the lender must offer a very high rate of downpayment to every borrower in order for separation to occur.

To insure that the indifference curves slope downward in contract space it is necessary that:

$$\frac{d(1+r)}{d\boldsymbol{a}} \text{ given } U^* = \frac{(p^iV' - F')}{p^i} < 0.$$

4. The lender's contract menu for each borrower of p type is: $1+r = \frac{1+\boldsymbol{q}}{p} - \frac{(1-p)k(1+\boldsymbol{a})}{p}$.

Since $p^i > 0$, then $p^i V' - F' < 0$. This requires that $V' < F'$. This is a very important result as it states that the borrower derives a great deal of discomfort making a downpayment. If this were not the case and $V' \geq F'$ the borrower would pay for the entire loan with a downpayment. It is necessary that the borrower dislike making a downpayment in order for her to participate in the loan market. Without $V' < F'$, there would be no loan market.

Since $p^L > p^H$, the indifference curve for the low risk borrower will always be less steep than that for the high-risk borrower. The intuition behind this result is that a high-risk borrower will only accept an increase in α if she gets a large decline in $1+r$. This is because she has a very low tolerance for collateral because she is more likely to default hence more likely to lose the down payment. On the other hand, a low risk borrower would accept an increase in α with only a small decline in $1+r$, because she is unlikely to default hence lose the downpayment.

Finally, the lender must offer a set of contracts attractive enough for the borrowers to participate in the market. Each borrower has a reservation utility level. This ensures that the lender offer contracts that if accepted by the borrower, makes the borrower better off than if she had not participated in the market at all.

III. Equilibrium under Symmetric Information

We can derive equilibrium under conditions of symmetric information. Solving for first order conditions, we take $\frac{\partial U}{\partial L}$ substitute $D = \alpha L$ to get:[5]

$$p^i V'(\alpha + 1) - p^i(1+r) - F'\alpha = 0,$$

re-arranging to get:

$$p^i((\alpha + 1)V' - (1+r)) = F'\alpha,$$

which shows that in equilibrium the borrower in a good state will choose the contract and loan size whereby the marginal net benefit $(V' - (1+r))$ she derives from the house is equal to the marginal disutility that arises from making a downpayment, F'.

Above it was demonstrated that $V' < F'$. We can prove from the first order conditions that the low risk borrower will accept any contract offered to the high-risk borrower and will take out a bigger loan.[6] This is an important because it is required for the separation equilibrium to occur under asymmetric information. This result means that the reservation indifference curve for the low risk borrower will never cross the reservation indifference curve for the high-risk borrower.

Graphically, equilibrium under symmetric information is shown in Figure 1.

5. See appendix for first order conditions.

6. See appendix for proof.

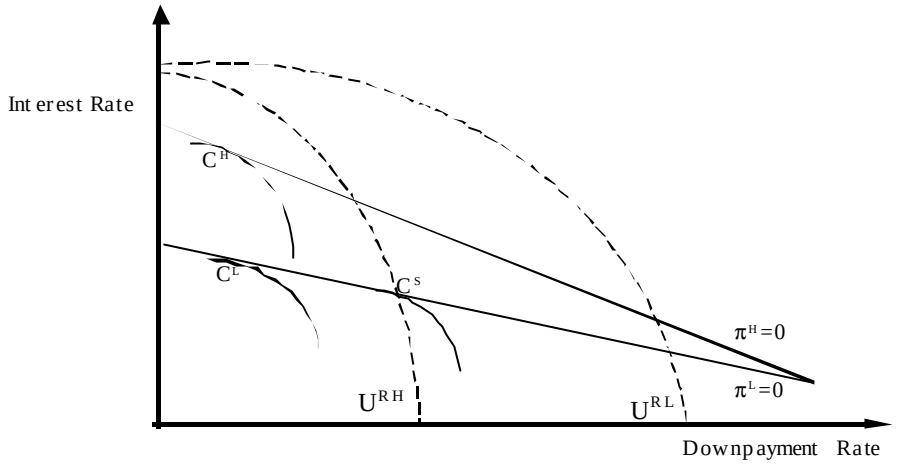

Figure 1 Equilibrium under Symmetric Information and Asymmetric Information

The lender offers each borrower a range of contracts or contract menu indicated as $p^L = 0$ for the low risk borrower and $p^H = 0$ for the high-risk borrower. Each borrower can choose whatever contract they want as long as it lies along their respective menu.

