Quid Pro Quo: Sudden Stops and Commitment*

Eduardo Cavallo†
Inter-American Development Bank

Roberto Chang‡
Rutgers University and National Bureau of Economic Research

Andrés Velasco
Ministry of Finance, Chile

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Abstract

We explore the implications of capital market imperfections that originate in the lender's side for the merits of building national institutions that secure property rights in borrowing countries. We modify a simple international borrowing contract to incorporate two key features of today's international financial markets: the possibility that lenders can trigger sudden stops in capital movements; and debt contracts in which lenders transfer resources to the country at the start of the period, which have to be repaid later. We find that, under these conditions, higher costs of default may be counterproductive for the borrower, so the advice "build institutions to secure repayment" may be very misleading. Our findings contrast with the conventional view that it is in the debtor country's interest to "tie its hands" and secure the property rights of lenders because this enhances the credibility of the country's promise to repay.

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†cavalloe@iadb.org

‡chang@econ.rutgers.edu

1. Introduction

Countries wanting to develop are told time and again to "fix institutions" and "protect property rights." The two are related, for one main task of good institutions is to keep property rights from being violated. If countries follow this advice, then presumably traders and investors carry out profitable trades and projects and the country prospers.

International borrowing and lending provides a concrete application of this wisdom. Countries can guarantee repayment by entering into binding international agreements, designing rules or institutions that make non-payment costly, or making themselves vulnerable to international sanctions. If they do, the wisdom stresses, then capital inflows occur, profitable projects are financed and opportunities for international risk-sharing do not go to waste.

We can call this the "tie your hands and prosper" strategy. The Washington Consensus included that strategy among its commandments and many proponents have been enthusiastically prescribing it.[1] But in this paper we argue that, when applied to international borrowing and lending, such a strategy may well be incorrect. Or, more precisely, that it is correct only under very narrow and specific circumstances. Under other conditions, which are more prevalent in today's financial markets, the advice "build institutions to secure repayment at all costs" may be bad advice indeed.

Our argument starts from the observation that conventional analyses of cross country lending usually make the assumption that lenders can credibly make commitments to a future state-contingent payment stream, whereas the borrower cannot. To provide stark contrast, we assume that lenders may have commitment problems of their own. This change in perspective has significant implication for debt contracts and, in particular, may imply that the "tie your hands and prosper" strategy can be counterproductive.

[1] See, for example, Williamson (2000) and Tirole (2002).

More precisely, we modify a textbook model of international insurance, taken from Obstfeld and Rogoff (1996), in two directions. First, lenders are not always well behaved: in any period when lenders have to make a net transfer to the country, there is an exogenous probability that transfer will not occur. We can think of this as the "sudden stops to capital movements" phenomenon discussed in the by now very voluminous literature started by Calvo (1998).[2] Second, we consider not only an insurance contract but also a debt contract, in which lenders transfer resources to the country at the start of the period, which have to be repaid later.

We show that increasing the penalties that the borrower pays if he defaults impairs the insurance properties of the contract and, therefore, can easily cause a fall of welfare. These findings contrast with the standard view of international borrowing, which assumes that the basic distortion is the incentive of the borrower to renege on the contract, as he cannot credibly pre-commit to a future state-contingent payment stream. Thus, that view's prescription is also simple: increase as much as possible the share of output that lenders can seize in the event of non-payment.

Our view is not that institutional reform and the protection of property rights are undesirable goals, but rather that the prescription for attaining those goals cannot be made independently of the international environment. If a country faces a benevolent external environment in which lenders always behave as they should, then maximal protection of lenders' rights may be the optimal strategy for that country. But if circumstances are more adverse, with lenders misbehaving from time to time, then tying one's hands may be counter-productive, and only partial protection of lenders' property rights is best for the borrowing

[2] A key feature of that literature is that the sudden stops in capital inflows occur for reasons that are exogenous to the country. The same is true in our model. Alternatively, in a more complicated setting one could think of this sudden stop as the outcome of a coordination problem among lenders, in the spirit of Sachs (1982) and, more recently, Morris and Shin (1998). Then, the probability of a sudden stop can be thought of as the probability associated with a sunspot in a model with multiple equilibria. See also Rodrik and Velasco (2000).

nation. A corollary of these results is that domestic and international reform must be undertaken jointly: a better international lending environment, with fewer sudden stops in capital movements, makes it more likely that nations will undertake institutional reforms at home.

Finally, we argue that our model can also serve as a theory of the size of international debt. In the standard model the size of debt is irrelevant. Here it is not: with larger debt, the country gets more relief from non-payment. And that relief may be necessary if lenders can disappear. If borrowers expect that the lenders will not make the promised transfers, they will want to have more defaultable debt to cushion the adverse consequences of sudden stops.[3]

This paper is related to the rich literature on sovereign default and national institutions summarized by Sturzenegger and Zettelmeyer (2006). A key insight from that literature is that, to a large extent, international borrowing and lending is feasible because it involves repeated interactions between agents and/or because one of the parties can impose direct sanctions on the other. In other words, borrowers pay back their international debts because the punishment for non-compliance is the possibly worse outcome of no new lending thereafter (as in Eaton and Gersovitz, 1981), or perhaps they pay back because lenders can impose unilateral sanctions (as in Bulow and Rogoff, 1989). We depart from this body of literature by considering the possibility that sovereign default is a strategic decision by borrowers in response to prior actions on the part of lenders. In doing so, we shed light on the strategic interaction between borrowers and lenders.

Our work is also related to Kletzer and Wright (2000). These authors argue that a positive level of sovereign debt can be sustained –even without exogenous penalties for default– once a double commitment problem is introduced (i.e., neither borrowers or lenders can commit to a predictable steam of payments in the future). Long-term implicit relationships may

[3]Sachs (1982) makes a similar point, arguing that the default option can be a way for developing countries' borrowers to transfer economic risk to creditors.

be fulfilled as the continual renegotiation of simple incomplete short-term loans. While we also have a double commitment problem in our model, we focus on the effects that the commitment problems of lenders have on the incentives of the borrowers to undertake institutional reforms.

2. Borrowing from an Imperfectly Committed Lender

Consider the standard problem of a small country that borrows from the world market. The country has a representative agent that, in the sole period of interest, receives an exogenous stochastic amount of a final good. The representative agent (henceforth "country", for short) is risk averse and has access to a continuum of risk neutral international lenders whose opportunity cost of funds is zero. Naturally, the country will try to obtain insurance against the uncertainty of its income.

For concreteness, suppose that the country's endowment can take one of $i = 1, ..., I$ possible values, y_i, each with probability $f_i > 0$. Then, denoting the expected value of the endowment by y, we can write:

$$y_i = y + \varepsilon_i$$

where ε_i has zero expected value and support $[\underline{\varepsilon}, \bar{\varepsilon}]$.

Assume that there is no other source of uncertainty, that the country has no other sources of income, and that the country's preferences are given by the expected value of a function of consumption, $Eu(c) = \sum_i u(c_i)f_i$, where u has standard properties. Then the *standard result* is that the country will write an insurance contract with one of the international lenders by which, upon learning the realization of y_i, the country will transfer the realized ε_i to the lender (or receive $-\varepsilon_i$, if ε_i is negative). This is easy to see because (i) the expected value of the payment to the lender, $E\varepsilon_i$, is zero; (ii) the country consumes y independently of shocks, and (iii) the country is risk averse while the lender is risk neutral.

Conventional analyses of international borrowing would now enrich the discussion by assuming some distortion which rules out perfect insurance. And, following a tradition started by Eaton and Gersovitz (1981), almost invariably the distortion would come from the borrowers' side. Eaton and Gersovitz, for example, assume that the borrower could decide, after uncertainty was resolved, not to honor its commitment to pay ε_i to the lender. If there is no effective penalty for reneging, it is obvious that no insurance would be possible and that the country would end up consuming its endowment y_i. This is ex ante costly, and a key implication is that the country would be better off if it could tie its hands behind its back and commit never to break its promises (see e.g. the discussion in Obstfeld and Rogoff 1996).

2.1. Capital Market Imperfections

Here we want to consider the possibility that the distortions in international contracts may come from the creditor's side, not the borrower's. To begin with, suppose that, having written a contract and upon learning the realization of the country's endowment, the creditor "disappears" with some exogenous probability q if he is supposed to send a positive payment to the country. This crude assumption intends to capture the possibility of "sudden stops," plain dishonesty, and the like. A key feature of the sudden stop literature is that they occur for reasons that are exogenous to the country as the origin lies in some imperfections in capital markets.[4] The same is true in our model.

The resulting contract problem is more complex than it appears because we are assuming that the terms of the contract affect the probability of the lender's disappearance (since the lender can disappear only in states in which the contract stipulates a positive payment to the country). However, the solution turns out to be unexpectedly simple.

[4] See, for example, Calvo (1998)

A contract is described by a vector $P = \{P_i\}$ of stipulated payments from the country to the lender in each state i. For the lender to agree to sign the contract, he must expect zero profit, taking into account the possibility that the lender will disappear (and hence not have to honor its part of the contract). This can be formalized as follows: a contract P divides the set of states into two classes, one (denoted by B) in which the country sends a payment to the lender, and a complementary one in which the lender is supposed to send a payment to the country:

$$\begin{aligned} B &= B(P) = \{i : P_i \geq 0\} \\ B^c &= \{i : P_i < 0\} \end{aligned}$$

A contract P gives zero expected profit to the lender, then, if

$$\sum_{i \in B} P_i f_i + (1-q) \sum_{i \in B^c} P_i f_i = 0$$

The country will choose a contract P that maximizes the expected utility of the resulting consumption:

$$\sum_{i \in B} u(y + \varepsilon_i - P_i) f_i + (1-q) \sum_{i \in B^c} u(y + \varepsilon_i - P_i) f_i + q \sum_{i \in B^c} u(y + \varepsilon_i) f_i$$

while giving zero profit to the lender. The first sum is the contribution to expected utility of consumption in states in which the borrower sends a payment to the lender. The middle sum is the contribution in states in which the lender does send payments to the borrower. Finally, the last sum is the contribution to utility of consumption in states in which the lender disappears.

