Modeling Australia’s Country Risk: A Country Beta Approach

Michael A. M. Gangemi, Robert D. Brooks, and Robert W. Faff

The debate on the consequences and appropriate policy response to Australia’s growing foreign debt has spawned a large literature. Part of this literature hypothesizes an adverse effect due to increased country risk. This paper analyzes Australia’s country risk using a country beta market model in the spirit of Harvey and Zhou (1993) and Erb et al. (1996a, 1996b). Specifically, we analyze the impact of macroeconomic variables, with a special focus on open economy variables, using a regression-based approach. We find that exchange rates are the only macroeconomic factor that has impacted significantly on Australia’s country beta. © 2000 Elsevier Science Inc.

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I. Introduction

It is widely believed that the continuing globalization of the world’s markets has considerably enhanced their integration, particularly in the past decade or so [see, for example, Naranjo and Protopapadakis (1997)]. In such an environment, in the context of the CAPM the most relevant risk/return relationship will be relative to a global market portfolio. Accordingly, many aspects of financial decision making, particularly for multinational companies, will need to adopt this type of framework. For example, the evaluation of offshore projects requires companies to consider this issue with considerable care. For example, Lessard (1996) and Godfrey and Espinou (1996) argue for an approach that requires (among other things) estimates of country-level risk.

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1 Naranjo and Protopapadakis (1997) provides a very good summary of recent studies that have examined the integration issue. It should be noted that the evidence is not universally in favor of a complete move to integration. Choi and Rajan (1997), for example, (employing data from Canada, France, Germany, Italy, Japan, Switzerland, and the United Kingdom) find in favor of partially segmented international capital markets.
The literature examining risk at the country level is well represented by Harvey (1991); Harvey and Zhou (1993); Erb et al. (1996a, 1996b); and Bekaert et al. (1996). The approach used by Erb et al. (1996a, 1996b) proposes that country beta depends upon the country credit rating, which in turn is a function of numerous economic, political, and financial variables. Specifically, their variable set includes political risk, inflation, exchange rate volatility, per capita GDP, growth of GDP, the size of the trade sector, the indebtedness of the country; debt service as a percentage of exports; the current account balance as a percentage of exports; and the trade balance.

For countries with a foreign debt that is predominantly official or government, country risk can be measured relatively easily by credit ratings. For example, Somerville and Taffler (1994) model credit ratings on government debt. Alternatively, De Haan et al. (1997) model the probability of debt rescheduling as a function of political and macroeconomic variables. However, for countries with a larger private sector debt, more refined measures are needed. For example, in Australia the mid-1996 the level of official net financial liabilities was around $60 billion compared to a figure of about $120 billion for non-official debt. One alternative measure of country risk is country beta [see Harvey (1991) and Harvey and Zhou (1993)]. Harvey and Zhou (1993) report country betas for 17 developed equity markets, while Erb et al. (1996b) extend this earlier analysis and report country betas for 21 developed and 26 emerging equity markets.

The current paper explores the relevance of the country beta approach in the Australian context. Specifically, the approach used in this paper is in the spirit of Erb et al. (1996a, 1996b), in that Australia’s country beta is allowed to vary as a function of a set of Australian macroeconomic variables. Our set of variables is generally similar to those chosen in the existing literature [see Erb et al. (1996a); Bekaert et al. (1996); Abell and Krueger (1989); and Groenewold and Fraser (1997)] and comprises Australian government’s net overseas borrowing; the rate of interest on 90-day bank accepted bills; the rate of interest on 10-year treasury bills; the price of wool; the Trade Weighted Index (TWI); the manufacturers price index; retail trade; the balance on current account; and the Australian money supply. While Erb et al. (1996b) specifically model country beta as a function of country credit risk, we look at the influence of economic variables, on Australia’s country beta. This is the primary contribution of our paper.

There has been much debate concerning the policy consequences of the growth in Australia’s foreign debt in the 1980s and 1990s. On the one hand, the Pitchford–Corden view of foreign debt contends that considerable benefits flow from foreign borrowing and that government intervention aimed at reducing or controlling foreign debt is unwarranted [see Pitchford (1989a, 1989b, 1990) and Corden (1991)]. On the other hand, it has been argued that foreign debt imposes costs on an economy, and in some circumstances, even at relatively low levels of foreign debt [see Stewart (1994), Ng and Fausten (1993), Knox (1996), and Applegate (1996)]. As such, our initial focus is on the role of foreign debt-related variables as potential sources of variation in country risk. Australia is an ideal choice for such an investigation, given the dramatic growth in foreign debt over recent years. That is, such increases in foreign debt may be important as a source of variation in country risk. As it turns out in our analysis, the only variable showing a significant role in the variation of Australia’s country beta is the TWI. Given the relative openness of the Australian economy and the

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2 For example, Stewart (1994) argues that domestic borrowers face a positively sloped supply curve for international funds. Hence, a higher level of foreign debt will lead to a currency depreciation, thus imposing real costs on the economy.
important role that external shocks play in impacting on macroeconomic performance, it is not surprising that the exchange rate is the primary determinant of country risk. Accordingly, the second (and major part) of our paper focuses on the relationship between beta and TWI.