Under symmetric information the lender will offer p^L to the low risk borrower and p^H to the high-risk borrower. The low risk borrower will choose the downpayment rate and interest combination at C^L and the high-risk borrower will choose the contract C^H. Each contract is chosen such that utility is maximized after the borrower has chosen the optimal loan size, given $1+r$ and α. The high-risk borrower will pay a higher interest rate than the low risk borrower. However, the low risk borrower may or may not choose a contract with a higher downpayment rate than the high-risk borrower.

IV. The Model Under Asymmetric Information

When asymmetric information is introduced the lender is no longer able to distinguish between borrower types hence cannot simply offer each borrower the appropriate contract menu. If a high-risk borrower is offered the contract meant for the low risk borrower they will be better off but the lender will lose money. To participate in the market the lender must be able to offer a loan contract that does not cause her to lose money nor make a profit. Strategically, the lender could offer three different contracts: a. pooled contract, b. high risk contract or c. low risk contract. We can prove that a pooled contract and a contract offered only to high-risk borrowers will result in an unstable equilibrium.[7] The only solution is for

7. See appendix for proof.

the lender to offer a single contract to the low risk borrower, which will work to separate out low from high-risk borrowers.

The only way for the lender to participate in the market is to offer a contract to the low risk borrower alone. This result differs from Bester in that in equilibrium both high risk and low risk borrowers are offered and would accept contracts with low interest and high collateral and high interest and low collateral, respectively. Here it is not possible to offer the high risk borrower a separate contract because a low risk borrower will accept any contract offered to a high risk borrower and a "skimming the cream" effect will occur (see appendix for proof). The only contract that results in stable equilibrium is a contract that meets the following conditions.

$$p^H(V((1+\alpha^S)L)-(1+r^S)) < F(\alpha^S L), \text{ for any } L^*, \text{ and}$$

$$E(\pi)^L = p^L(1+r)L + (1-p^L)k(H) - (1+\theta)L = 0.$$

The first equation insures that if a high-risk borrower were to choose the contract she would derive less net benefit from living in the house than the disutility from having to make the down payment. This insures that she will not choose the contract. The second equation insures that the contract will earn the lender zero profits.

A set of contracts exists that meet these requirements. In Figure 1 this set of contracts that could potentially separate lie to the right of the high risk borrower's reservation utility function, U^{RH}, and to the left of the low risk borrower's reservation utility curve, U^{RL}. All contracts to the right of the high risk borrower's reservation utility that are offered to a high risk borrower will not be accepted because she would be better off not participating in the loan market at all. The only borrower who would accept the contract - as long as it was to the left of the curve U^{RL} - would have to be low risk because they would still derive more satisfaction from participating in the market than from not participating at all.

Hence to separate out high from low risk borrowers the lender will offer every borrower a single contract, C^S as shown in Figure 1.[8] If an individual accepts the loan she signals herself as a low-risk borrower. If she rejects the loan she signals herself as a high risk borrower and we have got successful separation.

In this model lenders must offer a contract with a very high downpayment rate such that high risk borrowers even after reducing loan size are still faced with a downpayment high enough to discourage them from accepting the contract. In other words, $p^H(V((1+\alpha^S)L)-(1+r^S)) < F(\alpha^S L)$ for any L^* Unlike Bester, banks can continue to raise interest rates and collateral rates, to prevent a fall in the rate of return while lending to any borrower.

8. Note that C^S is preferable to any other contracts lying along $p^L = 0$ between U^{HR} and U^{LR}. At any other contract along $p^L = 0$, the lender will not make a profit, however competitors could enter the market and offer a lower rate of downpayment (not less than α^S) and skim the cream. Thus, competition forces the lender to offer the best separation contract at C^S.

The separation contract, C^S, is a source of fragility in the loan market due to the high downpayment rate required for separation. This fragility leads to two problems. First, it pushes out high risk borrowers entirely from the market. Second, it imposes an additional cost to the low risk borrower because she must pay a much higher downpayment than she would under symmetric information. For a given set of parameter this results is presented in Table 1.