Letting λ denote the Lagrange multiplier associated with the zero profit constraint, the first order conditions for the optimal choices of P_i are

$$-u'(y+\varepsilon_i-P_i)f_i+\lambda f_i=0$$

if $i\in B$, and

$$-(1-q)u'(y+\varepsilon_i-P_i)f_i+\lambda(1-q)f_i=0$$

if $i\in B^c$. These conditions imply that

$$u'(y+\varepsilon_i-P_i)=\lambda$$

for all i, that is, that the contract must equalize the marginal utility of consumption in *all* states, unless the lender disappears. Hence consumption is constant unless the lender disappears, and

$$P_i=\varepsilon_i-\alpha$$

for some number α.

To see the intuition, consider two states, i and j, in which the contract stipulates that the borrower must send positive payments P_i and P_j to the lender. Suppose that P_i is reduced by one unit and P_j is adjusted to preserve zero profit for the lender. Then P_j must increase by f_i/f_j. Such a marginal move reduces the utility of consumption in state i, with occurs with probability f_i, by $u'(y+\varepsilon_i-P_i)$; the corresponding increase in the utility of consumption in state j is $u'(y+\varepsilon_j-P_j)f_i/f_j$, and is obtained with probability f_j. At the optimum, then, the marginal move does not change expected utility only if $u'(y+\varepsilon_i-P_i)=u'(y+\varepsilon_j-P_j)$.

Analogous reasoning also applies if i and j are states in which the contract instructs the lender to send payments to the borrower, or if the lender is supposed to send a payment to the borrower in i and receive a payment in j. The crucial assumption is that the lender does not benefit nor suffer from disappearing.

Our reasoning then implies that a contract can be completely summarized by the number α, given which the set B is:

$$B = \{i : \varepsilon_i \geq \alpha\}$$

and the zero profit constraint can be written as:

$$F(\alpha) = \sum_{\{i:\varepsilon_i \geq \alpha\}} (\varepsilon_i - \alpha) f_i + (1-q) \sum_{\{i:\varepsilon_i < \alpha\}} (\varepsilon_i - \alpha) f_i = 0$$

Noting that α is the only endogenous variable in the previous expression, the optimal contract is now obtained by solving for a zero of $F(\alpha)$.

It is easy to show that α must be strictly positive and must increase with q, the probability of the lender's disappearance. α can then be interpreted as a compensation to the country for the possibility that the lender will not honor his side of the contract. To see this, consider Figure 1 which plots the vector P for different values of ε_i. The standard result in a context of no distortions in capital markets is that is that the country will write an insurance contract with one of the international lenders by which it will transfer ε_i to the lender (or receive $-\varepsilon_i$ if ε_i is negative). Thus, P is Figure 1 is the 45-degree line. Instead, in a context where lenders can disappear, the lender would make a strictly positive expected profit under the perfect insurance contract. The contract then stipulates reducing payments in all states by the amount α. Moreover, α increases with q, until in the limit with $q = 1$, $B = \emptyset$. But the lender always gets zero expected profit, which means that the expected utility of the borrowing country must fall with q. Intuitively, financial imperfections hurt the borrowers even if they originate in the lender's side, since perfect competition ex ante means that any surplus from the relationship accrues to the borrower.

3. Can Default by Borrowers improve matters?

3.1. Quid pro Quo

To examine the consequences of allowing the borrowing country to default at a cost, let us modify the previous setting by assuming that the lender can post some asset, d, with the country, before y_i is realized. The asset is returned to the lender after y_i is realized unless the lender disappears, in whose case the country must choose between returning d to the lender or keeping it at a cost $\eta \epsilon [0, 1]$, proportional to the country's total resources. Given this assumption, defaults in the model occur when output is low in the borrowing country, which is exactly what the available empirical evidence suggests.[5]

This (admittedly contorted) assumption is meant to capture a real asymmetry in the relationship between lenders and sovereign borrowers prevalent in capital markets. A sudden stop is a situation where the lenders unexpectedly disappear and thus the flow of funds to the borrowing nation is abruptly cut. In response, there is little that the borrowers can do other than a quid pro quo policy of seizing any asset that the lender already has in the country (the accumulated past flows, i.e., the stock of debt d). If the borrower decides to default on that stock of debt –retaliatory default–, then a costly litigation process begins whereby a share of the borrower's total resources is lost. Litigation is warranted because the asset that is defaulted upon in retaliation is not linked to the flows that the lender did not transfer amid the sudden stop. Here is where the asymmetry lies: the lender has grounds for litigation when the country defaults (there is a real asset that has been seized when the borrower defaults) while the country does not have grounds for litigation when the lender triggers a sudden stop (the funds that the lender did not transfer amid the sudden stop are her own). If the share of the country's resources that is lost in litigation is not very big, the option of defaulting might be attractive vis-à-vis the alternative of paying back the debt in

[5] See Tomz and Wright (2007).

full. The parameter η is, essentially, a measure of how costly litigation is and, thereby, of the value to the country of the default option.

Interestingly, η can be thought of a choice variable for the borrower. Countries can guarantee repayment by entering into binding international agreements, designing rules or institutions that make non-payment costly or making themselves vulnerable to international sanctions. There are persuasive arguments as to why countries should do so.[6] But is it always in the borrower country's best interest to set a high η? Once we allow for financial imperfections that originate in the lender's side, the answer is not clear. This dimension of the problem we explore carefully below.

3.2. The Contract

A contract, again, is completely characterized by the vector of stipulated payments $P = \{P_i\}$ from the borrower to the lender. A contract P determines as before the set $B = \{i : P_i \geq 0\}$ of states in which the borrowers is instructed to send a positive amount to the lender. It is useful to divide the remaining states into two classes, according to whether the borrower would default on d if the lender were to disappear.

Clearly, if the lender disappears, the borrower will default on d if

$$d > \eta(y_i + d)$$

where η is the (constant) fraction of income lost in default. Hence, given a contract P, one can define

$$B^{cn} = \{i : P_i < 0 \text{ and } \eta(y + \varepsilon_i) \geq (1 - \eta)d\}$$

[6] See, for example, Tirole (2002). In his view, the lack of commitment by debtors is so pervasive that, to facilitate borrower countries access to more and better financing, it would be in their own interest that foreign investors be represented by an external agency with enforcing power (for example, by the IMF).

to be the set of states in which the borrower would return d if the lender disappears, and

$$B^{cd} = \{i : P_i < 0 \text{ and } \eta(y + \varepsilon_i) < (1 - \eta)d\}$$

to be the set of default states. Then a contract P gives zero expected profit to the lender if

$$\sum_{i \in B} (P_i + d) f_i + (1 - q) \sum_{i \in B^c} (P_i + d) f_i + \sum_{i \in B^{cn}} dq f_i = d$$

where $B^c = B^{cn} \cup B^{cd} = \{i : P_i < 0\}$. The third term in the LHS of the previous equality reflects that, if the lender disappears, the borrower returns d only if it is profitable.

Likewise, a contract P determines the expected payoff to the borrower as:

$$\begin{aligned} &\sum_{i \in B} u(y + \varepsilon_i - P_i) f_i + (1 - q) \sum_{i \in B^c} u(y + \varepsilon_i - P_i) f_i \\ &+q \left[\sum_{i \in B^{cn}} u(y + \varepsilon_i) f_i + \sum_{i \in B^{cd}} u((y + \varepsilon_i + d)(1 - \eta)) f_i \right] \end{aligned} \tag{3.1}$$

In the preceding expression, the term in brackets captures the effect on expected utility of the option to default on d. If the lender disappears, which happens with probability q, the country can return d and consume $y + \varepsilon_i$, or keep it at a cost equal to the share η of total resources $(y + \varepsilon_i + d)$.

Letting λ denote again the Lagrange multiplier associated with the zero profit constraint, it is straightforward to verify that the first order conditions for the choice of P_i imply that, again,

$$P_i = \varepsilon_i - \alpha, \text{ all } i$$

One consequence is that, as before,

$$B = \{i : \varepsilon_i \geq \alpha\}, B^c = \{i : \varepsilon_i < \alpha\}$$

Recall that, if the lender disappears, there will be default on d if $d > \eta(y_i + d)$, that is, if

$$\varepsilon_i < \frac{(1-\eta)d}{\eta} - y \equiv z \tag{3.2}$$

In other words, if the lender disappears the borrower will default if the realization of the output shock ε_i is less than some threshold value z. It follows that there are three cases:

(i) $\alpha < z$: then $B^{cn} = \emptyset$ and $B^{cd} = B^c = [\underline{\varepsilon}, \alpha]$, where $\underline{\varepsilon}$ is the lowest realization of ε_i. In words, a default on d obtains in all states in which $P_i < 0$, if the lender disappears.

(ii) $z < \underline{\varepsilon}$: then $B^{cd} = \emptyset$ and $B^{cn} = B^c = [\underline{\varepsilon}, \alpha]$. In this case, there is never default on d.