The remainder of our paper is organized as follows. Section II first presents some statistics highlighting the rise in Australia’s foreign debt over the last two decades. It then discusses the opposing views of whether foreign debt has an important affect on country level risk. Section III outlines our approach to modeling time-varying country risk. Section IV contains the results of a regression-based approach to testing the effect of various macroeconomic variables on Australian country risk as measured by a country beta model. The final section contains some concluding comments.

II. Australia’s Foreign Debt Problem?

There has been a rapid increase in Australia’s foreign debt in the last 20 years. To illustrate, Figure 1 shows Australia’s Net External Debt over this period. It can be seen from the figure that this measure has risen in value quite dramatically from $10 billion in 1979–1980, to approximately $200 billion by 1996–1997.3

While the time series history of Australia’s foreign debt shows its growth, this provides little evidence on Australia’s indebtedness relative to the rest of the world. Accordingly, Table 1 highlights Australia’s foreign debt position on a comparative basis to a range of countries.4

3 The increase in Australia’s foreign debt over recent times is a manifestation of persistent current account deficits. There has been a rise in quarterly current account deficits from balance in the early 1970s to a record of approximately $8 billion by mid-1995. Current account deficits are financed by Capital account surpluses, which represents foreign borrowing. Consequently, persistent current account deficits lead to persistent capital account surpluses, thus leading to increased foreign debt. Similarly, the ratio of net foreign debt to GDP, which stood at less than 10 percent in the early 1980s, has grown to over 40 percent in the 1990s [source: RBA Bulletin, DX database].

4 We thank an anonymous referee for suggesting this additional perspective on the level of Australia’s indebtedness.
Table 1. A Country Comparison of Debt to GDP Ratios

<table>
<thead>
<tr>
<th>Year</th>
<th>Australia</th>
<th>Argentina</th>
<th>Brazil</th>
<th>Mexico</th>
<th>China</th>
<th>Indonesia</th>
<th>Malaysia</th>
<th>Philippines</th>
<th>Thailand</th>
<th>Vietnam</th>
<th>Hong Kong</th>
<th>South Korea</th>
<th>Singapore</th>
</tr>
</thead>
<tbody>
<tr>
<td>1992</td>
<td>44.1</td>
<td>29.7</td>
<td>20.1</td>
<td>33.9</td>
<td>10.1</td>
<td>32.6</td>
<td>9.2</td>
<td>24.4</td>
<td>13.8</td>
<td>12.8</td>
<td>1.1</td>
<td>7.8</td>
<td>0.8</td>
</tr>
<tr>
<td>1993</td>
<td>40.6</td>
<td>36.8</td>
<td>24.4</td>
<td>35.9</td>
<td>10.9</td>
<td>33.6</td>
<td>8.4</td>
<td>25.6</td>
<td>13.7</td>
<td>13.2</td>
<td>0.9</td>
<td>9.4</td>
<td>0.5</td>
</tr>
<tr>
<td>1994</td>
<td>32.4</td>
<td>31.0</td>
<td>30.6</td>
<td>28.0</td>
<td>8.9</td>
<td>30.7</td>
<td>8.9</td>
<td>18.9</td>
<td>13.5</td>
<td>7.3</td>
<td>1.5</td>
<td>6.9</td>
<td>0.4</td>
</tr>
</tbody>
</table>

This table presents comparative statistics on debt to GDP ratios across a range of countries. The data is presented for the years 1992 to 1994 and was sourced from the Datastream database.
Table 1 reports that for the years 1992–1994 Australia’s debt-to-GDP ratio ranged from a low of 32.4 percent to a high of 44.1 percent. In contrast, South Africa (like Australia, a predominantly resource-based economy), recorded debt-to-GDP figures of between 9 percent and 11 percent over the same period. Indeed, Australia’s high debt-to-GDP ratios were not even matched by the highly indebted South American economies (Argentina, Brazil, and Mexico) home of the 1980s “Debt Crisis” and the foreign debt caused “Peso Crisis” of 1993–94. The range of figures for these economies are 29.7 percent to 36.8 percent for Argentina, 20.1 percent to 30.6 percent for Brazil, and 28 percent to 35.9 percent for Mexico.

Interestingly, it could be argued that the current “Asian Crisis” has been caused in no small amount by the ballooning foreign debt and current account deficit figures of many of the newly industrializing economies (NIE) of Asia, which include China, Indonesia, Malaysia, Philippines, Thailand, and Vietnam. However, over the 3-year period 1992–1994, the debt-to-GDP figures recorded for these countries [ranging from 7.3 percent for Vietnam (in 1994) up to 33.6 percent for Indonesia (in 1993)] were all lower than the corresponding average figure for Australia of 39.03 percent.