Table1 Comparison of Loan Size under Symmetric Information with Loan Size with Separation Equilibrium

Information	Contract	Loan Size (L) Rand (000)	Downpayment Rate (α)	Interest Rate ($1+r$)	Utility
Asymmetric Information	C^S	$L^* = 6$	$\alpha^* = .137$	$1+r^* = 1.05$	$U^* = 11$
Symmetric Information	C^L	$L^{L*} = 20$	$\alpha^{L*} = .002$	$1+r^{L*} = 1.08$	$U^* = 30$

Parameters: $a = 5$, $b = .2$, $c = 10$, $k = .9$, $\theta = .05$, $p^L = .8$

The low risk borrower faces a much higher rate of downpayment than offered in a contract when information is complete. Although low risk borrowers do not mind making a downpayment, if it is too high they will choose to reduce loan size to compensate for the loss of utility from having to make a high downpayment. For a given set of parameters, it can be shown that the borrower takes out a smaller loan size under asymmetric information. In Table 1 loan size falls from 20 thousand to 6 thousand when the lender offers a separation contract.

Below an argument will be made that fragility in the loan market due to asymmetric information can impose additional hardship on low income South African households seeking mortgages as high risk borrowers are completely denied loans and low risk borrowers to receive loans must pay a very high rate of downpayment. In addition, the need to separate imposes additional fragility because due to the already high collateral as a proportion of loan size, lenders could be especially sensitive to external factors that could be seen to reduce the value of collateral. This is particularly important in the case of South African townships which for generations have been deprived of adequate resources, and which today face rising crime, corruption and ongoing degradation.

V. Asymmetric Information in South African

South Africa provides an interesting case study on the presence of asymmetric information and its potential impact on the flow of credit to prospective borrowers. Above a model was presented to show how the presence of asymmetric information could impede the flow of credit to borrowers. Here the example of the financing gap in the South African low-income mortgage market will be considered.

First, it is important to point out three characteristics of the post-apartheid economy that could be seen to exacerbate the asymmetric information problem, a problem that exists

to some degree in any financial sector (Stigliz and Jaffee (1990)). First is the insufficient or lack of credit information for the bulk of the African population, most notably Africans most in need of housing loans. There are two reasons for this. First, during apartheid many Africans engaged in organized bond strikes to protest against the apartheid system (Mayakiso (1997)). Those who participated in the boycotts incurred poor marks on their credit records when such credit reports existed. Although boycotts are seen today as legitimate forms of protest lenders still face a lack of accurate records. Second, most Africans especially those living in rural areas have never had credit records. This is due to a lack of credit recording bureaus and simply because many Africans never had contact with the formal financial market.

The second characteristic that can be seen to exacerbate the information problem in South Africa is the extreme social, economic and cultural differences that exist between whites and blacks that arose historically under the apartheid cultivation of separate development. Apartheid worked to foster the economic development of whites at the expense of the vast majority of blacks, many of which today are without houses, hence in the loan market whites are generally the lenders and blacks the low-income borrowers. Cultural, social and economic differences, why historical still exist a great deal today, could effect the lending decision on the part of whites and the willingness of blacks to participate in the market, given that financial markets depend a great deal on mutual familiarity and trust for their operation.

The third characteristic of post-apartheid South Africa is the emergence of a group of "high-risk" borrowers associated with rising crime and violence. Although crime and violence create a great deal of unease for all South Africans, it is most devastating in those areas where homelessness and poverty prevail, such as crowded townships like Soweto and new urban ghettos like Hilbrow in downtown Johannesburg. Faced with a rising crime in townships and communities that were once primarily white, lenders might find it more difficult to distinguish low from high-risk blacks when considering a mortgage loan application.[9]

These three characteristics, lack of credit records for Africans, historical unfamiliarity and mistrust, and high crime and violence, could exacerbate the asymmetric information problem in South African. As was discussed above information asymmetries are exacerbated by lenders inability to differentiate between black borrowers, which in turn can cause fewer loans supplied, smaller loan sizes and increased fragility of the financial market.