(iii) $\underline{\varepsilon} < z < \alpha$: then $B^{cd} = [\underline{\varepsilon}, z)$ and $B^{cn} = [z, \alpha]$. If the lender disappears, the borrower defaults if ε_i is low and returns d is ε_i is high.

Case (iii) is the only case with no empty sets. Figure 2 plots the key thresholds that appear in this case. There is a risk that materializes with probability q of the lender's disappearing for shocks i such that $\varepsilon_i < \alpha$. If the lender disappears, the borrower defaults if $\varepsilon_i < z$ (subregion B^{cd}). Otherwise he returns d (subregion B^{cn}). B in turn is the complementary region $(\alpha, \bar{\varepsilon}]$.

This analysis yields an algorithm to solve for the optimal contract. As we have seen, the optimal contract P_i is completely described by the value of α. The value of α also determines the sets B, B^c, and subsets B^{cn}, and B^{cd}, as we have just seen. Finally, the zero profit constraint can be now written as

$$0 = \sum_{i \in B} (\varepsilon_i - \alpha + d) f_i + (1-q) \sum_{i \in B^c} (\varepsilon_i - \alpha + d) f_i + \sum_{i \in B^{cn}} dq f_i - d \equiv \Gamma(\alpha)$$

The optimal contract is, therefore, given by a zero of $\Gamma(\alpha)$ in $[\underline{\varepsilon}, \bar{\varepsilon}]$.

3.3. Numerical Exercises I

To aid intuition, consider the following numerical exercises. For the purpose of these simulations, we set, $y = 0.9$, $d = 0.2$, $q = 0.5$, $\underline{\varepsilon} = -1$ and $\bar{\varepsilon} = 1$. Figure 3 plots the values of α that solve $\Gamma(\alpha) = 0$ and the associated values of z against η. [7] The figure shows that z is decreasing and α is increasing in η. The latter follows directly from equation 3.2. Intuitively, a higher η makes it more costly for the country to default on d, so z falls and the subregion B^{cd} shrinks. Since there is less default when the lender disappears, repayments when he does not disappear must fall to keep expected profits at zero, resulting in a higher α.

In terms of Figure 2 again, if η is larger the *default* subregion (B^{cd}) shrinks while the *no default* subregion (B^{cn}) expands, as z shifts leftward and α shifts rightward. This implies less consumption *ex-post* to the borrower in the event of a sudden stop, counteracted with more *ex-ante* consumption in the form of a higher α and lower contractual repayments.

Figure 4 plots the borrower's expected utility for different values of η, using equation (3.1). For this purpose we assume a CRRA utility function with coefficient of relative risk aversion (σ) equal to 2.1. [8] The figure reveals that the borrower's utility is a decreasing function of η. This may be surprising given the conventional literature, which argues that the borrower would be better off if he could increase his costs for default. But the intuition here is simple: at higher values of η, there is less insurance for the borrower. A larger η reduces the borrower's consumption in the event of a low output realization, if the lender disappears. But this means that consumption is shifted towards states with higher output realizations. Since high output realizations are associated with low marginal utility, it follows that the borrower would rather have a lower η, not a higher one.

[7] Given the chosen parametrization, z falls within the bounds of ε_i only when $\eta \geqq 0.095$. Therefore, the x-axis in Figure 3 start at that value of η.

[8] Simulations using other values of σ are reported in subsequent sections. More on this below.

Hence, as in the conventional literature, financial imperfections hurt the borrower. Here financial frictions originate in the lender's side, but perfect competition ex ante means that any surplus from the relationship accrues to the borrower. In the presence of financial imperfections that originate in the lender's side, the country does not want to tie its hands behind its back in order to guarantee repayment to the lenders.

4. Allowing for Sovereign Default

4.1. The Incentive Compatible Contract

The literature on international borrowing and lending has focused on the question of why sovereign countries repay their debts. The most frequent assumption is that noncompliance with international contracts result in an output cost. Here we examine the consequences of this assumption.

We amend the setting of the previous question to allow the borrower to walk away from the contract at a cost, independently of whether the lender disappears or not. To make things simple, we assume that the borrower decides whether or not to renege on the contract after ε_i is realized but before it becomes known if the lender will walk away. Reneging results in a loss of, say, a fraction $\phi \in [0,1]$ of the borrower's resources, and the borrower will walk away from the contract unless the utility of the resulting consumption is less than the expected utility of sticking to the continuation of the contract. For simplicity, we also assume that, if the borrower reneges on the contract, he must also default on the asset d, and (correspondingly) that $\phi \geq \eta$.

These assumptions ensure that, given a contract $P = \{P_i\}$, the borrower will not walk away in a state i if $P_i < 0$: walking away implies consuming $(1-\phi)(y_i + d)$ for sure, while sticking to the contract ensures that consumption will be at least $(1-\eta)(y_i + d)$. Hence walking away from the contract is relevant for the borrower only if $P_i \geq 0$, and will be optimal in those states i in which:

$$\phi(y_i + d) < P_i + d$$

However, a standard argument implies that it can never be part of an optimal contract to choose any P_i such that the borrower walks away for sure in state i.[9] The implication is that the optimal contract will solve the same problem as before, except that it also has to respect the incentive constraint:

$$\phi(y_i + d) \geq P_i + d$$

Recalling that the incentive constraint will not bind if $P_i < 0$, one can denote the (non-negative) Lagrange multiplier associated with the previous incentive constraint by $\theta_i f_i$ and show that the first order conditions for the optimal choice of P_i can be compactly expressed as:

$$-u'(y + \varepsilon_i - P_i) + \lambda - \theta_i = 0$$

with complementary slackness (that is, $\theta_i = 0$ if $\phi(y_i + d) > P_i + d$).

Now it follows that in states i in which the borrower's incentive constraint does not bind, there is some α such that:

$$P_i = \varepsilon_i - \alpha$$

while if the incentive constraint does bind, of course,

$$P_i = \phi(y_i + d) - d = \phi(y + \varepsilon_i) - (1 - \phi)d$$

Note now that if the incentive constraint does not bind for some state i, then $\phi(y_i + d) = \phi(y + \varepsilon_i + d) > P_i + d = \varepsilon_i - \alpha + d$, that is, $\alpha + \phi y - (1 - \phi)d > (1 - \phi)\varepsilon_i$. Hence the incentive

[9] Because there is a resource loss when the borrower walks away, any contract prescribing any such P_i is dominated by a contract that adjusts P_i to make the borrower indifferent between walking away or not.

constraint cannot bind for states $j < i$. The implication is that there must be some value, x say, such that the incentive constraint binds only if $\varepsilon_i > x$. In fact, one can see that this must be the case for a value x such that $\phi(y+x) - (1-\phi)d = x - \alpha$, that is,

$$x = \frac{\alpha + \phi y - (1-\phi)d}{1-\phi} \tag{4.1}$$

Note that x increases with α, reflecting that higher α means lower P_i's, and hence reduce the borrower's incentive to walk away from the contract. Likewise, x falls with d, since a higher d increases the temptation for the borrower to renege on the contract.

The form of the optimal contract now emerges. For a given α, define $P_i = \varepsilon_i - \alpha$. This is the contractual payment unless the incentive constraint binds, in whose case the contractual payment is reduced to $\phi(y+\varepsilon_i) - (1-\phi)d$. The value of α determines the sets B, B^c, B^{cd}, and B^{cn} as before. But now the set B can be split into two subsets,

$$\begin{aligned} B^b &= \{i : \varepsilon_i \geq x\} \\ B^{nb} &= \{i : \alpha \leq \varepsilon_i \leq x\} \end{aligned}$$

in which the incentive constraint binds and does not bind respectively. The graphical representation of these regions is in Figure 5. Comparing Figures 2 and 5 it emerges that subregions B^b and B^{nb} emerge based on the cut-off x.

This implies that the zero profit constraint for the lender can be written as:

$$0 = \sum_{i \in B^b} \phi(y+\varepsilon_i+d)f_i + \sum_{i \in B^{nb}} (\varepsilon_i - \alpha + d)f_i + (1-q)\sum_{i \in B^c} (\varepsilon_i - \alpha + d)f_i + \sum_{i \in B^{cn}} dqf_i - d \tag{4.2}$$

The RHS is a function of α, and therefore the optimal contract is a zero of that function.

Once α is found, the expected payoff to the borrower is given by

$$\sum_{i \in B^b} u((1-\phi)(y+\varepsilon_i+d))f_i + \sum_{i \in B^{nb}} u(y+\alpha)f_i + (1-q)\sum_{i \in B^c} u(y+\alpha)f_i \tag{4.3}$$
$$+q\left[\sum_{i \in B^{cn}} u(y+\varepsilon_i)f_i + \sum_{i \in B^{cd}} u((y+\varepsilon_i+d)(1-\eta))f_i\right]$$

4.2. Numerical Exercises II

Next, in order to gain some intuition, we again resort to numerical exercises. For the purpose of these simulations, we set $y = 0.9$, $d = 0.2$, $q = 0.5$, $\phi = 0.5$, $\underline{\varepsilon} = -1$ and $\bar{\varepsilon} = 1$. Figure 6 plots the values of α (that result from solving 4.2), z and x for different values of η (caeteris paribus) that satisfy the condition $\phi \geq \eta$. The results are similar to those in Figure 3 and carry the same intuition: z is decreasing in η (see equation 3.2) while α is increasing with η (more punishment ex-post is compensated with higher ex-ante transfer). The new feature is that x is shown to be an increasing function of η. This follows from equation (4.1) that shows that x is increasing in α. The intuition is that, if η increases, α increases for reasons already discussed. This implies uniformly reduced debt repayments, and hence a smaller incentive for the borrower to walk away from the contract.