Australia’s substantial current account deficits, and growing foreign debt, have been made possible by the current account surpluses and large foreign investment levels of countries such as Hong Kong, South Korea, and Singapore. Over the period 1992–1994, the debt-to-GDP ratios of these countries [classified as Developed Economies (Asia) in Table 1], provide a stark contrast to Australia’s figures. Specifically, the maximum debt service to GDP figure for South Korea is reported to be 9.4 percent, while for Hong Kong the maximum figure is 1.5 percent, and for Singapore, 0.8 percent.

Given the growth in Australia’s foreign debt in the 1980s and 1990s, together with its relatively high levels compared to other economies (as discussed above), there has been much debate concerning its policy consequences. The Pitchford–Corden view of foreign debt contends that considerable benefits flow from foreign borrowing and that government intervention aimed at reducing or controlling foreign debt is unwarranted. The counter view is that foreign debt imposes costs on an economy. Each of these positions are now briefly discussed in turn.

Pitchford (1989a, 1989b, 1990) argues that considerable benefits can flow from current account deficits and external debt. Capital is transferred between countries, with capital flowing to those countries with higher rates of return. This will lead, in part, to a current account deficit in the borrowing country (and a surplus in the lending country), which, again, is simply a reflection of domestic firms investing more than domestic households save. While interest and dividends will be paid to foreigners for the use of their funds, any growth occurring will expedite service and retirement of the debt, and wages, rents and residual profits will be retained by domestic agents. According to this view, such capital flows will maximize world income, as well as the income of the borrower and lender, and real capital inflow will raise real wages because it raises the capital/labor ratio.

Similar to Pitchford, Corden (1991) suggests that the current account deficit does not matter from a policy point of view. Corden’s “new view” argues, in part, that the current account is the net result of savings and investment in an economy, and that private (or national) savings and investment are determined independently and optimally. Therefore, an increase in the current account deficit that results from a rise in investment and a fall in savings should not be a matter of concern at all.

However, Corden does have a number of qualifications to his “new view.” These qualifications relate to 1) unsound private borrowing; 2) protectionism; 3) foreign own-
ership; and 4) exchange rate instability. In particular, he also suggests that there may be a “contamination effect” associated with foreign debt. Specifically, it may be the case that the larger the share of private agents and government equities and debt instruments issued in international portfolios, the greater the risk factor will be and, hence, the higher will be the interest rate that domestic borrowers will have to pay on international borrowings. Consequently, from this point of view, Corden sees potential for current account deficits and increasing debt as being of concern.

This contamination effect provides a motivation for a paper by Stewart (1994), who argues that domestic borrowers face a positively sloped supply curve for international funds. Based on actual Eurobond data, Stewart argues that the positive correlation between the costs of funds and external debt exists because investors anticipate a lower value for a nation’s currency as that nation’s external debt increases. In particular, Stewart sees a higher level of foreign debt leading to an anticipated currency depreciation, because an increase in national debt carries an obligation of repayment, and borrowers repaying their foreign currency loans places downward pressure on the national currency. Consequently, Stewart contends that external debt imposes real costs on an economy and that government intervention to restrict foreign borrowing is potentially beneficial. The very difficult question of course, is the appropriate timing and magnitude of this intervention.

III. Modeling Country Risk

Constant Beta Market Model of Country Risk

As a starting point for measuring country risk, a standard country beta market model is employed. Given that the focus of this study is modeling Australian country risk, our variables are analyzed in Australian dollars, with the model being of the form:

\[ R_{\text{aus},t} = a + b_0 R_{\text{wor},t} + e_t \]  

(1)

where \( R_{\text{aus},t} \) is the return on the Australian stock market index, \( a \) and \( b_0 \) are unknown parameters and \( R_{\text{wor},t} \) is the return on the global stock index.

As discussed later, the sample period chosen for analysis includes the October 1987 stock market crash. It is well known that the magnitude of the crash varied across different

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5 See Corden (1991, pp. 7–13) for a detailed discussion of these arguments.
6 This may be because of a large country effect or even for a small country with a diversity of expectations amongst economic agents as has been suggested by Ng and Fausten (1993).
7 In the context of trying to explain the Asian financial crisis of 1997–1998, Miller (1998, p. 231) makes a similar argument: “(c)urrencies linked to the dollar, therefore, inevitably became overvalued, and as the balance of payments of those countries deteriorated, their currencies became ripe for speculative attack...”
8 Knox (1996) also argues that foreign debt imposes costs on an economy. Knox (1996, pp. 79) contends that increases in Australia’s net foreign debt explain 67 percent of all increases in real housing loan interest rates on an annual basis since 1981 and that a 1 percent increase in net foreign debt generates a 0.18 percent increase in real housing loan interest rates. Similarly, Applegate (1996) contends that increased foreign debt leads to increases in the probability of default on repayment of this debt and, consequently, leads to an increase in default risk premiums being charged on foreign funds.
9 Most existing studies conduct their analysis from a U.S. investor’s point of view and hence use data measured in U.S. dollars terms [for example, see Harvey and Zhou (1993)]. Accordingly, we must be aware of a potential numeraire effect when comparing our results to the previous literature.
10 An issue here is whether to specify the models in excess or unadjusted returns form. Consistent with the literature, we find the results are insensitive to this choice.
national stock markets. In Australian dollar terms, the Australian market declined by 52.6 percent compared to a decline of only 12.3 percent based on the world market index. Thus, we would expect that this may impact upon country beta. Accordingly, we have the model:

\[ R_{\text{aus},t} = a + b_0 R_{\text{wor},t} + c_0 D_C R_{\text{wor},t} + e_t \]  

where \( D_C \) is a dummy variable taking the value of unity in October 1987 and zero otherwise.