VI. Fragility in the Mortgage Market in Alexandra Township (1989 - 1992)

By the late 1980s and the end of formal apartheid a wave of community activism occurred focused on improvements in the living conditions of the millions of previously disadvantaged African households. Activists, who had previously invested energy into fighting against the apartheid regime, took on the challenge to reduce the tremendous housing shortage amongst the primarily poor African population. Given the amount of

9. Paradoxically, much of the violence might be reduced if homelessness were eradicated.

financial resources required to build the estimated 2 million units, activists sought to draw on resources from private lenders, notably white upper class South Africans.[10] Although opening channels to facilitate the flow of credit from rich white bankers to poor Africans was - and remains today - a huge challenge, by 1986 banks responded positively to activist demands for increased mortgage lending to households in Alexandra (Mayekiso (1997)).

Between 1986 and 1990 about Rand 7 billion in mortgages (or bonds) were issued to residents of Alexandra (Mayekiso (1997)). The bonds were issued to the wealthiest households, those who could be thought of as low risk as they were willing to accept the contracts offered by the white lenders. The smallest size bond issued was about R35,000 (sufficient to cover the cost of a minimally decent house estimated at R30,000 (Bond (1997), Mayekiso (1997))). Despite the limited clientele - an outcome of the lenders attempt to separate out high risk borrowers - this was a great achievement indeed and was a positive indication that banks could lend mortgages successfully to African households living in townships.

However, by about 1990 the fragility of the mortgage market became clear. The fragility of the loan market, due to lender' s need to screen out high-risk borrowers, could be seen to have exacerbated the impact of external factors on the performance of the loan market. A number of events are responsible for this reversal in bank lending preferences. The first problem that occurred was the poor quality of housing construction (Mayekiso (1997)). Out of all township houses built by private developers by the late 1980s about 90 percent had cracks and other serious structural defects. Promises made to develop communities, churches, shops, etc. never materialized and many township houses went without electricity hook-ups for years (Mayekiso (1997)). Poor quality construction had the effect of reducing the value of houses as collateral on mortgage loans.

Second, along with poor construction corruption was prevalent. It is known that in some cases corrupt agents in the real-estate market conned banks into issuing second bonds to households when the household knew nothing about it. This worked to cheat homeowners out of building even better homes since the second loan was not used to for building purposes. In addition, to the reduction in value of houses already built banks now lost out on the collateral in the form of houses which were never built.

Third, another factor was the difficulty that banks had in actually attaining the collateral should the household default. Although estimates of arrears on housing loans were as high as 30 percent, townships continued to support the rights of black families to remain in houses even when they could no longer afford to pay (Mayekiso (1997)). This made it difficult for the banks to evict tenants and to gain access to the collateral (the house).

A final factor that contributed to the breakdown in the low-income housing market in Alexandra is the rise in interest rates. Initially, bonds were initially issued at 12.5 percent but

10. At this time there was a strong sense that the transition government was committed to moving away from the apartheid era interventionist regime (characterized with high levels of government spending on the economy) towards a pro-market regime. Hence targeting private lenders was an obvious outcome.

between 1988 and 1989 they soared more than 8 percent.[11] In this environment, characterized with falling house values, banks, which previously were politically and socially motivated to lend to low income Africans began to redline African residential areas such as Alexandra because they believed that "the value of the house (the bank's security) would decline" (Mayekiso (1997, p. 176)).[12]

The first three factors, poor construction, corruption and difficulty in collecting collateral after default, could be seen to reduce the lender's valuation of collateral, k. The lender's valuation of collateral would fall due to the perception that houses were worth less on account of bad construction, moral hazard associated with corruption, and the perception that transactions costs associated with the difficulty of collecting collateral had risen. Finally, the rising deposit rate banks were confronted with at the end of the 1980s, can be seen to put upward pressure on already high interest rates.

The fall in the lender's valuation of collateral as a result of these factors would have the effect shown in Figure 2. A fall in k would cause a rotation in the contract menu, from $p^{L1}=0$ to $p^{L2}=0$. This moves the separation contract from C^{S1} to C^{S2}, where the interest rate demanded in the latter is higher than in the former. This rise in the interest rate further squeezes out low risk borrowers who would prefer to pay high collateral in exchange for low interest rates.