Once again, the country is altogether worse-off at higher levels of η. This is observed in Figure 7 where we plot the borrower's expected utility for different values of η, using equation (4.3) with $\sigma = 2.1$. The figure reveals that the expected utility is a decreasing function of η. The intuition is once again fairly simple: at higher values of η, there is altogether less risk-sharing as the region where there can be a Sudden Stop in Figure 5 (i.e., region B^c) expands at the expense of region B. There is a countervailing effect in the complementary region B that is not enough to compensate the loss. To see where this other effect comes from, note that it follows from equation (4.1) that x grows at a higher rate than α (i.e., $\frac{1}{1-\phi} > 1$), thereby expanding the relative size of B^{nb} –where the ICC does not bind–at the expense of B^{b}, providing more scope for risk sharing within region B. Despite this, with the baseline simulations it becomes apparent that this secondary effect is not large enough to compensate the other one, and thus raising η ultimately has a dampening effect on the country's expected utility.

Figure 8 plots the values of α, z and x for different values of q in equation (4.3), holding $\eta = 0.4$ and the rest of the parameters at the same values as before. Note from equation 3.2 that z does not vary with q, so it is a horizontal line. Instead, both α and x increase with q. The intuition is that when the risk that the creditor may disappear increases, then –ceteris paribus– contractual debt payments must fall to keep the lender's expected profit from becoming strictly positive. And because the threshold x is increasing in α (see equation 4.1) then x increases too. Altogether, this implies that the region B^{c} is expanding at the expense of region B. As before, this hurts the country, and the expected utility of the borrower falls as q increases (see Figure 9).

Recall that ϕ is the cost that the country pays if he walks away of the contract when, given the realization ε_i , he is supposed to make positive payments to the lender. Next, we consider the effect of changing ϕ in equation (4.3) for a fixed $\eta = 0.4$ and $q = 0.5$. To satisfy the condition $\phi \geq \eta$, simulations begin at values of $\phi = 0.4$. The rest of the parameters are fixed at their previous values. Figure 10 plots the values of α, z and x for different values of ϕ.[10] The results are that z does not vary with ϕ while α and x are both increasing in that choice variable. Interestingly, this is qualitatively very similar to the results obtained when

[10] This is the range of values of ϕ for which, given the selected parametrization, in addition to the condition $\phi \geq \eta$, the following condition also holds:

$$z \leq x \leq \bar{\varepsilon}$$

This ensures that regions B^{c} and B are well defined.

η varies, but there is one key difference: the rate at which x increases in now higher than the rate at which α increases. The reason becomes clear from equation (4.1): x increases not only due to the increase in α (as before), but also due to ϕ itself. This is important because, unlike the previous case, we now have a shift in the relative size of regions B^b and B^{nb} that could potentially have welfare implications to the country: when B^{nb} increases at the expense of B^b the scope of risk sharing expands. In other words, risk sharing becomes feasible across a greater number of states i. This benefits the country which is the only risk averse party to the contract. Of course, against this background, the region B^c is expanding vis-à-vis B (due to the increase in α). This has exactly the opposite welfare implications for the country as we showed before. Thus, the net welfare implication to the country of increasing ϕ is theoretically ambiguous. But it turns out that for our baseline parametrization the positive effect prevails for the relevant values of ϕ. This is shown in Figure 11 that plots the expected utility of the borrower increasing against ϕ for the CRRA utility function with $\sigma = 2.1$. These simulations show that setting the highest possible ϕ is always in the best interest of the debtor. The reason is that, as Obstfeld and Rogoff (1996) state in the context of their model, as ϕ rises, consumption can be stabilized across more states of nature, to the debtor country's benefit. The key difference between η and ϕ is that the sanctions ϕ are never exercised in equilibrium anyway, so their role here is the positive one of enhancing the credibility of the country's promise to repay.

In other words, when the financial imperfections lie on the side of the borrower, it makes sense for the country to tie its hands behind its back reducing the scope for opportunistic behavior. The key assumption is that there is a targeted intervention (in this case summarized by parameter ϕ) that enables the country to mitigate that imperfection without exacerbating others. That is not the case, for example, if increasing ϕ exposes the country to bigger costs in the case of retaliatory default in the aftermath of a sudden stop. We turn to that case next.

4.3. Symmetric Costs

Up to this point we have assumed that η may change separately from ϕ, meaning that the cost that the country pays for retaliation in the case of a default in a sudden stop (i.e., keeping d at a cost equal to a share η of the country's total resources) is different from the cost he pays if he walks away from the contract unilaterally (i.e., share ϕ of the country's total resources). In principle, there is no reason why these two should be the same. But an interesting extension is to explore what happens when they are related.

The simplest assumption is that $\eta = \phi$, and may capture the idea that institutions that punish countries for default cannot distinguish between "opportunistic" and "retaliatory" behavior. Figures 12 and 13 explore this assumption in the case $y = 0.9$, $d = 0.2$, $q = 0.5$, $\underline{\varepsilon} = -1$ and $\bar{\varepsilon} = 1$. Figure 12 plots the values of α, z and x for different values of $\eta (= \phi)$. Clearly, these results combine the ones in the previous figures. Larger η naturally leads to smaller z, and larger ϕ leads to larger x. The net effect on α is ambiguous; in the figure, α increases.

Figure 13 plots the borrower's expected utility for different values of η, using equation (4.3) with $\sigma = 2.1$. We find that expected utility has a hump-shape, first increasing and then decreasing. This reflects that increasing η and ϕ at the same time, by the same amount, has conflicting effects on the contract problem and welfare. Larger η leads to less default on d when the lender disappears which, as we have argued, reduces the insurance value of the contract. But larger ϕ reduces the ex ante incentives for the borrower to unilaterally walk away from the contract, alleviating incentive constraints and increasing the value of the contract. In Figure 13, the net result on welfare depends on the precise value of η.

Note that our discussion implies that increasing η is more likely to reduce welfare the larger the value of σ. This is because, as we have stressed, the increase in η reduces the insurance value of the contract, which is more damaging with higher risk aversion.

It also follows from Figure 13 that, with sudden stops, the optimal value of η from the country's point of view is less than its possible maximum value. When choosing η, the country needs to weigh advantages against disadvantages. Raising η up to a certain threshold is beneficial for the country because it enhances the incentives for the borrower to stick to the contract. But raising η too much also reduce the insurance aspects of the contract.

Another way of interpreting these results is as follows: recall that in principle there are two types of country's default that could materialize in this model. The first one is when the country decides to walk away from the contract in "good" states i (i.e., high realizations of ε_i) –i.e., opportunistic default–, while the other one is triggered only as a response to a sudden stop during "bad" times –retaliatory default–. The first one is eventually prevented by the incentive-compatible payment contract which is more effective when η is higher (previously, through higher ϕ). This is to the advantage of the risk-averse borrower as it increases the scope for risk sharing. But higher η has the disadvantage from the point of view of the country of raising the cost of retaliatory default. In other words, a higher η reduces the attractiveness of default as an insurance against sudden stops.

4.4. Risk Aversion

The welfare results discussed in previous sections are not very sensitive to the chosen values of the coefficient of relative risk aversion (σ) in the CRRA utility function. The expected utility computations in the previous figures assume $\sigma = 2.1$, a value consistent with existing open economy models. Figures 14, 15 an 16 replicate some of these cases using a lower $\sigma = 1.1$ (similar to a log utility function) while Figures 17, 18, and 19 use a higher risk aversion coefficient $\sigma = 3.1$.[11] Figures 14 and 17 are the plots of the expected utility against η for the cases when $\eta \neq \phi$. They are downward sloping as in the the baseline case with $\sigma = 2.1$. Figures 15 and 18 are the plots of the expected utility against ϕ for the cases when

[11] Results are very similar for simulations using even greater coefficients of relative risk aversion.

$\eta \neq \phi$. They are upward sloping as the equivalent Figure 11.

Finally, Figures 16 and 19 are the plots of the expected utility against η for the cases when $\eta = \phi$. In these cases, Figure 16 still has the hump-shape as the equivalent Figure 13, while in Figure 19 the welfare-decreasing effect of raising η predominates throughout the relevant range of η's. As we pointed out already, these results reflect that higher values of η reduce the insurance value of the contract, which is more costly for the borrower as risk-aversion increases.

4.5. Taking Hostages

One common feature of many developing countries is the accumulation of large –sometimes excessive–stockpiles of external debt.[12] Our model provides a rationale for such behavior. Too see why, suppose that the country chooses the amount d that lenders can post with the country, before y_i is realized. As before this is returned to the lender after y_i is realized unless the lender disappears, in whose case the country must choose between returning d to the lender or keeping it at a cost $\eta \in [0, 1]$, proportional to the country's total resources. Also, we allow the borrower to walk away from the contract at a cost $\phi \in [0, 1]$, independently of whether the lender disappears or not. The set-up and the equilibrium conditions are identical to the previous one. The only difference is that, rather than setting either η and/or ϕ as the choice variables, we assume that they are fixed and that the choice variable is d.

Figures 20 and 21 explore this case assuming $y = 0.9$, $\eta = 0.4$, $\phi = 0.5$, $q = 0.5$, $\underline{\varepsilon} = -1$ and $\bar{\varepsilon} = 1$.[13] Figure 20 plots the values of α, z and x for different values of d. As discussed before, x falls with d, since a higher d increases the temptation for the borrower to renege on the contract, thereby reducing the scope for risk-sharing (i.e., subregion B^bexpands vis-a-vis B^{nb} in Figure 5). Instead, z is increasing in d.Intuitively, a higher d makes it more attractive

[12] See, for example, IDB (2007).