**Justification of Time-Varying Country Beta**

The existence and consequent affect of business cycles through a variety of macroeconomic influences is an important argument for why we may observe time-varying country betas. Indeed, there is a growing literature around the affect of business cycles on risk and/or return [see, for example, Fama and French (1989) and McQueen and Roley (1993)]. Further, the notion that beta risk is time-varying, in part as a result of business cycles, is suggested by Ferson and Harvey (1991) and Jagannathan and Wang (1996).

The extension of these ideas to the international setting is quite appealing. For example, Dumas (1994) has had some success in explaining the behavior of international stock markets in terms of leading indicators of business cycles. Moreover, Erb et al. (1994) find that phases of the business cycle seem to affect return correlations between countries and that in particular, correlations tend to be at their lowest when both countries are in contractionary phases. Hence, we argue that a set of economic factors, which capture the basic influence of business cycles, may induce time-varying country betas.

While this issue has not been systematically explored for beta risk in an international setting, Diamonte et al. (1996) and Erb et al. (1996a) have recognized a mean reversion feature in other international risk measures. Specifically, Diamonte et al. (1996) investigated political risk in 24 emerging and 21 developed markets. Based on analysts’ estimates of political risk over the period 1985–1995, they observe that “. . . emerging markets have become politically safer and developed markets have become riskier.”

Erb et al. (1996a) conducted a more comprehensive study that investigates the economic content of five different measures of country risk (political, financial, economic, a composite measure, and country credit ratings) over the period 1984–1995 for 117 countries. A major concern in their study was the nature of country risk and how it should affect global investment strategies, particularly in the context of emerging markets where risk information is very limited. Their most relevant result with respect to the current paper is a confirmation of the mean reversion phenomenon documented by Diamonte et al. (1996) for political risk, across all of their risk measures.

**Potential Economic Variables Driving Time-Varying Country Beta**

Erb et al. (1996a) and Bekaert et al. (1996) suggest a variety of factors that potentially influence country risk including political risk, inflation, exchange rate volatility, per capita GDP, growth of GDP, the size of the trade sector, the indebtedness of the country, debt...
service as a percentage of exports, the current account balance as a percentage of exports, and the trade balance.

In a similar vein at the domestic level in the United States, Abell and Krueger (1989) investigate a variable beta model that includes a set of ten macroeconomic variables. Specifically, their variable set includes budget deficit, 6-month commercial paper rate, consumer price index, AAA corporate bond yield, crude oil producer price index, exchange rate, federal funds rate, money supply, merchandise trade balance, and unemployment rate.

Arguably of greatest relevance in guiding our selection of economic variables is a paper by Groenewold and Fraser (1997) in which the relationship between share prices and macroeconomic factors was investigated in an Australian setting. While their paper was primarily concerned with macrofactors from an APT point of view, it provides a useful guide for our variable selection. Specifically, their variable set included an index of production, employment; unemployment rate, manufacturing price index, award wages, definitions of aggregate money supply, 90-day bank accepted bill rate, exchange rates, and the current account deficit.

One constraint, highlighted by Groenewold and Fraser (1997, p. 1377), was that of data availability—for example, GDP and the consumer price index (CPI) are not available on a monthly basis in Australia. Nevertheless, their set of variables were chosen to capture both domestic and international influences. In the end, the precise choice is somewhat arbitrary. What is important, however, is that the group of variables chosen must, on the one hand, be representative of both the major domestic and international influences, while, on the other hand, not be so large that the analysis becomes unwieldy.

Accordingly, based on the different variables investigated in the papers just discussed [Erb et al. (1996a); Bekaert et al. (1996); Abell and Krueger (1989); and Groenewold and Fraser (1997)], and taking account of the data availability constraints, our chosen set of economic variables are presented in Table 2.

The variables TWI, MPI, RT, and BCA were used as measures for the exchange rate, inflation, economic activity and national debt, respectively. Of the remaining variables used, MNY was included because monetary policy has become an important policy tool used by the Australian government, GOVN was included because government borrowing affects national debt, BAB and TB10 were included because short-term and long-term interest rates are indicative of monetary policy and may also be affected by national debt (current account deficit), and WOOL was included because the Australian economy is, still, to a great extent a commodity-based economy.