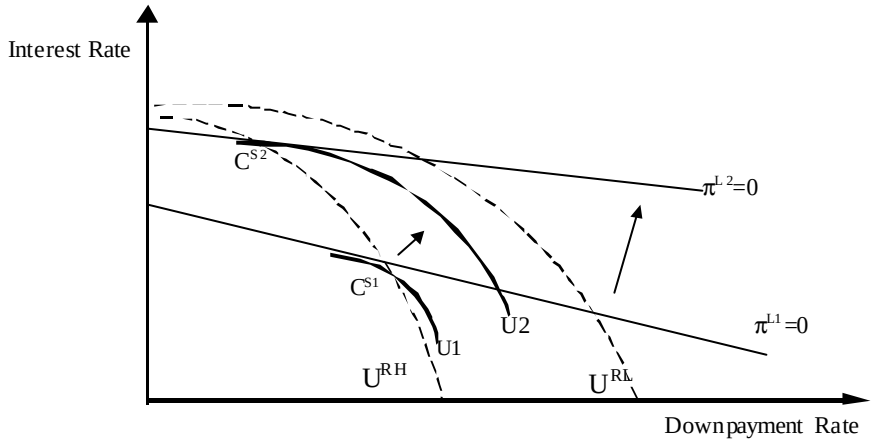

Figure 2 The Effect of Falling *k* on the Loan Contract under Asymmetric Information

11. By the end of 1988 the bank rate was 14.50 and rose to 18.00 by the end of 1989 (South African Reserve Bank Quarterly Bulletin (March 1998)).

12. As mentioned above this exacerbated the problem even more because houses could only be sold to someone with cash.

The fall in k and subsequent move from C^{S1} to C^{S2} has resulted in a decline in utility for the low risk borrower from $U1$ to $U2$. The loss in utility works to squeeze out some low risk borrowers and cause those who do participate to take out smaller loans. Finally, the model demonstrates how the rise in the bank rate can compound the problem of rising interest rates in an already fragile environment. The rise in the deposit rate, q, compounded the rise in the lending rate caused by rising k, as lenders were forced to match the rising bank rate after 1988.

VII. Policy Implications of Model

The policy implications of the model are as follows. First, the discussion above shows the importance of enforcing default and repossession. If banks were uncertain whether they would be able to repossess homes in the case of default it seems likely they would not lend. This is what appears to have happened in Alexandra.

Second, it points to the importance of strengthening the secondary market in homes. Households that cannot afford payments (due to rising interest rates) could avoid default and repossession if it were possible to sell the house in a secondary market.

Third, this case has shown the importance of the state's role in reducing the moral hazard of poor construction by providing sufficient housing inspection. If the state itself is prone to corruption in the administration of such standards it might be beneficial to set up an independent monitoring system to support the housing market.

Finally, the fourth policy implication is the strong complementarity between basic services such as sanitation, water, power and roads, and housing delivery. Local and provincial government could play a role here by investing in residential infrastructure and upgrades.

VIII. Conclusion

This paper has developed a model of the mortgage market to analyze the impact of asymmetric information on the lending decision among lenders and borrowers. Three characteristics of the South African economy were given that could be seen as a source of asymmetric information. First, was the lack of credit records among the African population, second, was the historical unfamiliarity and mistrust between whites, primarily the lenders, and blacks, primarily low income households and finally the third factor seen to exacerbate the information problem was high, and rising, crime. These factors combined with already poor infrastructure and institutional development can be seen to exacerbate the problem of incomplete information.

The model presented here works as a foundation to policy makers who are interested in social investment in housing markets. A number of policy implications were discussed based on the example of the low income mortgage in the township Alexandra. In particular, the policy implication of a falling k was pointed out, which included the enforcement of default and repossession efforts, the importance of a secondary market in homes, the need to insure high construction standards and to reduce moral hazard problems, and the strong complementarity between basic services and housing delivery. In order to resolve its housing

crises, in fragile loan markets, South Africa must focus not only on incentives to lenders but on upgrading communities, infrastructure and fighting crime. Unfortunately, the magnitude of the demand for such upgrading imposes a high monetary cost that ANC is unwilling to undertake.