[13] Results are very similar for the case $\eta = \phi$.

–for a given η– for the country to default on d, so z increases, thereby expanding subregion B^{cd} in Figure 5. At the same time, note that α also falls with d. The reason is that higher a level of d is an alternative form of ex-ante compensation from lenders. And since there is now more default when the lender disappears, repayments when he does not disappear must increase to keep expected profits at zero, resulting in a lower α.

The net welfare implication to the country of increasing d is theoretically ambiguous and hinge on how big is the risk of sudden stops q, and the degree of risk aversion σ. If borrowers expect that the lenders will disappear, they will want to have more defaultable debt to cushion the adverse consequences of sudden stops –somewhat like taking hostages–. But, as discussed, higher d also has the disadvantage of reducing the scope for risk-sharing and this hurts the borrower. It turns out that for a parametrization with $\sigma = 1.1$, the expected utility has a hump-shape, first increasing and then decreasing suggesting that there is an optimal level of d which is interior.[14] This is shown in Figure 21 that plots the expected utility of the borrower increasing against d for the CRRA utility function. Beyond the specifics of the simulation, the key point is that, in this model, the size of d matters: with larger d, the country gets more relief from non-payment. And that relief may be necessary if in equilibrium lenders can disappear.

5. Conclusion

The message of this paper is simple: in the presence of capital market imperfections that originate in the lender's side, borrower countries may not gain and can lose from building national institutions that secure the lender's property rights, as those guarantees might backfire if the country is forced to default. Similarly, borrowers might choose to accumulate large stockpiles of debt as a form of self-insurance.

[14] Unlike other results in the paper, this is not a general result. We find that for higher values of σ the positive effect prevails for the relevant values of d.

Forcing or recommending countries to behave differently will not work unless those countries perceive that the rest of the world is also a safe place. This implies that strategies like "tie your hands and prosper", which are embedded in popular policy prescriptions, can work only if they are accompanied by a better international lending environment with fewer sudden stops in capital movements.

We do not claim that institutional reform to secure property rights is an undesirable objective. Instead, our conclusion is that a more stable international lending environment would go a long way towards promoting the correct incentives for countries to undertake reforms aimed at protecting investors. The corollary of this is that domestic and international reform must be undertaken jointly: a better international lending environment, with fewer sudden stops in capital movements, makes it more likely that nations will undertake institutional reforms at home.