### Table 2: Set of Economic Variables

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Economic Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOVN</td>
<td>Australian Government’s Net Overseas Borrowing</td>
</tr>
<tr>
<td>BAB</td>
<td>90-Day Bank Accepted Bill Rate</td>
</tr>
<tr>
<td>TB10</td>
<td>Ten-Year Treasury Bill Rate</td>
</tr>
<tr>
<td>WOOL</td>
<td>Wool Price</td>
</tr>
<tr>
<td>TWI</td>
<td>Trade Weighted Index</td>
</tr>
<tr>
<td>MPI</td>
<td>Manufacturers Price Index</td>
</tr>
<tr>
<td>RT</td>
<td>Retail Trade</td>
</tr>
<tr>
<td>BCA</td>
<td>Balance on Current Account</td>
</tr>
<tr>
<td>MNY</td>
<td>Australian Money Supply</td>
</tr>
</tbody>
</table>


Unanticipated Components of Economic Variables

In an efficient financial market, we would only expect stock market reaction to the unanticipated component of the macroeconomic variables. Thus, given we are analyzing stock market returns data, we focus on the unanticipated components of the macroeconomic variables. We find the unanticipated components as the residuals from ARIMA models fitted to the macroeconomic data. These ARIMA models were identified from the autocorrelation and partial autocorrelation functions of the data. The outcome of this analysis is reported in Table 3. It should be noted that in two cases, namely for the Wool and TWI variables, the first differences conformed to innovations without the need to apply ARIMA modeling.\(^\text{13}\)

The justification for using ARIMA models is provided by previous event study papers in Australia, which have used such an approach. For instance, Tan (1992) in analyzing the

\(^{13}\) All variables were first checked for stationarity using Dickey–Fuller tests and first differenced where necessary. To conserve space, details are not reported here but they are available from the authors upon request.
impact of money supply, inflation rate, and balance on current account announcements on 90-day bank bill futures used an ARIMA model to form the expected components of the macroeconomic announcement. Similarly, Singh (1993) used the ARIMA approach to study the impact of money supply announcement on the stock market. Likewise, Singh (1995) used the same approach to study the impact of balance on current account announcements on exchange rates, interest rates, and the stock market. These studies also provide indirect support for our choice of macroeconomic variables in this study.

There is a further advantage to the use of unexpected macroeconomic variables in our study. If we used the macroeconomic variables directly, then we might expect these variables to be highly correlated giving rise to multicollinearity problems. This problem should be minimized for the unexpected components of the macroeconomic variables. In fact, the highest correlation is only 0.35 between the unexpected component of the 90-day bank bill and the unexpected component of the 10-year bond. All other correlations are less than 0.2 in absolute value.

**Time-Varying Beta Market Model of Country Risk**

Based on the discussion above, we propose a time-varying model of beta as:

$$\beta_t = b_0 + b_1MNY + b_2GOVN + b_3BAB + b_4TB10 + b_5WOOL$$

$$+ b_6TWI + b_7MPI + b_8RT + b_9BCA + u_t$$

(3)

where all variables are defined as their unanticipated components, according to the analysis contained in the previous section.

Unfortunately, our model of time-varying beta in equation (3) cannot be directly estimated. This is due to the fact that one is unable to directly observe $\beta_t$. However, one could postulate a general time-varying beta market model of the form,

$$R_{aus} = a + \beta R_{wor} + e_t$$

(4)

Within this framework we can now substitute equation (3) for $\beta_t$ into equation (4). Thus, the specific time-varying beta market model of Australia’s country risk to be estimated is:\(^{14}\)

$$R_{aus} = a + b_0R_{wor} + b_1MNY R_{wor} + b_2GOVN R_{wor} + b_3BAB R_{wor} + b_4TB10 R_{wor} + b_5WOOL R_{wor} + b_6TWI R_{wor} + b_7MPI R_{wor} + b_8RT R_{wor} + b_9BCA R_{wor} + C_D D_t R_{wor} + e_t$$

(5)

We now have an equation completely in terms of observable variables. Thus, by estimation of equation (5), we can indirectly determine the values for the parameter estimates in equation (3).

Prior to turning our attention to the outcome of our empirical analysis, it is appropriate to make some brief comment on the expected signs on the macroeconomic variables, in their role as potential explanations of Australia’s time-varying beta risk. The first thing to

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\(^{14}\) The error term in equation (5) is potentially heteroskedastic [depending on the role of the error term in the time-varying beta equation (3)]. To allow for this potentiality, all regressions are run with the White heteroskedasticity adjustment.
be said on this issue is that formulating credible predictions is notoriously difficult. Indeed, in their domestic setting Abell and Krueger (1989) do not offer such predictions with regard to U.S. industry portfolio betas. Similarly, in their APT setting Groenewold and Fraser (1997) avoid this issue as well. What this serves to highlight is that the current analysis is, like Abell and Krueger (1989), somewhat exploratory in nature.