Appendix

Appendix A (*footnote 3*)

We can solve for the first order conditions. These are as follows.

$$\text{Max } U = p(R+V(H)-(1-r)L)-F(D)+\lambda[1+r-\frac{1+\theta}{p}+\frac{(1-p)k(1+\alpha)}{p}].$$

$$\frac{\partial U}{\partial L} = pV' - p(1+r) - F' = 0 .$$

$$\frac{\partial U}{\partial \alpha} = \frac{\lambda(1-p)k}{p} = 0 .$$

$$\frac{\partial U}{\partial(1+r)} = -pL + \lambda = 0 .$$

Appendix B (*footnote 4*)

The proof is as follows. In equilibrium we get:

$$p^i((1+\alpha^i)V' - (1+r^i)) = F'\alpha^i .$$

Since $V' < F'$, $1+r-V' < 0$ or $V'-1+r > 0$, and $(1+\alpha)V'-(1+r) > 0$. And since $p^L > p^H$ or $(1-p^H) > (1-p^L)$ for a given loan level:

$$p^L((1+\alpha)V'-(1+r)) > p^H((1+\alpha)V'-(1+r)) \text{ and } p^L((1+\alpha)V'-(1+r)) > F'\alpha .$$

Thus in order to reduce the left-hand side of each equation the low risk borrower must take out a larger loan size. This will reduce V' and raise F' until $p^L((1+\alpha)V'-(1+r)) = F'\alpha$. This proves that at any downpayment - interest rate combination, the low risk borrower will choose a larger loan size than the high-risk borrower. It is also possible for a given set of

parameters that p^H is so low that the high-risk borrower's zero profit line, $p^H = 0$, sits above and to the right of the reservation utility. In this case, the high-risk borrower would choose not to participate in the loan market at all.

Appendix C

Faced with incomplete information the lender could offer all borrowers a pooled contract found along the contract menu:

$$E(\boldsymbol{p})^P = p^P(1+r)L + (1-p^P)kH - (1+\boldsymbol{q})L = 0,$$

where $p^P = \boldsymbol{l}p^L + (1-\boldsymbol{l})p^H$ and $\boldsymbol{l}$ = the proportion of low-risk borrowers in the population. However, since the indifference curve of the low risk borrower, U^L, is less steep than that of the high-risk borrower, U^H (as shown in section 1) we get a single crossing property hence a competitor could enter the market and "skim the cream" (Rothchilds and Stigliz (1981)).

The lender could also offer a single contract meant only for the high-risk borrower. However, it was shown above that the low risk borrower will always accept a contract meant for the high risk borrower (and take out a bigger loan), hence once again we get a skimming the cream effect. Competitors can enter the market and offer a better contract to the low risk that the high risk will not choose. The proof is as follows. Take a single contract $C^H = (1+r^H, \boldsymbol{a}^H)$ offered by the lender and accepted by a high-risk borrower. Referring to first order conditions, the borrowers net benefit will be equal to the disutility from making a down payment. We can see this from:

$$p^H(V((1+\boldsymbol{a}^H)L) - (1+r^H)) = F(\boldsymbol{a}^H L).$$

If the low risk borrower accepts this contract we get:

$$p^L(V((1+\boldsymbol{a}^H)L) - (1+r^H)) > p^H(V((1+\boldsymbol{a}^H)L) - (1+r^H)),$$

since $p^L > p^H$ this means that

$$p^L(V((1+\boldsymbol{a}^H)L) - (1+r^H)) > F(\boldsymbol{a}^H L).$$

Therefore, the low risk borrower will end up taking out a larger loan size at C^H because she derives a greater net benefit than the loss in utility from making a down payment. Thus the low-risk borrower will also accept any contract offered to the high-risk borrower and take out a larger loan size. In addition, at C^H the lender will make a profit because this contract lies above the contract menu of the low risk borrower; $p^L = 0$. However, positive profit mean that competitors will enter the market and offer the low risk borrower a better contract, anywhere to the right of the high-risk borrower's indifference curve. In this manner, once

again we get a skimming the cream effect and the equilibrium breaks down. A high-risk contract thus is also not a solution to the problem of incomplete information.

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