6. References

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Figure 1: Payoff Schedule

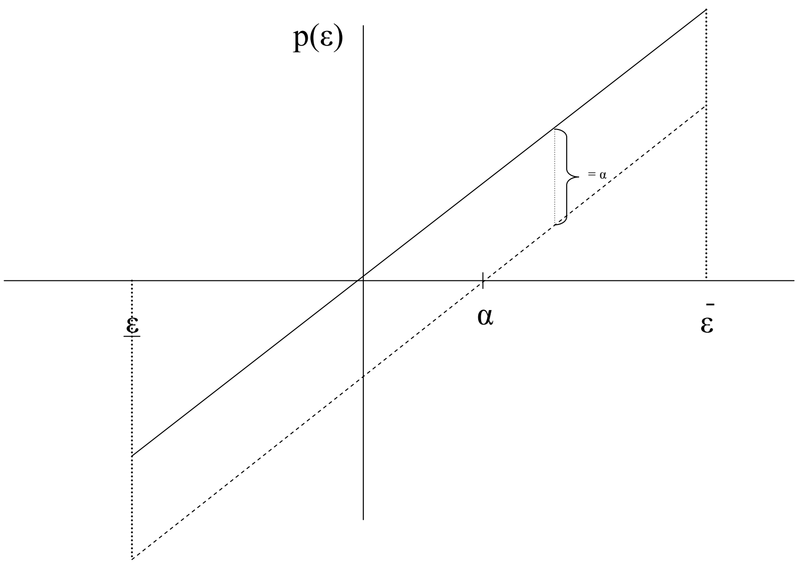


Figure 2: Key Thresholds

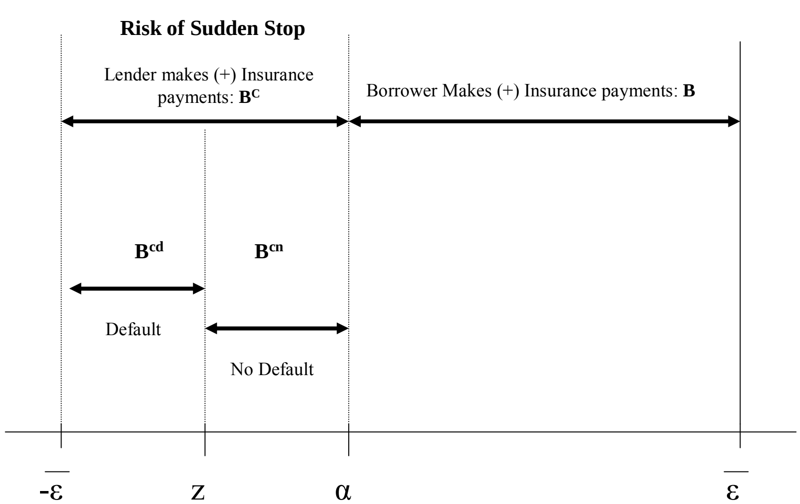


Figure 3

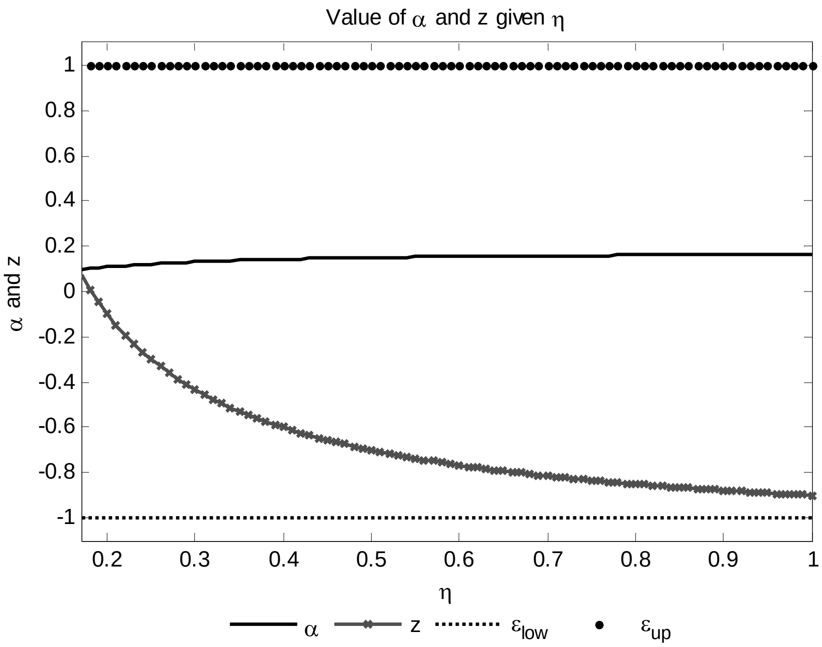


Figure 4

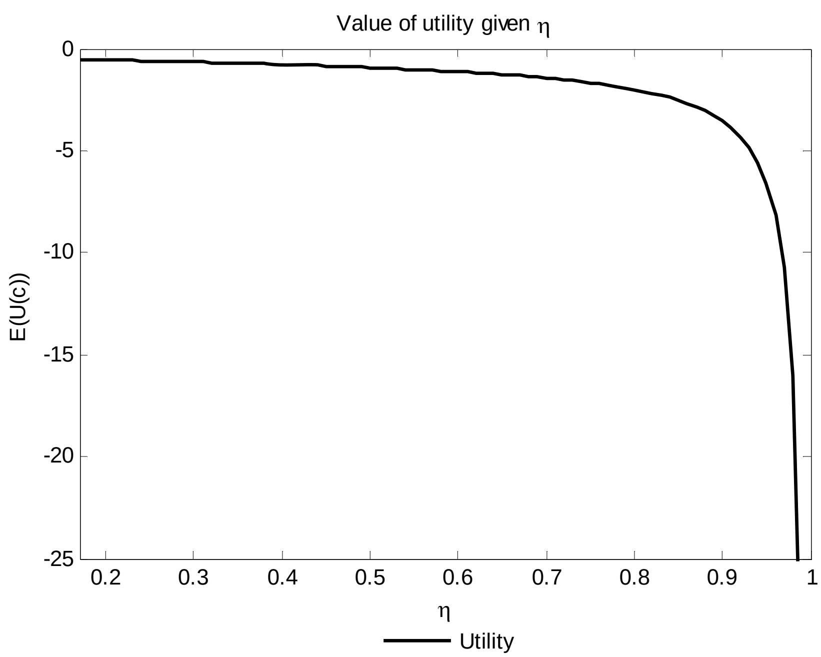


Figure 5: Key Thresholds II

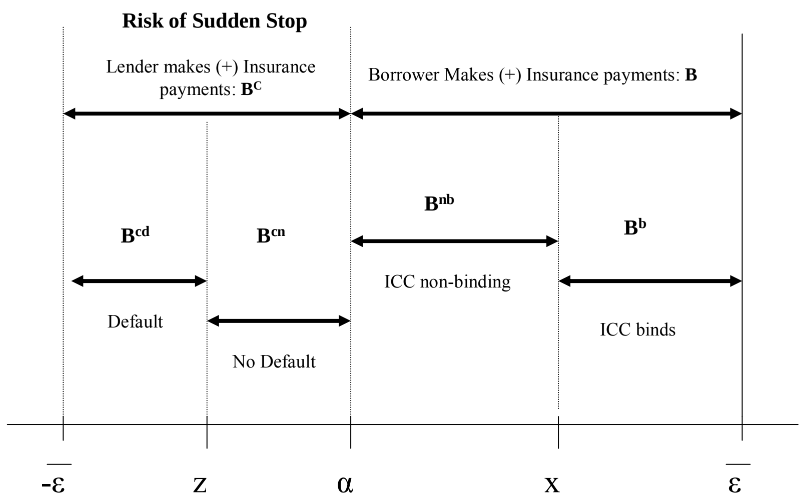


Figure 6

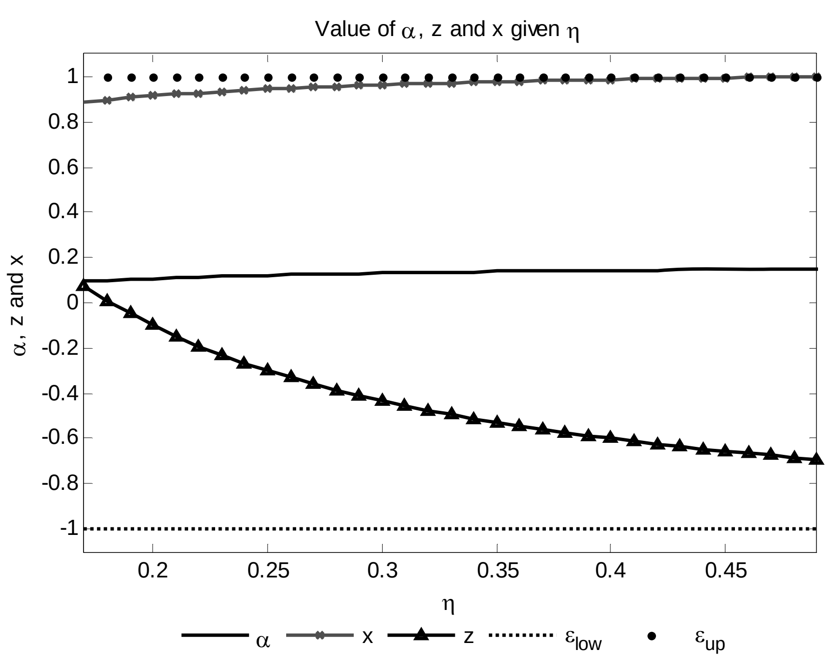


Figure 7

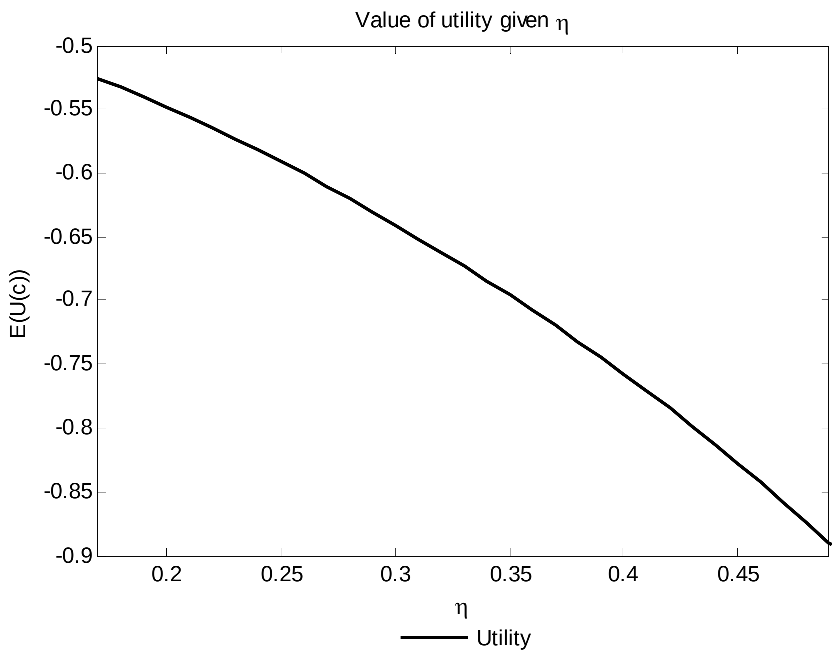


Figure 8

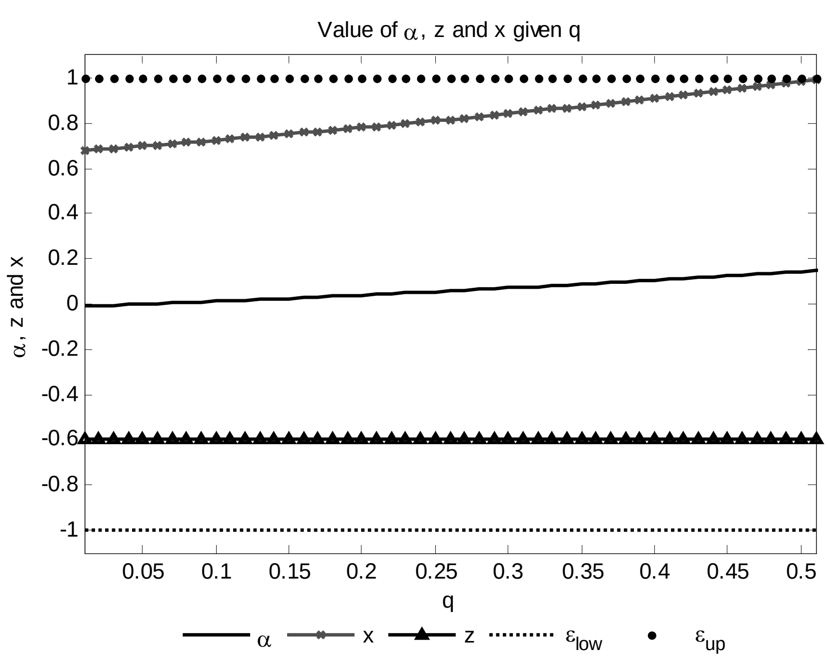


Figure 9

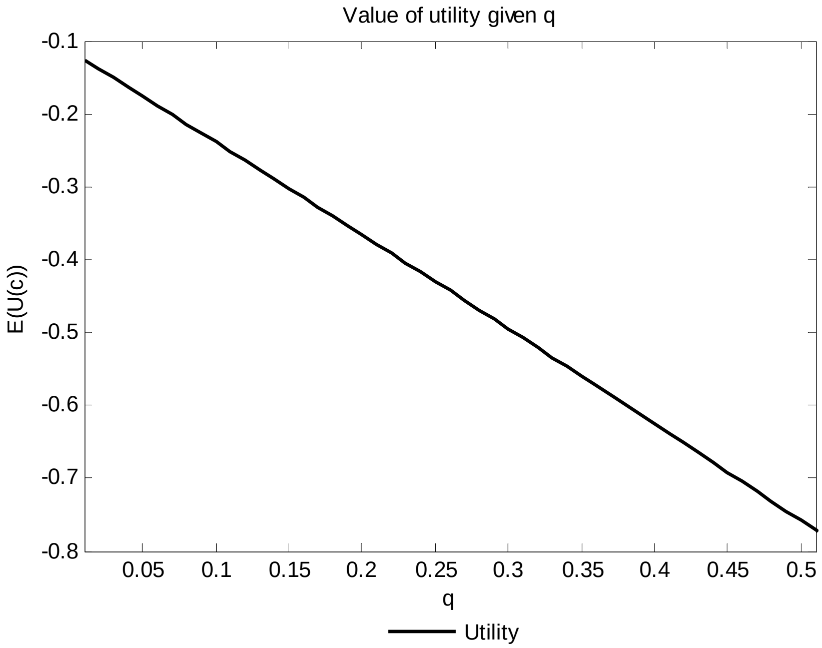

Value of utility given q
-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
E(U(c))
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
q
Utility