Nevertheless, some guarded general comments are possible. First, with regard to the debt-related variables, namely, GOVN and BCA, the predictions will (in part) relate back to the discussion of Section II. Specifically, while standard finance theory suggests a positive role for the debt variables [see Hamada (1972)], the extent of this effect will be modified by which of the views presented in Section II prevails. That is, the “beneficial” role of foreign debt propounded by Pitchford would tend to weaken this relationship, whereas the converse “negative” view of a potential “contamination” effect would tend to reinforce the positive prediction on the coefficients of the debt-related variables.

Second, with regard to the exchange rate variable, TWI, the prediction is contingent on (among other things) the relative roles of the traded/nontraded goods sectors, as well as the relative importance of the importing/exporting activity across the economy. As the nature of these relativities is likely to change over time, formulating a single prediction for Australia would be heroic. Indeed, like most developed economies, Australia has liberalized its financial and goods markets over our sample period. Thus, we expect the traded sector of the economy to have expanded, with growth in both imports and exports. As argued by Bodnar and Gentry (1993), the exchange rate sensitivity of firms will be of opposite signs, with an appreciation of the home currency generally having a positive effect for importers and a negative effect for exporters. Given that we are examining a country index, and that we are capturing these effects indirectly through the beta risk measure, they inevitably become confounded.

Finally, predictions regarding the remaining variables are even more problematic, and hence, similar to Abell and Krueger (1989) we leave these unspecified.

IV. Results

The analysis in this paper was conducted over the period 1974:1 to 1994:12, using monthly data. The data used for the Australian and World stock market indices were obtained from Morgan Stanley Capital International (MSCI). Specifically, the return on the MSCI Australian stock market index is used as the dependent variable, while the return on the MSCI global stock index is used as the proxy for the world return. The Australian macroeconomic data were obtained from the Australian Bureau of Statistics and the Reserve Bank of Australia Bulletin.

The results for the regression of equation (1) are reported in the first column of Table 4. Referring to the table, this model was found to be significant in explaining Australian country returns. Indeed, Australia’s estimated world beta of 0.5088 was found to be statistically significant at the 1 percent level. While this value contrasts the estimate of 1.1254 reported by Harvey and Zhou (1993), it compares very favorably with the 0.69 value reported by Erb et al. (1996b). This difference may be explained by variation in the sample period and/or measuring returns in different currencies. For example, Erb et al. (1996b) examined the 5-year period ending March 1995, with returns measured in U.S.
dollars. While our estimation period ends at roughly the same time, our beta is estimated over a 23-year period, with returns measured in Australian dollars.\footnote{Indeed, estimating Australia’s country beta over a similar period to Erb et al. (1996b) using U.S. dollar denominated returns produces a value of 0.628—an estimate extremely similar to theirs. As for the apparent discrepancy with the Harvey and Zhou beta estimate, it is noted that their time period covers 1970–May 1989 and that they use U.S. dollar returns. Yet again, by re-estimating Australia’s country beta over a similar 20-year period using U.S. dollar denominated returns, produces a value extremely similar to theirs, namely, 1.208. It should also be noted that Harvey and Zhou (1993) used excess returns data in contrast to the raw returns employed herein.}

This table reports the results of economic variable market models testing the significance of macroeconomic variables on Australian country beta and returns. The macroeconomic variables tested are: Australian Government’s net overseas borrowing (GOVN); the rate of interest on 90-day bank accepted bills (BAB); the rate of interest on ten-year treasury bills (TB10); the price of wool (WOOL); the Trade Weighted Index (TWI); the manufacturers price index (MPI); retail trade (RT); the balance on current account (BCA); and the Australian money supply (MNY). These variables are initially made stationary and then modelled using ARIMA techniques to obtain the unanticipated components. They are included interactively with the return on the world market index (RWOR) supplied by Morgan Stanley. A Dummy variable $D_c$, equal to unity in October 1987 (and zero otherwise), is also included to interact with RWOR. Parameters are estimated by OLS, an asterisk indicates statistical significance at the 5% level and t-statistics are reported in parentheses. All regressions are run with White’s heteroskedasticity adjustment.

