

**Arms Races**

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We propose a model of an arms race between two nations A and B. The war potential of each is measured by the expenditure on arms as a function of time  $t$ ,  $x_A(t)$  and  $x_B(t)$  say. The rate of increase of A's armaments will depend on the level B has reached, but also on the A's own level, since the cost of expansion has a restraining effect. This restraint we suggest has a timescale equal to the lifetime of a national parliament. This cannot be the whole story since  $x_A = x_B = 0$  will be a stable equilibrium and no pair of nations would go to war. There are of course some instances where this is true: for example, Canada and the US have had permanent peace since 1817. This is presumably because there is no source of grievance between them. In general the rate of change of armament spending must contain a grievance term. This suggests a system of two states will be in equilibrium if the mutual grievances are balanced by the financial constraints. Does this mean the model requires three states to initiate war? Can equilibrium hold at any level of spending? It is interesting that spending on arms amongst the principal European protagonists prior to 1914 were given by the following table.

Year	1909	1910	1911	1912	1913
Spending £M	199	205	215	239	289

which shows how spending increased over the period.