Figure 10

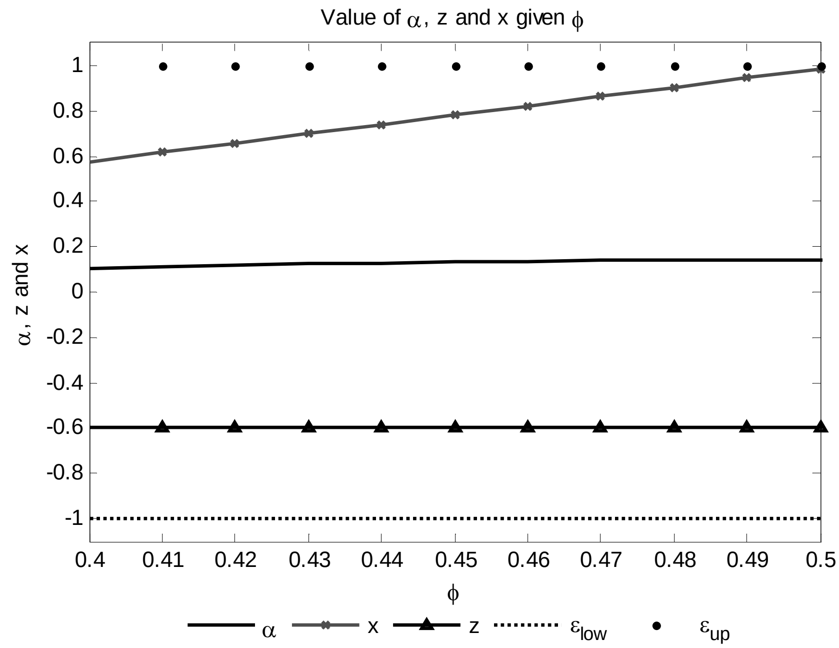


Figure 11

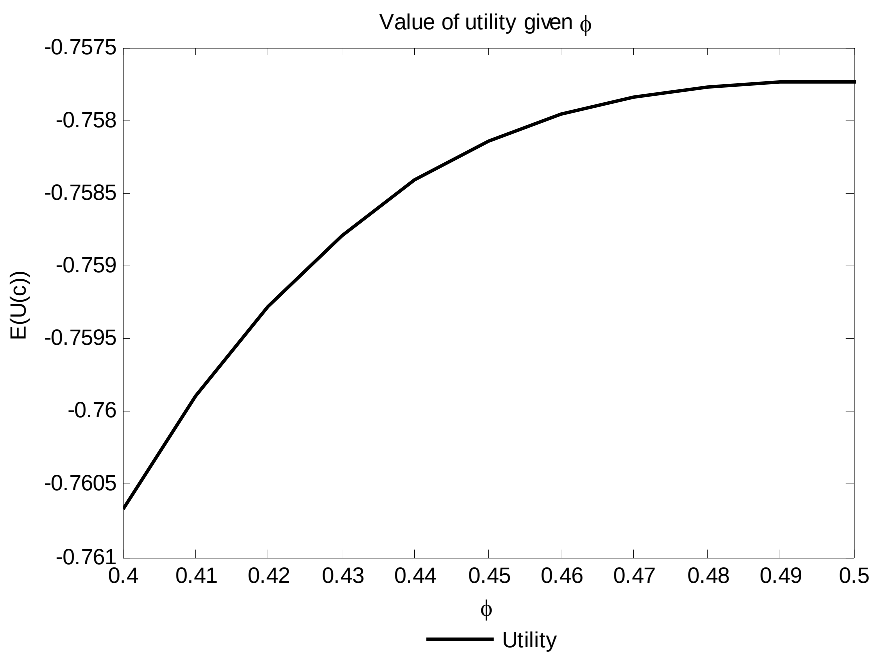


Figure 12

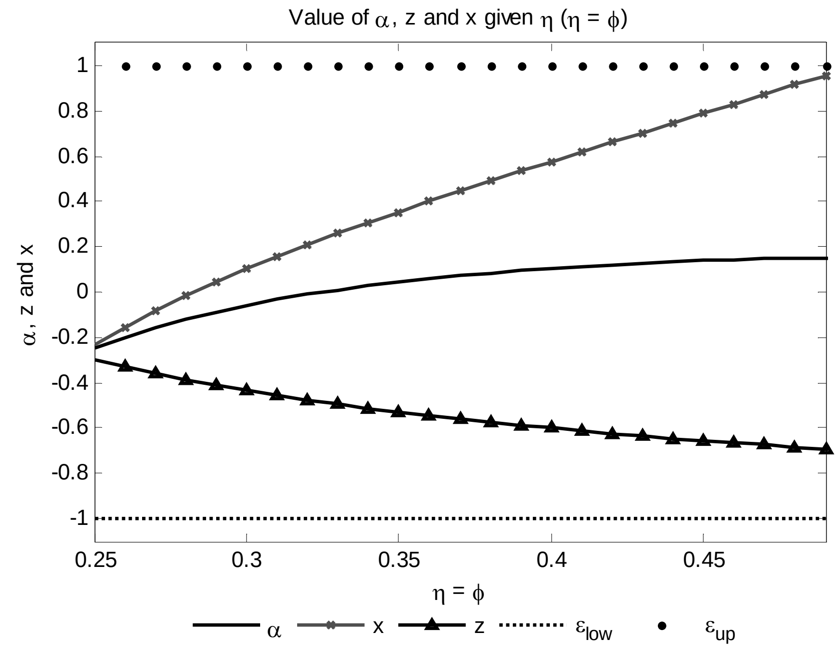
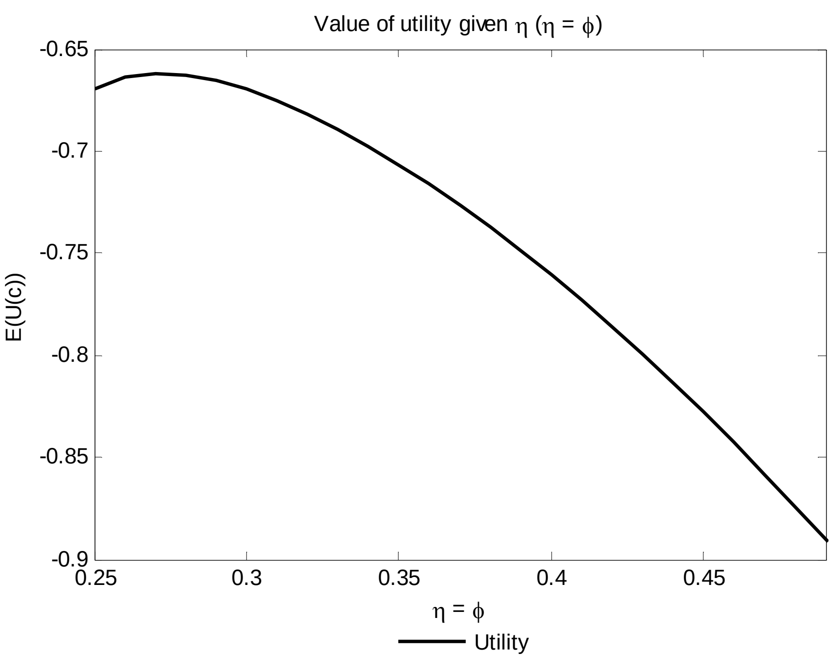


Figure 13



Part II- Simulations using different values of the coefficient of risk aversion (CRA)