\begin{table}[h]
\centering
\begin{tabular}{lcccc}
\hline
 & Constant & RWOR & RWOR $\times D_c$ & RWOR $\times$ GOVN \\
\hline
 & 0.0052 & 0.5088* & 3.5315* & 0.0004 \\
 & (1.16) & (3.40) & (34.96) & (1.32) \\
RWOR & 0.0086* & 0.3852* & 0.5183* & -0.0776 \\
 & (2.65) & (4.26) & (5.96) & (-0.74) \\
RWOR $\times D_c$ & 0.0089* & 4.1752* & 0.6667* & -0.1022 \\
 & (2.67) & (14.40) & (39.71) & (-0.47) \\
RWOR & 0.0101* & 0.5252* & 0.0050 & -0.0050 \\
 & (3.19) & (6.21) & (1.98) & (-0.12) \\
RWOR & 0.0052 & 0.0481* & 0.0003 & 0.0003 \\
 & (0.00) & (3.25) & (0.25) & (-0.12) \\
RWOR & 0.0000 & 0.0000 & -0.0000 & 0.0000 \\
 & (0.00) & (3.87) & (0.03) & (-0.07) \\
RWOR & 0.0000 & 0.0000 & 0.0000 & 0.0000 \\
 & (0.00) & (0.55) & (0.03) & (-0.07) \\
Adjusted R$^2$ & 0.1442 & 0.3655 & 0.4087 & 0.4098 \\
 & (0.97) & (2.4544) & (1.2436) & (1.2569) \\
D-W & 1.98 & 1.8030 & 1.8850 & 1.8679 \\
B-G LM Test & 0.0443 & 2.954 & 1.2436 & 1.2569 \\
 & (0.00) & (0.29) & (0.53) & (0.53) \\
White-Heteroskedasticity Test & 45.13 & 15.9192 & 54.9466 & 11.976 \\
 & (0.00) & (0.00) & (0.00) & (0.03) \\
ARCH Test & 0.0045 & 1.4779 & 0.3290 & 0.9408 \\
 & (0.94) & (0.22) & (0.56) & (0.48) \\
F Test & — & — & — & 0.9408 \\
 & — & — & — & (0.31) \\
\hline
\end{tabular}
\caption{Estimation of Time-Varying Beta Market Model of Australian Country Risk}
\end{table}
With regard to the considerable difference between the Erb et al. and Harvey and Zhou beta estimates, a potential explanation relates specifically to the growth in Australia’s indebtedness over our sample period. If there were a relationship between the level of external debt and the riskiness of a country, then Harvey and Zhou’s (1993) more recent beta estimate would refer to a higher debt period. We would expect our estimate of beta to be lower because much of our sample includes the lower debt period.\textsuperscript{16}

For the current study, the adjusted $R^2$ indicated that the model explained only 14.42 percent of the variation in Australian returns. No autocorrelation was found, with a Durbin–Watson value of 1.98. The Breusch–Godfrey LM test produced a value of 0.0443, also indicating an absence of autocorrelation. Unconditional heteroskedasticity is indicated by the White heteroskedasticity test, which takes a highly significant value of 45.13. In contrast, the LM test for ARCH effects produced a statistically insignificant value of 0.0045.

In unreported results, we also test the stability of the parameters of equation (1) using the CUSUM and CUSUM of squares test. The CUSUM test suggests the parameters are stable. In contrast, the CUSUM of squares test is indicative of parameter instability.

The results of the regression of equation (2) are also reported in Table 4, where it can be seen that the crash variable has a significant effect on Australia’s country beta. The value taken by the coefficient on the crash dummy ($c_0$) is 3.5315, implying a beta for October 1987 ($b_0 + c_0$) equal to 3.9167. This compares to a beta value of 0.3852 for the rest of the sample. We note this is lower than the country beta for the standard market model, which takes a value of 0.5088. Thus, in the standard market model the country beta is biased upward as a result of the crash. The adjusted $R^2$ indicates that the model augmented with a crash dummy now explains 36.55 percent of the variation in Australia’s country return. The Durbin–Watson statistic is 1.8030, indicating an absence of autocorrelation, which is also supported by the Breusch–Godfrey LM test taking a statistically insignificant value of 2.4544. The White heteroskedasticity test takes a statistically significant value of 15.9192. The ARCH LM test value of 1.4779, indicates an absence of ARCH effects.

The results of estimating the most comprehensive specification of the economic variable market model of equation (5) are also reported in Table 4. From these results, it can be seen that of the interactive macroeconomic variables, only the exchange rate variable (TWI) has a significant effect on Australia’s country beta and returns. This model explains 40.87 percent of the variation in Australian returns. The Durbin–Watson statistic is 1.8850, indicating an absence of autocorrelation, which is also supported by the Breusch–Godfrey LM test taking a statistically insignificant value of 1.2436. The White heteroskedasticity test value of 54.9466 indicates the presence of unconditional heteroskedasticity. However, an absence of conditional heteroskedasticity is indicated by the statistically insignificant value of the LM test of 0.3290.

Given that the full economic variable market model includes a number of insignificant variables, a more parsimonious model was estimated, whereby the significant macroeconomic variable, the trade-weighted index, was included, along with the crash dummy variable. This model is reported in the final column of Table 4. Once again, the TWI was found to have a significant effect on Australia’s country beta and return, along with the crash variable. This model explains 40.98 percent of the variation in Australia’s country return.

\textsuperscript{16} We thank an anonymous referee for suggesting this potential explanation.
return. The Durbin–Watson statistic of 1.8679 indicates an absence of autocorrelation. This absence of autocorrelation is supported by a Breusch–Godfrey LM test value of 1.2569. The White heteroskedasticity test takes a statistically significant value of 11.976, which is consistent with the presence of unconditional heteroskedasticity. However, the ARCH LM test value of 1.0004, indicates an absence of conditional heteroskedasticity. Finally, an $F$ test was calculated to compare our parsimonious model to the full economic variable market model. The $F$ test took a statistically insignificant value of 0.9408, which supports the parsimonious model.