Figure 14

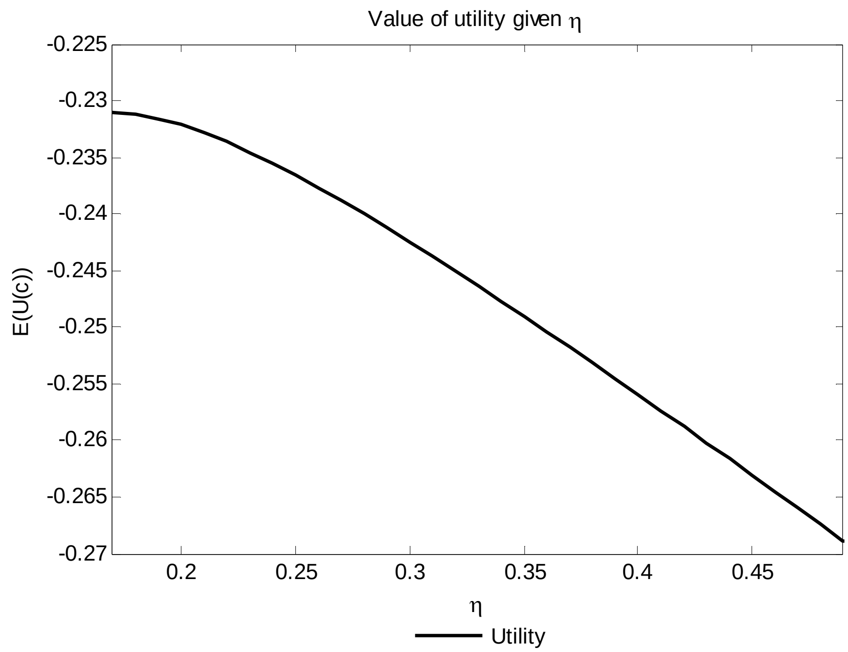


Figure 15

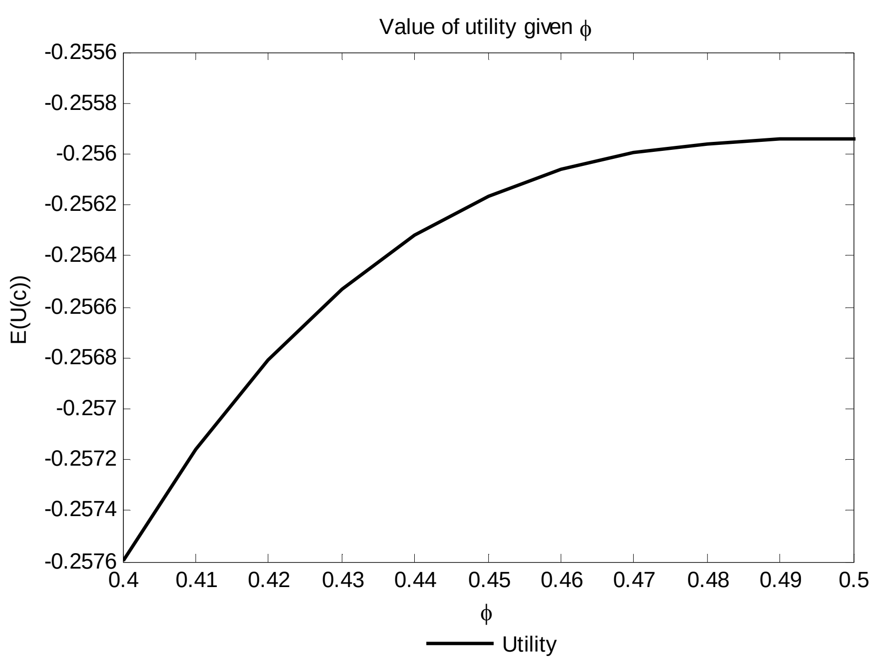


Figure 16

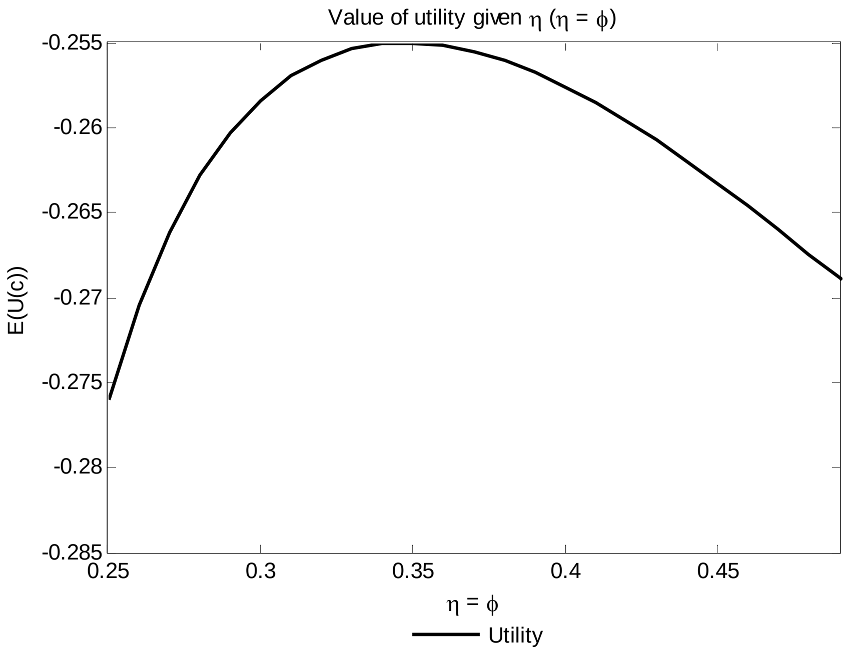


Figure 17

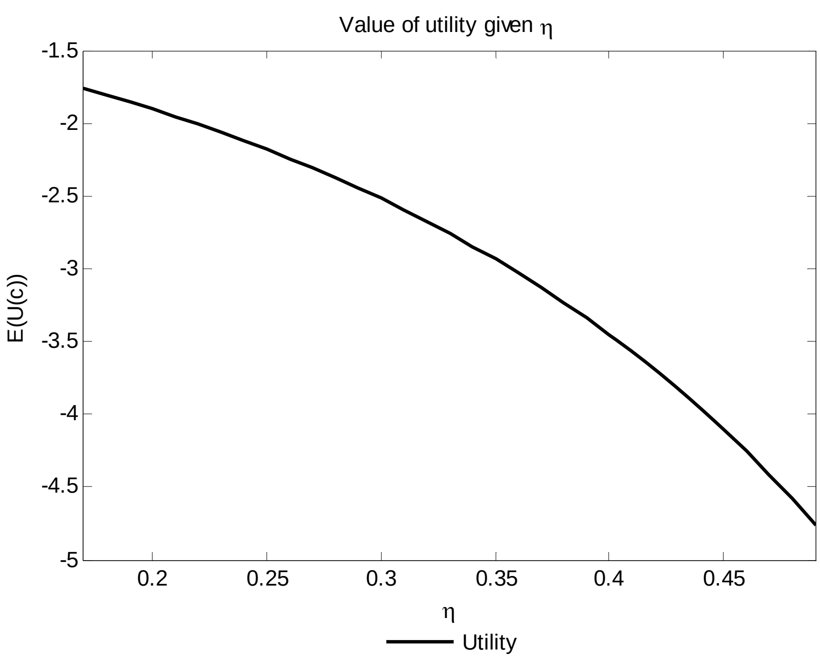


Figure 18

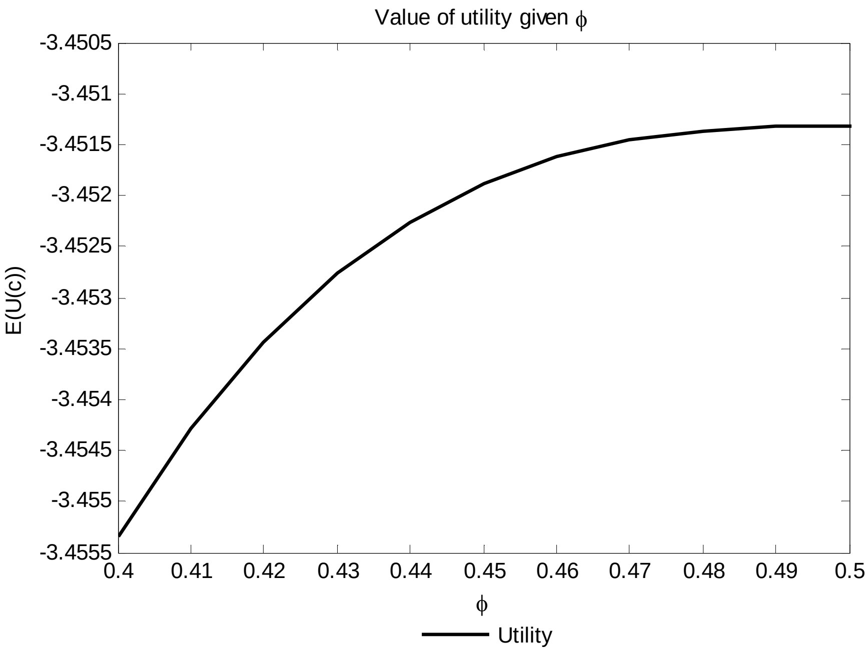


Figure 19

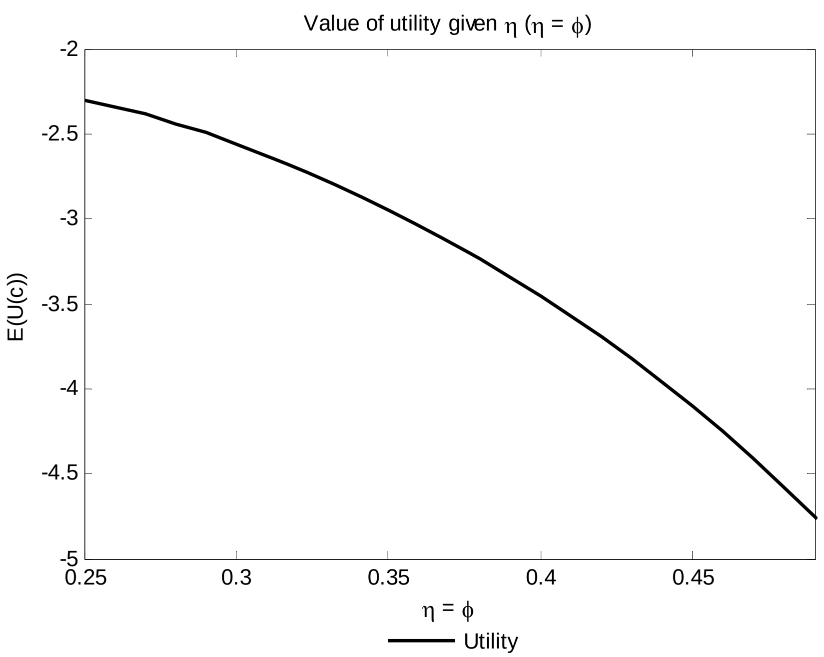


Figure 20

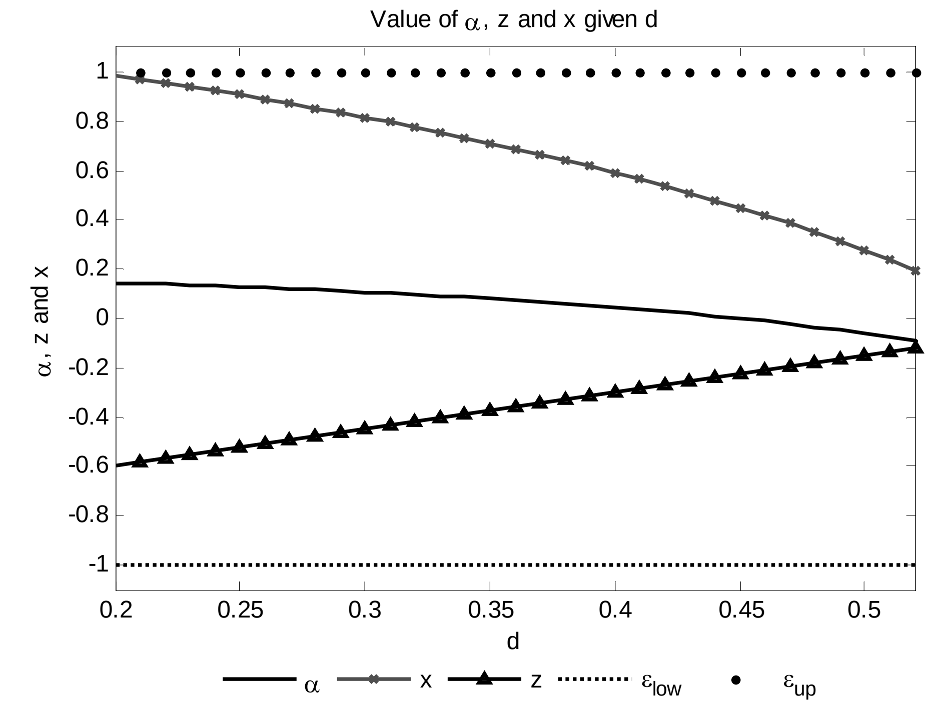


Figure 21