Now consider the outcome of our preferred parsimonious model more closely. It is telling us that the base value for Australia’s country beta is 0.5252. Further, it suggests that the beta is modified in a positive direction by a positive change in the trade-weighted index (as this variable was first differenced to ensure stationarity). Specifically, the model indicates that a one unit increase in the TWI will lead to a 0.0586 unit increase in country beta, other things being equal. Hence, this suggests that an appreciation in Australia’s currency (against a trade-weighted basket) has a positive impact on the country beta.

Following on from the preceding discussion, the logical question that emerges is whether this statistically significant result translates into an economically significant outcome. To help answer this question, the parsimonious model was used to produce a plot of Australia’s country beta. Figure 2 shows Australia’s country beta over the period, 1977–1994, including the crash, while Figure 3 shows the same plot excluding the crash. Further, Table 5 shows associated summary statistics for the conditional beta series produced.

From the table, we see that the average time-varying beta is 0.5323 (0.5165 with the crash excluded). This compares favorably to the point estimate of 0.5088 reported in Table 4. Further, we see that (aside from the crash beta) the range of betas vary between a low of 0.0278 to a high of 0.7415. Hence, while the point estimate accurately captures the mean effect of beta over the period, it ignores this potential for quite a deal of time variation in Australia’s country beta.

It is quite apparent from Figure 3 that, apart from the crash of October 1987, the model produces several outlier betas. These cases are summarized in Table 6. The first case listed is for March 1983, in which a beta value of 0.1566 is produced. This coincides with a substantial increase in value in the world market (in Australian dollar terms), namely, a
Figure 3. Australia’s time-varying country beta (Parsimonious model, excluding the crash).

return of 13.55 percent for the same month. However, in a modeling sense, the reason for the dramatic fall in beta is the negative change in the TWI of $-6.3$ units. That is, this substantial monthly exchange rate depreciation of approximately 10 percent (the TWI index fell from 84.2 to 76.1) has induced the beta to be about 30 percent of its mean value.

From a broader economic point of view, however, we can link the events of this observation to the change of federal government that occurred in Australia at the time. This represented the election of a labor government for the first time in 8 years. The change of government coincided with a substantial capital outflow and consequent depreciation of the Australian dollar exchange rate.

The second outlier value for Australia’s country beta occurred in February 1985, in which the minimum value of 0.0278 was reached. Interestingly, this case also coincides with a large positive world market return of almost 14 percent. Once again, the dramatic fall in beta is the negative change in the TWI of $-8.5$ units (also approximately a fall of 10 percent). As briefly indicated in Table 6, the major economic event occurring at this time was the beginning of the deterioration in Australia’s terms of trade, which continued until mid 1986.

The final two outlier betas shown in Table 6 (June 1986 and February 1989) have a similar story as the two cases discussed above. In the case of the former, we identified the policy consequences of the Treasurer’s warning about Australia achieving a ‘banana republic’ status. Finally, in February 1989, the tightening of monetary policy by the Reserve Bank of Australia had become clear. The occurrence of these major economic

<table>
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V. Conclusion

The considerable growth in Australia’s foreign debt in the 1980s and 1990s has opened up a policy debate regarding its consequences. While one view [see Pitchford (1989a, 1989b, 1990) and Corden (1991)] suggests that foreign debt is beneficial, the opposing view cautions that foreign debt may impose costs on an economy [see Stewart (1994), Knox (1996) and Applegate (1996)]. We translate the thrust of this debate into a traditional finance setting and hypothesize that increases in foreign debt may be important as a source of variation in Australian country risk. Investigating this issue was an important focus of the current paper.

The literature examining risk at the country level is well represented by Harvey (1991); Harvey and Zhou (1993); Erb et al. (1996a, 1996b); and Bekaert et al. (1996). Following this literature, we explore the relevance of the country beta approach in the Australian context. Specifically, the approach we use is in the spirit of Erb et al. (1996a, 1996b), in that Australia’s country beta is allowed to vary as a function of a set of Australian macroeconomic variables. While Erb et al. (1996b) specifically model country beta as a function of country credit risk, we look at the influence of economic variables, notably including foreign debt, on Australia’s country beta. This is the primary contribution of our paper.

The set of economic variables chosen is generally similar to those chosen in the existing literature and comprises: Australian government’s net overseas borrowing; the rate of interest on 90-day bank accepted bills; the rate of interest on 10-year treasury bills; the price of wool; the trade-weighted index; the manufacturers price index; retail trade; the balance on current account; and the Australian money supply.

The outcome of our modeling shows that only the trade-weighted index of exchange rates is linked to variations in Australia’s country beta. The insignificance of the balance on current account is particularly interesting given its prominent role in the Australian external balance debate and its link to Australia’s increasing net foreign debt. This

17 For a further discussion of the economic climate prevailing in Australia around the time of the events discussed in this section, see Argy (1992)—particularly Chapter 21.
suggests that, at least in terms of a potential country risk effect, the Pitchford–Corden view of foreign debt having a beneficial impact is not rejected by our analysis.

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References


